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A SYSTEMATIC REVIEW OF COST OF CAPITAL AND SUSTAINABILITY PERFORMANCE

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Abstract: *This research aims to comprehensively identify theoretical analysis and provide concrete empirical presentations relating to research trends regarding capital cost variables over the last five years from the top ten studies. The increasing popularity of investing among the public and the need for companies to plan new projects or expand product lines strategically have led to this crucial investigation. Focusing on the cost of capital, especially the weighted average cost of capital (WACC), is critical because it significantly impacts a business's growth strategy and various financial decisions. The profound impact of the cost of capital on business decisions cannot be overstated. This paper is a literature review, with qualitative analysis methods and data collection techniques through extensive reviews. This comprehensive review resulted in several studies in which the cost of capital (WACC) across various sectors and contexts highlights its impact on ownership structure and ESG practices. So, the cost of capital is a key determining factor in various financial decisions, with factors such as high-quality ESG reporting and ownership structure significantly impacting costs.*

Keywords: *cost of capital, sustainability performance, weighted average cost of capital*

1. INTRODUCTION

Lately, investment has become increasingly popular among the public. In this situation, many companies take advantage of this opportunity to develop their businesses. Companies typically adopt a business growth strategy by initiating new projects or expanding their product lines. Before embarking on a new project or adding

a product line, companies do not immediately approve and execute them. Instead, several factors need to be considered, and one of the most important is the cost of capital related to the weighted average cost of capital (WACC) to determine the cost structure for their new projects or product lines. Because the cost of capital is a substantial consideration in planning new projects within a business, many researchers conduct studies on the influence of the cost of capital on various types of projects. Some examples include the impact of the cost of capital on sustainability project planning within a company or the influence of the cost of capital associated with cost structure on a company's CSR/ESG activities, among others. Further research is needed in the future to support business development and growth. In this literature review article, the author aims to identify the research trends concerning the cost of capital variables over the past five years.

2. LITERATURE REVIEW

2.1. Corporate Sustainability Performance

Corporate sustainability encompasses various aspects such as corporate and social performance, corporate governance, corporate citizenship, and corporate sustainability (2022). It involves actions beyond a firm's interests and legal requirements to further social good (2022). The concept of environmental, social, and governance (ESG) has emerged to capture most sustainability-related activities firms pursue. Studies have shown that corporate sustainability performance can impact the cost of capital, with mixed results in the literature. While some studies find no significant relationship between corporate sustainability performance and the cost of capital, most studies suggest a negative association. Investors reward corporate sustainability performance laggers who invest in sustainability up to the industry median, while lenders penalize over-investments in sustainability. The optimal level of sustainability investment is crucial, as both underinvestment and overinvestment in sustainability can impact the cost of debt and equity. During periods of financial crisis, the relevance of sustainability and the degree of under- and overinvestment in sustainability activities become less significant to lenders and investors. Overall, corporate sustainability performance is

increasingly being recognized as value-relevant by capital markets, influencing how firms allocate resources and manage their cost of capital.

2.2. The Impacts of Environmental, Social, and Governance Factors on Firm Performance

Research has shown that considering environmental, social, and governance aspects can affect a firm's financial performance and cost of capital. Environmental factors, such as climate change, pollution, waste disposal, and renewable energy; social factors, including supply chains, discrimination, and human rights; as well as governance factors, like voting practices and executive compensation, are all crucial elements that can impact a firm's operations and financial outcomes. The study highlights that firms need to address ESG risks effectively to maintain their performance and manage their cost of capital. Management's level of risk tolerance can influence their approach towards environmental and social actions, which can either enhance the firm's reputation and sustainability or lead to negative consequences. The disclosure of environmental and social risks contributes significantly to the overall increase in ESG disclosure over time, emphasizing the importance of considering these factors in firm performance evaluations. In conclusion, the literature theory on the impacts of environmental, social, and governance factors on firm performance underscores companies' need to integrate ESG considerations into their strategic decision-making processes to enhance their financial performance and effectively manage their cost of capital.

