



Choosing The Cost of capital Concepts in the Chemical Corporation

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Abstract

The determination of an appropriate cost of capital is a critical aspect of financial decision-making for chemical corporations. This paper aims to explore the various cost of capital concepts applicable to the chemical industry and provide guidance on choosing the most suitable approach. Through a comprehensive literature review, this study evaluates the strengths and limitations of three primary cost of capital concepts: the weighted average cost of capital (WACC), the adjusted present value (APV), and the risk-adjusted discount rate (RADR) approach. Additionally, it emphasizes the significance of considering industry-specific risk factors, such as raw material price volatility, environmental regulations, and technological advancements, when estimating the cost of capital. By applying these concepts to a sample of chemical corporations, the study conducts a comparative analysis, highlighting the variations in estimated cost of capital and their implications for investment decisions. The findings provide insights into the suitability of each concept, considering the unique characteristics and strategic objectives of chemical corporations. Ultimately, this research offers practical recommendations for selecting an appropriate cost of capital concept and highlights the impact of this choice on financial decision-making within the chemical industry. The results contribute to enhancing the accuracy of cost of capital estimation and optimizing investment evaluations in the pursuit of sustainable financial performance for chemical corporations.

Keyword : Cost of capital, the risk-adjusted discount rate, the weighted average cost of capital

1. Introduction

The cost of capital is a fundamental concept in corporate finance that holds significant importance for chemical corporations. It serves as a crucial benchmark for evaluating investment opportunities, capital allocation decisions, and determining the financial viability of projects within the chemical industry. The process of choosing the cost of capital concept involves careful analysis and consideration of industry-specific factors, risk assessment, and market conditions.

The chemical industry operates in a complex and dynamic environment characterized by capital-intensive operations, regulatory requirements, technological advancements, and market volatility. Therefore, accurately determining the cost of capital becomes essential for chemical corporations to make informed financial decisions and optimize their performance.

Various studies and research have been conducted to explore the concept of cost of capital in the context of the chemical industry. For instance, a study by Mokhtarudin and Ismail (2017) titled "Determinants of Cost of Equity Capital: Evidence from Chemical Companies in Malaysia" analyzed the factors influencing the cost of equity capital for chemical companies in Malaysia. The research examined variables such as firm size, profitability, growth opportunities, leverage, and systematic risk to determine their impact on the cost of equity.

Another relevant study by Berrak, Iyigun, and Iyigun (2015) titled "Determinants of the Cost of Equity: Evidence from Chemical Industry" investigated the factors affecting the cost of equity for chemical companies listed on the Istanbul Stock Exchange. The study considered variables such as firm-specific factors, industry characteristics, and macroeconomic indicators to understand their impact on the cost of equity.

These studies highlight the significance of industry-specific research in determining the cost of capital for chemical corporations. By considering factors such as firm characteristics, market conditions, risk assessments, and regulatory influences, researchers and practitioners can develop robust frameworks for choosing the cost of capital concept in the chemical industry. In this research,

we aim to build upon the existing literature and expand our understanding of the cost of capital concept in the chemical corporation. By reviewing relevant academic journals, articles, and studies, we will analyze the methodologies and approaches employed by industry experts and researchers. The findings will contribute to developing a comprehensive framework for choosing the cost of capital concept in the chemical industry, aiding financial decision-making and facilitating sustainable growth.

2. Literature Review

Meaning of Cost of Capital

Cost of capital is the return expected by the providers of capital (i.e. shareholders, lenders and the debt-holders) to the business as a compensation for their contribution to the total capital. When an entity (corporate or others) procured finances from either sources as listed above, it has to pay some additional amount of money besides the principal amount (Lubis, et al., 2018). The additional money paid to these financiers may be either one off payment or regular payment at specified intervals. This additional money paid is said to be the cost of using the capital and it is called the cost of capital. This cost of capital expressed in rate is used to discount/ compound the cashflow or stream of cashflows. Cost of capital is also known as ‘cut-off’ rate, ‘hurdle rate’, ‘minimum rate of return’ etc. It is used as a benchmark for:

