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A Study of the Determinants of Capital Structure of Selected Cement Companies in India

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Abstract

Capital structure poses many challenges for companies. An appropriate mix of equity and debt is one of the most premeditated decisions for any organization. A wrong decision may hamper the growth of the company. There are many factors that must be taken into cognizance in determining the right mix of equity and debt. The Indian cement industry consists of a large number of small and big firms; however, 23 listed prominent cement companies are selected to identify relevant determinants of capital structure in the present study. Based on the analysis, it was found that factors such as growth, asset tangibility, tax rate, profitability, liquidity, size, cost of debt, and interest coverage ratio have a significant impact on the capital structure of the selected cement companies.

Keywords: Cement Industry, Capital Structure, Determinants of Capital Structure

Introduction

Capital structure is a combination of debt and equity capital that the company uses to finance its assets, operations, and future growth (Baker & Martin, 2011). It is the ratio between owner's funds and borrowed funds, i.e., long-term sources of funds. Owner's funds include share capital, preference share capital, reserves and surplus or retained earnings, and borrowed funds include long-term debts such as bonds, loans from banks and other financial institutions (Bhayani, 2005).

Capital structure refers to the amount of debt and/or equity used by a company to finance its operations and finance its assets. The proportion of debt to equity is a strategic choice of corporate managers (Niresh & Velnampy, 2012). This is usually expressed as a debt-to-equity ratio or debt-to-equity. Debt and equity funds are used to finance business operations, capital expenditures, acquisitions, and other investments. These decisions are very crucial for any firm, whether to raise funds from debt or equity, as both sources have specific cost of capital and affect the value of the firm (Jain & Khalsa, 2019).

The most appropriate capital structure for an organization is one of the most debated issues. While some arguments state that capital structure is not relevant for the valuation of a company's securities or the risk of investing in them, others comment that capital structures increasingly affect both value and risk. The optimal capital structure is constantly evolving, and successful business leaders must constantly consider factors such as the company and its management, government regulations, societal trends and the state of capital markets and industry dynamics (Handoo & Sharma, 2014). The term "capital structure" represents the share of capital that a company uses in its operation. Companies either use equity or debt or a combination of these to finance assets. The paper on capital structure was originally presented by Modigliani and Miller (1958).

Capital structure has been recognized as a significant factor that considerably affects the profitability of companies. A company's profitability is a key factor in measuring performance and enhancing its reputation. It also increases the value of both investors and owners. However, the profitability of a company is affected by many internal and external factors. Among these factors that significantly influence the profitability of companies is their capital structure (Sdhiq & Sher, 2014; Babbar & Singh, 2024).

The most appropriate financial structure of the organization is the most debated question. While some controversies suggest that financial performance is not critical to in-

forming or investing in corporate securities, others point out that capital formation has always had a significant impact on both value and risk. The ideal financial structure is constantly evolving, and successful corporate leaders must constantly consider factors such as corporate governance, economy, public administration, social customs, financial market conditions and industry flexibility (Handoo & Sharma, 2014).

Literature Review

Theories of capital structure, such as Trade-Off Theory, Pecking Order Theory, and Agency Theory, offer key insights into the capital structure of the firms. According to the Trade-Off Theory, firms weigh the advantages of debt-related tax benefits against the risks of financial distress and bankruptcy, shaping their leverage decisions. Modigliani and Miller (1963) highlighted the importance of tax shields, while subsequent research emphasized the costs associated with higher debt levels. The Pecking Order Theory, proposed by Myers and Majluf (1984), explains that firms prefer internal funding over debt and equity due to concerns about information asymmetry, making profitability and retained earnings significant determinants of leverage. Agency Theory focuses on conflicts of interest between stakeholders, suggesting that factors such as asset structure and managerial incentives influence financing decisions. Empirical studies of capital structure show that variables like firm size, profitability, and growth opportunities interact with these theoretical perspectives, providing a framework for understanding capital structure choices across different sectors of industry Ranjan and Zingals (1995).

Modigliani and Miller (1958) developed the capital structure irrelevance theory. They argued that under ideal marketing conditions, a company's capital structure does not affect its total value. Since the value of a company is calculated as the present value of future cash flows, the capital structure cannot affect it. They did not consider the taxes while analysing the data to develop their theory. Later on, this assumption was considered impractical, and in their subsequent research, Modigliani and Miller (1963) revised their view by taking into account corporate income tax and concluded that interest payments of debt are tax-deductible. It generates a tax shield that increases the firm's value as leverage rises. Under this revised framework, they emphasized that the firm must employ maximum debt to maximise the firm's value. In the process, they challenge the results of their irrelevance theory.

Modigliani and Miller (1977) later modified their earlier research work of 1963. Their new analysis includes personal taxes on both equity and debt income. In the

new analysis, personal taxes were divided into two categories: the tax on income from holding shares and the tax on income from debt securities. They demonstrated that when personal taxes are considered along with corporate tax, the net tax advantage of debt may be reduced or may become zero under certain conditions. In this, they further mentioned that leverage may be beneficial at the aggregate or macro level, an optimal capital structure may not exist at the firm (micro) level.

In contrast to tax-based explanations of the capital structure, there is another well-known theory called agency theory, proposed by Jensen and Meckling (1976). Their theory emphasized conflicts of interest among actors, i.e., managers, shareholders, and debt holders. They argued that capital structure influences the firm value through agency costs, including monitoring costs, bonding costs, and residual losses. They suggested that a debt can serve as a disciplinary mechanism by limiting managerial discretion and reducing free cash flows, but excessive leverage may encourage risk shifting and underinvestment. It is therefore necessary for the firm to have a good capital structure that balances debt benefits against the rising agency costs.

