

Marginal Effects of Dynamic ESG Factors on the Capital Cost of Highly Leveraged Companies

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Abstract: This article reviews recent researches related to the marginal effects of dynamic Environmental, Social, and Governance (ESG) factors on the capital cost of highly leveraged companies. It summarizes how ESG performance impacts the cost of capital for firms with elevated debt levels, and explores substantially grand theories, namely agency theory, stakeholder theory and dynamic capabilities theory, to explain how ESG commitments positively influence company valuation metrics. Results demonstrate that improvements in ESG performance significantly reduce capital costs by mitigating agency problems and enhancing investor confidence. However, most studies consider the ESG factors to be homogeneous across industries and unchanging over time, result in the lack of full consideration to measure a specific influence on capital cost coming from temporal changes in ESG metrics. This work advances existing literature by considering ESG metrics as dynamic, time-sensitive variables rather than static indicators, offering novel insights into the interplay between sustainability practices and financial risk in highly leveraged contexts. It is suggested that more efforts needed on making cross-sector comparisons and include qualitative evaluations of companies' ESG strategies. The findings underscore the strategic relevance of dynamic ESG management for cost optimization and sustainable financing in high-leverage scenarios.

Keywords: Dynamic ESG Factors, Highly Leveraged Companies, Cost of Capital, Governance Practices

1. Introduction

The importance of integrating Environmental, Social and Governance (ESG) factors into financial risk assessments has been growing over the last couple of years, especially for highly leveraged firms. The improved ESG performance can reduce financial risks, decrease the cost of debt, and increase the overall valuation of a firm [1]. However, most recent studies consider ESG metrics as static and cannot represent their dynamic nature, evolving in response to changes in regulations, market pressures, and shifting stakeholder expectations. The sensitivity of highly geared firms to such dynamic ESG changes remains unexplored, leaving a big research gap in understanding their marginal effects on capital costs [2]. Furthermore, studies have mainly focused on how ESG factors could contribute to reduced financial risk and enhanced firm value. Growing interest has been directed toward assessing the relationship of these factors to the capital structure, especially in times of economic uncertainty [3]. However, most studies consider the ESG factors to be homogeneous across industries and unchanging over time, which overlooks the heterogeneity among firms with different

levels of leverage [4]. In this regard, full consideration may not be available as to how temporal changes in ESG metrics represent a specific influence on the capital cost of highly leveraged firms. It therefore calls for an in-depth analysis of marginal effects, especially with respect to governance practices and dynamic risk responses. Thus, this research tries to fill this knowledge gap by investigating the dynamic ESG changes over time and their impact on the capital cost of highly geared firms, with a special emphasis on the differentiating role of governance practices and environmental risk management.

2. Literature review

2.1. Dynamic ESG analysis

Avramov, Lioui, Liu, and Tarelli [5] say that in recent years there has been a clear increase in how dynamically changing ESG preferences affect return differentials within green-versus-brown portfolio strategies. This shows how important it is to be careful with modelling ESG investment performance by extrapolating historical return patterns in a straight line. Current literature extensively refers to the dynamic nature of ESG factors, indicating that the impact on financial performance and also the assessment of risk itself changes with changing regulation and market volatility [6]. However, most of the existing literature considers ESG metrics as static and hence fails to capture their temporal variability and its implication for corporate capital costs [7]. In addition, due to the dynamic nature of ESG factors, especially in terms of governance and environmental aspects of risk factors, highly-leveraged firms are still relatively unexplored. The current paper seeks to fill both of these gaps by considering and applying a time-varying framework of ESG analysis, placing emphasis on the marginal effects of ESG dynamics on the capital costs of highly-leveraged firms.

2.2. Impact of ESG factors on capital cost

ESG metrics have emerged as a critical value creation mechanism in contemporary corporate governance, with their strategic salience being systematically internalized by investors, executives, and multilateral stakeholders to enhance firm value [8]. Eccles et al. [9] indicate that high-sustainability firms would report their ESG information to shareholders as well as stakeholders and are able to reduce long-term capital cost. Literature has identified the fact that good ESG performance is related to lower capital costs because of reduced perceived risk and increased investor confidence [10]. However, most analyses concern overall ESG scores and do not provide much recognition of the differing contributions from the environmental, social, and governance components [11]. Moreover, existing research often considers firms that have stable leverage and hence fails to capture the unique financial dynamics associated with highly leveraged companies. The current study tries to fill these lacunae by investigating separately the individual influences of ESG dimensions on the costs of capital focused on high-leverage contexts and providing an in-depth look at how G and E aspects act to mitigate financial risk.

2.3. High leverage and ESG sensitivity

The studies of Chen [12] suggest that under-leveraged capital structure might prevent a firm from higher return as there is a negative correlation between profitability and leverage. The higher leverage could mitigate losses from information asymmetry [13], due to that investors would require a higher risk premium to compensate for the uncertainty caused by information asymmetry. As a result, highly leveraged firms would face more vulnerability to exogenous risks, and sensitivity to ESG performance would be an important factor in maintaining financial stability [14]. However, most studies generalize these effects of ESG metrics across firms without highlighting the increased risk

exposure in highly leveraged contexts [15]. Moreover, no study so far analyzes how factors of industry specificity interact to modify the impact of ESG performance on capital costs for firms.

