

THESIS SUMMARY

THE IMPACT OF ESG RATINGS ON STOCK PERFORMANCE IN THE ELECTRIC VEHICLE (EV) MANUFACTURING INDUSTRY



Submitted by:

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Henry Efe Onomakpo Onomakpo, Prof. Amin Wibowo, Ph.D.

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Master of Business Administration
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ABSTRACT

Environmental, social, and governance (ESG) considerations are increasingly important to investors and businesses. This study investigates the relationships between ESG ratings and stock performance among electric vehicle (EV) manufacturers. The electric vehicle (EV) battery manufacturing industry faces unique ESG challenges and opportunities due to significant environmental and social effects throughout global supply chains. ESG ratings are becoming more important for EV companies, but little is known about their effect on stock performance. Furthermore, the impact of the EV supply chain and governance policies on stock performance has not been well examined. This knowledge gap impedes informed investor decision-making and business ESG alignment efforts.

The thesis utilizes ESG ratings and financial performance data from 2014-2023 for a sample of major publicly traded firms representing different segments of the global EV value chain to investigate how ESG ratings influence the stock performance of EV companies and whether ESG ratings' effects differ between electric and conventional automakers. Regression analysis and a capital asset pricing model (CAPM) are applied to analyze the links between ESG risk ratings and stock returns. The findings are interpreted through the theoretical lenses of stakeholder theory and behavioural finance.

The results show that better ESG ratings are positively associated with the stock performance of low-ESG-risk-rated EV automakers. However, no clear effects were detected for medium and high-ESG-risk-rated auto firms. Additionally, certain critical battery production factors like material sourcing significantly influenced returns. The effects of ESG ratings on stock performance do not differ between climate-friendly automakers and pure internal combustion engine (ICE) automakers.

The study contributes new empirical evidence to understanding ESG investing and sustainable finance in a strategically important transforming industry. The insights can help guide companies and policymakers on the role of sustainability ratings in stock performance in the energy transition.

Keywords: Environmental, social, and governance (ESG), Electric Vehicle (EV), Regression analysis, Capital Asset Pricing Model (CAPM), Stakeholder Theory, Behavioural Finance, Internal Combustion Engine (ICE), and Sustainability Ratings.

I. INTRODUCTION

1.1 Background

As the global transportation sector undergoes a radical transformation, the prominence of electric vehicles (EVs) is steadily growing as a viable alternative to traditional internal combustion engine (ICE) vehicles ([UNEP, 2019](#)). However, the extraction and processing of critical battery materials, such as lithium, cobalt, and nickel, required for EV production, pose significant environmental and social risks that necessitate careful management ([UNEP, 2019](#)).

Environmentally and socially conscious investors and supply chain procurement teams are increasingly seeking out businesses that have integrated robust environmental, social, and governance (ESG) principles into their operations, while more consumers are also seeking goods and services with more green and socially responsible credentials ([Friede et al., 2015](#)). The influence of these ESG considerations permeates throughout the automobile industry, shaping its operational practices, profitability, and the industry's ability to fulfil its environmental obligations ([Friede et al., 2015](#)).

1.2 Problem Statement

The EV battery manufacturing industry faces unique ESG challenges and opportunities due to significant environmental and social effects throughout global supply chains. ESG ratings are becoming more important for EV companies, but little is known about their effect on stock performance. Furthermore, the impact of the EV supply chain and governance policies on stock performance has not been well examined. This knowledge gap impedes informed investor decision-making and business ESG alignment efforts.

1.3 Research Questions

RQ1: *Do ESG ratings affect the stock performance of EV manufacturing companies?*

RQ2: *Do the effects of ESG ratings on stock performance differ between EV makers and ICE vehicle manufacturers?*