The notion of optimum capital structure is also expressed by Myers (1984), who was based on the notion of asymmetric information. Myers and Majluf (1984) added that if investors do not know more than company insiders when issuing shares, it can lead to mispricing. Inequality can be avoided if the business uses external financing, then low debt, and finally equity to fund new financing. The endowment theory proposed by Jensen (1986) states that firms will invest in large projects or bad advice that reduces corporate ownership, a problem that can be alleviated by borrowing more or paying more to fix it. Driffield and Pal (2001) studied the trend of capital structure in Indian companies from 1989 to 1997 and found that the main source of finance for businesses is debt and other borrowings. Song and Hang (2005) studied 6,000 Swedish companies to find out the factors that best suit the capital structure and concluded that Swedish firms are very reluctant about the amount of debt and the level of leverage when choosing a capital structure mix.

Niresh and Velnampy (2012) drew a link between capital structure and productivity and reasoned that capital structure has an adverse effect, in addition to debt, on value and ROE. This study was conducted on banks that are extremely supportive of the banking industry. Panigarhi (2013) investigated adverse working capital and profitability and found that low working capital leads to a bad liquid position within the organization, which is not at all desirable. There is a positive relationship between working capital and profitability, but this is not true in all cases. The study

found that there is a positive relationship between working capital and profitability. Revenues are higher in the case of higher working capital and vice versa.

Rajan and Zingales (1995) found that size, growth, profitability, and tangible assets are significant determinants of the capital structure of US companies. Lima (2009), Sayeed (2011), Siddiqui (2012), and Hossain and Ali (2012) argued that growth rate, tangibility, operating leverage, debt service capacity, age, and size of managerial ownership have significant effects on capital structure decisions. Kumar (2014) studied the capital structure of SMEs. The results showed that long-term investments accounted for roughly two-thirds of the total amount compared to short-term investments. As firms showed a greater reliance on equity financing, the associated financial risks were relatively low. It was found that companies were not using their debt in a way that would greatly benefit shareholders, as the highest profit margin was demonstrated. Jain and Khalsa (2019) studied the capital structure pattern of Indian companies, and an attempt was made to find out the capital structure pattern followed by blue-chip companies.

Based on the above literature review, it is found that different studies have been done on the determinants of the capital structure, but they are different in terms of context, research units, and no recent study has been conducted on the determinants of capital structure in the cement industry.

Table 1:

Determinant wise Summary of Review of Literature on the Determinants of Capital Structure

Authors / Determinants	1	2	3	4	5	6	7	8	9	10	11	12	13	14	No. of determinants
Asset Structure	Y	N	N	N	N	N	N	N	Y	Y	N	Y	N	Y	5
Corporate Size	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	12
Profitability	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	13
Age	N	Y	N	Y	Y	N	N	N	N	N	Y	N	N	Y	5
Value of Asset	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	1
Business Risk	Y	Y	N	Y	N	N	N	N	Y	N	Y	N	N	N	5
Dividend Policy	N	Y	N	N	N	N	N	N	N	N	Y	N	N	N	2

Debt Service capacity	Y	N	Y	N	Y	N	N	N	N	N	Y	N	N	N	4
Non-Debt Tax Shield	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	12
Managerial Ownership	N	N	Y	N	N	N	N	N	N	N	Y	N	N	N	2
Agency Cost	N	N	Y	N	N	N	N	N	Y	N	N	N	Y	N	3
Liquidity Ratio	N	N	Y	Y	Y	N	N	N	Y	N	Y	N	N	N	5
Growth	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	13
Asset Tangibility	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N	8
Debt Tax Shield	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	1
Financial Cost	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	1
Free Cash Flow	N	N	Y	N	N	N	N	N	N	N	Y	N	Y	N	3
Cost of Debt	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	1
Financial Distress	N	N	N	N	Y	N	Y	N	Y	N	N	N	Y	Y	5
Tax Rate	N	N	N	N	Y	N	Y	Y	Y	Y	N	N	Y	N	6
Volatility	N	N	N	N	N	N	N	Y	N	Y	N	Y	N	N	3
Industry Classification	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N	2
Uniqueness	N	N	N	N	N	N	N	N	N	Y	N	Y	N	Y	3
Inflation	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	1
GDP	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	1
Signalling	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	1

Sources: 1. Bhayani (2005): 2. Sibindi (2016): 3. Hossain & Hossain (2015) 4. Sinha & Samanta (2014): 5. Handoo & Sharma (2014): 6. Song (2005) 7. Qi Song 8. Bauer (2004): 9. Modugu (2015): 10. Mishra (2011): 11. Chaddha & Sharma (2015): 12. Titman & et.al (1988): 13. De Miguel et.al (2001): 14. Bhaduri (2002)

It is evident from Table 1 that the most commonly used determinants of capital structure are growth, corporate size, non-tax debt shield (NDTS), and profitability, and the least commonly used determinants are managerial ownership, financial cost, free cash flow, volatility, and industry classification. Based on the above analysis in the present study, 10 determinants have been identified. These are growth,

asset tangibility, size, cost of debt, liquidity, profitability, tax rate, age, non-tax debt shield, and interest coverage ratio. Based on the above review of literature, this study is undertaken to investigate the factors affecting the capital structure decisions and to analyse the relationship of selected determinants of capital structure with total debt, short-term debt, and long-term debt.

Research Methodology

This section presents the context of the study, research objectives, research questions, and hypothesis, the data used, as well as the research design.

