UNIVERSITI TEKNOLOGI MARA

THE EFFECT OF ESG PRACTICES ON VALUE CREATION: THE MODERATING ROLES OF FINANCIAL RISK AND AGENCY RISK

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THE EFFECT OF ESG PRACTICES ON VALUE CREATION: THE MODERATING ROLES OF FINANCIAL RISK AND AGENCY RISK

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CONFIRMATION BY PANEL OF EXAMINERS

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ABSTRACT

This study examines the effect of environmental, social, and governance (ESG) practices on corporate value creation, while also investigating the moderating roles of financial risk and agency risk. The study is situated within the context of listed firms operating in environmentally sensitive sectors on the Bursa Malaysia EMAS Index. Drawing on stakeholder theory and agency theory, the study views ESG practices as strategic mechanisms through which firms create value for multiple stakeholders while managing conflicts of interest between managers and shareholders. Stakeholder theory explains how ESG engagement supports long-term value creation by addressing the expectations of diverse stakeholder groups, whereas agency theory argues that ESG outcomes are contingent on firms' governance arrangements and financing decisions, which shape managerial incentives, resource allocation, and risk exposure. Financial risk is conceptualised as risk arising from capital structure and financing decisions, while agency risk reflects conflicts of interest between managers and shareholders. Four research questions were formulated to guide the study. A quantitative research approach was adopted, employing an ex-post facto and analytical research design. The study examined the effects of combined ESG practices as well as individual ESG components (environmental, social, and governance practices) on value creation, measured using enterprise value multiple (EVM) and market value added (MVA). Financial risk and agency risk were proxied by the weighted average cost of capital and executive compensation, respectively, while firm size and enterprise growth were included as control variables. The sample comprised all 161 firms across five environmentally sensitive sectors over the period 2019-2023. Data were analysed using descriptive statistics, cluster analysis, correlation analysis, and regression techniques. The findings indicate that combined ESG practices have a significant negative effect on EVM but an insignificant effect on MVA. At the component level, environmental practices exhibit a significant negative effect on both EVM and MVA, while social practices show a significant negative effect on MVA only. Governance practices, however, demonstrate a significant positive effect on both value creation measures. Regarding moderation effects, financial risk does not significantly moderate the relationship between combined ESG practices and value creation; however, it does significantly moderate the relationship between environmental practices and value creation. Similarly, agency risk does not moderate the combined ESG-value creation relationship but significantly moderates the relationships between environmental and governance practices and value creation. The study's key contribution lies in demonstrating that ESG value creation is conditional on firms' financing structures and governance-related incentive mechanisms, rather than ESG engagement alone. By integrating stakeholder and agency perspectives and empirically distinguishing the moderating roles of financial risk and agency risk, the study advances ESG literature by clarifying how and under what conditions ESG practices translate into value creation, offering important implications for corporate managers, investors, regulators, and policymakers.

Keywords: ESG practices, Environmental Practices, Social Practices, Governance Practices, Value Creation, Financial Risk, Agency Risk.

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LIST OF ABBREVIATIONS

Abbreviations	
ASIC	Australian Securities and Investments Commission
CDP	Carbon Disclosure Project
CPPIB	Canada Pension Plan Investment Board
CSRD	Corporate Sustainability Reporting Directive
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortisation
EC	Executive Compensation
ECB	European Central Bank
EGR	Enterprise Growth
ESG	Environmental, Social, and Governance
EU	European Union
EVM	Enterprise Value Multiple
F4GBM	FTSE4Good Bursa Malaysia
FCA	Financial Conduct Authority
FSA	Financial Services Agency
FSize	Firm Size
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
GSIA	Global Sustainable Investment Alliance
ICFR	Internal Control over Financial Reporting
IFC	International Finance Corporation
IIRC	International Integrated Reporting Council
IR	Integrated Reporting
ISO	International Organisation for Standardisation
ISSB	International Sustainability Standards Board
MCCG	Malaysian Code on Corporate Governance
MVA	Market Value Added

NFRD	Non-Financial Reporting Directive
NSRF	National Sustainability Reporting Framework
OSC	Ontario Securities Commission
SASB	Sustainability Accounting Standards Board
SEC	Securities and Exchange Commission
SFDR	Sustainable Finance Disclosure Regulation
SMEs	Small and Medium-Sized Enterprises
TBL	Triple Bottom Line
TCFD	Task Force on Climate-related Financial Disclosures
UNEP	United Nations Environment Programme
UNGC	United Nations Global Compact
WACC	Weighted Average Cost of Capital
WBCSD	World Business Council for Sustainable Development

CHAPTER 1
INTRODUCTION

1.1 Introduction

The research focus of this study is to examine the value creation in listed firms and investigate whether their value creation can be influenced by the executed environmental, social, and governance (ESG) practices. This perceived relationship between value creation and ESG practices is examined under the possible moderating influences of financial risk and agency risk. The moderating roles of financial risk and agency risk were explored through separate investigations as two theoretically distinct constructs, which could result from decisions made by corporate executives.

This chapter provides an overview of the fundamental conceptualisation around ESG practices and value creation, and equally identifies the key issues to be addressed by the study. It begins with an introduction in Section 1.1, which is then followed by a background of the study in Section 1.2. Next is the problem statement to identify the issues and research gap surrounding value creation and ESG in Section 1.3, the aim and objectives of the study in Section 1.4, and the posed research questions in Section 1.5. This is followed by the scope of the study and the significance of the research in Sections 1.6 and 1.7, respectively. Definitions of operational terms of the study are well elucidated in Section 1.8. The chapter concludes by providing a structured organisation and arrangement of the subsequent chapters of the study in Section 1.9.

1.2 Background of the Study

Value creation has long been stressed in accounting and business literature as the main objective of corporate organisations. Traditionally, it has been viewed from the perspective of shareholders' wealth maximisation through increased share prices and dividend payments. However, modern business perspectives have shifted towards a broader stakeholder-oriented approach to value creation, which incorporates the interests of employees, customers, regulators, vendors, financiers, and society at large (Windsor, 2017; Haksever et al., 2004). According to Jones (1995), firms that consider

the needs of all their stakeholders and not just the shareholders are more likely to become more successful, profitable, and resilient.

The value creation orientation guides business executives in choosing which investments to make and how to finance them in order to maximise corporate returns (Boyles, 2022). As such, it can be regarded as essential to the firm's long-term liquidity, profitability, and growth. Value is created when the benefit of a project outweighs the cost, giving rise to a surplus. This makes it a core driver and a critical issue for consideration when financial decisions are made by shareholders and other key stakeholders of an organisation.

However, the value created by firms will seem different for different stakeholders, given their varying value expectations (Bowman & Ambrosini, 2010). Shareholders are usually more interested in maximising their wealth, which can take the form of dividends received from profits and/or growth in their share prices. This aligns with the suggestion of Choi and Click (2006) that value, which is the existential objective of an organisation, can be associated with profits, share prices, cash flows, and strategic objectives. Employees and the local community are usually more interested in better welfare from the company as a value to them. This is supported by Windsor (2017), who postulated that created value represents an enhancement in an individual's welfare compared to the previous level of welfare. On the other hand, key stakeholders like the government would be interested in tax returns from the improved value created by firms, while employees and managers could be more interested in bonuses and good remuneration packages.

In the research literature, value creation has been a recurring and developing issue, attracting diverse research studies (Adams, 2017; Chakrabarty, 2020; Memili et al., 2015; Wang et al., 2024; Zheng et al., 2023). These research interests are geared towards explaining value creation and how it can be created by the organisation. Porter and Kramer (2006) had earlier suggested that value creation should not be restricted to a short-term focus like economic profit, but rather to encompass a long-term perspective related to societal and external environmental benefits. This is because firms that trade value creation for short-termism may jeopardise long-term stakeholder interests as well as the shareholder value created. According to Goedhart and Koller (2020), shareholder value could be destroyed when short-term focus leads to environmental disasters, which

may incur cleanup costs, fines, and possible damage to corporate image. Short-term profit focus may influence managers to withhold critical expenditures on safety and training, which in the long run would affect productivity, increase risk exposure, and impact overall corporate value created.

As a result, the foundation of any business strategy could be structured around sustainable value creation for the firm's customers and other key stakeholders in order to attain appreciable corporate performance (Payne & Holt, 2001). This could be exploited through developing a value-creation architecture, which is a strategic space that encompasses business orientations and strategic postures representing "the right things to do" while generating value for the stakeholders (Viet Ngo & O'Cass, 2008). It could also require pursuing value creation as a collaborative process involving all key stakeholders and anchored on the activities and information flow from the firm's human, material, and social resources (Espejo & Dominici, 2017; Zhu et al., 2018).

In this regard, investors and creditors, as key stakeholder groups, participate in the value creation process by providing the needed funding resources. In contrast, the government provides an enabling business infrastructure environment. Customers are expected to communicate their products' requirements and specifications, while employees will utilise the funding and other resources provided to satisfy the customer requirements and create overall corporate value. This aligns with Blanco-Mesa et al. (2018)'s postulation that a company cannot maximise value if it disregards the interests and engagements of its stakeholders, as captured in the stakeholder theory. This is in line with the bonding perspective, which holds that value creation arises from the goodwill that exists in a connection between a company and its stakeholders (Chakrabarty, 2020). Therefore, stakeholder-company relationships could provide a foundation for value creation, resulting in the formation of intricate information-sharing networks that enable access to vital resources and innovative opportunities for all parties involved.

In developing a value creation business strategy, it would be pertinent for companies to undertake an introspective strategic evaluation to identify those activities that could influence their corporate value creation. An area of corporate activity that has recently attracted researchers' attention due to its connection with value creation is the environmental, social, and governance (ESG) practices of firms (Ionescu et al., 2019;

Wang et al., 2024; Zheng et al., 2023). ESG practices are becoming increasingly attractive to investors as they seek corporate investments that are not only financially viable but also environmentally conscious and sustainable in the long run (Eccles & Youmans, 2015). According to Richardson (2009), the incorporation of ESG as a metric for assessing corporate value creation can create a connection between companies' environmental, social, and governance performance, which aligns with the tenets of socially responsible investment. This could offer a comprehensive perspective on the firm's operations and highlight its overall corporate sustainability and potential positive impact on corporate value in the long run.

ESG is an acronym that stands for "Environmental, Social, and Governance." It refers to a set of practices, such as policies, processes, and measurements, that firms integrate into their business strategy to minimise negative impact or improve positive impact on the environment, society, and governance structures (Apiday, 2024). As asserted by Choi et al. (2024), environmental, social, and governance practices have been seen by scholars as a method used to run companies in a sustainable manner and for the benefit of the stakeholders. Thus, the actions and practices of corporate entities concerning ESG could drive the value created for their stakeholders. Wang et al. (2024) also supported this perspective by arguing that the solution to a company's willingness and approach to ESG responsibility lies in the value that ESG practices create for the company.

Establishing a strong connection between ESG practices and the value creation of firms can spur a considerable inflow of investments into the firm, as canvased by the proponents of socially responsible investment (Richardson, 2009). Shareholders and investors are more willing to invest in companies with exceptional ESG performance because of the economy's and society's rapid development, coupled with other stakeholders' growing demand for corporate ESG information (Fink, 2020). This is an indication that the importance of ESG practices is commanding growing interest from stakeholders in guiding their sustainable business decisions. Similarly, Yu et al. (2020) have expressed that the three most crucial characteristics for gauging the sustainability of economic players in the global society are progressively evolving into the ESG criteria. Therefore, firms aiming to create sustainable value, achieve financial

sustainability, and attract global investors may prioritise the strategic planning and execution of their ESG practices.

ESG practices have been closely observed by the business sector and academic community lately (Arif et al., 2020). According to Eliwa et al. (2021), corporate organisations are facing pressure to enhance their operational and financial performance, and several stakeholder groups are exerting further pressure on them to surpass the mandatory standards of ESG activities. Previous studies have found that companies' strengths regarding their ESG practices impact their corporate value and performance (Wong et al., 2020; Battisti et al., 2019; Murashima, 2020). On the other hand, ESG inadequacies reduce the firm's value, while ESG strengths contribute to it (Fatemi et al., 2018).

The conceptual foundation presented in this study provides an opportunity to investigate and improve our understanding of how ESG practices can enhance or impede value creation in corporate organisations. The interactions between ESG practices and value creation, as observed by past studies, have shown divergent views and outcomes. Some studies highlighted a positive association between ESG performance and corporate value (Aydoğmuş et al., 2022; Wong et al., 2020), while others find neutral or even negative relationships (Ahmad et al., 021; Tampakoudis et al., 2021; Zheng et al., 2023). These inconsistencies suggest that the relationship could be more complex than just the basic causal relationship and may be influenced by contextual or moderating variables.

As such, this study was structured to address the potential research gaps in the existing literature by expanding the scope of this research beyond the conventional focus on the direct relationship between Environmental, Social, and Governance (ESG) practices and value creation. This was achieved by introducing financial risk and agency risk as moderating variables, which is crucial to fully understanding the dynamics around the ESG and value creation relationship. The incorporation of these risks into the study was aimed at providing a more comprehensive and subtle perspective on how ESG practices may influence value creation, offering new insights that extend beyond the identified gaps in the existing literature.

In the process of creating value, the board of directors is expected to make key corporate decisions to achieve the organisational goal of maximising shareholders'

wealth. However, when the board's financing and governance-related decisions fail to align with corporate objectives and goals, they expose the firm to financial risk and agency risk (Chaffai & Dietsch, 2015). Financial and agency risk exposures encompass a broad spectrum of issues, including capital structure choices, managerial incentives, stakeholder interests, and corporate governance mechanisms (Roberts et al., 2003). Thus, these risks may manifest in different forms of exposure to the firm. When governance and compensation-related decisions are driven by the self-interest of board members or executives, the firm faces agency risk exposure. Conversely, the firm becomes vulnerable to financial risk exposure when the board makes inefficient capital structure decisions, resulting in excessive financing costs or an unfavourable cost of capital.

This study is interested in these forms of risk exposure because they capture both opportunistic decisions arising from managerial self-interest and suboptimal financing decisions that may be unintentional but stem from executives' judgment, incentives, or competence levels. Furthermore, agency risk exposure is more likely to be observed in firms that are subject to high financial risk. This relationship is supported by the study on capital structure decisions and ESG performance by Al Amosh et al. (2022), which argued that firms with a high cost of capital may also incur greater agency costs due to capital transfers from debt holders to equity holders.

Agency risk emerges from the potential of managers to pursue personal goals, such as increased compensation or power, at the expense of shareholder wealth (Shleifer & Vishny, 1997). This may result in substantial agency costs, as shareholders and other stakeholders must invest more resources in monitoring and controlling managerial behaviour. Financial risk, on the other hand, can be associated with executives' decision-making processes regarding a firm's financing choices, particularly how it structures its debt and equity funding mix. A company with a high cost of capital signals a higher risk associated with the organisation's operations because the company is paying more for the capital that investors have put into the company (Chen et al., 2004). Understanding the relationships between ESG practices and corporate value creation and the extent to which financial risk and agency risk can moderate these relationships is pertinent at this time, where there is a need for greater synergy between corporate

entities and governments to address growing sustainability issues, and thus, justifies the study.

Furthermore, ESG research benefits are not limited to just corporations but also extend to macroeconomic impacts. Thus, it has been argued that nations must also become more effective in developing fresh ideas and perspectives for improving environmental policies that encourage more change and dynamics in considering the global and value-driven economy (OECD, 2005). These policies also encompass social and environmental issues like welfare distribution and growth. As such, ESG practices and policy strategies could serve as a progressive approach to meet this requirement. According to Kell (2021), the word "ESG" was first used in Western countries in 2005, and investors acknowledged at that time that it was essential to comprehend the goals, tactics, and managerial calibre of corporations.

To this end, an increasing amount of research is being done on ESG, with much of it focusing on economically developed Western nations. However, not enough research has been done on the issues around ESG practices and how they affect businesses in emerging economies. Malaysia would be a place of ESG research interest to consider, given its growing and emerging economic potential. This is added to the fact that the ESG practices and performance scores of Malaysian companies have shown consistent improvement over time relative to other emerging economies, with Malaysian firms' overall ESG score of 2.5 in 2022, a 33.7% increase from 2018 (Bursa Malaysia & FTSE Russell, 2022).

Furthermore, according to KPMG's biennial Survey of Sustainability Reporting 2022, Malaysia ranks first among the top 10 nations, achieving a score of 97% out of 100% for the inclusion of sustainability information in the annual financial reports of the top 100 companies. This elevates Malaysia to the position of global leader and a country of keen interest for this study. This is depicted in Figure 1.1 below.

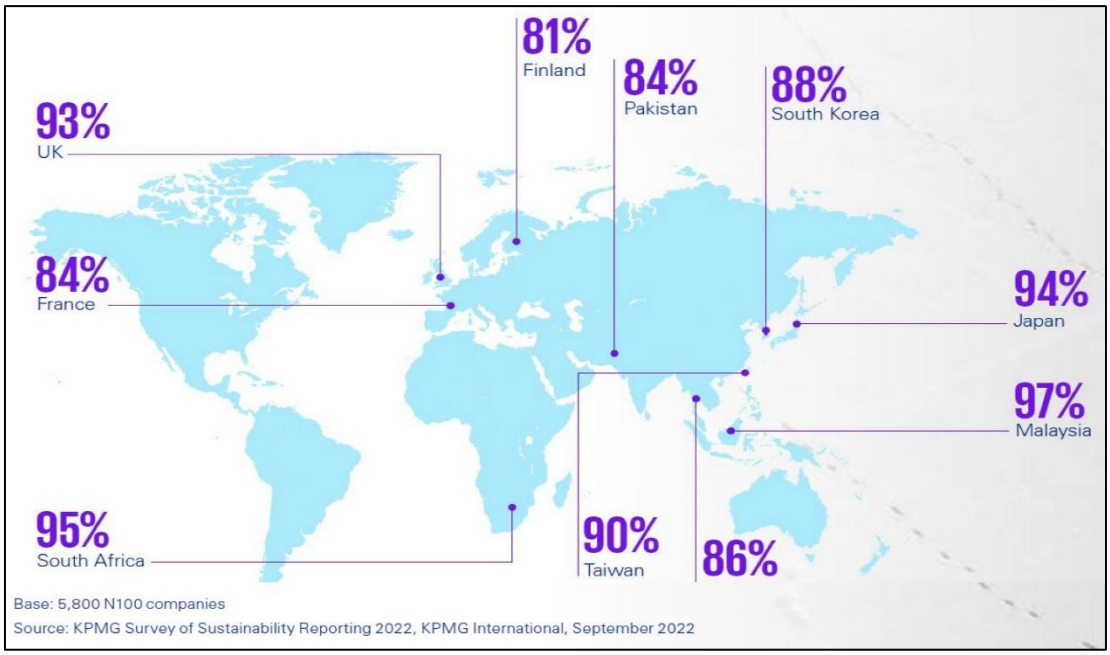

Figure 1.1 KPMG Survey of Sustainability Reporting September 2022

A more recent report released by Sustainable Fitch, KPMG (2023), summarises key ESG policy and regulatory developments over the last 18 months in major Southeast Asian markets, ranking Malaysia third in the region with an improved sustainability reporting score of 99% out of 100%. This performance, as shown in Figure 1.2 below is a substantial contribution to positioning the Asia Pacific region at the global forefront in sustainability reporting.

