Cost of Capital and Capital Structure Analysis of Power Sector in India: A Case Study

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Abstract

The capital structure, cost of capital, are important financial decisions in industries that require high investment in capital, like the Indian power sector. The study aims at understanding the impact of the financing structure on the cost of capital of a power sector company over the five-year period (FY2021-22 to FY2025-26). The cost of debt is calculated based on the finance cost, average debt and the effective tax rate, and the cost of equity is calculated using the Capital Asset Pricing Model. The WACC is determined using the book-value weights of debt and equity. The market value of the company is compared to two sector peers, having the same beta, to reflect the impact of financing structure and borrowing costs. The analysis reveals that there was a significant change in the company's capital structure during the period, with debt making up a substantial proportion of the total capital. The debt usage resulted in a reduction in the company's WACC as compared to its sector peers, however, it also increased the financing cost of the companies in FY2025-26. The results indicate that the trade-off between tax benefits from debt and financial burden due to increasing leverage levels.

Keywords: *Financial Leverage, WACC, CAPM, Cost of Debt, Cost of Equity, India Power Sector*

1. Introduction

Capital structure is a basic company-finance choice as it affects the financial risk of the company and the returns sought by the company's suppliers of capital. The power sector is a capital-intensive industry, meaning that a significant number of investments in both generation plants, transmission lines and renewable energy are needed. Therefore, decisions on funding can directly impact the firm's cost of capital and its capacity to make future investments.

The Modigliani-Miller framework highlights the significance of taxes in debt-firm value-economic cost of capital relationship; Trade-off theory considers the advantages of debt vs financial disadvantages of leveraging more. Empirical studies of Indian companies have identified that factors like return on profit, size, growth, tangibility of assets, tax rate and cost of debt have the significant impact on leveraging.

1.1 Research Gap

Existing studies on Indian power and energy sector capital structure like Chakrabarti and Chakrabarti (2019), Tupe (2020) and Desai (2020) have mainly examined the factors associated with the firms leverage and these include firm' size, tangibility, liquidity and profitability, based on large panel datasets of many companies. The trend in these studies did not focus as much on the calculation of the cost of capital over time for a single firm. One further drawback is the RBSA Advisors (2020) which provides a sector wide WACC benchmark for the power industry but does not provide a trend for the industry for an individual firm. It also does not capture firm's own actual effective tax rate into account.

Henceforth, this research combines, a real formula (based computation) of the cost of debt, cost of equity, and WACC of a single Indian power-sector firm over a recent period, thereby reflecting the ongoing renewable energy transition in the sector and debt-funded capacity expansion, using the firm's own disclosed effective tax rate and an estimated beta value at the beginning of every year. Moreover, it has a peer-benchmarked comparison against other firms in the same sector over the same period.

1.2 Research Objectives

- To calculate the year-wise cost of debt of Indian power sector company (Company X) for FY 2021-22 to FY 2025-26 based on the actual finance cost, total debt of the company and the effective tax rate

- Use the CAPM to estimate the year-wise cost of equity of Company X with beta obtained from regression of monthly returns over the last 12 months of the firm's stock with monthly returns of Nifty 50 for each financial year.
- To compute WACC of Company X for each year and explain the trend in the context of theories of capital structure, namely, the Trade-off Theory and Pecking Order Theory.
- To compare the capital structure and cost of capital for Company X with both masked industry peers (Peer Company A and Peer Company B) to determine if the financing pattern is generally similar or different from the sector.

2. Literature Review

In India, Chakrabarti and Chakrabarti (2019) focused on the determinants of capital structure specifically in the energy sector which comprises power generation, transmission and distribution companies. A sample of 141 companies was carried out to explain leverage using panel data techniques and the results indicated that the capital structure of firms is influenced by their size, liquidity, asset turnover, and age, whereas profitability, debt service capacity, sales growth, non-debt tax shield and tangibility ratio are not statistically significant.

The study, by Tupe (2020), investigated the factors affecting capital structure of the Indian Power generation and supply companies during the period from 1993 to 2004 using unbalanced panel data. A random-effects estimation method after formal specification tests was used. The results confirmed tangibility and profitability with relationships found in previous capital-structure studies, and firm size, growth opportunities, and borrowing costs and liquidity were consistent with their expected signs but were not statistically significant. Inflation and formation of banking sector were significantly related with leverage for sampled firms at macro level. Given the above, the study stressed the need to make finance in the power sector more accessible, both through banks and markets, to meet the high demand for capital.