2.3. Modigliani and Miller (M&M) Theory

The initial M&M proposition, referred to as "MM without tax," claims that in a perfectly efficient market devoid of taxes, bankruptcy costs, and informational asymmetries, a firm's value remains unaffected by its capital structure. This theory asserts that the total value of a firm remains constant, regardless of whether it has debt or equity financing. However, this elegant theoretical model is constrained by its perfect market assumption. The subsequent "MM with tax" addresses this limitation by incorporating the tax deductibility of interest payments, which effectively reduces the

firm's cost of capital and enhances its value through the tax shield provided by debt financing. This revision acknowledges that in real-world conditions, firms can strategically use debt to exploit tax benefits, thereby influencing their optimal capital structure. Beyond the M&M propositions, other theories have further advanced the comprehension of capital structure. The Trade-Off Theory proposes that firms balance the tax advantages of debt against the costs of potential financial distress, determining an optimal debt-equity ratio that maximizes firm value. This theory recognizes that while debt offers tax benefits, excessive leverage heightens the risk of bankruptcy. Conversely, in the Pecking Order Theory, firms prioritize internal financing over external sources and, when external funding is necessary, prefer debt over equity due to asymmetric information and transaction costs. This theory implies firms adhere to a financing hierarchy to minimize effort and expense.

3. RESEARCH AND METHODOLOGY

This qualitative research explores the development of cost of capital research in the last five years, utilizing literature reviews and the development of research libraries for data collection to visualize publication data using VOS viewer. Material from various sources, including Google Scholar and Publish or Perish, was used to find the most cited research. This research focuses on developing the Cost of Capital research from 2019 to 2023 by taking the two most cited articles each year. Taking the two most cited articles each year, it is considered capable of representing the direction of research development from year to year in the last five years regarding the Cost of Capital.

4. RESULT AND DISCUSSION

4.1 Cost of Capital Development

This paper outlines some of the previous researchers' reference findings and explorations with grounded theory on the Cost of Capital and the factors that influence the cost of capital directly or indirectly. The most cited research over the past five years (2019-2023) filtered out the top 10 are as follows:

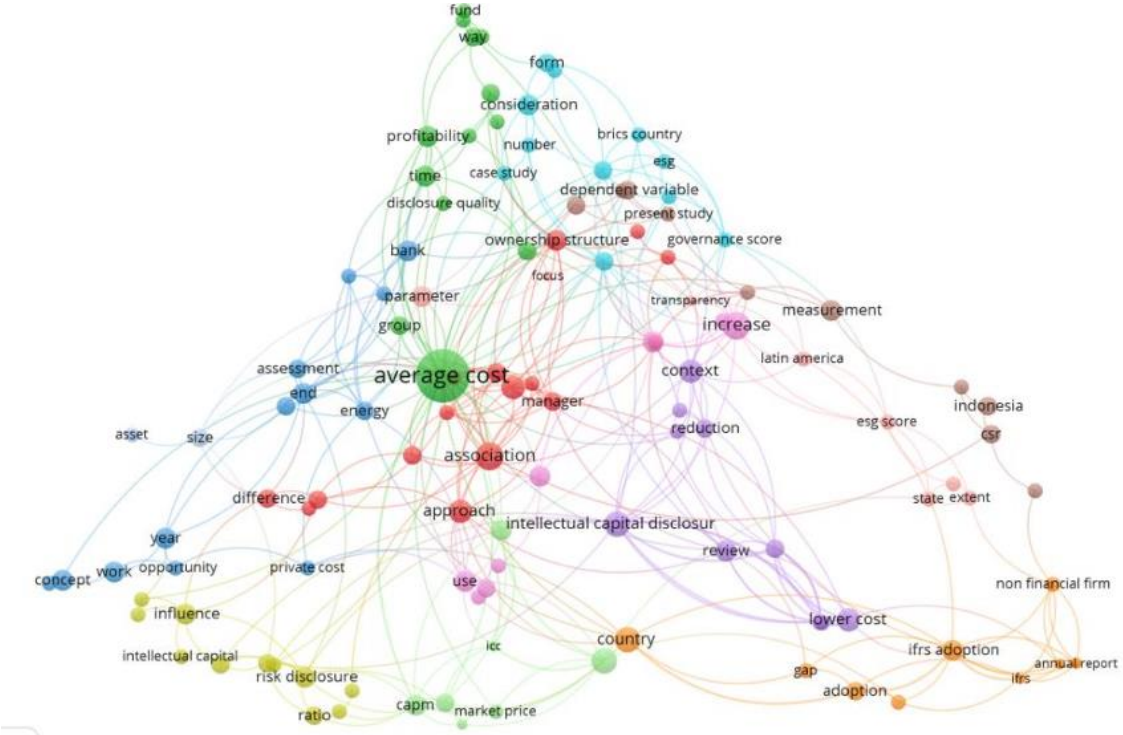
Table 1. List of Highly Top Ten Cited Articles