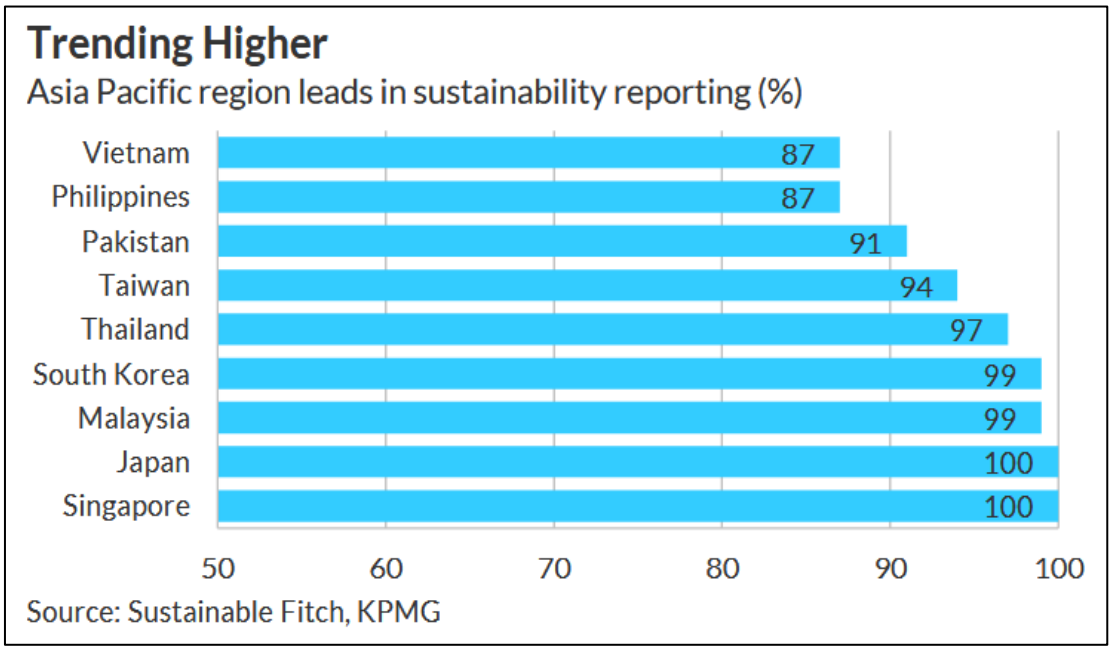

Figure 1.2 Sustainable Fitch, KPMG 2023

Figures 1.1 and 1.2 demonstrate a continuous improvement in Malaysia's rankings, which places it as an attractive market for understanding how the activities of companies engaging in ESG practices could affect the corporate value creation for their stakeholders. Such interest is equally supported by the postulation of Tarmuji et al. (2016), who argued that the impact of ESG on Malaysian companies is still unclear and requires more investigation. According to earlier studies, there has been significant pressure on Malaysian publicly quoted firms since the 1980s to embrace environmental, social, and governance (ESG) participation, yet the level of engagement is still inadequate (Ahmad et al., 2021; Said et al., 2009). This engagement gap could be associated with top management's constant failure to ensure that their organisations' corporate plans match their planned ESG practices. Such failure to effectively integrate ESG initiatives into the firm's corporate strategy can create a disconnect between the growing pressure for corporate sustainability practices and businesses' actions.

Furthermore, based on the findings of Ahmad et al. (2021), there is an inadequate level of thorough comprehension and understanding regarding the relationship between ESG and the corporate value creation of Malaysian companies. However, Malaysia, in recent times, has come to acknowledge the notion of ESG, which is an extension of corporate social responsibility (CSR) in the context of business sustainability development. Therefore, this study aims to fill the gap in understanding the effect of ESG practices on value creation by considering the moderating influences of financial risk and agency risk for publicly listed companies in environmentally sensitive sectors in the FTSE Bursa Malaysia EMAS Index.

The FTSE Bursa Malaysia EMAS Index is one of the indexes in the FTSE4Good Bursa Malaysia Index Series. According to Atan et al. (2018), the FTSE4Good Bursa Malaysia Index was introduced by Bursa Malaysia in December 2014 as a component of the global FTSE4Good Index Series. The index aligns with other prominent global ESG frameworks, including the GRI and the Carbon Disclosure Project. As such, investors, owners, and clients anticipate increased accountability and openness from businesses and their investments with the introduction of the FTSE4Good Bursa Malaysia Index Series (Lee, 2014).

This study contextualised the FTSE Bursa Malaysia EMAS Index, given that Malaysia is an emerging economy with appreciable growth of medium and large

companies. The EMAS Index appears suitable in the Malaysian context as it captures constituents of the FTSE Bursa Malaysia Top 100 Index (large capitalisation market) and FTSE Bursa Malaysia Small Cap Index (small capitalisation market). Thus, this study covered a broader scope of sample companies for extensive research. This ensures that a more precise and accurate conclusion can be drawn from the study findings, as a broader sample reflects a sufficiently representative view of the quoted firms operating in the Malaysian market.

1.3 Problem Statement

The integration of Environmental, Social, and Governance (ESG) practices into corporate strategy has become a defining feature of contemporary business management. Globally, this shift has been driven by heightened regulatory oversight, increasing investor scrutiny, and rising societal expectations for corporate transparency, accountability, and sustainability (Maione, 2023). In Malaysia, this transition has been reinforced through Bursa Malaysia's enhanced Sustainability Reporting Guidelines and the Securities Commission's emphasis on Sustainable and Responsible Investment (SRI). As a result, publicly listed firms are increasingly expected not only to disclose ESG-related information but also to demonstrate how sustainability initiatives contribute to long-term value creation.

Despite this growing regulatory and institutional emphasis, the extent to which ESG practices translate into tangible corporate value remains unresolved, particularly within the Malaysian context. While a substantial body of Malaysian and regional research has examined ESG practices and firm performance, the findings are far from uniform. Prior studies report positive, negative, and insignificant relationships between ESG performance and various measures of firm value, depending on the ESG dimension examined, the value metric employed, and firm-specific conditions (Lee & Isa, 2020; Ahmad et al., 2021; Mohamad, 2020; Aydoğmuş et al., 2022; Zheng et al., 2023). These mixed outcomes suggest that the ESG–value creation relationship is not universal, but conditional.

This inconsistency is particularly evident among Malaysian firms operating in environmentally sensitive sectors. Although the volume of sustainability disclosures has increased following regulatory reforms, concerns persist regarding their substantive

quality and economic relevance. Peer-reviewed evidence indicates that only about 11.6% of Malaysian firms have consistent ESG disclosure scores, with governance practices generally outperforming environmental and social dimensions (Kamaludin et al., 2022). Regulatory assessments further indicate that ESG reporting is often driven by compliance requirements rather than deep integration into corporate strategy, raising questions about its effectiveness in supporting value creation (Securities Commission Malaysia & World Bank Group, 2024). Studies on disclosure quality also highlight variability and gaps in meaningful sustainability information, particularly in sectors with higher environmental exposure (Abdul Latif et al., 2023). Consequently, ESG engagement in Malaysia may, in some instances, reflect compliance-driven or reputational motives rather than genuine value-oriented strategies.

Corporate value creation remains central to firm survival, competitiveness, and stakeholder confidence. Sustainable value creation reflects a firm's ability to generate returns that exceed the cost of capital while balancing financial performance with social and environmental responsibilities (Nik Abdullah et al., 2019). Firms that fail to sustain value creation risk declining investor confidence, reduced market relevance, and eventual exit (Lokman et al., 2021). At the macroeconomic level, persistent firm underperformance contributes to job losses, reduced tax revenues, and weaker economic growth, underscoring the broader importance of understanding how firms can create long-term value (Teece, 2018).

Although ESG practices are often promoted as mechanisms for enhancing reputation, reducing risk, and improving long-term performance, empirical evidence does not uniformly support this proposition. Some studies document positive valuation effects associated with ESG engagement, while others find neutral or adverse outcomes, particularly when ESG investments increase costs without immediate financial returns (Wu et al., 2022). These divergent findings point to an unresolved question: under what conditions do ESG practices enhance, diminish, or fail to influence corporate value?

One key limitation in the existing literature lies in the limited consideration of firm-level risk conditions that may shape ESG effectiveness. Firms operate under varying governance structures and financing constraints, which influence managerial incentives, resource allocation, and strategic priorities. Without accounting for these contextual factors, ESG-value relationships may appear inconsistent or misleading.

Wang et al. (2024) argue that ESG outcomes cannot be fully understood without examining the risk mechanisms through which ESG strategies are implemented and governed.

In the Malaysian corporate environment, financial risk and agency risk are particularly salient. The prevalence of family ownership, concentrated shareholding, and varying governance quality exposes firms to agency conflicts, where managerial or controlling shareholder interests may diverge from those of minority shareholders (Sheedy, 2010). In the ESG context, such conflicts may manifest as symbolic adoption or "greenwashing", where ESG initiatives are pursued for reputational benefits rather than value creation (Liao et al., 2019). At the same time, financial risk arising from suboptimal capital structure decisions can constrain firms' ability to sustain ESG investments, especially when financing costs are high or returns are uncertain (Realised, 2021).

Prior studies have largely overlooked how these two risk dimensions interact with ESG practices to influence value creation. While some research considers ESG as a risk-mitigating mechanism, few studies explicitly examine financial risk and agency risk as moderating factors that condition the ESG-value relationship, particularly in emerging markets such as Malaysia. This omission limits the explanatory power of existing findings and contributes to the observed empirical inconsistency.

Another limitation of prior research is the reliance on aggregated ESG scores, which may conceal important variation across environmental, social, and governance dimensions. Firms often exhibit uneven ESG performance, excelling in one dimension while lagging in others. Without disaggregated analysis, it is difficult to identify which ESG components drive value creation, and which may impose costs. Recent studies highlight the importance of examining ESG dimensions separately, yet such analyses remain limited in the Malaysian context (Ahmad et al., 2021; Aydoğmuş et al., 2022).

Furthermore, existing studies commonly rely on a single proxy for firm value, which may bias conclusions. Market-based measures capture shareholder perspectives, while enterprise-based measures better reflect stakeholder value and long-term sustainability (Eccles & Klimenko, 2019). A narrow measurement approach may therefore fail to capture the full economic implications of ESG engagement.

Against this backdrop, this study addresses a clear and empirically grounded research problem: the inconsistent and conditional nature of the ESG-value creation relationship in Malaysian firms, arising from differences in ESG dimensions, firm-level risk exposures, and value measurement approaches. By examining financial risk and agency risk as moderating variables, disaggregating ESG practices, and employing both Market Value Added (MVA) and Enterprise Value Multiple (EVM) as value proxies, this study seeks to clarify when and how ESG practices contribute to corporate value creation.

Accordingly, the core research problem is articulated as follows:

To what extent do ESG practices, individually and collectively, contribute to corporate value creation, and how are these relationships distinctively moderated by financial risk and agency risk in Malaysian publicly listed firms operating in environmentally sensitive sectors?

Addressing this problem contributes to theory by refining ESG-value explanations through a risk-contingent lens, advances empirical understanding by resolving inconsistencies in prior findings, and offers practical insights for managers, investors, and regulators seeking to align sustainability initiatives with effective governance, financing decisions, and long-term value creation.

1.4 Aim and Objectives

This study aims to examine the effect of ESG practices on value creation and the moderating role of financial risk and agency risk for listed companies in Malaysia. The following are the objectives of the study:

a) To investigate the effects of ESG practices on value creation (i.e., EVM and MVA) in Malaysian publicly listed companies.
b) To investigate the effects of ESG components (Environmental, Social, Governance) practices on value creation (i.e., EVM and MVA) in Malaysian publicly listed companies.
c) To examine the moderating role of financial risk on the relationship between ESG practices, ESG components (Environmental, Social, Governance) practices

and value creation (i.e., EVM and MVA) in the Malaysian publicly listed companies.

d) To examine the moderating role of agency risk on the relationship between ESG practices, ESG components (Environmental, Social, Governance) practices and value creation (i.e., EVM and MVA) in the Malaysian publicly listed companies.

1.5 Research Questions

The following research questions have been posed to examine the effect of firms' ESG practices on their value creation:

i. What are the effects of ESG practices on value creation (i.e., EVM and MVA) in Malaysian publicly listed companies?
ii. What are the effects of ESG components (Environmental, Social, Governance) practices on value creation in Malaysian publicly listed companies?
iii. Does financial risk moderate the relationship between ESG practices, ESG components (Environmental, Social, Governance) practices, and value creation in Malaysian publicly listed companies?
iv. Does agency risk moderate the relationship between ESG practices, ESG components (Environmental, Social, Governance) practices, and value creation in the Malaysian publicly listed companies?

1.6 Scope of the Study

This study examines the effect of Environmental, Social, and Governance (ESG) practices on corporate value creation, with particular emphasis on the moderating roles of financial risk and agency risk among Malaysian publicly listed firms. ESG practices constitute the independent variable and are operationalised using firms' environmental, social, and governance performance scores. Corporate value creation, the dependent variable, is measured using two complementary proxies: Enterprise Value Multiple (EVM) and Market Value Added (MVA), which jointly capture both stakeholder-oriented and shareholder-oriented value perspectives. Financial risk and agency risk serve as moderating variables, and are proxied by the weighted average cost of capital (WACC) and executive compensation ratio, respectively. Firm size (measured as the

natural logarithm of total assets) and sales growth are included as control variables to account for scale effects and growth dynamics that may influence value creation.

The study is grounded in stakeholder theory and agency theory, which provide the theoretical basis for linking ESG practices, governance structures, risk exposures, and value creation. Stakeholder theory explains why firms adopt ESG practices to meet broader stakeholder expectations, while agency theory explains how managerial incentives and financing decisions may shape the effectiveness of these practices. Together, these theories guide the selection of variables and the interpretation of the moderating mechanisms examined in the study.

Empirically, the scope is limited to firms listed on the FTSE Bursa Malaysia EMAS Index. This index was selected because it represents a broad and relatively comprehensive cross-section of Malaysian listed firms with consistent ESG disclosure practices, making it suitable for comparative ESG analysis. The study focuses specifically on five environmentally sensitive sectors: construction, transport and logistics, property, manufacturing, and energy and utilities. These sectors were chosen due to their higher environmental footprints, greater regulatory exposure, and stronger societal scrutiny, which make ESG practices more economically and strategically relevant than in less sensitive sectors.

The analysis covers a five-year period from 2019 to 2023. This period captures recent ESG regulatory developments in Malaysia, including enhanced sustainability reporting requirements, while also allowing sufficient time-series variation to observe changes in ESG practices, risk exposure, and value creation outcomes. Financial firms, such as banks and insurance companies, are excluded due to their distinct regulatory frameworks, capital structures, and risk profiles, which could distort comparability with non-financial firms.

While the study provides focused and policy-relevant insights, its scope is subject to limitations. The findings may not be generalisable to financial institutions, government-linked companies, or firms outside environmentally sensitive sectors. In addition, reliance on secondary ESG scores and accounting-based proxies may not fully capture qualitative aspects of ESG implementation or managerial intent. These limitations are acknowledged and provide avenues for future research.

1.7 Significance of the Study

This study has unveiled deep insights to help develop a better understanding of firms' ESG practices and their components that are critical for driving value creation, particularly across the five environmentally sensitive sector paradigms in the Malaysian business environment employed in this research. This study highlights the importance of integrating ESG practices into firms' risk management strategy and decision-making processes. By aligning ESG initiatives with the objectives of profitability, growth, and value creation for shareholders and key stakeholders, firms can drive more immediate and sustainable outcomes. This could, in turn, assist policymakers and regulators in implementing a new set of policies and regulations regarding ESG practices by managers of organisations.

The recommendations in this research work provide crucial benefits for the following relevant group classifications.

Prospective and Existing Investors*:* The study's findings enable investors to assess the risks of investing in companies with little or no consideration for ESG practices, that is, the financial prospects and value of these companies. This encourages them to invest in a company that is profitable and commands more sustainable enterprise and market value. Existing investors can analyse the enterprise and the market value created by these companies and then decide whether to continue their investment or withdraw their interest.

Management of Organisation*:* It provides a tool for assessing or evaluating the company's value and how well the firm's ESG programs have been utilised for greater value creation. This will drive decision-making about spending more on the practices that drive value. The study findings highlight the need for management of firms to consider investments in governance practices, as their integration with top executives' decisions has a positive impact on both the immediate and future value creation. Similarly, the study findings postulated that the effective integration of agency and financial risk management with investment planning around environmental practices will promote the creation of long-term corporate value by firms. Thus, environmental practices and governance practices are critical sustainability activities that strategic management decisions should align with to enhance value creation in environmentally sensitive firms.

Regulatory Authorities: The current rules and guidelines requirements in Malaysia for companies to prepare and publish ESG-compliant reports. The study findings, which postulated a significant relation between ESG practice components and value creation, could motivate regulatory agencies to further develop and enforce sustainability compliance requirements. Moreover, the new insights ESG-value creation relationships, postulated by the synthesised results of this study, could also help enhance the scope of ESG-value creation knowledge and serve as a guide to the regulatory authorities like the Malaysian Accounting Standard Board (MASB), Bursa Malaysia, the Securities Commission Malaysia in regulatory oversight, and the National Parliament in making legislations that encourage ESG practices.

Local Communities and Other Stakeholders: This research has provided a medium to sensitise the local communities where environmentally sensitive companies operate and other stakeholders, such as employees and non-governmental organisations, regarding the potential of ESG practices to drive value and meet their information needs. Thus, it reinforces the call for effective participation and collaboration of key stakeholders in the corporate goals and initiatives of firms. It could equally ignite the interest of stakeholders and guide them to hold these corporate organisations and their executives to account.

Academic and Research Institutions: It enriches the literature on value creation, ESG, and sustainability issues and provides more knowledge to students, scholars, and academics on the relationship between ESG practices and company value creation. The study demonstrated that a complex and significant interplay exists between the individual components of ESG practices and agency and financial risk exposures of firms, which also impacts their enterprise value created and market value added. This complex interplay was viewed from the strategic lenses of the stakeholder theory and agency theory, unveiling new insights into the ESG value creation relationships. As such, the research outcome can serve as a body of reserved knowledge for researchers' future reference.