1.4 Research Objectives

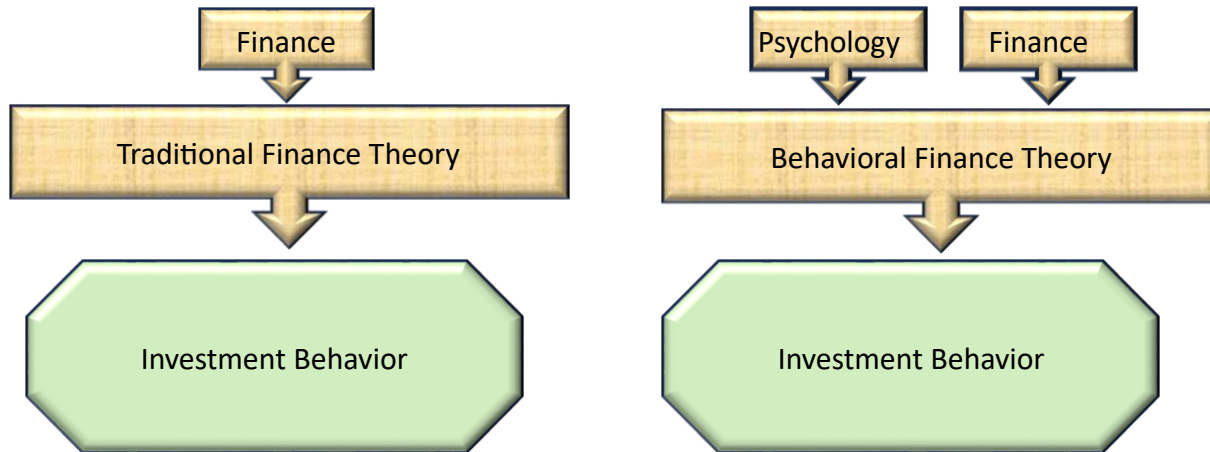
1. To investigate how ESG ratings influence the stock performance of EV companies.
2. To examine whether ESG ratings' effects differ between electric and conventional automakers.
3. To analyze the links between ESG risk ratings and stock returns using regression analysis and a capital asset pricing model (CAPM).
4. To interpret the findings through the theoretical lenses of stakeholder theory and behavioural finance.
5. To provide insights into the financial benefits of using ESG practices and sustainable supply chains in the EV industry.

II. LITERATURE REVIEW

2.1 The Theory of Behavioral Finance Perspective

Behavioural finance theory combines psychology and finance to better understand investment behaviour in financial markets, challenging traditional finance theory and offering new insights ([Shefrin et al., 2002](#)).

Figure 1: Explanation of The Theory of Behavioral Finance



As illustrated in Figure 1, the theory incorporates psychological factors that influence investor decision-making, such as:

- Cognitive biases (e.g., overconfidence, anchoring, framing).
- Emotional factors (e.g., fear, greed).
- Herd mentality and social influences.

These factors are recognized as important determinants of investment decisions, which traditional finance theory often fails to account for ([Shefrin et al., 2002](#)).

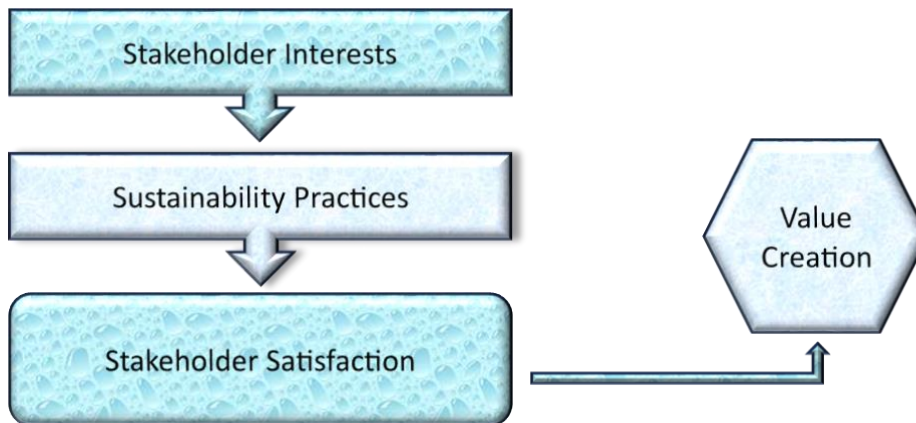
In the context of ESG, behavioural finance recognizes how psychological factors can influence investors' evaluations of firms based on ESG risk and impact ESG scores ([Thaler, 2005](#)). Research finds that sustainability information shapes investors' risk perceptions and evaluations of ESG scores and firm valuations ([Dhaliwal et al., 2012](#); [Khan et al., 2019](#)). Heuristics such as availability and representativeness can cause investors to misevaluate ESG risks (Brown & Tucker, 2016; [Dimson et al., 2015](#)).

Behavioural finance incorporates cognitive biases, such as optimism and excessive confidence, to explain financial market phenomena that are inconsistent with traditional models and influence perceptions of ESG risks and scores ([Yoshinaga et al., 2008](#)).

2.2 Stakeholder Theory and Analysis

Stakeholder theory provides a framework for understanding how sustainability practices create value by satisfying stakeholder interests ([Freeman et al., 2010](#)).