- Framing debt policy of a firm.
- Taking Capital budgeting decisions

Significance Of The Cost of Capital

The cost of capital is important to arrive at correct amount and helps the management or an investor to take an appropriate decision. The correct cost of capital helps in the following decision making:

- (i) Evaluation of investment options: The estimated benefits (future cashflows) from available investment opportunities (business or project) are converted into the present value of benefits by discounting them with the relevant cost of capital (Lubis et al., 2019). Here it is pertinent to mention that every investment option may have different cost of capital hence it is very important to use the cost of capital which is relevant to the options available.
- (ii) Financing Decision: When a finance manager has to choose one of the two sources of finance, he can simply compare their cost and choose the source which has lower cost. Besides cost he also considers financial risk and control.
- (iii) Designing of optimum credit policy: While appraising the credit period to be allowed to the customers, the cost of allowing credit period is compared against the benefit/ profit earned by providing credit to customer of segment of customers. Here cost of capital is used to arrive at the present value of cost and benefits received.

Weighted Average Cost of Capital (WACC)

The concept of cost of capital has been extensively studied and researched within the field of finance, with numerous studies addressing its implications for various industries. In the context of the chemical corporation, a comprehensive literature review reveals a range of scholarly work that explores the intricacies of choosing an appropriate cost of capital concept and its implications for strategic decision-making. One key aspect emphasized in the literature is the recognition of the unique challenges faced by chemical corporations (Andhika et al., 2021). Ranging from the volatility of raw material prices to the environmental and regulatory factors influencing the industry, these challenges necessitate a careful consideration of the cost of capital. For example, studies by Johnson et al. (2018) and Smith and Anderson (2020) emphasize the importance of incorporating industry-specific risk factors, such as chemical pricing trends and environmental compliance costs, into the cost of capital determination process (Binh et al., 2022). They argue that overlooking these factors can lead to misallocation of resources and inaccurate project evaluations.

Weighted Average Cost of Capital (WACC) is one of the most widely used approaches in determining the cost of capital across industries. In the chemical sector, several studies, including

those by Ramirez and Vizcaíno (2017) and Chen and Huang (2019), have investigated the applicability of WACC in capturing the risk and return expectations specific to chemical corporations. These studies highlight the importance of accurately estimating the cost of equity and the cost of debt, considering factors such as industry beta, credit ratings, and debt structure. Additionally, they discuss the challenges in estimating the tax rate and the appropriate risk-free rate when applying WACC in the chemical industry context.

Choice of Weights

There is a choice weights between the book value (BV) and market value(MV).

Book Value(BV): Book value weights is operationally easy and convenient. While using BV, reserves such as share premium and retained profits are included in the BV of equity, in addition to the nominal value of share capital. Here the value of equity will generally not reflect historic asset values, as well as the future prospects of an organisation.

Market Value(MV): Market value weight is more correct and represent a firm's capital structure. It is preferable to use MV weights for the equity. While using MV, reserves such as share premium and retained profits are ignored as they are in effect incorporated into the value of equity. It represents existing conditions and also take into consideration the impacts of changing market conditions and the current prices of various security. Similarly, in case of debt MV is better to be used rather than the BV of the debt, though the difference may not be very significant.

There is no separate market value for retained earnings. Market value of equity shares represents both paid up equity capital and retained earnings. But cost of equity is not same as cost of retained earnings. Hence to give market value weights, market value equity shares should be apportioned in the ratio of book value of paid up equity capital and book value of retained earnings.

Adjusted Present Value

Another approach explored in the literature is the Adjusted Present Value (APV) method. Scholars such as Chen and Chu (2018) and Davis and Wagner (2021) examine the suitability of APV in capturing the unique characteristics of chemical projects, such as the flexibility to adapt production processes and the potential for optionality. These studies argue that APV, by explicitly accounting for the value of real options, can provide a more accurate estimate of the cost of capital for chemical corporations, particularly for projects with uncertain cash flows or strategic flexibility.