Significance to the Body of Knowledge: The completion of this study has added contributions to the discussions around stakeholder theory, agency theory, value creation, and ESG. The applicability of agency theory was explored to demonstrate its association with financial and agency risks, and how these risks could moderate the

potential relationship between ESG practices and value creation. To this end, it was established that financial risk and agency risk significantly moderated the relationships between the ESG individual components of environmental and governance practices and value creation. Furthermore, the stakeholder theory was equally explored and applied in the ESG and value creation literature with the use of enterprise value multiple, market value added, and the individual pillars, which have not been much explored in the past. The study was also able to establish that a significant association exists between the ESG component practices and the value creation proxies. Thus, contributed to the body of knowledge that the environmental, social, and governance practices all have a significant effect on the enterprise value created for stakeholders by firms.

1.8 Definition of Key Operational Terms

***Value Creation*:** Value creation is the process of generating an excess or gain through trade, other transactions, investments, and relationships (Windsor, 2017).

***Enterprise Value**:* Enterprise value measures a company's total value, defined in terms of its financing, and is often used as a more comprehensive alternative to market capitalisation (Ammirati, 2022).

Market value added (MVA): MVA is the difference between the market value of the firm's shares and the amount equity holders have invested in the company. It is used to evaluate how well a firm is performing in relation to the value of return to the company's shareholders (Udiyana et al., 2022).

ESG: ESG is an abbreviation for environmental, social, and governance. It describes engaging in business management practices that adhere to moral and legal requirements while upholding social and environmental responsibility (Bassen, 2020).

Financial risk (FR): FR refers to a firm's exposure to uncertainty arising from its financing and capital structure decisions, particularly those relating to the mix of debt and equity and the associated cost of capital. Such risk reflects the economic consequences of structural financing choices made by corporate executives. In corporate finance theory, capital structure decisions influence investors' required returns and the firm's overall cost of capital, thereby affecting its corporate value and risk exposure (Damodaran, 2024; Huizinga et al., 2008; Modigliani & Miller, 1963).

Agency Risk: Agency risk arises when principals appoint agents to act on their behalf, and the interests of the principals and agents are not aligned (Heedy,1999). Agency theory postulates that managers may pursue personal objectives that diverge from shareholders' value maximisation goals unless effective monitoring and incentive mechanisms are in place (Jensen & Meckling, 1976).

FTSE4Good Index: The FTSE4Good Index Series is designed to measure the performance of companies demonstrating specific Environmental, Social, and Governance (ESG) practices.

Content Analysis. One of the four methods for measuring ethically framed variables is content analysis (Galant & Cadez, 2017). This method measures and examines the frequency, significance, and connections between terms, themes, or ideas found in qualitative data.

1.9 Organisation of the Remainder of the Study

The remainder of the study is structured across Chapters 2, 3, 4, 5, and 6. Chapter 2 provides a comprehensive literature review, covering foundational concepts, relevant theories and models, and an analysis of past empirical studies. It offers an in-depth discussion of ESG, value creation attributes, and the moderating roles of financial risk and agency risk, establishing clear linkages to key theories, which inform the development of the research framework and hypotheses for the study. Chapter 3 of the study extensively covered the overall research design and methodology. It extensively discussed the research design, the target population and sample, the source of data and methods for collection, procedures for data analysis and model specification, and ethical considerations. The chapter equally identifies the variables used as proxies for the study, how to measure them, and groups them into dependent, independent, moderating, and control variables.

Chapter 4 of the study presents results and findings from the data analysis. The results were presented in terms of descriptive analysis, trend analysis, sectoral average analysis, correlation analysis, and regression analysis. Hypotheses were tested from formulated mathematical models, and summary study results were presented and interpreted. Chapter 5 captures discussions on the presented results and findings obtained from the analysis of the collected dataset. The discussions were structured into

four core themes, which examined the relationship between ESG practices and value creation, the relationship between the components of ESG practices and value creation, and the moderating influence of financial risk on the separate relationships between ESG practices, ESG component practices and the value creation, and finally, the moderating influence of agency risk on the separate relationships between ESG practices, ESG component practices, and the value creation.

Chapter 6 concluded this thesis report by evaluating the research question and assessing the degree to which the study objectives were achieved. This chapter captures the summary of findings, the conclusion of the study, and recommendations for business policy and decision-making. In addition, the chapter discussed the practical and theoretical contributions of the study, identified the study's limitations, and made suggestions for further research into this study are

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The current literature that supports the study's theoretical framework is covered in this chapter. To determine the key variables associated with the relationship between ESG practices and value creation of listed companies in Malaysia that operate in the construction, transport & logistics, energy & utility, property, and manufacturing sectors, a range of fundamental concepts, empirical theories, and prior literature have been evaluated. This chapter begins with an introduction in Section 2.1. It then captures discussion on the conceptual foundations of value creation in Section 2.2, while value creation for stakeholders and value creation of firms are presented in Sections 2.3 and 2.4, respectively. This is followed by extensive literature on the evolution of ESG and the historical development of ESG frameworks in Section 2.5, global perspectives on ESG practices in Section 2.6, and regulatory frameworks and adoption trends in ESG in Malaysia in Section 2.7. Next is the conceptualisation of ESG practices in Section 2.8, ESG practices and value creation in Section 2.9, and financial risk and agency risk as moderators in Section 2.10. This chapter then considers the underpinning theories of the study in Section 2.11, which is followed by empirical evidence from prior literature on ESG and value creation in Section 2.12. It equally captures the trends in ESG empirical literature and the relevance of the current study in Section 2.13. The Development of the study hypotheses is captured in Section 2.14, while the research framework is presented in Section 2.15. Finally, the chapter concludes with a summary in Section 2.16.

This chapter unveils two separate reviews of empirical literature, as shown in sections 2.12 and 2.13. The initial review employed a thematic analysis of past literature to support the identification of general study gaps hinged around the conceptualisation, theoretical foundations and contextualisation of the current study. While the latter review deployed a bibliometric analysis to support the identification of specific thematic and geographical context gaps, based on the recent trends in ESG research.

2.2 Value Creation

The long-term goal of the company's existence is value creation (Teti et al., 2014). This is because corporate entities desire to be better at what they do and continue in business for the foreseeable future. Corporations that intend to pursue value creation need to first identify what actually constitutes value to them, and those factors or activities will create or influence their creation of value. Although there is not a single widely recognised definition for value creation, scholars have made a variety of attempts to explain value creation and its constituents. According to Barney (1991), value creation shows a company's capacity to create value through the growth and amassing of competitive resources for the organisation. Value creation, according to Windsor (2017), represents the surplus or gain from the benefits produced over the cost incurred in the process.

It is necessary to have a noble value creation strategy that protects the interests of all stakeholders, giving them the moral and legal right to demand the value that the company creates (Hoque, 2006). As such, encouraging participants from all key stakeholders in the activities of the firm. These key stakeholder groups include but are not limited to shareholders, employees, customers, vendors, government, and the local community. The subject of creating value for stakeholders has generated a lot of discussion in research literature with numerous studies conducted to understand value creation and its relevance to the firm (Della Corte et al., 2021; Freeman et al., 2007; Memili et al., 2015). In fact, how companies create value for stakeholders and whether some stakeholders have larger claims for managerial attention in this regard than others are two of the key problems of stakeholder theory (Mitchell et al., 1997).

Corporate executives create value for a variety of stakeholders according to the stakeholder theory, whereas, according to the traditional agency theory, the managers create value primarily for the shareholders. These two value creation perspectives could diverge and appear either in favour of agency theory or the stakeholder theory. However, there is a line of best fit, as noted by Jones (1995), that stakeholder value creation is essential to the creation of shareholders' wealth or value. According to Schwartz and Carroll (2008), businesses have a normative duty to enhance the general welfare of society or create net societal value. That is, both the firm's and society's long-term value should mutually grow. This position is connected by Schwartz and Carroll

to the idea of corporate social performance (Wood, 1991).

In this study, value creation is conceptualised to address the contemporary interest of organisations and the key stakeholders. This captures the value creation context, its constituents, and drivers of value creation in today's corporate entities.

2.2.1 Defining Value

Numerous notions can be specified using the term value. If the context is not provided, it is easy for its intended meaning to be misinterpreted. Value can be used to describe a wide range of ideas, including stakeholder value, shareholder value, market value, corporate value, and investment value. Defining value involves establishing and prioritising stakeholders, understanding how they relate to the mission and strategy of the organisation, and determining how to strike a balance between their various demands and expectations (IFAC, 2020). Businesses create value by innovatively integrating their resources to boost each resource's productivity (Moran & Ghoshal, 1999). That is, value is determined by overall net benefit; a business is profitable if the value it commands is more than the service or product's production cost.

In this study, value creation is conceptualised from the perspective of a collaborative deployment of resources, processes, and practices by the firm to produce output or benefits that address the needs or interests of key stakeholders of the firm and achieve the organisation's goals. This collaboration involves shareholders and creditors providing capital and other needed resources, while the government ensures an enabling business and infrastructure environment. The corporate managers will design processes, strategies, and practices for the utilisation of the provided resources and infrastructure to achieve the firm's goal and mission. According to Freeman (2017), a company's overall value is determined by the value it generates for its communities, suppliers, financiers, workers, and customers. A firm creates value exactly when it produces items or renders services, such that it meets the firm's objectives and the needs of various stakeholders involved in the process.

Value creation, as captured above, is a collaborative process involving several stakeholders such as the government, shareholders, creditors, and employees. It is primarily dependent on information obtained from human, material, and social

resources (Espejo & Dominici, 2017; Zhu et al., 2018). As such, the concept of value creation in the context of this study illustrates the value originating from corporate activities, policies, and practices of firms, especially as related to ESG practices. That is, to ascertain whether these strategies, activities, and practices are effective in utilising the available resources to create value for firms.

In terms of value, the relationship between a company and its stakeholders is bidirectional, meaning that costs and benefits flow in both directions. Thus, given rise to value creation or value destruction. According to James (2009), value destruction exists in contrast to value creation. Value creation or destruction may arise from a specific corporate transaction, such as an acquisition at high cost (Wu et al., 2016). A poorly managed company's stock will lose value, and the wealth of its stockholders will be reduced considerably. This results in the depletion of shareholder wealth, along with stress brought on by uncertainties regarding a company's present and future financial situation, dividend swings, unpredictability regarding future income, and a volatile stock price.

Furthermore, it is also worth noting that value creation could take the form of solitary value creation or shared value creation, which is created based on the varying degrees in both shared and solitary contexts (Porter & Kramer, 2006). Solitary value creation, which is a unique value created and claimed by a single business, has typically been associated with theories of firms. Chakrabarty (2020) postulated that a company's solitary value is primarily created from within, and it allows the firm to demonstrate its unique entrepreneurial capabilities. This value creation is facilitated by the firm’s inventive and distinctive ideas in achieving business goals, using available in-house resources.

According to research on the resource-based view, a firm's ability to create a solitary value is demonstrated by the extra benefits it generates from its distinct set of resources and skills (He et al., 2016). This will mostly emanate internally with minimal collaboration with all key stakeholders. According to Enders et al. (2009), a company's ability to create value for its clients and turn a profit on some of that value gives it a competitive advantage. This may be seen as a core organisational strength that could be sustained to stay competitive and in business in the long run. However, the resource-based approach does not offer a complete account of how firms create value until it is

combined with the activity-based approach (Sheehan & Foss, 2009). This is because the resources-based perspective is mostly an internal focus, less collaborative, and does not conform to the modern approach of creating value.

Shared value creation, on the other hand, has been associated with the modern perspective and has gained popularity recently (Porter & Kramer, 2011; Windsor, 2017). According to Clauss and Spieth (2017), the joint utilisation, combining, and development of resources and knowledge as sources of joint value creation originates from the real possibility of joint innovative activities among partners with complementary but separate knowledge capacity. To create shared value, a firm and a stakeholder in a relationship might choose to integrate or synergise their interactions; that is, both the firm and the stakeholder in the value creation process must contribute and collect the value created (Porter & Kramer, 2006). A failure to create shared value suggests that either one party gained the benefits at the other party's expense or that no value was created, and so nothing is to be captured. In a relationship where profit-seeking enterprises are involved, the successful development of shared value would indicate that firms have generated and captured economic gains.

This approach of shared value creation, which emphasises collaboration with all key stakeholders to create corporate value that satisfies the interests of relevant players, is in conformity with the context of this study. Stakeholders want to create and extract both experiential and economic value from their relationship with the firm. As such, shared value in relationships with them will need to be jointly created by the firm and the key stakeholders as they become more knowledgeable and aware of their negotiating clout (Prahalad & Ramaswamy, 2004). The shared value created in ties with community associations and unions would include both social and economic advantages. The partnership would invest in social context elements that boost business competitiveness with the goal of creating shared benefits.

2.2.2 Understanding Value: Traditional vs. Modern Value Creation

Over time, the concept of value has undergone substantial transformation because of changes in economic policies and practices, evolving business models, and shifts in stakeholder expectations. During traditional value creation, considerable

attention was directed towards financial performance, which acted as the primary focus where performance measures such as profitability, alongside return on investment and shareholder wealth maximisation, were prioritised by firms and shareholders (Friedman, 1970). However, the ushering of modern value creation exists as an expanded approach that merges environmental, social, and governance (ESG) factors in addition to financial performance metrics (Freeman, 2010; Porter & Kramer, 2011).

Traditional Value Creation: During the historical period, economists from classical schools like Adam Smith (1776), postulated that an effective way of measuring the value creation of firms is to consider their financial returns and competitive edge relative to other firms or participants in the market. Similarly, according to the neoclassical perspective, efficiency, together with productivity and profit maximisation, represented the main indicators of firm value as noted by Jensen and Meckling (1976). Shareholder-focused corporate structures dominated business operations at this time because firms' successes were measured simply by how well they were able to grow stock prices, together with increased dividend payments to shareholders, as argued by Sundaram and Inkpen (2004). This approach aligned with the tenets of agency theory, which propagated that managers serve as agents for shareholders to optimise firm performance for maximum shareholder wealth according to Eisenhardt (1989).

***Modern Value Creation*:** In recent times, concepts like shared value creation as postulated in Porter and Kramer (2011), and theories like the stakeholder theory, particularly managing stakeholders for effective value creation by Freeman (2010), have emerged and are commanding attention from research scholars and the business community. This emergence has led to a shift from the traditional perspective of viewing and measuring value creation. Thus, giving rise to a more comprehensive and long-term focus view of ascertaining firms' value creation for their stakeholders. The modern value creation has gone beyond the traditional profit-based financial measure to also capture non-profit and non-financial indicators such as corporate sustainability, enterprise value, social justice and ethical governance (Elkington, 1997). This has instigated corporate entities to gradually begin appreciating the possible association farms' financial metrics and their related social and environmental impact, by incorporating sustainability issues and ESG initiatives in their corporate planning and decision-making (Eccles et al., 2014).

Furthermore, concepts like Market Value Added (MVA) are becoming crucial as they extend beyond short-term value by considering long-term stakeholders' market expectations (Stewart, 1991). Similarly, Enterprise Value Multiple (EVM) has emerged as a corporate value creation and sustainability metric. Enterprise value assessment, according to Huang et al. (2020), serves as a crucial foundation for external investors to inquire about the organisation, as well as serving as a resource for the enterprise's internal financial management.

2.2.3 Strategic Implications: Shifting from Traditional to Modern Value Creation

The emergence of the modern perspective on value creation has ushered in a change in stakeholders' expectations and could hold substantial implications for companies. Eccles and Serafeim (2013) argued that the shift towards modern value creation tenets can cause a change at the strategic level of the organisation that will cut across areas like the corporate governance structure, the risk management mechanism, the corporate performance assessment, and the strategic planning and decision-making process. As such, sustainability concerns and initiatives around ESG could be incorporated into the firm's corporate strategy. This is consistent with Friede et al.'s (2015) postulation that corporate entities that can effectively integrate ESG initiatives into their strategic decisions may be exposed to lower risk and experience better long-term financial value. In addition, as expressed by Clark et al. (2015), investors are becoming more interested in firms that show great concern for environmental and sustainability-related issues, thereby strengthening the call to encourage both financial and non-financial indicators in corporate performance measurement schemes.

Overall, the traditional value creation perspective is relevant in measuring short-term financial value, while the modern value creation perspective unveils a more comprehensive way of measuring corporate value creation by not just assessing the traditional profit-based financial indicators but equally incorporating the environmental and social sustainability considerations into the firm's economic sustainability assessment.

2.3 Value Creation for Stakeholders

Any group or individual that has the potential to influence or be impacted by an organisation's operations is considered a stakeholder (Freeman, 2015). A fairly thorough list of key stakeholders of an organisation will include the following: suppliers, customers, government agencies, owners or shareholders, creditors, employees, and the community at large. One stakeholder group may profit or be rewarded from the firm's activities, while another group may suffer losses, incur higher costs, or face more risks.

Stakeholder value creation has emerged as one of the main concepts in stakeholder theory in recent times. This is because stakeholder theory has the ability to encompass the expectations and interests of a wide range of diverse stakeholders that are impacted by and could influence the actions of a business organisation, in addition to discussing and explaining business value creation beyond the limited lens of shareholder value (Freeman, 2010). Thus, identifying the constituents of stakeholder value creation and the factors that drive value is critical to corporate entities' long-term survival and competitive edge. This is against the backdrop that fulfilling the expectations of diverse stakeholder groups and not just that of the shareholders will ignite satisfaction and then attract their interest and support to the firm.

A stakeholder view of value was presented by Harrison and Wicks (2013). It was centred on stakeholder utility in relation to the real goods and services generated and received, affiliation, organisational justice, and perceived opportunity costs. Harrison and Wicks (2013) emphasized that a number of factors can influence value for stakeholders, including both immaterial (such as the advantages of working for an organisation that upholds organisational justice norms, fairness and reciprocity standards, and/or features that are consistent with concerns about stakeholder value and affiliation) and material components (such as the economic value of the goods and services the company offers). Similarly, Lankoski et al. (2016) view stakeholder value as the subjective assessment of the overall monetary and non-monetary benefit that a stakeholder experiences because of a decision or action made by an organisation at the individual level. However, while these views are all encompassing and relevant, it is interesting to note that identifying and measuring the non-monetary value created could be challenging due to its subjective nature. This is supported by Della Corte et al. (2021,

p. 314), who state that “value creation depends on the relative amount of value that is subjectively realised by a target user who is the focus of value creation, be it an individual, organisation, or society.”