Figure 2: Stakeholder Theory Model



Stakeholder Theory posits that a company's success depends on its ability to satisfy the interests of various stakeholders, beyond just shareholders ([Freeman et al., 2010](#)). Stakeholders include employees, customers, suppliers, local communities, regulators, and the environment, among others ([Freeman et al., 2010](#)).

When a company implements effective sustainability practices, it can satisfy the interests and needs of its diverse stakeholders, creating value, both financial and non-financial, for itself and its stakeholders ([Freeman, 1984](#)). This value can take various forms, such as improved brand reputation, customer loyalty, employee engagement, operational efficiencies, and risk mitigation ([Freeman et al., 2004](#)).

Recent developments in stakeholder theory include:

1. "Behavioral stakeholder theory", applies insights from behavioural finance and psychology to understand how cognitive biases and heuristics impact the way managers and stakeholders make decisions ([Hörisch et al., 2020](#); [Schaltegger et al., 2019](#)).
2. New systemic and process-oriented approaches, drawing on Luhmannian systems theory, conceptualizing corporations as operationally closed systems that must continuously reconstruct the "unity of difference" between business and ethics ([Valentinov & Roth, 2023](#)).

These developments have led to a more comprehensive understanding of the psychological, systemic, and paradoxical aspects of managing numerous stakeholders ([Modibo et al., 2022](#); [Wenjun et al., 2017](#)).

III. RESEARCH METHODS

3.1 Research Design

This study employs a quantitative approach to examine the relationship between ESG factors and financial performance in the automotive industry. The research encompasses:

- An analysis of stock returns for 73 companies in the automotive sector and related supply chain.
- Evaluation of ESG ratings from reputable sources.

- Assessment of critical battery component sourcing.

The sample is diverse, including EV manufacturers, battery producers, mixed ICE/EV manufacturers, and traditional ICE automakers. This design allows for a comprehensive examination of the industry across different business models.

3.2 Data Collection Method

The study utilizes a multi-source data collection strategy to ensure robustness. Firstly, financial data of daily stock prices and returns (2014-2023) will be gathered from Yahoo financial databases. Afterwards, ESG information ratings will be gathered from established ESG research firms like Morningstar - Sustainalytics, MSCI, etc. The ESG risk rating data was extracted using Python specialized financial data libraries “[yesg](#)” Supply Chain information will be gathered from corporate sustainability reports and annual filings.

Sample selection criteria prioritized data availability, public trading status, and adequate market liquidity. This approach aims to provide a representative view of the automotive sector while ensuring data quality and completeness.

3.3 Data Analysis Method

The analytical approach combines several quantitative techniques like Regression Analysis to identify relationships between ESG factors and stock performance, Asset Pricing Models were employed to account for various risk factors in financial performance. Finally, a Comparative Analysis was employed to evaluate differences between traditional and climate-friendly automakers.

These methods allow for a nuanced exploration of how ESG considerations impact financial outcomes in the automotive industry while controlling for other relevant factors.

IV. RESULT AND DISCUSSION

4.1 Findings for RQ1 and RQ2: CAPM and Regression analysis

The Capital Asset Pricing Model (CAPM) and regression analysis were conducted on low, medium, and high ESG-risk rated firms in the automobile industry and their supply chain to answer the research questions.

Key findings

For low ESG-risk-rated EV automakers, the Polestar ESG variable had a statistically significant negative coefficient, indicating better ESG scores were linked to higher stock returns ([Friede et al., 2015](#)). Meanwhile, for medium and high ESG-risk-rated EV automakers, ESG-related variables were not statistically significant, suggesting no clear impact on performance.

Table 1: EV CAPM Result

	low-ESG EV CAPM Model (Better ESG Rating)	medium-ESG EV CAPM Model(Average ESG Rating)	high-ESG EV CAPM Model(Poor ESG Rating)
(Intercept)	-0.02 (0.01)	-0.03 (0.02)	-0.03 * (0.01)
MKT_RF	0.76 ** (0.28)	1.26 *** (0.33)	0.77 ** (0.28)
nobs	109	109	109
r.squared	0.07	0.12	0.06
adj.r.squared	0.06	0.11	0.06
sigma	0.13	0.16	0.14
statistic	7.53	14.31	7.31
p.value	0.01	0.00	0.01
df	1.00	1.00	1.00
df.residual	107.00	107.00	107.00
nobs.1	109.00	109.00	109.00

All continuous predictors are mean-centered and scaled by 1 standard deviation. The outcome variable is in its original units. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Column names: names, low-ESG EV CAPM Model (Better ESG Rating), medium-ESG EV CAPM Model(Average ESG Rating), high-ESG EV CAPM Model(Poor ESG Rating)

The CAPM showed statistical significance only for low ESG-risk-rated EV betas, not medium or high-risk-rated betas. The low ESG-risk-rated EV portfolio had a beta of 0.7566, indicating lower volatility than the market. Medium and high-risk-rated portfolios had higher betas, suggesting higher volatility ([UNEP, 2019](#)).