Year	Title	Author	Publication
2019	Impact of weighted average cost of capital, capital expenditure, and other parameters on future utility-scale PV-levelised cost of electricity	Eero Vartiainen | Gaëtan Masson | Christian Breyer | David Moser | Eduardo Román Medina	Wiley
2019	Ownership structure influencing the joint determination of dividend, leverage, and cost of capital	Abhinav Kumar Rajverma, Rakesh Arrawatia, Arun Kumar Misra & Abhijeet Chandra	Taylor & Francis
2020	Environmental, Social, and Governance Disclosure, Ownership Structure and Cost of Capital: Evidence from the UAE	Nejla Ould Daoud Ellili	MDPI
2020	The link between environmental, social and corporate governance disclosure and the cost of capital in South Africa	Ruth Johnson	Research Gate
2021	Energy Sector Risk and Cost of Capital Assessment—Companies and Investors Perspective	Justyna Franc-D ąbrowska , Magdalena M ądra-Sawicka and Anna Milewska	MDPI
2021	The Impact of CSR/ESG Reporting on the Cost of Capital:An Example of US Healthcare Entities	Agnieszka Piechocka-Kałużna1, Agnieszka Tłuczak2 Paweł Łopatka3	Research Gate
2022	"Cost of capital and firm value: Evidence from Indonesia"	Augustina Kurniasih Muhamad Rustam Heliantono Endri Endri	Business Perspective
2022	Sustainabiliy Performance and the Cost of Capital	Tiago Cruz Gonçalves 1, João Dias 2 and Victor Barros	MDPI
2023	Environmental Disclosure and the Cost of Capital: Evidence from the Fukushima Nuclear Disaster	Pietro Bonetti, Charles H. Cho & Giovanna Michelon	European Accounting Review: Taylor & Francis
2023	Hybrid and Avant Garde Methods for Cost of Capital Evaluation	Pablo Ricardo San Andrés Reyes, Juan Antonio Jimber del Río1, Fidel Márquez Sánchez2, Arnaldo Vergara Romero1	Research Gat

Source: Data Analysis

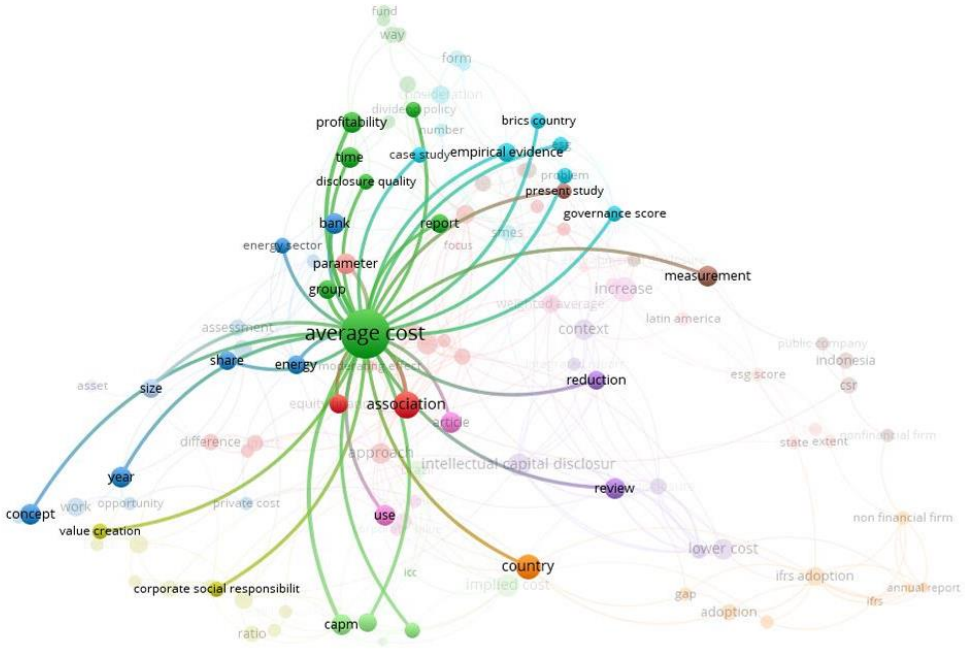
4.2 Topics Related to the Cost of Capital