Context

Capital structure decisions are very crucial decisions for any organization. The choice of capital structure is the most fundamental issue of the financial framework of a business activity. In this paper, factors affecting the capital structure decisions have been studied to help firms make capital structure decisions. The cement industry has been chosen as not many studies are available in this sector and this sector has a very significant role in India's GDP.

Research Objectives: As mentioned above, the determinants of capital structure are studied by many researchers. These studies are different in many contexts, such as the number of determinants, time horizon, research units, and industry. Based on the literature review, the following objectives are identified for the present study to investigate the factors affecting the capital structure decisions.

- To study and analyse the relationship of selected determinants of capital structure on total debt.
- To study and analyse the relationship of selected determinants of capital structure on long-term debt.
- To study and analyse the relationship of selected determinants of capital structure on short-term debt.

The objectives have been divided into various models for the sake of better investigations. The sample comprises Indian cement companies, considering three dependent variables namely short-term debt, long-term debt, and total debt, and 10 independent variables, namely growth rate, tangibility ratio, tax rate, profitability ratio, liquidity ratio, size of company, cost of debt, age of the company, non-tax debt shield, and interest coverage ratio.

The objectives will be studied in the context of 3 Models (i) **Total debt Model:** Indian cement companies and total debt: To understand the impact of each independent variable while raising total debts of Indian cement companies. **(ii) Long Term debt Model**: Indian cement companies and long-term debt: To understand the impact of each independent variable while raising long term debts for Indian cement companies. (iii) **Short Term debt Model:** Indian cement companies and short-term debt: To understand the impact of each independent variable while raising short term debts for Indian cement companies.

Research Questions: The present study is an attempt to find a possible answer to the following research questions

- RQ1: What are the important determinants of capital structure?
- RQ2: How do the determinants impact the Total debts, long term debt and short-term debt?
- RQ3: Which factors influence the capital structure decisions most?
- RQ4: Which factors do not influence the capital structure?

Research Hypotheses: Based on the review of literature research hypotheses of the present study are in line with research objectives and research questions and are listed as under.

H_o1: There is no significant impact of firm specific factors on total debt to asset ratio.

H_o2: There is no significant impact of firm specific factors on long term debt to asset ratio

H_o3: There is no significant impact of firm specific factors on short term debt to asset ratio

Research Design

The research design of this research paper is explanatory, considering three regression models. It is based on secondary data compiled from websites such as Money Control, Business Standard, and annual reports of the companies, but is also sufficient to justify saying that the design is conclusive.

The multiple regression analysis is done to assess the impact of determinants of capital structure on total debts, long term debts and short-term debts. The functional form of multiple regression equations is as follows:

Model 1: Impact of determinants on total debts

$$Total\ Debt = \beta_0 + \beta_1 Growth\ rate + \beta_2 Tangibility\ ratio + \beta_3 Tax\ rate + \beta_4 Profitability\ ratio + \beta_5 Liquidity\ ratio + \beta_6 Size\ of\ the\ company + \beta_7 Cost\ of\ debt + \beta_8 Age\ of\ the\ company + \beta_9 NTDS + \beta_{10} Interest\ coverage\ ratio + \varepsilon$$

where Total debt is the dependent variable and from X_1 to X_{10} are independent variables such as X_1 = Growth rate and X_2 = Tangibility ratio, X_3 = Tax rate, X_4 = Profitability ratio, X_5 = Liquidity ratio, X_6 = Size of the company, X_7 = Cost of debt, X_8 = Age of the company, X_9 = NTDS (Non-Tax Debt Shield), and X_{10} = Interest coverage ratio and is the error term.

Model 2: Impact of determinants on long term debts

$$Long\ Term\ Debt = \beta_0 + \beta_1 Growth\ rate + \beta_2 Tangibility\ ratio + \beta_3 Tax\ rate + \beta_4 Profitability\ ratio + \beta_5 Liquidity\ ratio + \beta_6 Size\ of\ the\ company + \beta_7 Cost\ of\ debt + \beta_8 Age\ of\ the\ company + \beta_9 NTDS + \beta_{10} Interest\ coverage\ ratio + \varepsilon$$

where long term debt is the dependent variable and from X_1 to X_{10} are independent variables such as, X_1 = Growth rate and X_2 = Tangibility ratio, X_3 = Tax rate, X_4 = Profitability ratio, X_5 = Liquidity ratio, X_6 = Size of the company, X_7 = Cost of debt, X_8 = Age of the company, X_9 = NTDS (Non-Tax Debt Shield), and X_{10} = Interest coverage ratio and is the error term.

Model 3: Impact of determinants on short term debts

$$Short\ Term\ Debt = \beta_0 + \beta_1 Growth\ rate + \beta_2 Tangibility\ ratio + \beta_3 Tax\ rate + \beta_4 Profitability\ ratio + \beta_5 Liquidity\ ratio + \beta_6 Size\ of\ the\ company + \beta_7 Cost\ of\ debt + \beta_8 Age\ of\ the\ company + \beta_9 NTDS + \beta_{10} Interest\ coverage\ ratio + \varepsilon$$

where Short term debt is the dependent variable and from X_1 to X_{10} are independent variables such as , X_1 = Growth rate and X_2 = Tangibility ratio, X_3 = Tax rate, X_4

= Profitability ratio, X_5 = Liquidity ratio, X_6 = Size of the company, X_7 = Cost of debt, X_8 = Age of the company, X_9 = NTDS (Non-Tax Debt Shield), and X_{10} = Interest coverage ratio and is the error term.