Comparing climate-friendly and ICE automakers, ESG variables were not statistically significant for either group across low, medium and high-risk ratings, except for the low-risk climate-friendly group.

4.2 RQ1 and RQ2: Interpretation of Results

RQ1: Do ESG ratings affect the stock performance of EV manufacturing companies?

Table 2: EV Regression Results

	low-ESG EV REGRESSION Model (Better ESG Rating)	medium-ESG EV REGRESSION Model(Average ESG Rating)	high-ESG EV REGRESSION Model(Poor ESG Rating)
(Intercept)	-0.01 (0.01)	-0.02 (0.03)	-0.01 (0.02)
MKT_RF	0.69 * (0.31)	1.24 *** (0.36)	0.57 (0.31)
Polestar_ESG	-0.01 * (0.00)		
SMB	0.45 (0.57)	0.83 (0.68)	0.50 (0.59)
HML	-0.59 (0.48)	-1.29 * (0.57)	-0.08 (0.49)
RMW	0.78 (0.71)	-1.32 (0.86)	-0.83 (0.73)
CMA	1.25 (0.71)	0.76 (0.85)	-0.74 (0.73)
TSLA_ESG		-0.00 (0.00)	
FSR_ESG			0.00 (0.00)
RIVN_ESG			-0.00 (0.00)
nobs	109	109	109
r.squared	0.16	0.22	0.16
adj.r.squared	0.11	0.18	0.11
sigma	0.13	0.15	0.13
statistic	3.15	4.82	2.83
p.value	0.01	0.00	0.01
df	6.00	6.00	7.00
df.residual	102.00	102.00	101.00
nobs.1	109.00	109.00	109.00

All continuous predictors are mean-centered and scaled by 1 standard deviation. The outcome variable is in its original units. *** p < 0.001; ** p < 0.01; * p < 0.05.

Column names: names, low-ESG EV REGRESSION Model (Better ESG Rating), medium-ESG EV REGRESSION Model(Average ESG Rating), high-ESG EV REGRESSION Model(Poor ESG Rating)

The findings reveal that ESG ratings do affect stock performance, but impacts vary by rating level. For low ESG-risk-rated EV automakers, better ESG scores led to higher stock returns. On the other hand, no clear impact was found for medium and high ESG-risk-rated EV automakers.

Consequently, the answer to RQ1 is yes - ESG ratings affect stock performance in the EV manufacturing industry, but primarily for low-risk (better ESG-performing) companies.



Table 3: EV vs ICE Automaker's CAPM Results

	low-ESG Climate_frie ndly CAPM Model (Better ESG Rating)	low-ESG pure_ICE CAPM Model (Better ESG Rating)	medium-ESG Climate_frie ndly CAPM Model(Averag e ESG Rating)	medium-ESG pure_ICE CAPM Model(Averag e ESG Rating)	high-ESG Climate_frie ndly CAPM Model(Poor ESG Rating)	high-ESG pure_ICE CAPM Model(Poor ESG Rating)
(Intercept)	-0.05 ** (0.02)	-0.09 *** (0.02)	-0.05 ** (0.02)	-0.06 ** (0.02)	-0.06 *** (0.02)	-0.03 (0.02)
MKT_RF	1.20 *** (0.32)	1.09 * (0.48)	1.44 *** (0.33)	1.46 *** (0.40)	1.31 *** (0.34)	1.35 *** (0.39)
nobs	109	109	109	109	109	109
r.squared	0.12	0.05	0.15	0.11	0.12	0.10
adj.r.square d	0.11	0.04	0.14	0.10	0.11	0.09
sigma	0.15	0.23	0.16	0.19	0.16	0.19
statistic	14.12	5.20	19.23	13.64	14.68	11.68
p.value	0.00	0.02	0.00	0.00	0.00	0.00
df	1.00	1.00	1.00	1.00	1.00	1.00
df.residual	107.00	107.00	107.00	107.00	107.00	107.00
nobs.1	109.00	109.00	109.00	109.00	109.00	109.00