In several studies, the cost of capital serves as an independent variable, impacting the future use of PV LCOE in European countries (Vartiainen et al., 2019), which is associated with non-financial disclosure such as ESG (Johnson, 2020), linked to firm value (Ellili, 2020), (Kurniasih et al., 2022), viewed from an investor perspective (Dąbrowska et al., 2021), related to sustainability performance (Gonçalves et al., 2022), (Bonetti et al, 2023), and analyzed through evaluation results (Reyes et al., 2023). Meanwhile, the cost of capital as a dependent variable appears in studies related to the influence of ownership structure on the cost of capital (Rajverma et al., 2019) and by CSR/ESG (Kałużna et al., 2021). Based on the PoP application software, we extracted 200 articles related to the cost of capital from 2019 to 2023. We processed them using VOSviewer software, which demonstrates the relationship between the cost of capital and several other topics as shown in the figure below.



Source: Result from VOSviewer

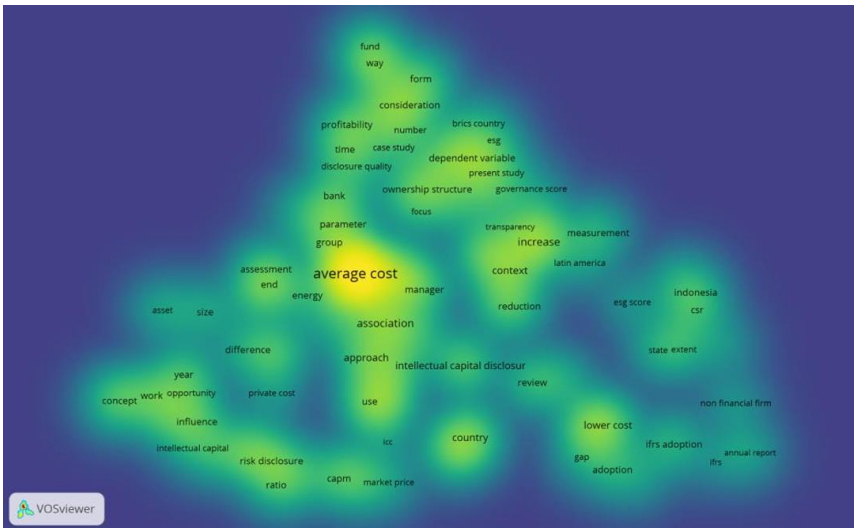
Picture 1. Network Visualization of Cost of Capital



Source: Result from VOSviewer

Picture 2. Network Visualization of Cost of Capital

The visualization results from VOSviewer indicate that several topics influence the cost of capital, particularly the average cost, such as CSR/ESG, CAPM, country, association, profitability, and others. Understanding these factors that affect the cost of capital can provide a better understanding of decision-making processes related to determining the cost structure of a project.



Source: Result from VOSviewer

Picture 3. The density of terms in research about the Cost of Capital

4.3 Methods Used by Researchers

Vartiainen et al. (2019) conducted research using market price data from PV Modules and other components. They tested several parameters, including WACC, inflation, CAPEX, OPEX from market prices of PV Modules and other elements, and battery storage, and then conducted sensitivity analysis. Meanwhile, Rajverma et al. (2019) used a 3 SLS approach to demonstrate the influence of ownership structure on dividends, leverage, and cost of capital. Ellili (2020) used multivariate regression analysis to find the relationship between ESG and Cost of Capital. Johnson et al. (2020) used data from 68 companies from 7 stock exchanges in Johannesburg and panel regression analysis to investigate the link between ESG disclosure and the cost of capital. Dąbrowska et al. (2021) used companies listed on European stock exchanges, mainly in the energy sector. The data was then processed using the WACC methodology, and the results were compared. Nonparametric tests of variance were performed to find the results. Piechocka-Kałużna et al. (2021), identifying the direction and strength of the relationship between individual elements of ESG disclosure, ESG total disclosures, and the cost of capital (weighted average, equity, and debt) in the healthcare industry, used an analytical approach. Kurniasih et al. (2022) estimated and analyzed the influence of the cost of capital on firm value using the moderation regression analysis approach, whose calculations were based on data from pulp & paper companies in IDX from 2013-2020. Gonçalves et al. (2022) examined the association between firms' ESG performance and the cost of capital using data from the most prominent European firms listed on the STOXX Euro 600 (2002-2018), using a qualitative approach, robustness tests, and additional tests. Bonetti et al. (2023) used a cross-sectional analysis of data from Japanese companies to assess the relationship between environmental disclosure and the cost of capital related to companies disclosing carbon emissions in their non-financial reports. Reyes et al. (2023) utilized bibliographical sources about several methods to evaluate the cost of capital.