Data: The data for this study, drawn from 23 Indian cement companies (Appendix) listed on the National Stock Exchange, spans 18 years from 2003-04 to 2020-21. The selection criteria for these companies were based on the availability of consistent data. The primary sources of data include annual reports and financial websites such as Money Control, Business Standard, and Yahoo Finance. Statistical analyses, including descriptive statistics, were conducted, with key computations involving variables such as total debt ratio, long-term debt ratio, short-term debt ratio, growth rate, asset tangibility, firm size, cost of debt, liquidity ratio, profitability ratio, tax rate, age, non-tax debt shield, and interest coverage ratio. To examine the impact of independent variables on dependent variables, correlation and multiple regression analysis were employed using SPSS version 25. The dependent variables—total debt, long-term debt, and short-term debt—were analyzed in relation to 10 determinants: growth, asset tangibility, firm size, cost of debt, liquidity, profitability, tax rate, age, non-tax debt shield, and interest coverage ratio. The results of the analyses are presented in tabular form to provide clear insights into the relationships between these variables.

Brief of dependent variables: Three different measurements of capital structure, i.e., Total Debt Ratio, Long Term Debt Ratio, and Short-Term Debt Ratio, have been used as dependent variables, based on their book values, as mentioned above. A brief explanation of these dependent variables is given as follows.

- Total Debt Ratio = Total Debt/ Total Asset. The debt ratio measures how well borrowed funds support a company's assets.
- Long Term Debt Ratio= Long Term Debts/Total Assets. It indicates the percentage of total assets of the companies that are financed by long-term debt.
- Short Term Debt Ratio= Short Term Debt/ Total Assets. This ratio indicates whether a company can meet its immediate financial obligations. Calculated as short-term borrowings against total assets.

Brief description of 10 Independent Variables: The study is based on 10 independent variables as determinants of capital structure. These determinants are explained in brief in the following, along with a brief support from existing literature.

(i) Growth Rate: The functional formula for calculating the growth rate of a company is ((present-past)/ past) or (Total Assets of current year-Total Assets of Previous Year)/ Total Assets in Previous Year. Companies with a high growth rate are relatively large and have the capacity to implement expansion projects, creating new product lines, acquisitions of other companies, and efficient maintenance and replacement of existing assets. Companies with high growth rates and high cash flow volatility have an incentive to deleverage their capital structure over time. Growth is measured using the growth rate of total assets. Growth rate is also measured as the rate of change in wealth. The growth rate as the determinants of the capital structure is studied by Rajan and Zingales (1995), Barclay and Smith (2005), Ahmed et al (2010), Bhayani (2005), Sibindi (2016), Hossain and Hossain (2015), Sinha and Samanta (2014), Handoo and Sharma (2014), Song (2005), Bauer (2004), Modugu (2015), Mishra (2011), Chaddha & Sharma (2015), Titman & et.al (1988), and Bhaduri (2002) besides others.

(ii) Asset Tangibility: The asset tangibility is defined as total fixed assets divided by total assets, wherein total assets are the total of tangible and intangible assets. Tangible assets that are land, buildings, machinery, equipment, etc are more easily acquired by the companies following the path of acquisition. The intangible assets cannot be acquired so easily (Frank & Goyal, 2009). The asset tangibility is studied in the context of capital structure, debt capacity, and bankruptcy is studied in the past by Sibindi (2016), Hossain and Hossain (2015), Sinha and Samanta (2014), Handoo and Sharma (2014), Ahmed and Abbas, 2011), Song (2005), Bauer (2004), Chaddha and Sharma (2015).

(iii) Size of the company: It is measured as the natural log of total assets. It is incorporated as a determinant to compare financial stress in companies with respect to their size (total assets). The size of the company is included as a determinant of capital structure, investment decisions, and raising debt in the past by Marsh (1982), Bennett and Donnelly (1993), Bhayani (2005), Sibindi (2016), Sinha and Samanta (2014), Handoo and Sharma (2014), Song (2005), Bauer (2004), Modugu (2015), Mishra (2011), Chaddha and Sharma (2015), Titman et al, (1988), Bhaduri (2002).

(iv) Cost of Debt: Cost of debt is measured as interest before tax divided by long term debts. Cost of debt is defined as the cost to the company, which is the effective interest rate that a company must pay on its current debt. Handoo and Sharma (2014) studied this as a determinant with pre-tax interest/long-term debt, i.e., a measure of borrowing costs. It is the least used determinant. Even Kumar et al

(2017) reported one article on the cement industry in their review paper on capital structure for the period 1972 to 2013.

(v) Liquidity: Liquidity is calculated as the ratio of total current assets to total current liabilities. It is studied as a determinant of capital structure by many researchers including Hossain and Ali (2012), Hossain and Hossain (2015), Sinha and Samanta (2014), Handoo and Sharma (2014), Modugu (2015), and Chaddha and Sharma (2015).

(vi) Profitability: The profitability is measured as operating margin (earnings before interest and taxes (EBIT) / total assets). Baral (2004) mentioned that profitable firms have better capacity to borrow, and providers of debt will be willing to provide funds to profitable companies. In addition, profitability as a determinant of capital structure studied by many researchers including Bhayani (2005), Sibindi (2016), Hossain and Hossain (2015), Sinha and Samanta (2014), Handoo and Sharma (2014), Song (2005), Bauer (2004), Modugu (2015), Mishra (2011), Chaddha and Sharma (2015), Titman & et al, (1988), Bhaduri (2002).

(vii) Tax Rate: It is computed as [(tax expenses / profit before tax) *100]. Many variations in the computation of tax exits in practice, such as the inclusion of personal income as a determinant of capital structure by Modigliani and Miller (1977). The other researchers who incorporated tax rate as a determinant of capital structure are Handoo and Sharma (2014), Song (2005), Bauer (2004), Modugu (2015), Mishra (2011), and Miguel et al. (2001).

