



Financial Management Assignment

Group 11

Industry - Refineries
Target Firm - Bharat Petroleum
Corporation Ltd.



Links for Colab Notebook, Google Sheets

[Colab Notebook Hyperlink](#)

[Google Sheets Hyperlink](#)



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We thank the Economics Department of Birla Institute of Technology and Science, Hyderabad Campus, for providing us with the resources for this project as part of our curriculum.

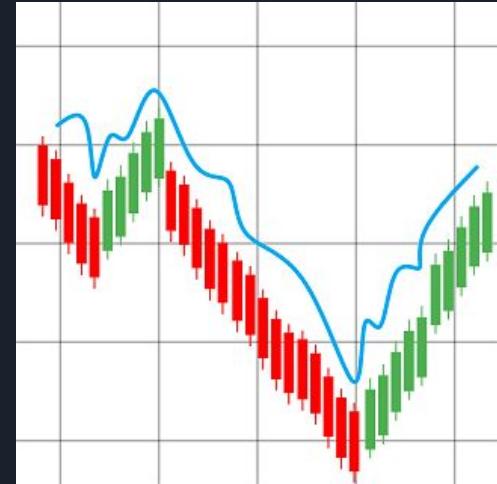
OBJECTIVE

The goal of this project is to calculate the **Cost of Equity Capital** of **Bharat Petroleum Corporation Limited** using **Top Down** and **Bottom Up Approach**.

We will also calculate **Cost of Debt** and **Weighted Average Cost of Capital (WACC)**.

AIM

1. Calculation of Cost of equity Capital
 - a. Using Top down approach
 - b. Using bottom up approach
2. Calculation of cost of debt
3. Calculation of cost of capital



Bharat Petroleum Corporation Limited

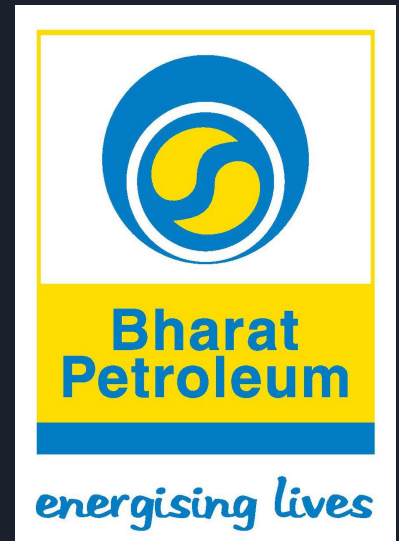
Industry - Refinery

BPCL is an Indian state-controlled oil and gas company. Bharat Petroleum Corporation Limited is one of the leading oil companies in the country, engaged in refining, marketing, and distribution of petroleum and petrochemical products. BPCL operates several refineries and has a vast network of fuel stations across India.

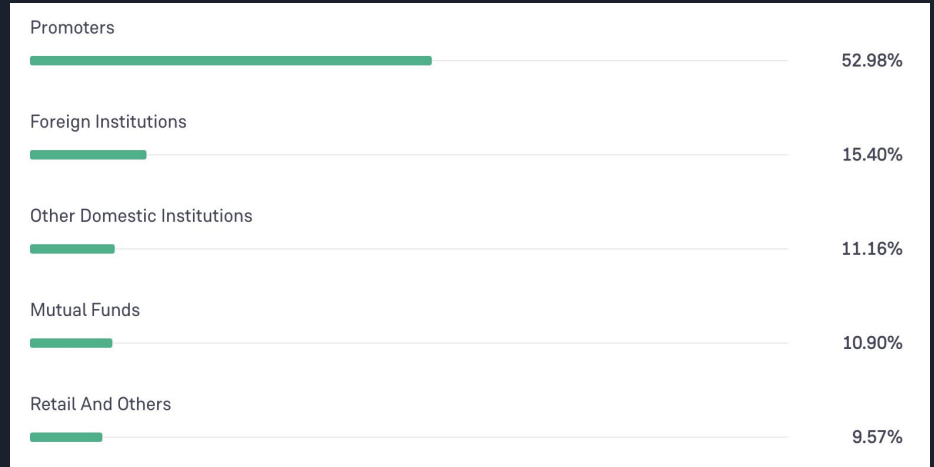
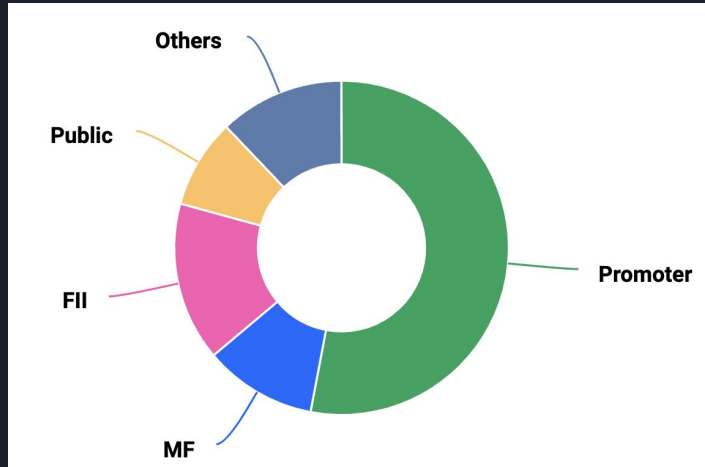
Types of Products