Desai (2020) analysed the usefulness and applicability of the capital structure theories by using a panel data of 25 companies listed in the Energy and Power Sector for a decade from 2010 to 19. Using panel regression model approach, the major factors which influence the capital structure choice of the sampled firms were identified and these factors are profitability, tangibility, liquidity, non-debt tax shield, interest coverage ratio. More importantly, the paper found that the financing behaviour of Indian power and energy companies was better captured by a combination of Pecking Order and Trade-off Theory than either of the theories alone: Companies tended to rely on their own funds and debt to finance their growth (consistent with Pecking Order theory), and also displayed leverage levels that were consistent with trade-off theory, where they sought to balance out tax advantages with distress costs. This dual-theory result is directly applicable to the analysis of power-sector capital structure, as it implies a single-theory model is likely to be a partial lens in this sector.

Sinha (2017) explored the association between capital structure and firm value in the context of Indian power companies only, taking a sample of 11 power companies from the BSE power index that are available in the Capitaine database between 2007-2015. The firm value proxies include Tobin's Q and enterprise value (EV) per profit before interest, depreciation and taxes. This is the leverage ratio, which is debt: equity, and the model used for analysis of the data is the panel data regression model. Based on the results, it is concluded that there is a significant negative relation between financial leverage with value of firm based on Tobin's Q and there is not a significant relation between financial leverage with value of firm based on enterprise value. Interestingly, this finding is important for the power sector capital structure literature because it suggests that a certain level of debt may begin to diminish the firm's market value, offering direct empirical evidence for the capital structure value relationship that has been highlighted in the general capital structure literature as the inverted-U.

Handoo and Sharma (2014) examined the capital structure of the Indian corporate sector as a whole and their results showed that the firm specific as well as the macroeconomic factors affect the capital structure. The study was conceptualized with a large sample of 870 publicly listed Indian companies for the period 2001 to 2010 (both government owned and private companies) and involved a wide range of hypotheses on leverage and profitability, growth, tangibility, firm size and non-debt tax shields etc. It was found that financing characteristics of Indian firms are not necessarily explained by firm specific factors but are also influenced by macro level factors and that the presence of regulatory factors and government ownership patterns result in structural variations in leverage patterns that are not captured by

the generic capital-structure theory. It was one of the initial attempts to determine capital structure of the sectoral firms of Indian infrastructure sector on a large sample size basis.

RBSA Advisors (2020) have calculated the weighted-average cost of debt, cost of equity and WACC for the top ten companies in thirteen major industry sectors of India based on enterprise-values, not simple averages. The power sector has the lowest average WACC of all the 13 sectors at 7.9% because of the borrowing of the big power sector public sector players including NHPC, NTPC, Power Grid etc. at heavily subsidised rates, the report said. All equity risk premiums were assumed to be 7% and the risk-free rate proxy the 10-year zero-coupon government bond rate. This study offers one of the few sector-wide market-based WACC benchmarks to compare the cost of capital of any individual power company.

3. Research Methodology

3.1 Research Design

The research methodology used is quantitative, analytical type with case study approach as it involves computing the cost of capital and capital structure of one of the Indian power companies (Company X) for 5 years (FY 2021-22 to FY 2025-26) and establishing the framework for benchmarking with two of its industry peers (Peer Company A & Peer Company B). The method used is descriptive, the paper reconstructs year-by-year the actual cost of debt, the actual cost of equity, the actual capital weights, and the resulting WACC of the firm, directly from the financial statements disclosed by the firm and market data.

3.2 Data Sources

The following sources were used to manually extract and crosscheck all financial and market data:

- Audited Annual Reports of the case company and peer firms (FY22-FY26), for finance cost, profit before tax, tax expense, total debt, and shareholders' equity.
- Screener.in, to cross-check consolidated balance sheet and profit-and-loss figures across years.
- Moneycontrol, for historical month-end stock closing prices and to cross-verify debt/equity figures.
- NSE/Nifty 50 historical index data, for month-end index values used in the beta regression.
- RBI/market data on 10-year Government of India securities, used as the risk-free rate (Rf) proxy for each year.
- Opening and closing borrowings for each year were taken from the balance sheet (long-term borrowings plus short-term borrowings), so that average debt could be computed.