(viii) Age: Age refers to the number of years since the start of the company. It is used as a dummy variable in the studies by all researchers. In the current study, it is also used as a dummy variable with a value of 1 if the company was founded less than 40 years ago, and 0 otherwise. Ahmed and Aris (2015) also studied age as a determinant of capital structure and discovered the negative relationship between age and capital structure.

(ix) Non-Tax Debt Shield: Non-tax debt shield is measured as depreciation or amortization divided by total assets. The non-debt tax as an indicator is a direct estimate of the non-debt tax shelter relative to total assets and studied by Bhayani (2005), Sibindi (2016), Hossain and Hossain (2015), Sinha and Samanta (2014), Song (2005), Bauer (2004), Chaddha and Sharma (2015), Titman et al, (1988), Miguel et al, (2001), and Bhaduri (2002). DeAngelo and Masulis (1980) propose the ideal capital structure used in the tax-protected companies and non-lending companies.

(x) Interest Coverage Ratio: The interest coverage ratio is calculated as the company's earnings before interest and taxes (EBIT) divided by its interest expense during a given period. The interest rate ratio is used to determine how easily a company can repay the interest on its debt. This factor is also studied as a determinant of the capital structure (Siddiqui, 2012; Lima, 2009; Bhayani, 2005; Hossain & Hossain, 2015; Handoo & Sharma, 2014).

Results and Discussions

The results of the analysis are presented in this section. As mentioned earlier, descriptive analysis, correlation analysis, and multiple regression analysis have been done on dependent and independent variables. The descriptive analysis is shown in Table 2, the results of correlation analysis are presented in Table 3, and the results of multiple regression analysis are presented in Tables 4 and 7. Here, models are named with the names of dependent variables.

Descriptive Analysis

Descriptive statistics of the measurement of capital structure (total debt ratio, long-term debt ratio, and short-term debt ratio) and determinants (growth, tangibility, tax rate, profitability, liquidity, size, cost of debt, age, NTDS, interest coverage ratio) of 23 selected cement companies are presented in Table 2 in the context of research objectives.

Table 2:

Descriptive Analysis of Dependent and Independent Variables

Variables	Range	Minimum	Maximum	Mean	Std. Error
Growth Rate	1376.58	-40.72	1335.86	16.8450	3.43
Tang.	0.95	0.00	0.95	0.57	0.00
Tax Rate	1155.95	-441.67	714.29	21.88	3.00
Pro.	114.22	-24.56	89.66	5.74	0.38
Liq.	336.90	-3.22	333.68	2.18	0.80
Size	8.96	2.34	11.29	7.48	0.08
COD	471.96	0.00	471.96	23.55	2.47
Age	136.00	11.00	147.00	46.94	1.30
NTDS	49.71	0.00	49.71	4.74	0.29

Variables	Range	Minimum	Maximum	Mean	Std. Error
ICR	239.98	-1.80	238.18	12.63	1.05
TDR	208.94	16.57	225.51	58.09	1.06
LTR	79.46	0.00	79.46	28.91	0.81
STR	159.84	0.30	160.14	29.21	0.77

Author's Calculations

The descriptive statistics reveal significant variability in several variables. Growth Rate shows a wide range (1376.58) with a high standard deviation (69.70), indicating substantial differences in companies' performance, with some experiencing extreme growth and others facing declines. Tangibility averages at 0.57, suggesting 57% of assets are tangible, with minimal variation (Std. Dev. 0.15). Tax Rate exhibits considerable variation (Range: 1155.95), with a mean of 21.88, reflecting fluctuations in tax obligations across firms or periods. Profitability (Pro.) has a modest average (5.74) and limited variation (Std. Dev. 7.80). Liquidity (Liq.) shows a mean of 2.18 and a relatively high range (336.90), indicating differing financial stability among firms. Size has a moderate range (8.96) and a mean of 7.48, reflecting relatively similar company scales. Cost of Debt (COD), with a mean of 23.55 and a range of 471.96, indicates diverse borrowing costs. Age shows a wide range (136 years) but an average of 46.94 years, indicating a mix of established and newer firms. Non-tax debt shield (NTDS) and Interest Coverage Ratio (ICR) also exhibit considerable variation, with means of 4.74 and 12.63, respectively. Total Debt Ratio (TDR), Long-Term Ratio (LTR), and Short-Term Ratio (STR) have means of 58.09, 28.91, and 29.21, with moderate variability, indicating differences in debt structure among the companies.

Correlation Analysis

Correlation between two variables measures the degree of linear association between them. In this paper, the correlation analysis is undertaken to find out the relationship between capital structure (Total debt, long-term debt, and short-term debt) and determinants (growth, tangibility, tax rate, profitability, liquidity, size, cost of debt, age, NTDS, interest coverage ratio) (Table 3).