- Fuels: Petrol, diesel, and liquefied petroleum gas (LPG).
- Lubricants: Automotive and Industrial Lubricants.
- Specialty products: Bitumen, solvents, and petrochemicals.
- Natural Gas: Liquefied natural gas (LNG) and piped natural gas (PNG).

Moreover, the company engages in hydrocarbon exploration and production.



Shareholding Pattern of BPCL



Firms for Bottom Up Approach



IndianOil



Reliance
Industries Limited

हिन्दुस्तान पेट्रोलियम



ONGC



एमआरपीएल
MRPL

Calculation of Cost of Debt (R_b)

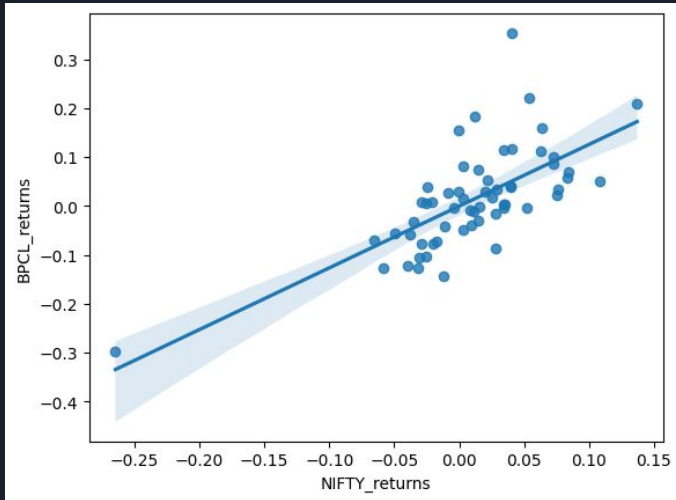
- The Cost of Debt (R_b) is the estimated required rate of return for the firm's interest bearing debt rate of return required by the firm's creditors.
- The firm experiences a net cost of $R_b (1-T)$ since interest expense is tax deductible.
- While calculating the WACC, we add the Cost of Debt by multiplying it by w_b (weight of R_b)

EBIT (In Cr)	46,302.84
Interest expense (In Cr)	4149
Interest Coverage Ratio	11.16
CRISIL Credit Rating	AAA
Credit Default Spread	0.75%
Risk Free Rate	6.97%
Pre Tax Cost of Debt	7.72%

Top-Down Approach

- The top-down approach involves performing regression analysis and finding the slope of the SCL (Security Characteristic Line)
- The coefficient of the regression line is the Beta of the stock.
- We performed this for our target company BPCL and $\beta_{BPCL} = 1.263$