3.3 Data Variables and Formulas

A. Cost of Debt (Kd)

The pre-tax K_d equal to Finance Cost / Average Total Debt.

Average Total Debt = (Opening Total Debt + Closing Total Debt) / 2

After-tax K_d = Pre-tax $K_d \times (1 - t)$

The average debt facility is used instead of the year end debt facility, because a company with a large debt facility during the year has not been using a high debt facility for the entire year and dividing by the closing debt facility would overstate the rate of borrowing. Effective tax rate is used and the FY2026 a standard Indian corporate tax rate of 25.17% is applied.

B. Cost of Equity (K_e): CAPM

$K_e = Rf + \beta \times ERP$

The Average of the 10-year Government of India security returns over the financial year is denoted as Rf while the covariance of the monthly returns of the firm with the monthly returns of Nifty 50 over the five years is divided by the variance of monthly returns of Nifty 50 over the five years to obtain the value of beta. The equity risk premium (ERP) is fixed at 7.00% as per the cost of capital estimation done by RBSA Advisors (2020) for India.

C. Capital Weights

$W_D = D \div (D + E)$ $W_E = E \div (D + E)$

Both D and E are book value of total borrowings and total shareholders' funds (share capital plus reserves and surplus) from the year-end balance sheet.

WACC

$WACC = W_D \times K_d$ (after-tax) $+ W_E \times K_e$

This WACC is calculated independently for the five financial years, providing a trend of WACC when compared to the previous five years, not a static number.

4. Data Analysis and Interpretation

4.1 Cost of Equity

Table 1: Cost of Equity -CAPM

FY	Rf	β\beta	ERP	K_e
FY 2021-22	6.80%	0.798	7%	12.39%
FY 2022-23	7.31%	0.915	7%	13.72%
FY 2023-24	7.07%	1.407	7%	16.92%
FY 2024-25	6.58%	1.918	7%	20.01%
FY 2025-26	6.96%	0.919	7%	13.39%

Source: Author's computation

The premium was fixed, the only meaningful variable moving K_e was beta, as the risk-free rate remained within a tight range of 6.58% to 7.31%. In FY26 beta fell back to 0.919 and K_e dropped to 13.39%. A higher beta indicate that the stock was trading at a higher deviation from the market in the years when the company assumed a lot of debt and expansion of capacity occurred, which would be consistent with investors demanding a higher return for the more leveraged company

4.2 Cost of debt

Table 2: Cost of debt

FY	Finance Cost	Opening Debt	Closing Debt	Average Debt	Pre-tax Kd	Tax Rate Applied	After-tax Kd
FY22	776.91	7,262.38	8,892.54	8,077.46	9.62%	22.11%	7.49%
FY23	844.30	8,892.54	24,817.22	16,854.88	5.01%	23.82%	3.82%
FY24	2,053.40	24,817.22	31,326.61	28,071.92	7.31%	20.41%	5.82%
FY25	2,269.13	31,326.61	49,621.30	40,473.96	5.61%	10.43%	5.02%
FY26	5,816.45	49,621.30	75,846.14	62,733.72	9.27%	25.17%	6.94%

Source: Author's computation

The low readings in FY23 and FY25 indicate that a significant portion of the fresh borrowing occurred towards the end of the year or at low interest rates. The higher FY26 rate indicated that either fresh borrowing was experienced at higher

costs or a bigger proportion of borrowings were seen as income statement items as projects were finished. Additionally, FY25's after-tax cost is helped by a very low effective tax rate of 10.43%. It is reported at this amount, even though it is a real, positive amount, since it indicates that the tax shield that year was less than in the other years.

4.3 Weighted Average Cost of Capital

Capital weights are calculated on book values. Debt is total borrowings and equity is total shareholders' funds.