Table 3:

Relationship between Capital structure and determinants through Correlation Analysis

	Growth rate	Tang.	Tax Rate	Pro.	Liq.	Size	Cod	Age	NTDS	ICR	TDR	LTDR	STDR
Growth rate	1	.078	.024	.053	-.010	-.027	-.035	-.072	-.037	.056	.011	.082	-.072
Tangibility	.078	1	-.057	-.072	-.198**	-.146**	-.267**	-.076	.169**	-.121*	.200**	.421**	-.171**
Tax Rate	.024	-.057	1	.031	.013	.014	.002	.025	.026	.016	-.168**	-.102*	-.137**
Profitability	.053	-.072	.031	1	-.028	-.040	.009	-.058	-.047	.428**	-.257**	-.301**	-.035
Liquidity	-.010	-.198**	.013	-.028	1	-.096*	-.019	-.003	-.042	-.008	-.023	.071	-.107*
Size	-.027	-.146**	.014	-.040	-.096*	1	.158**	.077	-.392**	-.014	-.193**	-.039	-.226**
Cod	-.035	-.267**	.002	.009	-.019	.158**	1	-.082	.016	.085	-.256**	-.315**	-.025
Age	-.072	-.076	.025	-.058	-.003	.077	-.082	1	-.219**	.063	-.055	-.197**	.132**
NTDS	-.037	.169**	.026	-.047	-.042	-.392**	.016	-.219**	1	-.056	.082	.038	.073
ICR	.056	-.121*	.016	.428**	-.008	-.014	.085	.063	-.056	1	-.370**	-.377**	-.117*
TDR	.011	.200**	-.168**	-.257**	-.023	-.193**	-.256**	-.055	.082	-.370**	1	.698**	.656**
LTDR	.082	.421**	-.102*	-.301**	.071	-.039	-.315**	-.197**	.038	-.377**	.698**	1	-.079
STDR	-.072	-.171**	-.137**	-.035	-.107*	-.226**	-.025	.132**	.073	-.117*	.656**	-.079	1

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)
Author's calculations

The correlation matrix reveals weak and strong relationships among variables. Growth Rate shows weak correlations, with a slight positive association with LTDR (0.082) and ICR (0.056), indicating limited dependence on these factors. Tangibility is positively correlated with TDR (0.200), LTDR (0.421), and NTDS (0.169) but negatively with liquidity (-0.198) and COD (-0.267), suggesting firms with higher tangible assets rely more on debt while being less liquid and facing lower borrowing costs. Tax Rate is negatively related to TDR (-0.168) and STDR (-0.137), implying that higher tax rates are linked to lower debt levels. Profitability is strongly associ-

ated with better ICR (0.428) and negatively with debt measures like TDR (-0.257) and LTDR (-0.301), indicating that more profitable firms maintain better interest coverage and lower debt reliance. Liquidity negatively correlates with Tangibility (-0.198) and STDR (-0.107), showing that more liquid firms tend to have fewer tangible assets and less short-term debt. Larger firms (Size) rely less on NTDS (-0.392) and STDR (-0.226) and have lower Tangibility (-0.146). Age has a slight positive correlation with STDR (0.132) and a negative one with LTDR (-0.197), favouring short-term debt over long-term debt as firms mature. ICR is negatively correlated with TDR (-0.370) and LTDR (-0.377), indicating that firms with better interest coverage ratios use less debt. Debt measures like TDR, LTDR, and STDR are highly intercorrelated, reflecting their interconnected nature in the debt structure. These relationships highlight how firm characteristics, liquidity, profitability, and debt structure interact.

Multiple Regression Analysis

Total Debt Model: Table 4 depicts the regression analysis that highlights the determinants of the Total Debt Ratio in the Total Debt Model. Among the independent variables, Profitability (-0.203, p=0.000), Liquidity (-0.144, p=0.002), Size (-0.157, p=0.002), Cost of Debt (-0.198, p=0.000), and Interest Coverage Ratio (ICR) (-0.228, p=0.000) have significant negative relationships with the total debt ratio, leading to the rejection of their null hypotheses. This suggests that firms with higher profitability, liquidity, size, higher cost of debt, and better interest coverage ratios tend to use less debt. Conversely, variables like Growth Rate (0.034, p=0.437), Tangibility (0.054, p=0.275), Tax Rate (-0.063, p=0.145), Age (0.021, p=0.687), and Non-Tax Debt Shields (NTDS) (0.026, p=0.608) show no significant impact on total debt ratio, as their null hypotheses are not rejected. These findings indicate that while firm-specific financial and operational characteristics significantly influence debt levels, factors like growth, tangibility, and tax shields play a limited role in determining total debt usage.

Long-term Debt Model:

Table 5 depicts the regression analysis for the Long-Term Debt Model that reveals significant relationships for several determinants. Growth Rate (0.084, p=0.043), Tangibility (0.339, p=0.000), Profitability (-0.094, p=0.049), Cost of Debt (-0.211, p=0.000), and Interest Coverage Ratio (ICR) (-0.278, p=0.000) show statistically

significant impacts, leading to the rejection of their null hypotheses. Growth Rate and Tangibility positively influence the long-term debt ratio, suggesting that firms with higher growth rates and more tangible assets are more likely to use long-term debt. Conversely, Profitability, Cost of Debt, and ICR negatively affect long-term debt, indicating that profitable firms, with lower borrowing costs, and with better interest coverage ratios, tend to use less long-term debt. Variables such as Liquidity (0.026, p=0.551), Size (0.052, p=0.274), Age (-0.020, p=0.680), and Non-Tax Debt Shields (NTDS) (0.002, p=0.974) have no significant impact on the long-term debt ratio, as their null hypotheses are not rejected. These findings highlight the importance of growth potential, asset tangibility, profitability, borrowing costs, and debt serviceability in determining long-term debt usage, while other factors play a minimal role.