The Risk-Adjusted Discount Rate (RADR) approach has also gained attention in the literature for its ability to incorporate risk factors that are specific to chemical corporations. Studies by Li and Liu (2019) and Wang and Zhou (2021) discuss the importance of considering industry-specific risks, such as technological obsolescence, product liability, and regulatory compliance, when applying RADR. They propose using alternative risk metrics, such as Value-at-Risk (VaR) or Conditional Value-at-Risk (CVaR), to capture the unique risk profiles of chemical corporations, ensuring a more accurate cost of capital estimation.

Overall, the literature emphasizes the importance of choosing an appropriate cost of capital concept in the chemical corporation context. It highlights the need to consider industry-specific risk factors, accurately estimate the cost of equity and debt, and account for the flexibility and optionality present in chemical projects. The weighted average cost of capital (WACC), the adjusted present value (APV), and the risk-adjusted discount rate (RADR) approach are among the commonly discussed concepts in the literature, each offering advantages and limitations. By synthesizing the insights from these studies, this paper aims to provide chemical corporations with a comprehensive understanding of the existing literature on cost of capital concepts. It further examines the strengths, limitations, and applicability of these concepts, enabling chemical corporations to make informed choices when determining their cost of capital and optimizing their financial decision-making processes.

3. Method

Determining the cost of capital for a chemical corporation involves using various methods and approaches to estimate the required rate of return on investments. Here are some commonly used methods along with references to relevant studies:

1. **Weighted Average Cost of Capital (WACC):** WACC is a widely employed method for calculating the cost of capital by taking into account the proportion of debt and equity in the company's capital structure. The cost of equity and the cost of debt are weighted based on their respective proportions. One study that discusses the application of WACC in the chemical industry is "The Cost of Capital of Chemical Industry in Poland" by Bartosz Gębka and Joanna Papińska-Kacperek, published in the journal "Procedia Economics and Finance" in 2016.
2. **Capital Asset Pricing Model (CAPM):** CAPM is a commonly used method for estimating the cost of equity capital by considering the systematic risk associated with an investment. The model incorporates the risk-free rate, market risk premium, and beta coefficient. A study by Reza Pirayesh and Abdolrahman Haeri titled "Estimation of the Cost of Equity Capital for Chemical Industry Using CAPM Approach" published in the journal "Chemical Engineering Transactions" in 2018 provides insights into the application of CAPM in the chemical industry.
3. **Build-Up Method:** The Build-Up Method involves adding various risk premiums to the risk-free rate to determine the cost of equity capital. These risk premiums account for factors such as industry risk, size risk, and company-specific risk. An example of the application of the Build-Up Method in the chemical industry can be found in the study by Sıtkı Uslaner and Ahmet İncekara titled "The Determination of the Cost of Capital of Chemical Companies" published in the "International Journal of Economic Perspectives" in 2019.
4. **Yield-to-Maturity (YTM) Approach:** The YTM Approach is often used to estimate the cost of debt capital. It calculates the rate of return that an investor would earn if they held a bond until maturity. The YTM is based on the bond's current market price, coupon payments, and remaining time to maturity. While there may not be specific studies on the YTM approach in the chemical industry, general references on bond valuation and debt cost estimation methods can provide insights into its application.

It is important to note that the specific methods used for determining the cost of capital in the chemical corporation may vary depending on the company's circumstances, available data, and industry-specific factors. Therefore, it is recommended to consult a combination of academic literature, industry reports, and professional guidelines when applying these methods.

4. Result and Discussion

Result

1. **Evaluation of Cost of Capital Concepts:**
 - In simple terms Cost of capital refers to the discount rate that is used in determining the present value of the estimated future cash proceeds of the business/new project and eventually deciding whether the business/new project is worth undertaking or not. It is also the minimum rate of return that a firm must earn on its investment which will maintain the market value of share at its current level. It can also be stated as the opportunity cost of an investment, i.e. the rate of return that a company would otherwise be able to earn at the same risk level as the investment that has been selected.
 - Provide a summary and analysis of the different cost of capital concepts explored in the paper, including the weighted average cost of capital (WACC), the adjusted present value (APV), and the risk-adjusted discount rate (RADR) approach.
 - Discuss the underlying principles, assumptions, and calculations involved in each concept.
 - Highlight the advantages, limitations, and potential challenges associated with each concept in the context of the chemical corporation.
2. **Components of Cost of Capital**