The notion of value creation itself is still somewhat opaque, even though defining value creation for stakeholders necessitates an in-depth understanding of their requirements and expectations, as discovered through particular engagement activities. Pursuing value creation for all stakeholders of the firm will ultimately satisfy the value needs of shareholders, who are a key stakeholder group. According to Bistrova and Lace (2012), who in their study created a theoretical model of shareholder value measurement, shareholder value is a universal concept and should be sustained. The authors proposed, based on a content analysis of the academic literature, that the company's innovation capacity, profitability, cost of capital, management accountability and ethics, and quality of corporate governance are the key factors that create and measure shareholder value and its sustainability.

Value creation in the past was viewed from a narrow lens (solitary value perspective) that prioritised the interests of shareholders, frequently with a particular focus on maximising profits for them (Vidal et al., 2015). Conversely, models of broad (shared value perspective) value creation strive to create value for a wide range of stakeholders (Della Corte et al., 2021). They consider the creation of value for one stakeholder group to be entwined with that of other stakeholder groups; this is particularly true for the important stakeholders, which include consumers, employees, financiers, suppliers, shareholders, and communities. In addition, Garcia-Castro and Aguilera (2015) contended that given the significance of various stakeholders and their collaboration for a company's success, they should share in the economic value created in a proportionate manner, considering the resources and capabilities they contributed to value creation in the firm.

A significant body of scholarly research indicates that efforts to maximise profits do not always conflict with taking stakeholder interests into account. As a result, according to the instrumental stakeholder theory put forward by Jones (1995), businesses that function by taking into account all of their stakeholders may be able to achieve more success from traditional performance perspectives like profitability. Sound financial performance can be attained through the application of ethical

principles and corporate social responsibility initiatives that meet stakeholder needs (Donaldson & Preston, 1995). This is particularly true when considering the long-term value that shareholders derive from their businesses. According to Lazonick and O'Sullivan (2000), the word "shareholder value" can be used to refer to corporate governance, particularly when considering decisions about profit distribution (dividends) and a company's stock market performance.

Bowman and Ambrosini (2000) postulated that firms play a critical role in the distribution and creation of wealth. They create value by collaboratively achieving the goals of the organisation and satisfying the needs and interests of the stakeholders. It can be challenging for managers to articulate and achieve value creation across the major stakeholder groups since doing so calls for measurements that need a higher level of managerial thought than just concentrating on attaining financial performance targets (Jensen, 2001). Therefore, creating value for important stakeholder groups should be integrated into the company's enterprise-level strategy and business practices as described by Freeman et al. (2007). These business practices will include the firm's strategy and activities around ESG practices. Consequently, it is helpful to understand the extent to which ESG practices can influence value creation in corporate entities.

Porter and Kramer (2011) emphasised that there is a connection between the concepts of ESG or corporate practices and value creation for stakeholders. In addition to serving the financial objectives of the company's shareholders, the introduction of ESG practices as a variable to drive wealth maximisation goals of the firm may also benefit a wider network of impacted parties, including customers, society, employees, and other stakeholders. On the other hand, Bundy et al. (2013) argued that the organisational identity and the strategic frameworks that managers adhere to make stakeholder value creation and related challenges are becoming prominent. As such, corporate managers need to consider how crucial practices such as activities promoting ESG can be incorporated into strategic corporate plans and tailored towards creating long-term corporate value.

Furthermore, organisational characteristics and managerial beliefs are shown to have an impact on the stakeholder management strategies that businesses choose to implement (Crilly, 2013). These tendencies can be minimally reduced by getting every relevant party involved in the value-creation process, including identifying and

selecting appropriate value-creation influencing activities and practices. Firms can improve value creation opportunities and discover fresh, creative approaches to produce value for all stakeholders by managing the multi-attribute utility functions of stakeholders and their synergies (Tantalo & Priem, 2016).

2.4 Value Creation of Firms

The goal of every profit-seeking organisation is to maximise the generation of wealth and create value. Value creation may involve more than just creating financial value for the company. The literature on value creation revealed that academic attempts to quantify value creation relied either on non-financial or financial value drivers, making it challenging to locate evidence in the literature on value creation that would justify using both financial and non-financial value drivers in tandem to measure the value firms create (Wanigasekara et al., 2022). This occurs because the various groups of stakeholders inside the company have varied expectations and evaluate the creation of value based on how well their interests are met. This is corroborated by Della Corte et al. (2021), who assert that the extent of value creation hinges on the proportionate quantity of value that is subjectively perceived by a target user, irrespective of whether it be an individual, organisation, or society.

Studies have suggested that there is an intertwining between the financial and non-financial value measures or drivers of the firm. According to Ocean Tomo (2020), the primary driver of the high market value of a firm's stocks in modern times is predominantly derived from intangible factors such as relationships, reputation, and shareholder loyalty. Thus, achieving value in intangible areas like relationships with clients, vendors, and reputation with creditors could, in turn, positively affect the value of shareholders' stocks. Zumente and Bistrova (2021), in their study, considered both financial and non-financial value indicators in determining the long-term value creation of the organisation. However, prone to the fact that non-financial value indicators may be highly subjective and a little challenging to identify and measure, a number of recent researchers have settled for financial value measures (Bukreeva & Grishunin, 2023; Hall, 2023; Udiyana et al., 2022; Zheng et. al, 2023).

Zhu et al. (2020) suggested that the concept of value creation should include data from corporate finance and market opportunity income, in order to analyse

corporate performance and ensure optimal investment and improve wealth creation for shareholders, and by extension, other key stakeholders. The ultimate objective that motivates an organisation's existence is the creation of value, which can be assessed using metrics such as earnings, cash flows, stock prices, or strategic objectives (Choi & Click, 2006). For a company to survive, value creation is essential, especially during times of economic hardship (Zoni & Pippo, 2017). The balance sheet, organisational growth, profitability, and stock prices are the financial value drivers.

Consequently, this study makes use of financial drivers to measure value creation in the corporate organisations identified for the research. The study went beyond the recent studies, which considered financial value indicators that focus mainly on the shareholders or customers, such as market value added (MVA), sales growth, etc., but employed an indicator that encompasses the overall corporate value created for all stakeholders. A couple of prior studies noted that improvements in sales growth, market perception (such as stock price), and financial strengths (such as enterprise value) can all be used to measure the performance of value creation (Said & Abdullah, 2014; Sulaiman, 2016). When value is created for the overall enterprise or corporate entity, creditors and vendors will be paid timely, good numeration will be approved for employees, jobs will be created for the local community, shareholders' stock value will appreciate, and the government will earn more tax returns.

Economic-based measures of shareholder return maximization, such as economic value added, market value added, cash flow return on investment, and cash value added, have recently challenged and supplemented traditional accounting-based measures to quantify shareholder creation, such as earnings per share, return on equity, return on assets, and dividend per share, to name a few (John, n.d.). To capture value for shareholders and other key stakeholders, this study employs two distinct value creation measures: the Market Value Added (MVA), which represents the intangible-driven value creation, was considered to measure the value creation by Shakina et al. (2017), and the enterprise value multiple (EVM). Both the enterprise value multiple (EVM) and the market value added (MVA) are accurate measures of how stakeholders perceive the company's prospects and, by extension, its created value over time.

2.4.1 Market Value Added (MVA)

MVA is a popular measure of a firm's corporate value as perceived by the stock market. It demonstrates the willingness of investors in the financial markets to pay a higher price for the company's shares relative to the share value in the books of accounts. Considering that the main objective of a profit-driven organisation is to maximise the wealth of its shareholders, Ansori (2015) proposed that if a company aims to optimise shareholder wealth, then the market value added (MVA) should have a direct correlation with the returns received by the company's shareholders. Shareholders are one of the key stakeholder groups, and their wealth can be maximised through dividends from profits and/or capital gains from sales of their shares due to value appreciation (Udiyana et al., 2022). Thus, market value added (MVA) is deemed relevant to this study as it does not just reflect meeting shareholders' interest by the firm, but also reflects what participants and investors in the capital market perceive of the company's overall corporate value created.

Several scholars have exhibited concern around MVA and put forward explanations of what it is and how it can be measured. According to Kaczmarek (2018), market value added (MVA), which may be categorised as the external or market measurement of a firm's performance, is a way to assess a firm's value and, by extension, value created for key stakeholders. Banerjee (2000) said that MVA measures external company performance and is an indicator of how much the capital market values the capital that has been invested. Market Value Added (MVA) can be described as the difference between the market value of the shares held by the company and the book value of stock that a shareholder has invested in, according to Brigham and Houston (2010). It can be inferred that management is creating shareholder wealth when market value added is positive (MVA > 0); inversely, when MVA is negative (MVA < 0), it suggests an erosion in shareholder capital value.

Furthermore, market value added is used to assess how well an organisation manages and allocates scarce resources to maximise shareholder value, and thus, reflects the ability and efficiency of the company to create value (Hillman & Keim, 2001). Likewise, MVA may be deployed as an organisational performance monitoring instrument for listed firms for a predetermined amount of time, according to Pandya (2016). Erdogan et al. (2000) define MVA as the difference between the total assets of

the company as recorded in its book value and its total market value; any amount above zero represents the value generated for the investment of its shareholders. Conversely, if MVA is less than zero, it suggests that the company may have cut back on investments that failed to optimise the value of the money that shareholders provided. Comparably, market value added (MVA), as calculated by Berzakova et al. (2015), is the difference between the firm's market value and invested capital; consequently, a value greater than zero indicates that the return on capital invested has been covered by the cost of capital.

According to other studies, market value added can maximise shareholder wealth by optimising the discrepancies between the market value of the company's shares and the total capital of equity owners (Petravičius & Tamošiūnien, 2008). The information needed to calculate MVA can be found in annual reports or financial statements from businesses. While it might be difficult to determine the market value of debt, an estimate of its market value could be substituted with the debt's book value (Petravičius & Tamošiūnien, 2008).

Market value added is considered a hybrid indicator of corporate financial performance since it integrates both market and accounting value, resulting in a mixed measure (Carini et al., 2017). In other words, this means that MVA can evaluate both the extent to which value is generated for shareholders and the effectiveness of capital management. Bognárová (2019) explains that market value added is a statistic used to measure the accumulated worth of a company over time. It should be noted that the market value added is distinct from the economic value added, which specifically quantifies the economic profit made by a company. However, both market value added and economic value added are more interested in the firm’s economic profit than accounting profit.

Market value added (MVA) is determined by economic profit, which reflects a company's ability to create or destroy value (Johnson, 2001). Economic profit is calculated by deducting the cost of capital from the surplus or net return distributed to shareholders (Pandya, 2016). Economic profit represents the disparities between the cost of equity and the product of return on equity and the book value of equity. Traditional accounting performance metrics, such as return on assets, fail to evaluate the potential for future profitability. This is why market value added (MVA) is considered a crucial research variable (Carini et al., 2017).

Udiyana et al. (2022) emphasised that the most important elements in establishing the firm value that will ultimately impact the return on stock are the results of the company's effective implementation of the market value added (MVA) approach. Thus, MVA has an impact on shareholder wealth and value creation, as shown by stock returns as an indicator of strong performance. The abovementioned claim is supported by research conducted by Nugroho (2018), which found that Market Value Added (MVA) has a favourable and noteworthy impact on stock value and returns. Nevertheless, this outcome contradicts the findings of Ferinda (2019) and Yoshua and Muhammad (2021), who concluded that Market Value Added (MVA) does not have a substantial impact on the value of stocks.

This study deployed Market Value Added (MVA) to utilise it as a market indicator of corporate value creation for listed companies in Bursa Malaysia, considered in the target population. MVA calculations here will be aligned with the formula of Hall (2023) and Udiyana et al. (2022), which calculates market value added as the total market value of equity less total book value of equity. Hence, this deviates from the previous studies like Aydoğmuş et al. (2022), Bodhanwala and Bodhanwala (2023), and Chouaibi et al. (2022), which utilised Tobin's Q and market-to-book value as market measures for firm value.

2.4.2 Enterprise Value Multiple (EVM)

Enterprise value (EV) is a popular financial indicator that shows a company's overall value and total worth after deducting its debt, cash reserves, and market capitalisation. The market value of debt, common stock, and preferred equity, less the cash and investment values, equals the enterprise value of the entire company (CFA Institute, 2023). A more accurate substitute for market capitalisation is enterprise value, which is a measurement of a company's total value as determined by its funding. It comprises the debt minus the cash cost of paying off debt, as well as the current market capitalisation (Ammirati, 2022). Enterprise value can also be referred to as corporate value, as it is a precise representation of a firm's intrinsic value. According to Huang et al. (2020), enterprise value assessment serves as a crucial foundation for external investors to inquire about the organisation, as well as serving as a resource for the

enterprise's internal financial management.

According to several researchers (Bradburd and Richards, 2013; Gorenak and Košir, 2012; Hulten and Hao, 2010), an enterprise is a commercial entity, and hence, the enterprise value represents the total value of the entire organisation and should be regarded as such. Enterprise value is an economic metric that represents the total value of a corporation and goes beyond the market capitalisation value. The aggregate consists of the claims of all security holders, including debt holders, preferred shareholders, minority shareholders, ordinary equity holders, and other parties.

This study employs the enterprise value to earnings before interest, taxes, depreciation, and amortisation (EBITDA) multiple, which is a widely used metric for assessing the total value of a company throughout different time periods. This approach is consistent with the methods and instruments deployed by Kukaj and Ahmeti (2016) to evaluate the value of enterprises. Nevertheless, the study diverges from previous research on value creation, such as Bukreeva and Grishunin (2023), Dkhili (2023), and Zheng et al. (2023), which focused largely on just market indicators, including market-to-value ratio and revenue growth. The enterprise value multiple (EVM) is preferable since it is cash-based and considers the whole value of the company, considering the interests of all key stakeholders. Cash-based measurements, in contrast to profit-based measures, are less influenced by accounting practices and provide a more accurate representation of the real wealth created by managers (BPP Learning Media, 2014). Incorporating EBITDA into the calculation of the EVM measure brings it in line with a cash-based approach and helps to accurately assess the real wealth or value created for all stakeholders.

Enterprise value multiples establish a connection between a company's overall fundamental value and the total market value of all its funding sources. Similar reasoning underlies enterprise value multiples: investors assess an organisation's total market value in relation to its EBITDA (CFA Institute, 2023). Harbula (2009) concluded on the superiority of enterprise value multiples both on accuracy and bias, for corporate valuation in most business sectors. Examining the performance of multiples compared to discounted cash flow valuations, Kaplan and Ruback (1995) conclude that the enterprise value to EBITDA multiple results in a similar valuation accuracy for highly leveraged transactions. Market capitalisation leaves out a lot of

essential components, such as a company's debt and cash reserves. In essence, the enterprise value multiple is a modification of market capitalisation because it incorporates debt and cash to calculate the value of a company (Kennon, 2021).

However, Kukaj and Ahmeti (2016) noted that enterprise value measures are thought to be cash-based but also have their faults, as they do not deliver the exact information to management, which could be used to value the firm and fix an initial offering price in case of mergers. They would rather offer focused knowledge on the innovative possibilities of future values. As such, relying on a single measure or indicator of corporate value seems not to be adequate to provide a comprehensive perspective. Other measures such as market value-added, sales growth, and market-to-book value should also be considered alongside the enterprise value multiple (EVM).

2.5 The Evolution of ESG and Its Frameworks

The environmental, social, and governance practices of firms are increasingly becoming an integral part of their corporate strategy and investment decision-making (Fanter et al., 2022). Thus, embracing ESG practices could enhance corporate sustainability consciousness, reduce sustainability-related risks, and create value for stakeholders. Similarly, ESG frameworks have undergone continuous standardisation in the assessment methodologies and disclosure requirements. According to Saegert and Grossman (2018), this is in response to the needs of the evolving and dynamic global financial markets and regulatory advocacy for greater transparency. As such, the development of ESG initiatives and their frameworks has progressed through a gradual evolution of frameworks over the years, ranging from the early foundational conceptualisation of ESG to the standardisation and emergence of Integrated Reporting and ESG. These gradual historical movements have been extensively explored in the literature review of this study.

2.5.1 Foundational Conceptualisation of ESG

The origins of Environmental, Social, and Governance (ESG) practices can be traced to early corporate social responsibility (CSR) movements that gained prominence in the mid-20th century. The emergence of stakeholder theory in the 1970s, particularly

Freeman's perspective, shifted corporate attention toward social and environmental accountability alongside financial performance. This shift encouraged early sustainability frameworks that emphasised ethical conduct and broader disclosure responsibilities. According to Agudelo et al. (2019), these frameworks promoted corporate accountability beyond profit maximisation, laying the foundation for responsible business practices.

Closely related to this development was the rise of socially responsible investment (SRI), which emerged in the 1960s in response to socio-political movements such as opposition to the Vietnam War and the civil rights movement in the United States. SRI gained further momentum during the 1970s and 1980s, particularly through resistance to apartheid in South Africa, where investors adopted exclusionary screening strategies against firms operating in oppressive regimes (Manulak, 2024). Over time, SRI evolved from simple ethical exclusions to more integrated investment strategies that combined financial objectives with social and environmental considerations. This evolution supported the emergence of impact investing and strengthened CSR as a self-regulatory framework aimed at ensuring corporate accountability to stakeholders and society (Fanter et al., 2022).

Institutional and regulatory developments further reinforced these shifts. The establishment of the United Nations Environment Programme (UNEP) in 1972 underscored the growing importance of environmental considerations in corporate activities. During the late 20th century, increased attention to corporate governance followed major financial scandals that exposed weaknesses in accountability structures (Buhmann, 2017). The publication of the Brundtland Report, "*Our Common Future"*, in 1987 marked a critical milestone by defining sustainable development as meeting present needs without compromising future generations (World Commission on Environment and Development, 1987; Agbakwuru et al., 2024; Monica et al., 2023). This report significantly influenced the integration of environmental and social considerations into corporate practices.

Further pressure from advocacy groups, policymakers, and investors intensified expectations for ethical business conduct and governance reform (Haufler, 2010). Regulatory initiatives, such as the U.S. Foreign Corrupt Practices Act of 1977, strengthened governance requirements and accountability standards. Complementing

these developments, Elkington's (1994) triple bottom line framework formalised the idea that firms should simultaneously account for economic, social, and environmental performance, reinforcing the conceptual basis upon which contemporary ESG practices were later developed.

Despite these advances, much of the literature on ESG's foundations remains largely descriptive, focusing on historical evolution and framework development rather than analytical evaluation. As a result, the transition from early CSR and SRI concepts to modern ESG practices is well documented, yet the practical implications and outcome-oriented significance of these developments remain insufficiently examined. This highlights the need for more critically grounded ESG research that moves beyond historical progression toward deeper analytical understanding.