4.4 Finding The Development Research Cost of Capital

Virtanen et al. (2019) conducted a study on the cost of capital, discussing the impact of weighted average cost of capital (WACC), CAPEX, and other parameters on

the scale of solar panel usage. The solar panels are the cheapest electricity generation tool available. The researchers want to determine whether these solar panels will remain the cheapest electricity generator in the following years and continue to be widely used by large companies in several European countries. The data used consists of market prices of PV modules and other components of PV. The researchers predetermined several parameters, including WACC and inflation, CAPEX (PV modules, inverters, and other Balance of System components), OPEX, yield, degradation, system lifetime, and battery storage. Indeed, after conducting several tests on the data, the parameter with the most significant influence on PV LCOE is WACC, apart from the location. Another research study talked about the cost of capital from a different perspective. Rajverna et al. researched the influence of ownership structure on dividends, leverage, and cost of capital. In this study, the cost of capital becomes the dependent variable influenced by the ownership structure. The researchers used data from company structures existing in India. The researchers used the 3SLS method and found that cost and dividend structures are interrelated, and in family-owned businesses, the ownership structure influences dividend policies and cost structures. The subsequent results showed that family ownership has a positive influence on leverage and a negative influence on the cost of capital.

Another study by Ellili (2020) on the cost of capital discussed the impact of non-financial disclosures on the cost of capital. Ellili (2020) used multivariate regression analysis to examine the effect of ESG/CSR scores and ownership structure on a company's cost of capital. The results obtained after testing showed a positive trend between ESG disclosure, environmental disclosure, social disclosure, and governance disclosure on the cost of capital. Moreover, this non-financial disclosure also reduces the overall cost of capital. Johnson (2020) also conducted a similar study on the linkage between environmental, social, and governance factors and South Africa's capital cost. The researcher used data from 68 companies listed on the Johannesburg Stock Exchange from 2011 to 2018 and analyzed it using panel regression analysis. The results showed a negative relationship between the combined score of ESG disclosure and WACC in both the goods and services sectors. In contrast, there was a positive relationship between ESG disclosure and WACC in the industrial sector.

The resulting research conducted by Agnieszka (2021) focuses on the relationship between ESG reporting practices and the cost of capital for firms in the US healthcare industry. The study found that higher-quality ESG reporting is associated with lower costs of equity and debt for these companies. Specifically, the research highlights that ESG and corporate governance components significantly impact the weighted average cost of capital and the cost of equity. However, there was no significant effect on the cost of debt. Furthermore, the study emphasizes the importance of ESG reporting in influencing the cost of capital for healthcare companies, highlighting the value of transparency and accountability in corporate reporting practices. The research aims to identify the direction and strength of the relationship between individual ESG elements and the cost of capital within the healthcare industry, particularly in the US market.

Additionally, Kurniasih (2022) addresses the contradictory empirical evidence regarding the impact of leverage on firm value, highlighting the motivation for further investigation in the Indonesian context. The study emphasizes that investors perceive a company's success in managing its resources through its value, proxied by the stock price reflecting investor wealth. The ultimate goal of a company is to create and maximize company value, with optimal capital structure policy playing a crucial role in achieving this goal.

Whereas Dabrowska et al. (2021) claim that the energy sector, being highly regulated, underscores the importance of WACC as it guides suitable financing strategies, providing insight into capital costs and financial management. Reducing information asymmetry can lower these costs. Research indicates WACC depends on company size, equity, total revenues, and age but not necessarily on asset value or market capitalization. For younger firms, WACC is higher due to uncertain future performance. The study partially confirmed that total assets influence WACC, and the Beta coefficient significantly impacts equity costs, highlighting market risks and stock price anomalies. Additionally, a negative relationship between WACC and profitability suggests that profitable companies use retained earnings for growth while less profitable ones rely on debt. High WACC is associated with lower firm values, negatively affecting market performance, whereas companies maintaining low WACC achieve the best financial results.