In order to calculate the specific cost of each type of capital, recognition should be given to the explicit and the implicit cost. The cost of capital can be either explicit or implicit. The explicit

cost of any source of capital may be defined as the discount rate that equals that present value of the cash inflows that are incremental to the taking of financing opportunity with the present value of its incremental cash outflows. Implicit cost is the rate of return associated with the best investment opportunity for the firm and its shareholders that will be foregone if the project presently under consideration by the firm was accepted

3. Industry-Specific Factors Consideration:

- Present a comprehensive analysis of the industry-specific risk factors identified in the paper, such as raw material price volatility, environmental regulations, technological advancements, and market demand fluctuations.
- Examine how each cost of capital concept incorporates or fails to incorporate these industry-specific factors.
- Discuss the implications of not considering these factors on the accuracy of cost of capital estimation and subsequent financial decision-making.

4. Application of Cost of Capital Concepts:

- Apply the identified cost of capital concepts to a representative sample of chemical corporations.
- Utilize the collected financial data and industry-specific information to calculate required inputs for each concept, such as the cost of equity, cost of debt, and risk premiums.
- Present the estimated cost of capital for each chemical corporation using each concept.

5. Comparative Analysis:

- Compare and contrast the results obtained from applying different cost of capital concepts to the sample of chemical corporations.
- Analyze the variations in the estimated cost of capital and their implications for investment decisions.
- Identify the factors that contribute to the differences in cost of capital estimation using each concept.

5. Discussion of Findings:

- Interpret the results obtained from the comparative analysis of cost of capital concepts.
- Discuss the strengths and weaknesses of each concept in relation to the industry-specific factors and strategic objectives of chemical corporations.
- Provide insights into the suitability of each concept for different types of chemical projects or investment opportunities.

6. Recommendations:

- Based on the findings and analysis, offer recommendations for chemical corporations in choosing an appropriate cost of capital concept.
- Discuss the factors that should be considered when selecting a cost of capital concept, such as the nature of the project, industry risk profile, and company-specific characteristics.
- Provide guidelines for integrating industry-specific factors into the cost of capital estimation process to enhance accuracy and decision-making.

7. Limitations and Future Research:

- Acknowledge any limitations encountered during the research process, such as data availability or the scope of analysis.
- Highlight opportunities for future research, such as exploring other cost of capital concepts or investigating the impact of specific industry events or trends on cost of capital estimation.

The results section should present a clear and concise summary of the findings obtained from the application and analysis of different cost of capital concepts in the chemical corporation context. Ensure that the results align with the objectives and scope of your research.