2.5.2 Emergence of Sustainability Reporting

The 1990s marked a significant shift in corporate disclosure practices with the formalisation of sustainability reporting and the development of structured reporting frameworks. During this period, firms increasingly recognised the strategic importance of transparency and accountability in relation to their environmental and social activities. Sustainability reporting began to extend beyond voluntary communication, serving as a mechanism for enhancing corporate credibility and stakeholder engagement through structured year-end disclosures.

A major milestone in this evolution was the establishment of the Global Reporting Initiative (GRI) in 1997. The GRI was developed to provide a standardised framework for sustainability disclosures, enabling greater consistency, comparability, and credibility in corporate environmental and social reporting. As noted by Haufler (2010), the GRI became one of the most widely adopted voluntary reporting systems globally, reinforcing the legitimacy of ESG disclosures. The growing adoption of GRI further signalled a shift in corporate perception, where sustainability reporting was increasingly viewed as strategically relevant rather than purely compliance-driven.

This transition was influenced by rising investor demand for non-financial information and increasing regulatory scrutiny. Maione (2023) argued that the expansion of sustainability reporting frameworks reflected heightened expectations for

harmonised and decision-useful ESG disclosures. Sustainability reporting also aligned firms with broader global initiatives such as the United Nations Global Compact and sustainable development principles, positioning ESG disclosures as a means of demonstrating responsible corporate behaviour to international stakeholders (Podrecca et al., 2022).

Beyond the GRI, several international organisations played important roles in advancing sustainability reporting standards. These included the United Nations Environment Programme (UNEP), the World Business Council for Sustainable Development (WBCSD), and the International Organisation for Standardisation (ISO), all of which contributed to promoting sustainability and ESG disclosure practices. Similarly, the launch of the United Nations Global Compact in 2000 reinforced the relevance of sustainability reporting by encouraging firms to align with principles related to human rights, labour standards, environmental protection, and anti-corruption (CCCMC, 2014).

Institutional investor pressure further accelerated the adoption of sustainability reporting. Heightened awareness of climate-related risks following the Kyoto Protocol in 1997 encouraged firms to incorporate environmental and carbon-related disclosures into their reporting systems. In parallel, the introduction of sustainability indices such as the Dow Jones Sustainability Index in 1999 provided benchmarks for evaluating corporate ESG performance, strengthening incentives for firms to improve sustainability practices (Buhmann, 2017).

Regulatory developments also played a critical role in shaping sustainability reporting. The European Union's Non-Financial Reporting Directive, introduced in 2014, required large publicly listed firms to disclose ESG-related information, signalling a shift from voluntary to mandatory reporting in several jurisdictions (Saegert & Grossman, 2018). In Southeast Asia, Malaysia followed a similar trajectory, with Bursa Malaysia introducing sustainability reporting guidelines in 2015 to align domestic firms with global reporting practices (Peng et al., 2020).

Despite these advancements, much of the literature on sustainability reporting remains focused on framework development and regulatory progression. While reporting practices have expanded in scope and volume, less attention has been given to the substantive quality and outcome relevance of sustainability disclosures. This

highlights a persistent gap between the proliferation of reporting standards and the analytical assessment of how sustainability reporting contributes to meaningful corporate outcomes, thereby underscoring the need for more critically grounded ESG research.

2.5.3 The Rise of Integrated Reporting and ESG Standardisation

The early 2000s marked a pivotal phase in ESG reporting with the emergence of integrated reporting (IR) and increasing efforts toward global standardisation. Integrated reporting was developed in response to growing stakeholder demand for a more holistic disclosure approach that combines financial and non-financial performance indicators (KPMG International, 2012). By encouraging firms to present a longer-term view of value creation, IR enabled stakeholders to better assess how strategic, environmental, and social factors influence corporate sustainability. Consequently, annual reports increasingly reflected both financial outcomes and the broader risks and opportunities shaping business operations.

The movement toward ESG standardisation gained momentum in the 2010s with the establishment of specialised reporting bodies. The creation of the Sustainability Accounting Standards Board (SASB) and the Task Force on Climate-related Financial Disclosures (TCFD) introduced industry-specific and climate-focused disclosure standards aimed at improving decision-usefulness for investors (Agbakwuru et al., 2024). Similarly, the formation of the International Integrated Reporting Council (IIRC) in 2010 formalised the Integrated Reporting Framework by emphasising the connectivity between sustainability performance and financial outcomes (IIRC, 2013). These initiatives collectively signalled a shift toward more structured, investor-oriented ESG reporting. Regulatory support further reinforced this trend, particularly through the European Union's Non-Financial Reporting Directive in 2014, which strengthened oversight and mandated ESG disclosures for large firms (Saegert & Grossman, 2018).

During this period, multinational corporations increasingly extended ESG expectations across their supply chains, requiring suppliers to comply with sustainability standards. The Carbon Disclosure Project (CDP) gained prominence as a platform for enhancing transparency in climate-related disclosures, particularly carbon

emissions (Peng et al., 2020; Hahn et al., 2015). These developments contributed to greater alignment between corporate reporting practices and global sustainability objectives.

The convergence of ESG reporting frameworks further advanced standardisation efforts. Buhmann (2017) observed that the integration of major reporting initiatives, including the merger of the IIRC and SASB into the Value Reporting Foundation in 2021, reflected a move toward greater coherence in ESG reporting. This trajectory continued with the establishment of the International Sustainability Standards Board (ISSB) by the IFRS Foundation in 2021, aimed at harmonising sustainability disclosures globally. While these developments strengthened consistency and comparability, much of the literature remains focused on institutional evolution rather than critically assessing how integrated and standardised reporting contributes to substantive organisational outcomes. This highlights an ongoing gap between reporting convergence and a deeper analytical understanding of ESG's role in corporate performance and value creation.

2.6 Global Adoption of ESG Practices and Its Challenges

The adoption and execution of ESG practices have commanded keen interest from the global community. This ESG interest has equally instigated growing adoption at the regional and national levels. However, the ESG adoption process has also witnessed multi-faceted challenges across the globe.

2.6.1 Global Perspectives on ESG Practices

Over the past two decades, ESG reporting has evolved from voluntary sustainability disclosures into structured regulatory frameworks. This is highlighted through the establishment of the Global Reporting Initiative (GRI) in 1997, which was among the first structured reporting initiatives, then followed by the Sustainability Accounting Standards Board (SASB) and the Task Force on Climate-Related Financial Disclosures (TCFD) (Eccles & Krzus, 2015). Also, the rise of ESG-focused investment funds and regulatory requirements further emphasises the growing significance of sustainability issues in corporate decision-making (Friede et al., 2015). Several factors

have propelled ESG adoption globally, among which include regulatory pressures, investor demand, and stakeholder expectations.

2.6.1.1 Regulatory Pressures

Governments around the globe and international regulatory bodies have increasingly mandated ESG disclosures to ensure corporate accountability and sustainable development. The European Union's Sustainable Finance Disclosure Regulation (SFDR) and the U.S. Securities and Exchange Commission (SEC) ESG disclosure proposals exemplify the shift towards global standardised reporting (European Commission, 2020). In addition, the United Kingdom's Financial Conduct Authority (FCA) has implemented sustainability disclosure requirements, while the International Financial Reporting Standards (IFRS) Foundation has established the International Sustainability Standards Board (ISSB) to create a unified ESG disclosure framework (IFRS, 2024). Furthermore, emerging economies are also taking steps to regulate ESG reporting, with countries like China and Malaysia introducing sustainability guidelines tailored to their market needs and peculiarities (Duan et al., 2023; Makhdalena et al., 2023). These regulations and standards enhance transparency and drive corporations towards a better environmental, social, and governance performance and disclosures.

2.6.1.2 Investor Demand

Institutional investors, asset managers, and private equity firms are integrating ESG factors into their decision-making, recognising the long-term financial benefits of sustainable practices (McCahery et al., 2022). Thus, this is leading to the attraction of global funds by ESG and sustainability-conscious firms. The Global Sustainable Investment Alliance (GSIA) reported a significant rise in ESG-aligned investments, reaching $30.3 trillion globally in 2020 and 20% in sustainable investment assets under management in non-US markets (GSIA, 2022). This surge in responsible investing has been driven by findings from research studies that suggest that firms with strong ESG performance have lower capital costs, reduced volatility, and improved financial

resilience (Friede et al., 2015). Additionally, impact investing and shareholder activism have also gained attention, which has prompted firms to align their corporate strategies with sustainability principles (Boffo & Patalano, 2020). By doing so, firms can be able to attract the right institutional investors and fund managers. Eccles and Klimenko (2019) noted that many asset management firms, such as BlackRock and Vanguard, have incorporated ESG considerations into their portfolio strategies, influencing corporate decision-making on a global scale.

2.6.1.3 Stakeholder Expectations

The needs and expectations of key stakeholder groups are a crucial factor that has considerably contributed to shaping the evolution of the global adoption of ESG practices by corporate organisations. Deng et al. (2013) argued that the increasing demand for transparency and accountability in corporate ESG commitments by consumers, employees, and communities has greatly influenced the corporate strategies and brand positioning of public entities. Consequently, companies that fail to meet these expectations risk reputational damage, reduced customer loyalty, and difficulties in attracting top talent. Drilling down to consumer behavioural segments, the Millennials and Gen Z consumers have been noted for prioritise ethical sourcing responsibilities of firms, and social impact when making purchasing decisions (Palomo-Domínguez et al., 2023). Moreover, employee satisfaction and retention have been linked to strong ESG practices, as workers prefer to be associated with purpose-driven organisations (Alves et al., 2025).

These stakeholders, through different social groups like labour unions and civil society organisations, can exert significant pressure on corporations as they strive to attract a quality workforce and increase sales by gaining a higher market share. This corroborates the postulation of Kölbel et al. (2020) that social movements advocating for corporate accountability, such as climate action groups and human rights organisations, have further pressured firms to adopt sustainable business practices and disclose their ESG performance more transparently.

Also, the collaborative and oversight role of key stakeholders like the shareholders is crucial in driving firms' ESG initiatives. According to Matsumura et al.

(2014), shareholders often exert substantial pressure on firm managers, urging them to consider the risks and opportunities associated with climate change and broader ESG concerns. This pressure can be directed towards understanding the corporate value implications of climate change and sustainability-related exposures, which have emerged as issues for firms participating in the global market. Clark et al. (2015) had earlier acknowledged that shareholders are increasingly demanding that companies assess the short-term financial value and long-term implications of ESG practices on sustainability and corporate valuation.

2.6.2 Regional Adoption of ESG Practices

Although ESG principles are globally acknowledged, their implementation differs by region due to variations in regulatory landscapes, market development, and cultural perspectives. Consequently, the literature review of this study has considered some of the key issues that have shaped ESG adoption in crucial regional markets. They include Europe, North America, Asia-Pacific, and Emerging Markets.

2.6.2.1 Europe

The European Union (EU) leads ESG adoption with stringent regulations to promote corporate accountability, sustainability, and transparency. Some of the key initiatives include the Sustainable Finance Disclosure Regulation (SFDR), which mandates financial institutions to disclose their sustainability risks and impacts, and the Corporate Sustainability Reporting Directive (CSRD), which expands ESG reporting requirements to a broader range of companies (European Commission, 2021). There is also the EU Taxonomy Regulation, which provides a classification system for sustainable economic activities and is geared towards ensuring that ESG investments align with climate and environmental objectives. European investors are also increasingly prioritising ESG compliance, thereby compelling companies to integrate sustainability into their business strategies to remain competitive in capital markets.

Furthermore, the European Central Bank (ECB) has incorporated climate risk assessments into its financial stability monitoring and banking supervision frameworks.

This reinforces ESG as a vital factor in financial resilience and value creation of firms. The region also came up with the European Green Deal, an ambitious policy framework, which aims to make Europe the first climate-neutral continent by 2050, by driving alignment within the corporate and financial sectors with sustainability goals (Koundour et al., 2022). Additionally, national governments across the EU, including Denmark, the Netherlands, and Germany, have advocated for stringent environmental sustainability regulations and have similarly introduced supplementary ESG disclosure and reporting requirements, enhancing regulatory oversight (Bäckstrand, 2022). As ESG expectations rise, European businesses face increasing pressure from regulators, investors, and consumers to improve transparency, mitigate environmental risks, and contribute to the region's sustainability objectives.

2.6.2.2 North America

This region, particularly led by the USA and Canada, has also been at the forefront in promoting and shaping ESG adoption by corporate organisations. In the USA, a surge in the ESG movement has been fuelled by investor activism, regulatory changes, and mounting demands from consumers and advocacy groups. Nonetheless, the implementation of ESG practices is still uneven, with variations in federal regulations compared to state policies (Boffo & Patalano, 2020). The US Securities and Exchange Commission (SEC) has put forth proposals for climate-related disclosure that mandate publicly traded companies to share information on ESG risks and emissions. However, political opposition and legal hurdles have hampered the expected progress of some of these measures (US-SEC, 2024). On the other hand, certain states, including California and New York, have proactively adopted stricter ESG reporting standards, whereas others are either reluctant or resistant to such mandates (Emerick, 2024). Additionally, corporate entities in America are experiencing a rise in shareholder activism, with investors pressing for enhanced accountability and disclosures in environmental and social governance.

On the other hand, Canada has enhanced its focus on ESG by requiring the Ontario Securities Commission (OSC) to enforce stricter climate risk disclosures for publicly listed companies. Furthermore, the Canadian government has rolled out

sustainable finance policies and tax incentives designed to promote ESG integration within businesses and financial entities. The Canada Pension Plan Investment Board (CPPIB) has pledged to achieve net-zero greenhouse gas emissions across its investment portfolio by 2050, which further underscores the region's commitment to sustainable finance (Switzer & McCool 2022). In summary, North America's ESG landscape is continuously evolving, and it is balancing regulatory actions with market-driven initiatives that promote responsible corporate practices.

2.6.2.3 Asia-Pacific

ESG adoption in Asia is also rising, with countries like Japan, China, and Australia playing the leading role by implementing comprehensive corporate sustainability reporting guidelines. In Japan, the Financial Services Agency (FSA) has encouraged companies to adopt ESG-focused corporate governance practices, while in China, the government has mandated ESG disclosures for state-owned enterprises (Duan et al., 2023). Furthermore, China has introduced its green finance taxonomy to align with global ESG standards. Australia has witnessed an increase in sustainable investment funds and regulatory emphasis on ESG compliance, particularly concerning climate risk (Armour, 2023). The Australian Securities and Investments Commission (ASIC) has also amplified its efforts to combat greenwashing by ensuring companies provide accurate sustainability-related disclosures. Meanwhile, in Southeast Asia, countries including Singapore, Malaysia, and Indonesia are actively developing ESG investment frameworks and green bond markets to attract sustainable capital and transition towards low-carbon economies (Makhdalena et al., 2023).

2.6.2.4 Emerging Markets

The adoption of ESG and sustainability-related practices and disclosures by developing economies is also worth exploring. These economies face challenges in adopting ESG largely due to weaker regulatory frameworks, financial constraints, and a lack of standardised reporting guidelines. Nevertheless, ESG initiatives are gaining traction, particularly in sectors such as renewable energy, green bonds, and sustainable

finance (Alamgir, 2023). Some governments in emerging markets are also introducing tax incentives and financial support mechanisms to encourage corporate ESG adoption. In Latin America, countries like Brazil and Mexico have implemented ESG reporting guidelines to align with international standards. Meanwhile, African economies like South Africa promoted ESG-linked financial instruments and green bonds to attract sustainable investment and foster economic growth (Goel et al., 2022). The increasing involvement of multilateral organisations, such as the World Bank and the International Finance Corporation (IFC), has further helped to bridge the gap in ESG adoption, as they provide technical assistance and funding opportunities to governments and public corporations of these emerging markets.

2.6.3 Global ESG Adoption Challenges

Despite its growing importance, the adoption of ESG practices globally has faced several challenges spanning across corporate organisations and nations. These setbacks include issues of greenwashing, data inconsistency, and colossal compliance costs.

2.6.3.1 Greenwashing

According to Marquis et al. (2016), greenwashing occurs when firms falsely claim adherence to ESG principles while continuing unsustainable practices, creating a misleading image of corporate responsibility. As such, they see the implementation of ESG practices as just a compliance mechanism to gain public recognition, and not necessarily to support the external environment and create real corporate value for stakeholders. Evidence has shown that some corporations exaggerate their ESG commitments without substantive actions, thereby undermining investor trust and leading to misallocation of capital (Kölbel et al., 2020).

This misrepresentation can mislead consumers, erode public confidence, and deter genuine sustainable investment, as expressed by the United Kingdom's Financial Conduct Authority (FCA) press release in 2022. Also, Testa et al. (2015) contended that greenwashing undermines corporate responsibility to stakeholders and damages the

credibility of environmental programs. Numerous industry and regulatory organisations have recognised the detrimental effect of greenwashing on sustainability initiatives. The European Commission stated in 2022, postulated that greenwashing misleads market participants and fails to provide appropriate benefits to companies striving to make their products and practices more eco-friendly. This, in turn, results in a less sustainable economy.

Consequently, regulatory bodies are introducing stricter compliance measures, independent ESG auditing standards, and enhanced disclosure requirements to counter greenwashing challenges, and companies that fail to provide verifiable ESG disclosures may face legal repercussions, reputational damage, and reduced investor interest (Moodaley & Telukdarie, 2023). As regulators and stakeholders demand higher corporate sustainability standards, firms must also consider the global and long-term perspective of their actions by aligning their ESG initiatives with measurable and credible frameworks to avoid the risks associated with greenwashing.

2.6.3.2 Data Inconsistency

The reliability and accuracy of ESG data are crucial for informed investment decisions, whether the data are self-reported by companies, aggregated by ESG data providers, or generated through advanced information technologies such as artificial intelligence and machine learning tools (Cort & Esty, 2020). However, the lack of a single global standardised ESG reporting framework complicates cross-border comparisons and investor analysis, thereby creating difficulties in assessing the true ESG performance of corporate organisations (Fometescu et al., 2024). This is the case of multinationals with operations in various countries that have to comply with the different ESG guidelines and standards of these varying jurisdictions.

Furthermore, despite the rising popularity of ESG investing and the growing availability of ESG data, a significant portion of the investment community still does not fully integrate ESG aspects into their investment strategies and choices (Belkhir et al., 2017). Studies have indicated that the sheer variety and volume of ESG data often lead to inconsistencies and poor data quality (Bender et al., 2018; Kotsantonis & Serafeim, 2019). This, in turn, could deter institutional investors from utilising ESG

metrics for investment decision-making and planning (Jonsdottir et al., 2022).

It is also worth noting that there have been efforts to harmonise ESG and sustainability reporting, which are led by organisations such as the ISSB and GRI, with the aim of improving the comparability and credibility of the disclosures. However, ESG disclosure remains largely voluntary, allowing companies to select from multiple reporting frameworks, thereby limiting the consistency and transparency of ESG data across industries and regions (Eccles et al., 2017). As such, the current challenge could be reduced to a bare minimum when ESG practices and disclosures are executed not just to meet compliance objectives, but seen from the perspective of a factor that can create corporate value for all stakeholders.