Short term debt Model: Table 6 depicts the regression analysis for the Short-Term Debt Model that identifies significant determinants influencing the short-term debt ratio. Tangibility (-0.318, p=0.000), Profitability (-0.175, p=0.001), Liquidity (-0.238, p=0.000), and Size (-0.289, p=0.000) exhibit significant negative relationships with short-term debt, leading to the rejection of their null hypotheses. These results suggest that firms with higher tangible assets, greater profitability, better liquidity, and larger size are less reliant on short-term debt. On the other hand, variables such as Growth Rate (-0.047, p=0.300), Tax Rate (-0.025, p=0.581), Cost of Debt (-0.048, p=0.336), Age (0.052, p=0.330), Non-Tax Debt Shields (NTDS) (0.036, p=0.499), and Interest Coverage Ratio (ICR) (-0.020, p=0.720) do not show significant effects on short-term debt, as their null hypotheses are not rejected. This indicates that while firm characteristics like asset composition, profitability, liquidity, and size are key determinants of short-term debt usage, other factors such as growth, tax rates, borrowing costs, and age have a minimal impact in this context.

Table 4:

Regression Coefficients and 't-statistics' and p-values of 10 determinants (independent variables) with total debt ratio in Total Debt Model

Model	Unstandardized Regression Coefficient Beta ± SE (β)	Standardized Regression Coefficient Beta	Sig.	Null Hypotheses Result
Constant	78.523±8.357		0.000	
Growth Rate	0.010±0.012	0.034	0.437	Not rejected
Tangibility	7.422±6.784	0.054	0.275	Not rejected
Tax Rate	-0.024±0.016	-0.063	0.145	Not rejected
Profitability	-0.615±0.154	-0.203	0.000	Rejected
Liquidity	-2.284±0.717	-0.144	0.002	Rejected
Size	-1.985±0.626	-0.157	0.002	Rejected
Cost Of Debt	-0.078±0.019	-0.198	0.000	Rejected
Age	1.016±2.525	0.021	0.687	Not rejected
NTDS	0.093±0.181	0.026	0.608	Not rejected
Interest Coverage Ratio	-0.211±0.048	-0.228	0.000	Rejected
Source: data collected from annual reports and coefficients estimated through MS Excel and SPSS by author(s)				

Table 5:

Regression Coefficients and 't-statistics' and p-values of 10 determinants (independent variables) with long term debt ratio in Long Term Debt Model

Model	Unstandardized Regression Coefficient Beta ± SE (β)	Standardized Regression Coefficient Beta	p-value.	Null Hypotheses Result
Constant	9.130±6.309		0.149	
Growth Rate	0.019±0.009	0.084	0.043	Rejected
Tangibility	36.953±5.121	0.339	0.000	Rejected
Tax Rate	-0.022±0.012	-0.072	0.080	Rejected
Profitability	-0.227±0.116	-0.094	0.049	Rejected
Liquidity	0.323±0.541	0.026	0.551	Not rejected

Model	Unstandardized Regression Coefficient Beta ± SE (β)	Standardized Regression Coefficient Beta	p-value.	Null Hypotheses Result
Size	0.518±0.473	0.052	0.274	Not rejected
Cost Of Debt	-0.066±0.014	-0.211	0.000	Rejected
Age	-0.786±1.906	-0.020	0.680	Not rejected
NTDS	0.004±0.137	0.002	0.974	Not rejected
Interest Coverage Ratio	-0.204±0.036	-0.278	0.000	Rejected
Source: data collected from annual reports and coefficients estimated through MS Excel and SPSS by author(s)				

Table 6:

Regression Coefficients and 't-statistics' and p-values of 10 determinants (independent variables) with short-term debt ratio in Short Term Debt Model

Model	Unstandardized Regression Coefficient Beta ± SE (β)	Standardized Regression Coefficient Beta	p-value.	Null Hypotheses Result
Constant	69.851±6.010		0.000	
Growth Rate	-0.009±0.009	-0.047	0.300	Not rejected
Tangibility	-30.110±4.878	-0.318	0.000	Rejected
Tax Rate	-0.007±0.012	-0.025	0.581	Not rejected
Profitability	-0.366±0.110	-0.175	0.001	Rejected
Liquidity	-2.600±0.515	-0.238	0.000	Rejected
Size	-2.507±0.450	-0.289	0.000	Rejected
Cost Of Debt	-0.013±0.014	-0.048	0.336	Not rejected
Age	1.769±1.816	0.052	0.330	Not rejected
NTDS	0.088±0.130	0.036	0.499	Not rejected
Interest Coverage Ratio	-0.012±0.035	-0.020	0.720	Not rejected
Source: data collected from annual reports and coefficients estimated through MS Excel and SPSS by author (s)				

Table 7:

Model Summary of Capital Structure

Model	R	R-square	Adjusted R-square	Std, Error	p-value
Total debt Model	0.544	0.296	0.277	17.26	0.00
Long Term debt Model	0.599	0.358	0.341	13.03	0.00
Short Term debt Model	0.478	0.228	0.208	12.41	0.00
Source: By Author (s)					

Table 7 presents the results of multiple R, coefficient of determination (R Square), adjusted R Square, Standard Error, and p-values of the three models of capital structure. It is evident from the table that the 29.60%, 35.80%, and 22.80% variation in the dependent variables, i.e., Total debt ratio, Long- term debt ratio, and short-term ratio, is explained by the 10 determinants. Though the values of adjusted R-squares are not very high, they are significant for all three models, as evidenced by the p-values, which are approximately zero in all three models. Hence, it can be concluded that multiple regression equations significantly explain the variability of dependent variables.