Table 3: Capital weights

FY	Debt (D)	Equity (E)	Debt Weight	Equity Weight
FY 2021-22	8,892.54	17,414.90	33.80%	66.20%
FY 2022-23	24,817.22	18,628.81	57.12%	42.88%
FY 2023-24	31,326.61	20,831.74	60.06%	39.94%
FY 2024-25	49,621.30	27,361.43	64.46%	35.54%
FY 2025-26	75,846.14	30,751.51	71.15%	28.85%

Source: Author's computation

Table 4: WACC

FY	Debt Weight	After-tax Kd	Equity Weight	K_e	Revised WACC
FY 2021-22	33.80%	7.49%	66.20%	12.39%	10.73%
FY 2022-23	57.12%	3.82%	42.88%	13.72%	8.06%
FY 2023-24	60.06%	5.82%	39.94%	16.92%	10.25%
FY 2024-25	64.46%	5.02%	35.54%	20.01%	10.35%
FY 2025-26	71.15%	6.94%	28.85%	13.39%	8.80%

Source: Author's computation

WACC plunged in FY23 due to the presence of cheaper debt, reached back to approximately 10.3% in FY24 and FY25 with the rise in the cost of equity (due to increasing beta), and dropped to 8.80% in FY26 due to a decrease in the cost of equity (due to the decrease in beta). The best comparison is between FY22 and FY26, in both years beta was similar (0.798 and 0.919) and so was K_e broadly (12.39% and 13.39%). Modigliani and Miller (1958) demonstrated that the return required by shareholders increases with an increase in leverage; with corporate taxes (Modigliani & Miller, 1963) there is an additional tax shield that pulls WACC down as long as the increase in financial risk does not push the cost of equity and borrowing up sufficiently to offset the tax shield benefit.

In comparison, the average is 9.64% which is higher than RBSA Advisors (2020) reported power-sector WACC of 7.9%. All the weights are based on book value, and a market value approach would likely have resulted in a higher WACC in the later years since the book value of equity is likely well below its market value.

5. Peer Benchmarking and Discussion

The companies are compared using the same cost-of-capital methodology used in the main analysis. Debt and equity are calculated in consolidated financial statements, and the average debt is used for calculating the cost of debt. To keep the comparability, all three companies are assumed to have a common beta of 1.0 and a 7.00% equity risk premium. This approach will enable comparison of the differences that are due to capital structure or financing costs, and not to the differences in the estimated equity beta.

Table 5: Comparative WACC of Company X and Peer Companies, FY2022–FY2026

Financial Year	Company X	Peer Company A	Peer Company B
FY2021–22	11.67%	8.86%	7.99%
FY2022–23	8.32%	8.85%	8.49%
FY2023–24	9.12%	9.36%	7.45%
FY2024–25	8.06%	8.84%	9.52%
FY2025–26	8.96%	8.60%	8.90%
Five-year average	9.23%	8.90%	8.47%

Source: Author's computation

5.1 Discussion

There is a significant shift in the financing of Company X over the 5 years as indicated in the comparison. Company X's debt weight is 33.80%, whereas other peers had an average debt weight of ~70% in FY20221-22. Its higher WACC of 11.67% is a result of the fact that it relies more on equity than do the other companies, Peer A with an equity WACC of 8.86% and Peer B with an equity WACC of 7.99%.

Over the next few years, the financing mix shifted toward more debt for Company X. While, the peers, had a more limited leverage range. Their cost of debt stayed consistent between 7.56%-8.69% for Peer A and 7.76%-8.67% for Peer B, compared to the cost of debt for Company X, which was more volatile.

Throughout the change of financing structure, Company X's WACC significantly decreased. It has fallen from 11.67% in FY2021-22 to 8.32% in FY2022-23 and stayed broadly in the range of the two peers since then. The situation changed a little in FY2025-26 however, where the WACC of the Company X rose to 8.96% while the WACC of Peer A and Peer B rose to 8.60% and 8.90% respectively.

6. Findings

The five-year analysis shows a clear shift in Company X's financing structure towards greater use of debt. This change reduced the difference between Company X's WACC and those of the two peer companies, particularly after FY2022-23. By FY2025-26. The increase in debt therefore appears to have reduced the initial cost-of-capital disadvantage associated with Company X's relatively high reliance on equity, while the higher level of leverage was accompanied by greater financing costs in the final year. These results are consistent with the basic argument of the Trade-off Theory, under which firms may benefit from the tax advantages of debt but also face greater financial risk as leverage increases.

7. Limitations

- The calculation of the cost of debt is based on the accounting book values. Average debt is used in the calculation, which may not fully capture the timing of individual borrowings during the financial year
- The book-value weights do not represent the investors' expectations, such as market-value weights would, and thus the calculated WACC will not match the market-implied value, especially towards the end of the years when investors' value is likely to be much higher than the book value of equity.
- The data for FY26 is provisional and based on the last disclosures received as of the date of this report.

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