2.6.3.3 Compliance Costs

The cost of complying with the requirements of ESG reporting standards is also a crucial challenge faced by corporate organisations, particularly small and medium-sized enterprises (SMEs) and smaller publicly listed firms. This has earlier been expressed by Eccles and Krzus (2015), in their postulation that smaller companies are faced with the challenge of the financial burden of ESG compliance, which creates disparities in reporting quality and may hinder meaningful sustainability efforts. ESG compliance incurs significant costs, such as hiring sustainability professionals, implementing data tracking systems, obtaining third-party certifications to verify ESG performance, etc. Unlike large corporations that have dedicated ESG teams, SMEs frequently lack the material, human, and financial resources to meet the complex reporting requirements of ESG guidelines, thereby placing them at a competitive disadvantage (Fometescu et al., 2024).

To address the compliance cost challenge, policymakers are considering incentives such as tax benefits, subsidies, and grant programmes to support ESG adoption among smaller firms. The European Union, for instance, has introduced financial assistance programmes to aid SMEs in transitioning toward sustainability reporting under the Corporate Sustainability Reporting Directive (CSRD) (Odobaša & Marošević, 2023). Furthermore, advancements in digital reporting tools and AI-driven analytics are assisting in streamlining ESG data collection, thereby reducing the time

and costs associated with compliance (Moodaley & Telukdarie, 2023). Despite these efforts, disparities in ESG reporting quality remain a concern, with smaller firms struggling to meet the rigorous standards imposed by institutional investors and global regulatory frameworks.

Notwithstanding the above global adaptation challenges, there still exists a considerable potential for the continuous adoption and implementation of ESG practices. The future of impactful ESG practices still lies in greater standardisation, technological advancements, and enhanced regulatory frameworks. The ISSB has commenced with its objective of establishing globally recognised ESG reporting standards and a reduction in fragmentation. Also, innovations like AI-driven ESG analytics and blockchain technology will further improve data accuracy, accountability, and reporting efficiency (Wang & Yang, 2024). As ESG becomes a fundamental aspect of corporate governance, companies that proactively integrate sustainability into their operations could gain a competitive edge and create better value for their stakeholders. Additionally, the evolving consumer awareness and investor expectations could continue to drive further improvements in ESG transparency and corporate responsibility by firms and governments.

2.7 ESG in the Malaysian Context: Regulatory Frameworks and Adoption Trends

Environmental, social, and governance practices are increasingly gaining prominence in the Malaysian economy, cutting across both private and public sector organisations. Bursa Malaysia and the Securities Commission Malaysia are key regulatory bodies in the country that have been at the forefront, taking significant strides to enhance the adoption, reporting, and integration of ESG initiatives among publicly listed companies. Exploring the regulatory frameworks governing ESG in Malaysia and the adoption trends among Malaysian companies was crucial to the study. This aided in better understanding and contextualising the study results related to how Malaysian publicly listed companies integrated their financial and agency risk exposures into their business and ESG strategies to create value for key stakeholders.

Over the years, Bursa Malaysia and the Securities Commission Malaysia have issued several regulatory frameworks and ESG reporting guidelines to direct the

adoption, execution, and reporting of ESG practices by listed firms in the country. The literature review of this study considered several of them, including Bursa Malaysia's Sustainability Reporting Framework, the Malaysian Code on Corporate Governance (MCCG) i-ESG Framework, the SRI-Linked Sukuk Framework, and the Mandatory ESG Reporting by 2025 Guideline.

2.7.1 Bursa Malaysia's Sustainability Reporting Framework

ESG adoption in Malaysia can be said to still be in its early stages, given that its initial regulatory initiatives were launched about a couple of years ago, in 2014 (Krishnan, 2023). The Sustainability Reporting Framework was first introduced in 2015 by Bursa Malaysia with the aim of promoting greater transparency, accountability and consistency in the implementation and reporting of ESG initiatives, which ensures listed firms report material sustainability matters that impact corporate value creation (Krishnan, 2023). Furthermore, Bursa Malaysia's Sustainability Reporting Guide serves as a valuable reference tool to assist companies in enhancing their ESG disclosure practices. It offers a structured approach to sustainability reporting, addressing key elements such as stakeholder engagement, risk management, and performance measurement using globally recognised ESG metrics. The guide also aligns with Malaysia’s broader national sustainability agenda, which includes commitments under the National Climate Change Policy 2.0 and the Net Zero Carbon target by 2050 (NRES, 2025).

Over the years, this framework has undergone some enhancements to align with international standards such as the Global Reporting Initiative (GRI), the Task Force on Climate-related Financial Disclosures (TCFD), and the Sustainability Accounting Standards Board (SASB) (Bursa Malaysia, 2024; Peng et al., 2020). In 2022, Bursa Malaysia issued an enhanced Sustainability Reporting Guide that provided sector-specific ESG disclosure requirements, particularly for industries with high environmental and social impact, such as energy, finance, and manufacturing. The enhanced sustainability reporting provisions required companies to disclose climate-related risks and opportunities, greenhouse gas (GHG) emissions, energy consumption, biodiversity impact, and social issues such as workforce diversity and supply chain

sustainability (EY, 2022).

Bursa Malaysia equally introduced the FTSE4Good Bursa Malaysia (F4GBM) Index in December 2014, which assesses and ranks publicly listed companies based on their ESG performance scores (Atan et al., 2018). This index, which is a collaboration between FTSE Russell and Bursa Malaysia, has encouraged greater corporate participation in sustainability initiatives as companies strive to enhance their ESG scores to attract investors and improve market competitiveness (Bursa Malaysia, 2023). The F4GBM index utilises a transparent assessment methodology, evaluating companies on their governance, climate strategy, human rights policies, and overall sustainability impact.

To further strengthen ESG accountability, Bursa Malaysia has announced that ESG reporting will become mandatory for all listed companies by 2025. The mandatory disclosure requirement is expected to drive more rigorous ESG integration within corporate governance structures, fostering long-term sustainable business practices across industries (Bursa Malaysia, 2023). By taking this step, the country is gradually moving from voluntary compliance to a compulsory or rule-based approach.

2.7.2 Malaysian Code on Corporate Governance (MCCG)

The Malaysian Code on Corporate Governance (MCCG), which was initially launched in 2017 by the Securities Commission (SC) Malaysia and was later revised in 2021, to integrate ESG considerations into corporate governance principles, emphasising board accountability, transparency, and sustainability practices (Securities Commission, 2021). The MCCG serves as a voluntary best practice guide but is widely adopted by publicly listed companies to strengthen investor confidence and corporate resilience. Thus, it is helping to shape the governance practices and disclosures of firms in Malaysia.

One of the MCCG's main emphases is on board leadership and oversight of ESG risks. With regard to ESG, it requires boards to codify governance structures for managing ESG-related risks and opportunities. The code provides companies with the incentive to incorporate sustainability within their corporate strategies and risk management frameworks. Bursa Malaysia (2023) expects boards to be clear in

overseeing ESG initiatives to meet the long-term objectives of the business and the stakeholders. This is because when the board engages in decision-making and choices that lead to failure in achieving capital mix and governance objectives, it could expose the company to financial and agency risk exposures, and ultimately affect its corporate value creation.

Furthermore, the MCCG also stresses diversity and inclusion at the board and senior management levels, thereby acknowledging that diversity at the leadership level improves decision-making and integration of sustainability. Companies are asked to disclose their governance practice, including board diversity policy (that is, gender diversity target). MCCG promotes ethical business conduct to include anti-corruption measures, whistleblower mechanisms and transparent remuneration policy to enhance the integrity of governance through the companies (Krishnan, 2023).

The MCCG recognises that better sustainability reporting and disclosure practices will help with the improvement in transparency and accountability. As such, for companies to build consistent and broad ESG disclosures, it would be advisable to use both the local guidelines and internationally recognised frameworks, such as GRI and TCFD. Furthermore, there is also traction on the MCCG integration of ESG factors into executive compensation, which recommends that firms should link their performance-based remuneration packages to sustainability targets (Nigam et al., 2018). The MCCG also supports stakeholder engagement as a critical aspect of corporate governance. Through stakeholder engagement, companies are encouraged to maintain open communication with investors, regulators, and other stakeholders on ESG-related risks and performance. The use of stakeholder engagement mechanisms, such as sustainability committees and investor briefings, is encouraged to foster trust and accountability (Ismail et al., 2022).

The MCCG has been instrumental in advancing the ESG landscape in Malaysia by incorporating sustainability into corporate governance frameworks. Given the dynamic nature of the business and regulatory environment, the Security Commission could also be proactive in issuing updated enhancements to the MCCG that would continue to improve ESG integration and alignment of Malaysian firms with global best practices.

2.7.3 i-ESG Framework and the SRI-Linked Sukuk Framework

To promote sustainable financing and align corporate practices with ESG principles, Malaysia has introduced the i-ESG Framework, a strategic initiative aimed at supporting the transition to sustainable business operations across various industries. This framework plays a crucial role in assisting corporations, particularly those in the manufacturing, energy, and financial sectors, in integrating ESG considerations into their operational models and long-term growth strategies (Lim, 2023). The i-ESG Framework encourages businesses to adopt green technology, enhance resource efficiency, and implement responsible business practices aligned with internationally recognised ESG standards. It offers guidelines and incentives, including tax benefits and access to green financing, to expedite the adoption of corporate sustainability. Furthermore, the framework promotes greater transparency by requiring participating firms to disclose their ESG commitments and sustainability performance (Krishnan, 2023).

Similarly, this initiative was complemented by the Securities Commission's introduction of the Sustainable and Responsible Investment (SRI)-Linked Sukuk Framework in 2022, which emerged as a key financial instrument for driving ESG-compliant investments (SC, 2022). This framework facilitates the issuance of Shariah-compliant bonds (Sukuk) that support sustainability-driven projects, which further positions Malaysia as a global leader in Islamic sustainable finance. As such, corporations can raise capital through this initiative for projects that align with climate resilience, renewable energy, social impact objectives and Shariah-compliant foundational principles.

The SRI-Linked Sukuk Framework provides performance-based incentives, where issuers benefit from financial rewards such as lower financing costs if they achieve predefined ESG targets. As such, it encourages businesses to commit to measurable sustainability goals while ensuring accountability in using funds for ESG-related initiatives (Adenan et al., 2024). Furthermore, this framework strengthens Malaysia's reputation as a pioneer in sustainable Islamic finance, setting an example for other markets looking to integrate ESG considerations into financial instruments that are Shariah-compliant.

The integration of these two frameworks could promote better mobilisation of

sustainable investments, enhance corporate responsibility, and facilitate Malaysia's transition to a low-carbon economy. Krishnan (2023) argued that such a synergism between the i-ESG Framework and the SRI-Linked Sukuk Framework could drive sustainable economic growth, positioning Malaysia at the forefront of the regional ESG finance landscape.

2.7.4 Mandatory ESG Reporting by 2025

According to KPMG (2024), Bursa Malaysia, under the National Sustainability Reporting Framework (NSRF), has mandated that all listed companies in the country comply with International Financial Reporting Standards (IFRS) S1 and S2 when reporting on their ESG performance by 2025. This requirement speaks volumes about the new direction in which the economy is heading, towards greater transparency and accountability in corporate governance and sustainability practices. As such, Bursa Malaysia's (2023) mandatory ESG reporting requires all companies to report on their key environmental, social, and governance impact metrics to this mandatory reporting framework. This direction enables a standardised and transparent approach towards sustainability disclosures in the country.

The implementation strategy is structured such that larger companies and particularly high-impact sectors (energy, manufacturing, construction) have to comply with more demanding and detailed ESG disclosure requirements. This is because of their significant carbon footprint and social implications, which require stricter reporting standards in such industries and sectors. The requirements encompassed a detailed reporting on carbon emissions, waste management, human rights policies, and corporate governance structures. One of the key objectives of this assignment, as elucidated by Krishnan (2023), is to align Malaysia's corporate reporting framework with the best global practices in international reporting, such as the Task Force on Climate-related Financial Disclosures (TCFD), the International Sustainability Standards Board (ISSB), and the Global Reporting Initiative (GRI). The initiative seeks to boost Malaysia's appeal to foreign investors, a goal that traditional sources of ESG data cannot fulfil.

Bursa Malaysia has also made compliance with ESG requirements necessary by

imposing penalties for non-compliance. This approach could pressure companies to integrate sustainability within their corporate governance structures to avoid being charged fines, which are also packaged with delisting and reputation risks. García-Meca (2024) has equally expressed that corporate managers are willing to execute specific strategies to avoid being penalised by stakeholders due to weak compliance in ESG initiatives. Such actions could include dismissals of directors involved, substantial fines and penalties, and even restructuring of the board composition.

Bursa Malaysia and Securities Commission Malaysia have also developed capacity-building programmes, industry workshops, and digital tools to help companies achieve complete ESG compliance by educating corporate leaders on best ESG reporting practices. In addition, financial incentives and tax benefits are being given to early adopters to promote proactive sustainability strategies (Krishnan, 2023). These tax savings would also serve as a booster to motivate increased compliance by firms.

Furthermore, the Securities Commission and Bursa Malaysia's requirements to make ESG reporting mandatory by 2025 for publicly quoted companies in Malaysia may be seen as a strategy to position the country as a leader in corporate sustainability within the ASEAN region and an active global player. This move could, in the future, drive greater accountability, improve long-term corporate sustainability, and enhance investor confidence, thereby ensuring that businesses operate with a strong commitment to environmental and social responsibility.

2.7.5 ESG Adoption Trends Among Malaysian Publicly Listed Companies

Listed firms in Malaysia as part of the key participants playing a critical role in driving the adoption of ESG and sustainability practices in the country. They are expected to plan their ESG activities, execute them and make relevant disclosures to stakeholders through the sustainability or ESG reports. However, ESG Adoption in Malaysia can be said to still be at it early stage, as the first sustainability reporting framework was only introduced in 2015 by Bursa Malaysia. Thus, a couple of firms might also be in their early adoption and implementation phase, with a lot to learn in the process before gaining mastery. Notwithstanding the early Adoption stages of ESG in Malaysia, the last few years have also witnessed an increase in ESG integration,

disclosures, and performance amongst listed companies in the country, as explored by the literature review of this study.

2.7.5.1 Increasing ESG Integration

Adenan et al (2024) postulated that Malaysia offers a crucial context for examining ESG integration, owing to the government's growing emphasis on sustainable development as part of Vision 2020, the nation's long-term strategic framework initiated in 1991. The integration of ESG principles among Malaysian firms has significantly accelerated over the past decade, propelled by investor demand, regulatory pressures, and evolving global market expectations (Krishnan, 2023). Stakeholders, including institutional investors, consumers, and regulators, are increasingly scrutinising companies' ESG performance, making sustainability a crucial part of corporate strategy and risk management.

According to the Malaysian Businesses Sustainability Pulse Report (2022), more than 70% of listed companies have embedded ESG considerations into their business models. Governance practices have traditionally received the most attention, with companies focusing on board independence, anti-corruption policies, and risk management to ensure compliance with the Malaysian Code on Corporate Governance (MCCG). However, there has been a growing emphasis on environmental and social practices, particularly in sectors with high carbon footprints, such as energy, manufacturing, and palm oil.

In environmental practices integration, Malaysian firms have increasingly adopted climate risk assessments, energy efficiency programs, and carbon reduction commitments in line with international sustainability frameworks such as the Task Force on Climate-related Financial Disclosures (TCFD) and the Net Zero Carbon 2050 Agenda (NRES, 2025; Tang, 2023). Companies in the energy sector have begun investing in renewable energy projects and green infrastructure, while manufacturing firms are incorporating circular economy principles to minimise waste and improve resource efficiency.

The ESG social practices have also gained momentum in Malaysian firms, particularly in areas such as workplace diversity, labour rights, and community

engagement (Adenan et al., 2024; Tang, 2023). Corporate entities are actively enhancing employee well-being through diversity and inclusion initiatives, enhanced occupational health and safety measures, and fair labour practices. Furthermore, Malaysian firms in consumer-focused industries such as retail and finance are prioritising ethical sourcing, data privacy, and customer-centric sustainability programs to align with global social responsibility trends (Adenan et al., 2024).

One of the significant drivers of ESG integration in Malaysia is the alignment with global investment trends, that is, integrating ESG initiatives into firms' investment decision-making. According to Agbakwuru et al. (2024), the ESG initiatives in investment decision-making of firms have witnessed significant growth, instigated by a notable rise in ESG-focused funds and stakeholders' socially responsible investing interest. This change reflects a wider realisation that ethical investments and sustainable business practices can boost long-term corporate value. Thus, leading to enhanced ESG disclosures, improved reporting mechanisms, and a more strategic approach to sustainable business practices.

Despite the rapid progress, challenges remain in ensuring standardised ESG reporting, data reliability, and meaningful stakeholder engagement. Many firms, particularly small and medium enterprises (SMEs), face difficulties in integrating ESG due to limited resources, lack of expertise, and high compliance costs. To address these challenges, government incentives, sustainability-linked financing, and capacity-building programs have been introduced to facilitate ESG adoption across all industries (Ismail et al., 2022).

In light of the above, ESG integration in Malaysia can be said to be on an upward trajectory, bolstered by regulatory mandates, investor expectations, and corporate commitments to sustainability. As businesses continue to adapt to the evolving ESG landscape, the focus is likely to shift towards improved ESG performance tracking, impact measurement, and long-term value creation.

2.7.5.2 ESG Disclosure and Performance Trends

ESG practices and disclosures among Malaysian firms have shown consistent improvements, reflecting a broader commitment to sustainability and responsible

corporate governance. According to Bloomberg's ESG data for ASEAN-5 countries, there was a steady increase in ESG disclosure scores for Malaysian firms from 2016 to 2021, signalling enhanced transparency and compliance with global reporting standards (Krishnan, 2023). Moreover, a recent report released by Sustainable Fitch, KPMG (2023), which summarises key ESG policy and regulatory developments over an 18-month period for major Southeast Asian markets, has ranked Malaysia third in the region with an improved sustainability reporting score of 99% out of 100%.

Notwithstanding the progressive trend, considerable challenges remain to be addressed, particularly in environmental practices and reporting. While governance disclosures are relatively strong due to the Malaysian Code on Corporate Governance (MCCG), environmental and social disclosure practices still require further development. Metrics related to biodiversity impact, waste management, carbon footprint, and water resource utilisation still need to be further developed, as they limit investors' and regulators' ability to effectively assess long-term environmental risks and opportunities (Mohd Taib & Haron, 2024).