3. Theoretical foundations and previous studies

The increasing trend of corporate ESG activities have promoted an in-depth academic exploration in examining the relationship between ESG practices with company performance. However, academic consensus has yet to emerge on how ESG commitments positively influence company valuation metrics [16] [17]. Recent studies are based on three substantially different grand theories, namely agency theory, stakeholder theory and dynamic capabilities theory.

3.1. Agency theory

Agency theory deals with the conflicts that arise because of the different interests of shareholders (principals) and managers (agents), particularly in highly leveraged firms where managers might pursue risky projects that benefit them but harm long-term shareholder value [18]. Previous studies indicate that corporate involvement in ESG activities would give rise to agency problems as ESG activities usually substitute those more profitable projects for the company [19]. Furthermore, Huang, Fang, Xue, & Gao's [20] research shows that ESG performance significantly promotes the quality of corporate governance, which could reduce agency cost. Most scholars discuss the relationship between ESG activities and company performance based on modern corporate governance. They believe that enterprises actively practicing ESG can obtain stakeholders' support and external resources for future development [21]. Agency theory has been applied in papers by studying how improvements in governance, as part of dynamic ESG factors, can decrease highly leveraged firms' risk and lower their capital costs.

3.2. Stakeholder theory

Under the theory of stakeholders, the identification of a firm's long-term success is brought by balancing all the interests in the business rather than only focusing on maximizing shareholder profits [22]. This theory emphasizes stakeholder satisfaction, and indicate companies with stronger ESG performances can meet their stakeholder's needs better, enhancing their reputation and diminishing overall risk [14]. Empirical research provides evidence that addressing the concerns of stakeholders, especially in the fields of social and environmental dimensions, reduces capital costs through increased investor confidence. Stakeholder theory is relevant to a great extent—as evidenced by how the improvement of environmental and social factors in dynamic ESG changes could reduce the perceived risk of highly leveraged firms, which in turn decreases their capital costs.

3.3. Dynamic capabilities theory

Dynamic capability theory suggests that companies appropriately respond to changes in the business environment, such as regulatory changes or evolving ESG expectations, are able to maintain the sustainability of competitive advantage [23]. Persistent scholarly discourse has focused on strategies to enhance corporate sustainability practices. Empirical evidence shows that firms utilizing dynamic capabilities are better aligned with the strategies of the stakeholder demands, which lessen perceived risk and decrease capital costs [24]. They emphasize that companies should pay attention to reducing their ESG footprints and achieving harmonious development of ESG to achieve corporate sustainability [25]. This dynamic capability theory is applied within studies to view how highly leveraged firms adapt their strategies to dynamic ESG changes, building resilience and reducing the capital cost due to quick responses to changing environmental and social expectations.

4. Future directions

It is essential to fill this knowledge gap by investigating the dynamic ESG changes over time and their impact on the capital cost of highly geared firms, with a special emphasis on the differentiating role of governance practices and environmental risk management. The further research could conduct a quantitative assessment of the marginal effects of the dynamic changes in ESG factors on the capital cost of highly leveraged companies and measure how the changed sensitivity to environmental risk affects the capital cost of severely leveraged firms across industries. By integrating quantitative and qualitative results, the analysis of dynamic ESG factors in relation to capital costs becomes comprehensive. Triangulation could be done through the cross-validation of quantitative findings through qualitative insights in an attempt to identify and resolve any discrepancies. The integration of extensive data sources and diverse methods into one analysis provides a comprehensive insight into how the ESG factors influence capital costs. Whereas the quantitative part helps identify the statistical relationships, qualitative parts give explanations and contexts for firm-level responses and strategies. In this regard, the mixed-methods approach amply provides a framework for making sense of such nuanced influence caused by ESG factors on the highly leveraged firms.

This study would contribute to the literature by elucidating the financial consequences of dynamic ESG factors for highly leveraged firms. By investigating the time-varying effects of governance and environmental risk on capital costs, this study indicates the strategic ESG improvements that will result in upgraded financial soundness and investor confidence. The expected outcomes will guide corporate decision-makers and enhance understanding in the fields of sustainable finance and risk management.

5. Conclusion

This article tends to establish that dynamic ESG factors—notably governance practices and environmental risk management—significantly reduce capital costs for highly leveraged firms. By analyzing ESG performance as time-sensitive variables, the research reveals that incremental ESG improvements lower financing expenses through risk mitigation and enhanced investor confidence. Governance reforms and proactive environmental strategies emerge as the most impactful drivers, highlighting their strategic importance in high-leverage contexts. The adoption of a time-varying framework advances ESG research by capturing its evolving nature and dimension-specific effects, challenging traditional static interpretations. However, limitations such as industry-specific variability and sample biases necessitate cautious generalization. Future research should confirm these results in a wider range of industries, use a mix of research methods to look into how companies prioritize ESG factors when they have to deal with limited borrowing power, and look into the connections between changes in ESG factors and changes in capital costs. Practically, the results advocate integrating dynamic ESG analytics into risk management frameworks for debt-heavy firms, emphasizing governance transparency and environmental resilience. Policymakers and investors should incentivize granular ESG disclosures to better assess long-term financial stability. This work bridges sustainability and finance research, positioning ESG agility as a critical tool for balancing profitability and risk amid escalating climate and governance challenges.

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