Discussion

1. Evaluation of Cost of Capital Concepts:

- a. Summarize the strengths and weaknesses of each cost of capital concept examined in the paper, including the weighted average cost of capital (WACC), the adjusted present value (APV), and the risk-adjusted discount rate (RADR) approach.
 - b. Discuss how each concept captures the risk and return expectations specific to the chemical industry.
 - c. Evaluate the applicability of each concept to different types of chemical projects, such as basic chemical manufacturing, specialty chemical production, or research and development initiatives.
2. Consideration of Industry-Specific Factors:
- a. Reflect on the importance of incorporating industry-specific risk factors in the cost of capital determination process for chemical corporations.
 - b. Discuss the impact of these factors on the accuracy of cost of capital estimation and subsequent investment decisions.
 - c. Highlight the challenges associated with quantifying and incorporating industry-specific risk factors into the cost of capital calculations.
3. Comparative Analysis of Cost of Capital Concepts:
- a. Compare the results obtained from applying different cost of capital concepts to the sample of chemical corporations.
 - b. Analyze the variations in the estimated cost of capital and their implications for investment decisions.
 - c. Identify the factors that contribute to the differences in cost of capital estimation using each concept, such as the treatment of industry-specific risk factors or the flexibility to account for project-specific characteristics.
4. Suitability of Cost of Capital Concepts for Chemical Corporations:
- a. Discuss the suitability of each cost of capital concept for chemical corporations based on their unique characteristics and strategic objectives.
 - b. Evaluate how well each concept captures the specific risk and return expectations of the chemical industry.
 - c. Consider the practical implications of using each concept, such as data availability, ease of calculation, and integration with existing financial decision-making processes.
5. Recommendations for Choosing a Cost of Capital Concept:
- a. Provide practical recommendations for chemical corporations when selecting a cost of capital concept.
 - b. Consider the specific circumstances and objectives of the corporation, such as the nature of the project, risk appetite, and long-term strategic goals.
 - c. Highlight the importance of considering both the advantages and limitations of each concept in the decision-making process.
6. Implications for Financial Decision-Making:
- a. Discuss how the choice of a cost of capital concept influences financial decision-making within chemical corporations.
 - b. Examine the potential impact on investment project evaluations, capital budgeting decisions, and overall financial performance.
 - c. Address the importance of aligning the cost of capital concept with the corporation's strategic goals and risk management strategies.
7. Conclusion:
- a. Summarize the key findings and insights discussed in the paper regarding the choice of cost of capital concepts in the chemical corporation.
 - b. Emphasize the significance of accurately determining the cost of capital and considering industry-specific factors in financial decision-making processes.
 - c. Provide a closing statement that encapsulates the value of the research and its implications for the financial management of chemical corporations.

The discussion section should critically analyze the findings and provide a comprehensive understanding of the implications of choosing different cost of capital concepts in the context of the chemical industry. Ensure that the discussion aligns with the objectives and scope of your research and offers meaningful insights to the reader.

5. Conclusion:

The determination of an appropriate cost of capital is a crucial factor in financial decision-making for chemical corporations. This paper has examined and compared three primary cost of capital concepts: the weighted average cost of capital (WACC), the adjusted present value (APV), and the risk-adjusted discount rate (RADR) approach, in the context of the chemical industry. Through a comprehensive literature review, we have evaluated the strengths and limitations of each concept and highlighted the importance of considering industry-specific risk factors when estimating the cost of capital.

Our analysis has revealed that each cost of capital concept has its own merits and drawbacks. The WACC provides a straightforward approach, considering both the cost of debt and equity, but may overlook industry-specific risk factors. The APV allows for a more accurate valuation by considering the present value of cash flows associated with individual projects, but it requires additional inputs and assumptions. The RADR approach incorporates risk premiums to account for industry-specific risks, making it suitable for evaluating projects with high-risk profiles, but it can be more complex to implement.

Furthermore, we have emphasized the significance of considering industry-specific risk factors such as raw material price volatility, environmental regulations, and technological advancements. These factors have a significant impact on the cost of capital estimation for chemical corporations and should not be overlooked. Incorporating these risk factors into the cost of capital calculation improves the accuracy and relevance of financial decision-making.

Based on our findings, we recommend that chemical corporations carefully consider their specific circumstances and strategic objectives when choosing a cost of capital concept. There is no one-size-fits-all approach, and the choice should align with the nature of the project, risk appetite, and long-term goals of the corporation. Additionally, integrating industry-specific risk factors into the cost of capital estimation process is crucial for obtaining accurate and meaningful results.

By selecting an appropriate cost of capital concept and considering industry-specific risk factors, chemical corporations can enhance the accuracy of investment evaluations, improve capital budgeting decisions, and ultimately optimize financial performance. However, it is important to note that the choice of cost of capital concept is not static and may require periodic review and adjustment as market conditions and industry dynamics evolve.

In conclusion, this research provides valuable insights into the selection of cost of capital concepts in the chemical corporation context. It highlights the importance of accurately determining the cost of capital and considering industry-specific risk factors. By incorporating these recommendations into their financial decision-making processes, chemical corporations can make informed investment decisions, mitigate risks, and drive sustainable growth and profitability in the dynamic and competitive chemical industry.

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