There is the issue of ESG performance tracking, which is caused by the inconsistent quality, variation in methodologies, and comparability of ESG data across economic sectors (Beckmann & Rogmann, 2024). Companies in the country struggle to effectively align the standardised reporting guidelines from Bursa Malaysia with international ESG benchmarks such as the Global Reporting Initiative (GRI) and the Task Force on Climate-related Financial Disclosures (TCFD). This challenge could delay the timely issuance of sustainability reports and thus affect local and foreign investors' perception and confidence in the credibility of the ESG disclosures when making sustainability-related investment decisions.

However, several initiatives geared toward addressing these challenges are being implemented. Bursa Malaysia introduced sector-specific ESG reporting requirements in 2023, particularly targeting high-impact industries such as energy, manufacturing, and finance to ensure more rigorous disclosures. Additionally, advancements in ESG digital reporting tools and AI-driven analytics are assisting in streamlining ESG data collection, thereby helping firms improve the accuracy and timeliness of their sustainability reports (Moodaley & Telukdarie, 2023).

Furthermore, a notable trend worth considering is the increasing adoption of

third-party ESG verification and assurance services by Malaysian firms. Independent ESG ratings and audits are becoming more prevalent, with companies seeking external validation to enhance the credibility and reliability of their disclosures. This shift is driven by investor demand for more transparent and verifiable ESG data, aligning with global sustainable investment trends (Ismail et al., 2022). However, this comes at an additional cost to the companies paying for these third-party reviews and audits.

Malaysia's ESG disclosure landscape is expected to evolve further, with increased regulatory support, corporate engagement, and stakeholder collaboration. As the mandatory ESG reporting deadline in 2025 (Bursa Malaysia, 2023) approaches, companies must focus on enhancing their sustainability strategies, improving data collection mechanisms, and aligning ESG disclosures with internationally recognised standards. This would ensure that they not only comply with local regulatory requirements but could also highlight their commitment to actively participating in the global markets and create a more sustainable corporate value for their stakeholders.

In summary, Malaysia has made significant progress in institutionalising ESG practices through regulatory frameworks and incentives. However, if challenges such as data inconsistencies, variability of methodologies, high compliance costs, and inadequate expertise can be addressed, the adoption of ESG could be enhanced, and the adoption impact would be significantly felt by stakeholders. As Malaysia moves towards mandatory ESG compliance by 2025, corporations must integrate sustainability into their business models to remain competitive globally.

2.8 ESG Practices: Conceptualisation

The foundations of environmental social governance (ESG) emerged from the intersection of corporate governance and corporate social responsibility, which takes social and environmental practices into consideration (Ionescu et al., 2019). There are two camps of opinion when it comes to how environmental, social and governance (ESG) practices affect company performance and value. The first is founded on the agency theory, which claims that companies that engage in ESG activities do so to further the personal interests of management at the expense of shareholder value, making ESG initiatives a wasteful investment that has a detrimental effect on performance. The second camp, on the other hand, is founded on the stakeholder theory,

which maintains that good management of businesses via satisfying the interests of all stakeholders is reflected in ESG practices and has a beneficial effect on performance (Lee & Isa, 2020).

The perspective of the first camp is anchored on the issues around the agency problems in organisations. The agency problem could be manifested in the organisation where there are symptoms of conflict of interest between the managers and the owners of the company. As such, corporate plans and activities may be designed and implemented to cater for the self-interest of the executives. This aligns with the submission of Brown et al. (2006), that corporate managers could implement ESG practices and environmentally friendly activities for their own self-gain. Also, Barnea and Rubin (2010) believe managers could make huge investments out of the company's resources just to project their personal image and reputation in society at the expense of shareholders' returns. The amount spent on such activities will be expensed from the firm's profit, thus reducing the available retained profit to be distributed to shareholders as dividends.

Furthermore, Schuler and Cording (2006) assert that firms may forgo profitable projects just to fund ESG activities at the expense of the owners. Companies are usually faced with a funding availability challenge and will exploit capital rationing in funding their various projects. Managers could allocate large funds to promote ESG activities, such that little is available to execute urgent, profitable ventures. Thus, it reduces the profit retained for shareholders of the company. Consequently, it can be deduced that this camp views promoting environmentally friendly activities and ESG practices in the organisation as a venture that may not favour the shareholders and could further exacerbate the agency problem and discourage increased investment from shareholders.

The perspective of the second camp is anchored on the precepts of stakeholder theory, which prioritises consideration for the needs and interests of all stakeholders and not just the shareholders. According to Lee and Isa (2020), ESG practices and policies are essential for both boosting shareholder value and safeguarding the bottom line, as the ESG practices can be transferable or synergised into the firm's overall performance and value. The needs and interests of the different stakeholder groups are though different, but may be interconnected to the overall corporate value and performance. For instance, contented employees will be more dedicated to the

company, contented clients will be loyal and become ambassadors of the company, contented vendors will supply discounted and timely offerings, satisfied creditors will continue to provide credits to the firm as the need arises, etc.

Addressing these expectations of the employees, customers, vendors, and creditors will contribute to the company's improved reputation, improved financial performance, and corporate value. Thus, ultimately meeting the expectation of maximising shareholders' wealth and value created. El Ghoul et al. (2017) postulated that ESG practices have a good impact on corporate performance and value, as they may help managers and stakeholders resolve agency issues in the organisation. This would be possible where ESG activities are embarked upon for the good of all stakeholders and not out of the self-interest of managers.

The theoretical framework of this study aligns with the tenets of the second camp, which incorporates the interests of all stakeholders in executing environmentally friendly activities and ESG practices of the firm. As such, the study is interested in examining the relationship between ESG practices and value created for all stakeholders of the company. This is because, as emphasised by Porter and Kramer (2011), there is a connection between the concepts of ESG or corporate practices and value creation for stakeholders. In addition, Lee and Isa (2020) believe ESG practices can be transferable or synergised to achieve a firm's overall performance and value. Furthermore, creating overall corporate value will benefit all stakeholder groups, as demonstrated above and not just the shareholders.

The ESG practices are based on a wide range of activities of the firm to enhance corporate sustainability within and around the organisation. They are categorised under the environmental, social and governance activities and practices as captured in Bursa Malaysia Sustainability Reporting Guide (2015) and The Nigerian Stock Exchange sustainability disclosure guidelines (2018). The environmental practices are activities related to the company's policies and actions to promote research and development, renewable energy usage policy, reducing carbon emissions, switching to zero-waste products, sustainable packaging, and developing greener products and services. The social practices are activities related to the company's policies and actions in the areas of product safety, security of customer data, enforcing labour rights, training employees, supporting health and safety, policy on diversity and equality in the workforce,

corporate social responsibility spending in local community projects and others, and recruitment policies and child labour. The governance practices are activities associated with the company's policies and actions relating to reporting to stakeholders on financial performance, business strategy and operations, accountable for risk and performance management by the management team, conducting ethical business, such as preventing bribery, diversity leadership team, and disclosure in top management remuneration.

The consciousness of the likely impact of ESG practices on a firm's reputation and value is encouraging companies to develop better ways to drive the implementation of ESG-related activities (Ni et al., 2024). Nonetheless, shareholders may become hesitant to make investments due to the large anomalous returns from businesses with poor environmental, social, and governance (ESG) practices (Cadman, 2011). Murphy and McGrath (2013) asserted that legal concerns, such as litigation or penalties, are the reason for the necessity for improved disclosures of ESG practices. This can lead to additional overall company costs and thus affect corporate profitability. Even with subpar performance, the company can still be protected by having strong ESG practices and performance because the company's reputation will keep shareholder value from declining, and by extension, other key stakeholders. Investors can get a positive impression of the company's transparency from ESG data (Möller et al., 2015).

Aydoğmuş et al. (2022) found that the combined ESG pillar is associated with corporate value, but individually, the environment pillar was not significant. Similarly, prior studies carried out by Ahmad et al. (2021) and Fuente et al. (2022) found divergent results where some of the individual pillars of ESG were significant while others were insignificant. Thus, proper corporate planning and execution to create ESG-driven corporate value may be impaired if corporate managers were to consider just the combined ESG practice performance. This is because the individual practices or ESG pillars requiring improvements may not be identified, and corrective measures implemented. For instance, environmental practices could directly affect a company's long-term viability through resource management, while governance practices will likely influence transparency and stakeholder trust (Eccles et al., 2014). The social aspect may affect employee morale and consumer perceptions (Fombrun, 2012). Consequently, this study's framework examines the combined ESG practices and

further separately examines the ESG components under the categorisation of *environmental practices, social practices, and governance practices*. This equips users with the study results to make more informed judgments and decisions.

2.8.1 Environmental Practices

Environmental practices demonstrate those activities in terms of policies and implementation, which could potentially impact environmental impact the internal and external environment. According to Ting et al. (2019), the "E" in the acronym ESG represents the environment, encompassing waste management, pollution, climate change, insufficient water resources, and energy efficiency. The basis for measuring environmentally friendly practices is the company's capacity and efficacy in reducing emissions, responsible use of natural resources in production and operation, and contribution to the development of new products and services through research and development (Ahmad et al., 2021).

According to Tarmuji et al. (2016), concerns about the environmentally friendly practices of private organisations have drawn the attention of both internal and external stakeholders to the issue of environmental pollution. Thus, it is critical for a firm with the intention to build a positive corporate image and attract green and low-cost finance to be very intentional in addressing stakeholders' environmental concerns. Given the significance of environmental practices in the context of the company, the relationship between corporate ESG practices and corporate value is not entirely clear and requires investigation. During a company's evolution, a variety of environmental conditions frequently have an impact on the economic implications of its ESG practices (Wang et al. 2024).

The relevance of environmental practices has been reinforced by several past researchers. Fuente et al. (2022) in their study of the value of a firm's engagement in ESG practices, found that ESG performance and growth options value were stronger for the environmental pillars. According to Radhouane et al. (2018), who looked at the implications for businesses reporting on their environmental practices, shareholders and customers viewed it favourably and tend to favour firms that do better environmentally. Thus, separately examining the relationship between environmental practices and value

creation would shed more light and provide deeper information to support decision-making around this ESG pillar.

2.8.2 Social Practices

Social factors assess concerns connected to the health of communities and the workforce, as well as the ability to build loyalty and trust among stakeholders (Lee & Isa, 2020). Therefore, the company needs to be socially conscious and accountable in order to foster a sense of loyalty and trust among its clients, workers, and the community. According to Ting et al. (2019), social symbolises the letter "S" in ESG and encompasses aspects of working conditions, human rights, interactions with the community, and health and safety. Indices of corporate social responsibility include environmental sustainability, human rights, equity and justice, workplace norms, safety, and physical wellness (Reuters, 2018).

According to Barnett and Salomon (2012), there exists a positive correlation between financial performance and social practices in certain firms, whereas a negative correlation exists between social practices and financial performance in others. They argued that the way firms profit from their social sustainability practices determines whether progress is meaningful. An essential tool for a company to build and preserve goodwill among its stakeholders is socially conscious behaviour. Similarly, Fuente et al. (2022) found that social practices have a strong association with the financial and growth value of the firm's stakeholders. Social practices take a broader approach to address concerns both in the internal and external operations of the firm and thus command substantial involvement at every level in the organisation. It delves into activities and practices which may not necessarily result in measurable profitability.

Due to the qualitative nature of the social indices, it is more legitimate, and stakeholders are more likely to believe that ESG practices are sincere. As a result, these activities are seen as more significant rather than merely symbolic (Cuypers et al., 2016). This unveils the social practices of firms as a category of the ESG pillars, whose relationship with value creation is worth separately investigating.

2.8.3 Governance Practices

According to Sitorus (2017), good corporate governance is a system that governs and supervises firms that add value. Management ownership, institutional ownership, the size of the board of directors, the makeup of the independent directors, audit committees, and an understanding of how the company's size affects the implementation of good corporate governance are among the mechanisms used by the organisation to help realise corporate governance. Ting et al. (2019), postulated that the letter "G" in the ESG acronym stands for a collection of guidelines, procedures, and regulations pertaining to corporate governance. The term "governance criteria" covers norms, procedures, shareholder rights, internal controls, leadership, and administration philosophy. The board of directors is primarily saddled with the responsibility of ensuring good, inclusive and effective governance practices of the organisation.

Previous studies have shown that weak corporate governance relates to a slightly lower company value and lower stock returns (Lavorini, 2020). In recent years, the availability of sustainability management and board practices within a corporation has been associated with good governance and social responsiveness. This is consistent with new study findings that demonstrate the incompatibility of discussing sustainability and successful corporate governance separately (Fernando et al., 2019). Notwithstanding that Fuente et al. (2022) found governance pillars have no statistical significance on the financial and growth value of the firms, numerous studies, like Tarmuji et al. (2016) and Sitorus (2017), highlighted the significance of the considerable impacts of sustainable governance activities on organisations. Thus, making it worthwhile to separately investigate the relationship between the governance practices and value created for stakeholders, such findings have the capacity to influence investors and management decision-making.

2.9 ESG Practices and Value Creation of Firms

Business and operational models play a central role in determining whether value is created or destroyed for consumers and other stakeholders (IFAC, 2020). ESG practices form an integral part of these models and can be deliberately embedded into organisational processes to enhance long-term value creation. From a strategic

perspective, the business model explains how firms transform resources and relationships into outputs that create value for stakeholders in both the short and long term. Hart and Milstein (2003) emphasise that value creation through ESG practices requires firms to balance immediate outcomes with future-oriented considerations.

One key channel through which ESG practices contribute to value creation is cost efficiency and capital market performance. The socially responsible investment literature suggests that ESG engagement can lower firms' cost of capital and improve market valuation, as initial investments in sustainability are often offset by reduced financing costs and improved risk profiles (Ionescu et al., 2019). Effective ESG implementation can also mitigate rising operating costs related to raw materials, environmental compliance, and resource scarcity. Henisz et al. (2019) reported that such cost pressures could account for up to 60% of a firm's operating profitability, underscoring the economic relevance of sustainability-oriented practices.

Cost reduction remains a crucial driver of stakeholder value. While ESG investments may appear costly in the short term, their long-term benefits often outweigh initial expenditures through efficiency gains, risk mitigation, and reputational advantages. Goedhart and Koller (2020) caution that excessive short-term focus can destroy shareholder value, particularly when environmental failures lead to regulatory fines, remediation costs, and reputational damage. ESG practices, therefore, serve as preventive mechanisms that protect and enhance corporate value over time.

From a stakeholder perspective, ESG practices can generate value when they are designed and implemented through inclusive engagement with key stakeholder groups. Porter and Kramer's (2011) shared value framework highlights how firms can align social and environmental objectives with economic performance. Effective relationship management with both internal and external stakeholders strengthens this alignment (Yang & Zhou, 2004). Empirical evidence supports this view, as firms with strong ESG performance tend to exhibit superior business outcomes and lower overall risk exposure, suggesting enhanced value creation for both firms and stakeholders (Mihajlovski & Gukovas, 2020).

Despite strong theoretical arguments, empirical evidence on the ESG-value creation relationship remains mixed. Prior studies report positive, negative, and insignificant effects across different contexts and measurement approaches (Fatemi et

al., 2018; Zheng et al., 2023). Recent studies further illustrate this inconsistency, with some finding significant effects for specific ESG components only (Ahmad et al., 2021; Aydoğmuş et al., 2022), while others report positive effects for aggregated ESG measures (Wang et al., 2024; Jin & Lei, 2023). Conversely, several studies have found ESG practices to have limited or no significant impact on firm value (Atan et al., 2018; Bodhanwala & Bodhanwala, 2023; Signori et al., 2021).

These divergent findings suggest that ESG practices do not operate uniformly across firms and contexts. Much of the existing literature focuses on ESG disclosures or composite scores, with limited attention to how ESG strategies and activities translate into broader value creation for stakeholders. Corporate value creation extends beyond financial performance to include social and environmental outcomes, which may be better captured through both financial and non-financial indicators.

Importantly, the relationship between ESG practices and value creation is unlikely to be linear or unconditional. Value creation through ESG initiatives depends on managerial decisions related to strategy formulation, resource allocation, and execution. These decisions are subject to internal organisational risks. Financial risk, arising from financing and capital structure decisions, can constrain a firm's ability to sustain ESG investments. Similarly, agency risk may emerge when executives pursue ESG initiatives for personal or reputational motives rather than value-oriented objectives. Such risk exposures can either weaken or strengthen the effectiveness of ESG practices in generating value.

Accordingly, this study recognises financial risk and agency risk as key moderating factors in the ESG-value creation relationship. By examining how these risks interact with ESG practices, the study seeks to provide a more nuanced understanding of why ESG initiatives create value in some firms but not in others. This approach responds directly to inconsistencies in prior findings and contributes to a more context-sensitive explanation of corporate value creation.

2.10 Financial Risk and Agency Risk as Moderators

Risk plays a central role in shaping the relationship between ESG practices and corporate value creation. However, risk has many dimensions, and empirical studies must clearly define the specific risk being examined to ensure conceptual clarity and

construct validity.

In this study, the moderating role of risk is examined through financial risk and agency risk as two theoretically distinct constructs, which could result from decisions made by corporate executives. This approach is consistent with established accounting and finance literature, which emphasises alignment between theoretical constructs, empirical proxies, and conceptual models (Jensen & Meckling, 1976; Damodaran, 2024).

The top executive decisions and actions of a company could potentially impact how the firm creates value and execute their environmental, social, and governance (ESG) policies. This, in turn, affects or moderates the possible relationship between ESG and value creation. Creating value for all stakeholders is a collaborative process that requires contributions made by each key stakeholder (Oubihi & Elouidani, 2016). Thus, where decisions at the top management level are made deliberately in the absence of certain key stakeholders, the level of value generated by the firm might be impacted.

Furthermore, where top executive choices are made such that less profitable ventures are selected, and high-cost funds are secured for projects, the firm's overall profitability and corporate value would be negatively impacted. Similarly, executives' choices might be made to ignore certain vital environmentally friendly activities like cleaning up spillage, preventing workplace hazards, and ensuring employee safety. This may appear like a cost-saving strategy, but it can result in regulatory penalties, low staff morale, and poor corporate image, and ultimately affect value creation in the organisation.

Financial risk is contextualised to refer to the firm's exposure to uncertainty arising from its financial and capital structure decisions, including the choice of financing mix, cost of capital, and tax-related financing strategies. Capital structure theory suggests that such decisions influence investors' required rates of return and the firm's overall risk profile, thereby affecting corporate value and value creation outcomes (Damodaran, 2024; Huizinga et al., 2008; Modigliani & Miller, 1963).