Table 8:

Summary of combined Results of all three capital structure models of selected Indian cement companies

Determinants	Total debt	Long term debt	Short term debt
Growth Rate	Negative	Positive	Negative
Tangibility	Negative	Positive	Positive
Tax Rate	Negative	Positive	Negative
Profitability	Positive	Positive	Positive
Liquidity	Positive	Negative	Positive
Size	Positive	Negative	Positive
Cost Of Debt	Positive	Positive	Negative
Age	Negative	Negative	Negative
NTDS	Negative	Negative	Negative
Interest Coverage Ratio	Positive	Positive	Negative
Source: data collected from annual reports and coefficients estimated through MS Excel and SPSS by author(s)			

Table 8 shows the combined results of all three models of capital structure, and it is evident from the table that firms with higher growth rates tend to avoid total and short-term debt but prefer long-term debt to finance investments. High tangibility discourages total debt but supports both long-term and short-term debt by providing collateral. Higher tax rates reduce total and short-term debt but encourage long-term debt for tax-shield benefits. Profitable firms generally support all types of debt due to their ability to manage obligations. Firms with higher liquidity use more total and short-term debt but avoid long-term debt, indicating a preference for flexibility. Larger firms access more total and short-term debt but often avoid long-term debt, relying instead on internal funds. High costs of debt are associated with increased total and long-term debt but reduced short-term borrowing. Older firms prefer internal financing, avoiding all types of debt due to established reserves. The presence of non-debt tax shields decreases reliance on debt, including long-term and short-term, by reducing the need for debt-related tax advantages. Lastly, a high interest coverage ratio supports total and long-term debt while discouraging short-term debt, reflecting a preference for stable, long-term financing. These patterns align with financial theories, reflecting firms' strategic preferences in capital structure.

Conclusion

The findings of the study will contribute towards a better understanding of the capital structure of select Indian cement companies. The study includes testing hypotheses with respect to regression coefficient of three models wherein dependent variables or effects are total debt ratio, long term debt ratio, and short-term debt ratio and 10 independent variables (determinants) or causes are growth, asset tangibility, tax rate, profitability, liquidity, size of the firm, cost of debt, age of the firm, non-tax deduction shield and interest coverage ratio with a view to study impact of these determinants on capital structure.

Based on multiple regression analysis, it is inferred that profitability, liquidity, size of firm, cost of debt, and interest coverage ratio impact total debt ratio significantly, while growth, tangibility, tax rate, age, and non-tax debt shield have an insignificant impact on total debt ratio. Similarly, growth, asset tangibility, tax rate, profitability, cost of debt, and interest coverage ratio have a significant impact on long-term debt. On the other hand, factors such as liquidity, size of the firm, age of the firm, and non-tax debt shield do not have a significant impact on the long-term debt ratio. Multiple regression equation with short term debt ratio (as dependent

variable) concludes that regression coefficients of asset tangibility, profitability, liquidity, and size of the company are found significant, while regression coefficients of growth rate, tax rate, cost of debt, age of firm, non- tax debt shield, and interest coverage ratio have non-significant regression coefficients. It means that for raising short-term debt as part of the capital structure of the firms, asset tangibility, profitability, liquidity, and size of the company play a significant role, while other determinants' role is non-significant statistically.

Another important finding of the study is that profitability is the only determinant that has a significant impact on the capital structure, whether using total debt ratio, long-term debt ratio, or short-term debt ratio models. Age of the firm and non-debt tax shield are the determinants that did not impact the capital structure significantly, whether using the total debt ratio model, long-term debt ratio model, or short-term debt ratio models.

This research has important implications for financial managers and decision makers in the cement industry. It is suggested that financial managers should give higher weight to the determinants that have a significant impact on the capital structure while taking into account the other determinants that do not significantly impact capital structure. Such analysis may help firms in the cement industry in maximising the wealth of investors.

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Appendix

List of Indian Cement Companies selected for study				
S.N.	Name of the company	Traded at	Year of Estab-lishment	Web site
1	UltraTech Cement	NSE & BSE	1983	http://www.ultratechcement.com/
2	Ambuja Cements	NSE & BSE	1983	http://www.ambujacement.com/
3	Shree Cement	NSE & BSE	1979	https://www.shreecement.com/
4	ACC Limited	NSE & BSE	1936	http://www.acclimited.com/
5	RAMCO Cements Lim-ited	NSE & BSE	1961	https://www.ramcocements.in/
6	JK Cement	NSE & BSE	1974	https://www.jkcement.com/
7	JK Laxmi Cement	NSE & BSE	1938	https://www.jklakshmicement.com/
8	Heidelburg Materials	NSE & BSE	1874	https://www.heidelbergmaterials.com
9	India Cements	NSE & BSE	1946	https://www.indiacements.co.in/
10	HIL Limited	NSE & BSE	1946	https://hil.in
11	Jai Prakash Associated Limited	NSE & BSE	1979	http://www.jalindia.com/
12	Ramco Industries Lim-ited	NSE & BSE	1965	http://www.ramcoindltd.com/
13	Sagar Cements Limited	NSE & BSE	1981	https://sagarcements.in/
14	KCP Cement	NSE & BSE	1941	http://www.kcp.co.in/
15	Sanghi Cements Limited	NSE & BSE	1991	https://www.sanghicement.com/
16	Shree Digvijay Cement Company Limited	NSE & BSE	1942	https://www.digvijaycement.com
17	Visaka Industries Ltd.	NSE & BSE	1981	https://www.visaka.com
18	NCL Industries Ltd.	NSE & BSE	1979	https://nclind.com/
19	Mangalam Cement Limited	NSE & BSE	1976	https://www.mangalamcement.com/
20	Deccan Cements Ltd.	NSE & BSE	1979	https://www.deccancements.com
21	Shree Keshav Cements and Infra Limited	BSE only	1993	https://www.keshavcement.com/
22	Prism Johnson Limited	NSE & BSE	1992	https://www.prismjohnson.in
23	Kesoram Industries Ltd.	NSE & BSE	1969	https://www.kesocorp.com/
www.ibef.org/industry/cement-india.aspx				