$$r_E = r_f + \beta[E(r_m) - r_f]$$

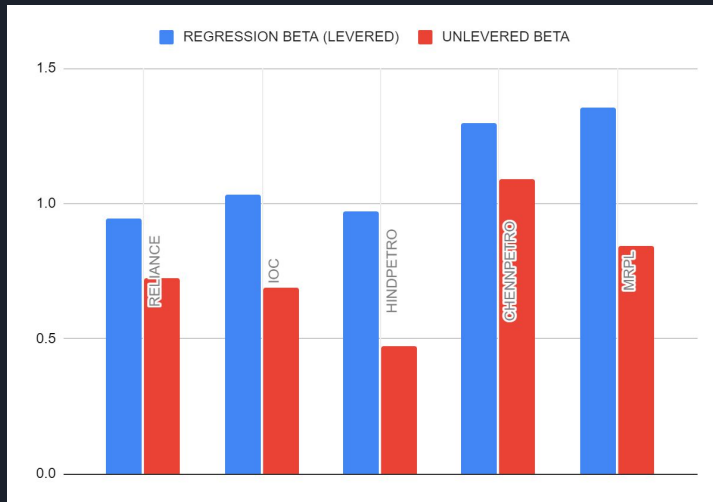


- The adjacent image shows the OLS Regression line for BPCL.
- Logarithmic returns of BPCL v/s NIFTY were used for the same
- Market Return $E(r_m)$ was calculated by annualizing the NIFTY 50 monthly returns.
- $E(r_m) = 6.087\%$
- Statistical Inferences are provided in the Code.

Bottom- Up Approach

- The top-down approach involves finding the Industry Beta
- This is done by unlevering the betas of the firms in the industry, averaging them and re-levering it.
- We performed this for 5 refineries as mentioned previously and $\beta_{\text{industry}} = 1.106$

$$\beta_e = \beta_a \left[1 + (1 - T) \frac{D}{E} \right]$$



COMPANY	REGRESSION BETA (LEVERED)	UNLEVERED BETA
RELIANCE	0.945607528	0.7232179947
IOC	1.032904516	0.6874572485
HINDPETRO	0.9697673113	0.4741674708
CHENNPETRO	1.296942784	1.087674257
MRPL	1.355671567	0.8415093527



LEVERED AND UNLEVERED BETA

Levered and unlevered beta are measures of a company's risk relative to the market, accounting for the impact of debt (levered beta) or assuming no debt (unlevered beta). They are used primarily in financial analysis and valuation to assess a company's exposure to market risk.

- Unlevered Beta(Asset Beta) :
 - Unlevered beta reflects the company's risk without the impact of financial leverage (i.e., debt). It represents the risk of the company's assets alone.
- Levered Beta(Equity Beta) :
 - Levered beta reflects the company's risk with debt included. It accounts for the leverage that debt brings, amplifying the company's overall risk exposure due to the fixed financial obligation of debt repayment.

Relationship between Levered and Unlevered Beta :

- Unlevered beta can be thought of as the base risk level of the company, while levered beta shows how debt magnifies this risk.
- Unlevered beta is adjusted for leverage by considering the company's debt-to-equity ratio and tax shield effects.

$$\text{Levered Beta} = \text{Unlevered Beta} \times \left(1 + (1 - \text{Tax Rate}) \frac{\text{Debt}}{\text{Equity}} \right)$$

WACC From Top- Down Approach

$$WACC = ((E/V) * R_e) + [((D/V) * R_d) * (1 - T)]$$

Where :

- E : The market value of equity (common stock)
- D : The market value of debt
- V : The total market value of the company (equity + debt)
- R_e : Cost of equity = $R_f + \beta \times (R_m - R_f)$
- R_d : Cost of debt
- T : Corporate Tax Rate

WACC	11.27%
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Cost of Equity	14.653%
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Cost of Debt	7.72%
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D/E	0.608
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E/V	0.6218905473
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D/V	0.3781094527
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Tax Rate	26%
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WACC From Bottom-Up Approach

$$WACC = ((E/V) * R_e) + [((D/V) * R_d) * (1 - T)]$$

Where :

- E : The market value of equity (common stock)
- D : The market value of debt
- V : The total market value of the company (equity + debt)
- R_e : Cost of equity = $R_f + \beta \times (R_m - R_f)$
- R_d : Cost of debt
- T : Corporate Tax Rate

WACC

10.683%

Cost of Equity

13.71%

Cost of Debt

7.72%

D/E

0.608

E/V

0.6218905473

D/V

0.3781094527

Tax Rate

26%



REFERENCES

BPCL	https://www.screener.in/company/BPCL/consolidated/	https://www.moneycontrol.com/india/stockpricequote/refineries/bharatpetroleumcorporation/BPC
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MRPL	https://www.screener.in/company/MRPL/consolidated/	https://www.moneycontrol.com/india/stockpricequote/refineries/mangalorerefinerypetrochemicals/MRP