All continuous predictors are mean-centered and scaled by 1 standard deviation. The outcome variable is in its original units. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Column names: names, low-ESG Climate_friendly CAPM Model (Better ESG Rating), low-ESG pure_ICE CAPM Model (Better ESG Rating), medium-ESG Climate_friendly CAPM Model(Average ESG Rating), medium-ESG pure_ICE CAPM Model(Average ESG Rating), high-ESG Climate_friendly CAPM Model(Poor ESG Rating), high-ESG pure_ICE CAPM Model(Poor ESG Rating)

RQ2: Do the effects of ESG ratings on stock performance differ between climate-friendly automakers and ICE vehicle manufacturers?

The low ESG-risk climate-friendly automakers showed a relationship between ESG performance and returns, while comparable ICE automakers did not. Whereas, ESG variables had no significant effect for either portfolio type for medium and high-risk groups.

Based on the analysis, the answer to RQ2 is no - the effects of ESG ratings on stock performance do not meaningfully differ between climate-friendly and ICE manufacturers across various ESG performance tiers, except for the low-risk segment.

4.3 Summary of Findings

ESG ratings impact stock performance for low ESG-risk EV automakers, with better scores leading to higher returns. Contrary, the effect is not observed for medium and high ESG-risk-rated companies.

Low ESG-risk-rated portfolios show lower volatility compared to the market. The impact of ESG ratings does not significantly differ between climate-friendly and ICE manufacturers, except in the low-risk segment.

These findings contribute to understanding ESG impacts in the evolving EV industry, highlighting the need to consider sector-specific factors when examining ESG-financial performance relationships ([Friede et al., 2015](#); [UNEP, 2019](#)).

V. CONCLUSION AND SUGGESTION

5.1 Conclusion

This study offers compelling empirical evidence that ESG risk ratings and supply chain practices exert a significant influence on the stock performance of EV automakers. The research reveals that companies boasting superior ESG scores, particularly those with low ESG risk ratings, tend to enjoy higher stock returns, especially within the EV manufacturing sector. These findings underscore the importance of sustainability factors in providing insights that extend beyond traditional finance models, as evidenced by the impact of critical materials sourcing practices on returns. Notably, the regression analysis employed in this study proved more effective than the CAPM method in modelling these complex relationships.

The results lend strong support to stakeholder theory and ESG integration perspectives by demonstrating the tangible influence of non-financial factors on stock prices, as previously suggested by Friede et al. (2015). This contribution enhances our understanding of the role ESG factors play in financial markets and highlights their significance in the ongoing energy transition. By focusing on the automobile manufacturing industry and critical battery component companies, this study offers a nuanced understanding of how ESG risk ratings influence stock returns in these specific contexts, adding depth to the broader discourse on sustainable finance and investment.

5.2 Recommendation

Looking ahead, several avenues for future research emerge from this study. To build upon these findings, researchers should consider incorporating additional controls to further strengthen the inferences drawn. As the EV industry continues to mature, expanding the sample size and scope of similar studies would allow for more complex and robust analytical models. Furthermore, conducting longitudinal studies over extended periods would provide valuable insights into the long-term effects of ESG risk ratings on stock performance, potentially revealing lagged effects and evolving trends over time.

Another promising direction for future research lies in exploring the specific mechanisms and channels through which ESG factors impact stock performance. This could involve a detailed examination of the particular ESG practices and initiatives undertaken by companies and their subsequent effects on financial performance. By pursuing these research avenues, scholars can significantly advance our knowledge of ESG ratings and stock performance, particularly within the automobile manufacturing industry and its associated supply chain.

5.3 Limitation

Several limitations were considered in interpreting the results and implications of this study. First, a relatively small sample size due to the nascent EV industry due to unobserved firm-specific effects. Furthermore, the selection criteria based on data availability may limit the generalizability of the findings to other industries. Different industries may exhibit varying patterns. However, this context was deliberately chosen as an economically vital sector undergoing renewable transformation. Second, the use of ESG-risk ratings or scores obtained from third-party agencies may be subjective and may not fully capture the comprehensive ESG performance of some companies which could lead to limitations in the analysis.

Finally, this study does not account for all factors that may influence stock performance, such as macroeconomic conditions or investor sentiment. Although the Fama-French 5-factor model used in my analysis includes various risk variables, there may be other unmeasured factors that could impact stock returns. Despite limitations, the results provide meaningful insights to regulators and market participants.

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