Almost the same as before, research conducted by Leg Goncalves et al. (2022) discussed sustainability performance and cost of capital. From two perspectives, namely the cost of debt and the cost of equity, researchers found that the equity and debt markets strongly influence environmental, social, and governance (ESG) performance. In contrast to previous research, which tested variables in Indonesia, this time, the test was carried out to determine the relationship between environmental, social, and governance (ESG) performance and cost of capital in the largest companies in Europe included in the STOXX Euro 600 for the last 16 years from 2002 to 2018. This research found that the sustainability performance score in an industry is optimal when there is a balance between the cost of equity and the cost of debt. Apart from that, researchers also found that environmental, social, and governance (ESG) did not significantly shape firms' cost of capital in financial periods.

Previous research discussed in a complex way the influence of the cost of capital on Environment, Social, and Governance. Research conducted by Bonetti et al., 2023, reveals the impact of companies that carry out Environmental Disclosure on the Cost of Capital of Japanese company data based on the Fukushima Nuclear Disaster incident. Researchers investigate the pre-disaster heterogeneity of companies that carry out environmental disclosure, which has a different influence on the cost of capital after a disaster. The research results show that firms that disclose carbon emissions experience a lower increase in cost of capital when compared to companies that do not disclose emissions. However, overall, environmental disclosure can mitigate increases in capital costs and explain the impact of a company's carbon emissions.

Subsequent research by Reyes et al. (2023) evaluated the Cost of Capital using a hybrid method and an Avant-garde method. Simple Addictive Weighing and KOPRAS-G, Analytical Hierarchy Process (AHP), 3SLS approximation system (DIV, LEV, and COC models), tree regression, and model-based used in some hybrid and avant-garde methods of cost determination using Support Vector Regression (SVR), Novel Artificial Intelligence model, Ant Colony Optimization algorithm based on Deep Neutral networks, Partial Least Squares equation (PLS-SEM), multiple Least Squares regression analysis, Accounted FOR (VAF), Implied cost of capital (GLS, CT, OJ, MPEG and GD models), Bayesian Markov chain Monte Carlo approach, stochastic

assessment via Monte Carlo simulation, Stretchy econometric methodology, based on Panel Smooth Transition Regression (PSTR), Social Environment And Governance (ESG), Hybrid approach beta, and REIT model factors. According to the Fama & French model, other variables need to be considered to increase the company's cost of capital. Investors can use this method to calculate the company's cost of capital for future evaluation.

5. CONCLUSION, LIMITEDNESS, AND RECOMMENDATION

5. 1 Conclusion

The extensive research on the cost of capital highlights its critical role in various sectors and contexts. Studies such as those by Virtanen et al. (2019) emphasize the influence of WACC, CAPEX, and other parameters on solar panel usage, revealing that WACC is a significant determinant of PV LCOE. Rajverna et al. found that ownership structure affects dividends, leverage, and cost of capital, with family ownership positively influencing leverage but negatively affecting the cost of capital. Ellili (2020) and Johnson (2020) demonstrated that ESG disclosures generally lower the cost of capital, though effects vary by industry. Agnieszka (2021) confirmed that high-quality ESG reporting reduces the cost of equity and debt in the US healthcare sector. Kurniasih (2022) and Dabrowska et al. (2021) discussed the impact of WACC on firm value, emphasizing its dependency on company size and market conditions. Goncalves et al. (2022) found that balanced ESG performance optimizes European companies' equity and debt costs. Bonetti et al. (2023) showed that environmental disclosure can mitigate increases in capital costs, particularly in the context of the Fukushima disaster. Reyes et al. (2023) evaluated innovative methods for assessing the cost of capital, providing tools for investors to gauge future financial evaluations better. Overall, these studies underscore the multifaceted impact of WACC, ownership structures, ESG practices, and innovative assessment methods on the cost of capital across various industries and regions.

5.2 Recommendation and Managerial Implication

Based on the research conducted, the researchers intend to provide relevant information to stakeholders, whether they are company owners, management, investors,

or the general public, regarding the importance of the cost of capital. Different viewpoints will produce various interpretations of how to use the cost of capital in decision-making. Based on the analysis conducted using PoP and VOSviewer software, several topics have a direct network with the cost of capital. Still, there are also those unrelated, such as ESG disclosure, intellectual capital disclosure, IFRS adoption, and many more. Researchers will explore new cost-of-capital topics that have not yet been studied, leading to fresh trends in the field.

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