In multinational and complex corporate settings, capital structure choices may further amplify financial risk through mechanisms such as international debt shifting, where firms strategically allocate debt across jurisdictions in response to tax differentials and financing conditions. Huizinga et al. (2008) demonstrate that such

financing strategies materially affect firms' cost of capital and financial risk exposure, reinforcing the view that financial risk is an outcome of financing and capital structural decisions.

Consistent with this perspective, financial risk in the present study is operationalised using the Weighted Average Cost of Capital (WACC). WACC captures the blended cost of debt and equity financing and incorporates market-based assessments of firm-specific risk, financing choices, and tax effects. Prior literature recognises WACC as a theoretically sound and empirically robust indicator of financial risk and value creation efficiency (Stewart, 1991; Damodaran, 2024).

Furthermore, Kolari and Velez-Pareja (2012) emphasise that corporate income taxation and financing decisions are integral to the accurate estimation of the cost of capital, reinforcing the appropriateness of WACC as a measure of financial risk arising from capital structure and tax-related financing choices. This supports the use of WACC in examining how financial risk moderates the ESG-value creation relationship.

Agency risk, on the other hand, arises from conflicts of interest between managers and shareholders due to information asymmetry and incentive misalignment. Agency Theory posits that managerial behaviour and risk-taking decisions are significantly shaped by compensation structures and incentive mechanisms (Jensen & Meckling, 1976). In the context of ESG practices, managerial incentives may either promote long-term sustainability-oriented value creation or encourage short-term opportunistic behaviour that undermines firm value.

Accordingly, agency risk in this study is operationalised using executive compensation, which serves as a proxy for managerial incentives and their alignment with shareholders' interests. Executive compensation has been widely employed in prior literature as a key indicator of agency-related risk and governance effectiveness (Core et al., 1999; Jensen & Murphy, 1990).

Financial risk and agency risk are therefore treated as independent moderating variables that condition the strength and direction of the relationship between ESG practices and firm value creation. By explicitly distinguishing these constructs and grounding them in established corporate finance and agency theories, the study ensures coherence between its theoretical framework, conceptual model, and empirical measurement.

However, before delving into the moderating roles of financial risk and agency risk, it would be crucial to also extensively explore how managing these risks could guide corporate decision-making by managers.

2.10.1 Risk Management in Corporate Decision-Making

Risk management plays a critical role in corporate decision-making, particularly in the context of environmental, social, and governance (ESG) practices and value creation. Financial and agency risks, as conceptualised in this study, involve risk exposures that result from faulty decisions made by corporate executives that may lead to failure in achieving corporate objectives. Thus, it highlights the centrality of executive judgment and governance structure mechanisms to achieve organisational success. Effective management of financial and agency risk exposures could become a crucial driver, ensuring that faulty top executives' decisions do not derail business objectives. This study elucidates the interactions between the management of financial and agency risks with corporate decision-making. It explores their roles in shaping risk-conscious and value-oriented managerial decisions and strategies, especially within publicly listed firms.

2.10.1.1 The Nature of Financial Risk and Agency Risk in Corporate Decision-Making

Financial risk and agency risk arise from corporate decision-making processes that shape firms' financing choices, incentive structures, and governance outcomes, and their alignment with long-term value creation objectives. These risks emerge when financing and incentive decisions fail to adequately account for internal constraints and external conditions affecting the firm. Unlike purely operational risks, financial and agency risks are forward-looking in nature and are embedded in strategic financial and governance choices, including capital structure decisions, funding mix, executive incentive design, and long-term investment commitments (Frigo & Anderson, 2011).

These risks are inherently interconnected and complex, as corporate decision-making frequently involves trade-offs across financial constraints, incentive alignment,

and broader organisational objectives. For example, Basar et al. (2020) demonstrate that optimisation decisions in aviation training organisations require simultaneous consideration of financial, operational, and maintenance-related factors, highlighting how financial constraints and managerial choices jointly shape decision outcomes. Similarly, Li et al. (2025) show that environmental challenges such as climate change can constrain firms' financial resources, thereby increasing financial risk and limiting managerial discretion in long-term decision-making. These findings underscore the importance of understanding financial risk and agency risk as key mechanisms through which corporate decisions influence firm outcomes.

2.10.1.2 The Role of Financial Risk and Agency Risk Management in Decision-Making

Financial risk and agency risk management involve identifying, assessing, and mitigating risks arising from firms' financing decisions, capital structure choices, and managerial incentive arrangements that could materially affect an organisation's ability to achieve its long-term value creation objectives (Kaplan & Mikes, 2012). According to Frigo and Anderson (2011), developing robust risk management processes and governance capabilities provides a strong foundation for improving decision-making quality and organisational control mechanisms. Effective management of financial and agency risks plays several crucial roles in corporate decision-making, including enabling informed resource allocation, facilitating adaptive responses to external shocks, balancing short-term and long-term corporate choices, integrating multiple stakeholder perspectives, and aligning executives' risk-taking behaviour with corporate objectives.

Enabling Informed Resource Allocation: The study by Li et al. (2025) illustrates how effective management of financial risk enables firms to allocate scarce resources efficiently in response to external threats such as climate risk. Firms facing heightened climate exposure were observed to redirect financial resources toward climate-related innovations while scaling back non-essential initiatives. This behaviour aligns with the resource-based view of the firm proposed by Wernerfelt (1984), which suggests that competitive advantage arises from the optimal deployment and

reconfiguration of internal resources in response to environmental changes. Similarly, the work of Basar et al. (2020) demonstrates how structured risk management frameworks support disciplined resource allocation by explicitly considering financial constraints alongside operational and maintenance requirements. Such approaches facilitate systematic evaluation of trade-offs across competing priorities, thereby enhancing decision quality and alignment with long-term corporate objectives.

Facilitating Adaptive Responses to External Shocks: Financial and agency risk management also enable firms to adapt their decisions in response to external pressures and economic changes in the business environment. This adaptive capacity is critical for sustained value creation, particularly in ESG contexts where regulatory, environmental, and market pressures are increasingly pronounced. McCahery et al. (2022) argue that institutional investors, asset managers, and private equity firms are increasingly integrating ESG considerations into their investment decisions in recognition of their long-term financial implications. Consequently, capital providers are becoming more aligned with firms that effectively manage financial exposure and governance risks. Furthermore, Yilmaz (2020) emphasised the importance of adaptive decision-making processes by proposing structured frameworks for managing risks associated with internal and external change, which are essential for maintaining alignment between financial exposures, managerial incentives, and corporate decisions in dynamic environments.

Balancing Short-term and Long-term Strategic Choices: The management of financial and agency risks supports the balancing of short-term pressures with long-term objectives. Li et al. (2025) found that managerial myopia may lead firms to reduce risk-taking in response to climate exposure, potentially undermining long-term value creation. This highlights the importance of risk management frameworks that explicitly incorporate long-term financial sustainability and incentive alignment considerations. Similarly, Basar et al. (2020) highlighted the need to balance immediate operational demands with long-term objectives such as sustainability and system viability. In addition, effective financial and agency risk management enables boards and executives to systematically assess the risk–return implications of alternative corporate decisions. For example, investments in environmentally friendly technologies may impose short-term financial burdens but can mitigate longer-term regulatory, reputational, and

financing risks.

Integrating Multiple Stakeholder Perspectives: Financial and agency risk management incorporate the perspectives of multiple stakeholder groups by considering how investor expectations, regulatory requirements, employee incentives, and supply chain relationships influence corporate decisions and value creation outcomes. This multi-stakeholder orientation is particularly relevant in ESG-related decision-making, where firms must balance financial performance objectives with environmental and social responsibilities (Eccles et al., 2014). By explicitly accounting for these considerations, firms are better positioned to create sustainable value for a broad range of stakeholders.

Aligning Risk Appetite with Corporate Objectives: Effective management of financial and agency risks helps align executives' risk-taking behaviour with corporate objectives by ensuring that financing decisions and incentive structures remain within acceptable risk thresholds (Kaplan & Mikes, 2012). This alignment guides choices related to capital structure, funding strategies, and executive compensation, thereby reducing the likelihood of excessive financial exposure or agency-driven decision distortions that could undermine firm value.

In light of the above, the management of financial and agency risks is critical to corporate decision-making, particularly in contexts characterised by complex trade-offs and external pressures. By enabling informed resource allocation, facilitating adaptive responses to environmental change, balancing short-term and long-term considerations, integrating multiple stakeholder perspectives, and aligning managerial incentives with corporate objectives, financial and agency risk management supports firms' efforts to create value through ESG practices while managing the risks associated with financing and executive decision-making.

2.10.2 Financial Risk Moderating Role

Corporations typically create annual corporate plans to outline and specify actions for the upcoming year. The approval of executives and managers is required for these business plans, as well as their financial strategies and funding mix decisions. As canvassed by BPP Learning Media (2016), companies typically obtain funding from a

mix of long-term sources (such as ordinary shares, reserves, preference shares, debentures, bank loans, and convertible loan stock) and short-term obligations, including bank overdrafts and trade suppliers. The term capital structure or financial structure is used to describe the combination of financing methods employed by a company.

The financing structure, sometimes referred to as the capital structure, pertains to the composition and proportion of funds obtained from various sources when a firm seeks to raise capital (Realised, 2021). Financial risk reflects the exposure to uncertainty that arises from these capital structure and financing decisions. Specifically, it captures the likelihood that a firm will incur higher costs of capital as a consequence of the particular funding mix chosen. Thus, financial risk represents the economic consequences of capital structure decisions rather than the structural configuration itself. The financing arrangement of a firm's projects may signal the rationality of the proportion of different financing sources used and, consequently, the degree of financial risk embedded in those decisions (Wang & Jin, 2021).

Through its financial risk profile, an organisation's ESG practices and activities may influence its value creation outcomes. A higher firm value could theoretically be associated with a lower financial risk profile, consistent with the risk–return trade-off. This aligns with the findings of Sassen et al. (2016), who reported a negative relationship between corporate risk and ESG performance. Similarly, Giese et al. (2019) examined the relationship between ESG performance and risk measures and found that improved ESG performance is associated with reduced risk exposure for firms. This study is therefore interested in the potential role that financial risk, arising from capital structure decisions, may play in moderating the relationship between ESG practices and value creation, as the findings can guide stakeholders in making more informed financing decisions.

If a company adopts a funding mix that results in a high cost of capital, the associated financing costs will reduce overall profitability and ultimately diminish the value created for stakeholders. In addition, funds that could have been utilised to support critical environmental, social, and governance (ESG) initiatives may instead be diverted toward servicing expensive debt. Forgoing such essential ESG activities—such as infrastructure maintenance, safety prevention training, and provision of adequate

equipment for personnel—may expose firms to further operational and reputational challenges, thereby adversely affecting overall value creation, and vice versa.

The cost of capital arises from the combination of various funding sources used in financing corporate activities, and its complexity has long been regarded as one of the most debated issues in corporate finance literature (Khan et al., 2020). According to Durand (1952), the net income approach suggests that firms can influence their value by adjusting the level of debt in their financing mix, as a relationship exists between capital structure and firm value. Arnold (2008) further explains that increasing debt capital initially lowers the weighted average cost of capital, thereby enhancing firm value, until an optimal level of leverage is reached. Beyond this point, financial distress costs increase and outweigh the benefits of additional debt.

The financial risk associated with a high cost of capital resulting from capital structure decisions can be measured using the weighted average cost of capital (WACC). WACC represents the cost of all funds employed by the firm, encompassing both equity and debt financing. It has been recognised as one of the most important variables in corporate decision-making and firm valuation (Battisti et al., 2020). The WACC rate reflects the cost at which firms obtain funds to finance their operations and investment projects and comprises the cost of equity, representing shareholders' required returns, and the cost of debt, representing financing from lenders such as banks, bonds, and debentures. According to Albarrak et al. (2019), firms with lower capital costs and higher market values tend to attract a broader investor base.

Prior studies have established a close association between capital structure decisions and operational and financial risk (Chen et al., 2009; Chen et al., 2004). A higher cost of capital signals greater financial risk, as firms are required to pay more for the capital provided by investors. Companies with higher risk profiles generally face higher borrowing costs and equity capital requirements (Atan, 2018). Conversely, firms with lower risk profiles tend to enjoy lower costs of debt and equity capital (Bassen et al., 2006). High costs of capital may crowd out funding that could otherwise be directed toward ESG initiatives and corporate reputation-building activities aimed at attracting cheaper financing. Goss and Roberts (2011) found that firms with significant environmental concerns paid substantially higher interest rates on loans compared to firms with fewer environmental issues. Similarly, Gupta and Aggarwal (2023) reported

a negative and significant relationship between ESG performance and cost of capital, mediated by systematic risk.

Several studies (Jia et al., 2020; Lins et al., 2017; Shiu & Yang, 2017) provide evidence that integrating ESG practices into corporate strategy can reduce risk exposure and protect financial performance against future shocks. Reduced risk has been shown to be significantly associated with stronger environmental, social, and governance performance (Shiu & Yang, 2017). Firms with sustained commitments to ESG initiatives tend to exhibit lower volatility in stock and bond prices. Trigeorgis and Lambertides (2014) argue that as the volatility of an underlying asset declines, the value of financial options also decreases, implying lower risk exposure. Ng and Rezaee (2015) further support this view by documenting an inverse relationship between ESG engagement and cost of capital.

A firm can achieve a more efficient financing structure by optimally combining low-cost and higher-cost sources of capital, thereby reducing its overall cost of financing (Al Amosh et al., 2022). The increased use of lower-cost debt, as discussed by Arnold (2008), can reduce the firm's financial risk up to an optimal leverage level. This suggests that financial leverage influences both WACC and firm value. Moreover, savings generated from a lower cost of capital can be reallocated toward ESG-related initiatives, such as investment in low-carbon technologies, innovation in production processes, enhancement of employee welfare, and improvements in safety and risk prevention systems. Accordingly, WACC, as a proxy for financial risk arising from capital structure decisions, is treated as a moderating variable influencing the relationship between ESG practices and value creation.

Furthermore, capital structure decisions are influenced by agency-related considerations, including conflicts between managers and shareholders (Grabinska et al., 2021). Highly leveraged firms may face increased agency costs due to wealth transfers between debt holders and shareholders (Al Amosh et al., 2022), potentially reducing resources available for ESG investment. Consequently, the moderating role of financial risk exposure is of significant relevance for stakeholders in Malaysia and beyond in understanding the ESG–value creation nexus.

According to Wang et al. (2024), theories relating to risk, information asymmetry, and strategic decision-making provide insights into how ESG practices

contribute to firm value by mitigating harm and enhancing long-term performance. In light of the foregoing discussion, this study examines the effect of ESG practices on value creation among listed firms in Malaysia, with particular emphasis on the moderating roles of financial risk and agency risk. It investigates how these risks shape the effectiveness of ESG practices in enhancing corporate value.

2.10.3 Agency Risk Moderating Role

Agency risk can be said to result from situations where risk exposures stem from corporate executives prioritising their self-interest over the best interests of the company and its shareholders in their decision-making and actions. It distinguishes itself from financial risk by highlighting that the poor judgments made regarding the funding mix, which results in excessive finance costs, may be attributed to the competency level of the top executives rather than being purposeful. However, agency risk is not inherently linked to the level of competence of managers, but rather to their self-interest, which may be deliberate. This study is interested in investigating the role agency risk would play in moderating the relationship between ESG practices and value creation.

Agency risk is the risk that managers may not act in the best interests of the owners of the organisation (Sheedy, 2010). This may involve making poor self-driven choices, such as making extremely low-risk investments, engaging in dishonest behaviour, and paying executives highly. Agency risk is closely associated with agency costs, which are costs incurred when managers invest in social activities to enhance their personal reputation (Barnea & Rubin, 2010). This was also expressed in Lee and Isa (2020), and it's described as the agency problem that leads to a decline in value. It has the potential to influence both ESG practices and value creation, and thus, affects their possible relationship.

Profitable endeavours may be disregarded if they clash with the personal interests of senior executives. This could diminish the overall profitability of the corporation and potentially impact on the value created for shareholders and other significant stakeholders. This is because a profitable company has the ability to utilise its accumulated profits to distribute dividends, support environmental, social, and governance initiatives, finance employee well-being, and contribute to community

projects, all for the greater good of all stakeholders concerned.

Furthermore, agency risk has the ability to unveil ESG initiatives designed as greenwash programmes aimed at providing a false impression of environmental responsibility. Greenwashing, as defined by Lee and Suh (2022), refers to the deliberate practice of deceiving consumers by making false claims about a company's environmental efforts and their impact. Hence, corporate managers may undertake specific ESG activities that yield negligible or no discernible benefits to the company but cater to their own self-interest and personal reputation. The expenditure incurred on such initiatives will decrease the company's profitability without contributing any value. In addition, certain ESG activities that are disregarded due to self-interest could subsequently generate further complications for the organisation. Torelli et al. (2020) also argued that companies involved in greenwashing frequently face legal disputes, including class action lawsuits and allegations of misleading advertising.

The theoretical framework of this study deploys executive and top management pay as a proxy for agency risk. Measuring the executive and top management pay as a ratio of total staff remuneration could serve as a trigger to identify some of the self-interest behaviours of managers, which could affect the implementation of ESG practices and the creation of value for stakeholders of the organisation. Segun (2021) supported this thought line by postulating that boards are establishing policies to disclose the ratio of executive and board compensation to the average income of employees, in line with the principles of ESG transparency.

Investigating the likely moderating role of agency risk provides a guide from the research findings to assist in curbing the agency issue in organisations, which may also be affecting their value creation process. Ramly and Rashid (2010) proposed that effective corporate governance serves as a framework to curb dishonest behaviour by managers, improve the quality of information flows within the company, and monitor management operations with the goal of reducing agency risk. For companies to guarantee and create the ideal environment for long-term business success and economic growth, as well as to uphold investor and corporate confidence, sound corporate governance and appropriate ESG practices are essential. These ESG practices may, in turn, drive the creation of corporate values for all stakeholders of the firm.

2.11 Underpinning Theories

The theoretical foundations proposed for this study include the stakeholder theory and the agency theory. As earlier elucidated, there are two camps of opinion when it comes to ESG practices and value creation. The first camp is founded on the agency theory and aligns with the solitary value perspective. This camp focuses on value creation for shareholders and claims that companies that engage in ESG activities do so to further the personal interests of management at the expense of shareholder value (Barnea & Rubin, 2010; Masulis & Reza, 2015). The second camp, on the other hand, is founded on the stakeholder theory and aligns with the shared value perspective, which emphasises that good management of corporations to satisfy the interests of all stakeholders is reflected in ESG practices and has a beneficial effect on corporate performance (Lee & Isa, 2020; Windsor, 2017).

2.11.1 Stakeholder Theory

Stakeholders are individuals or groups who experience benefits or negative outcomes as a result of a company's actions (Freeman, 2015). These groupings encompass customers, suppliers, investors, creditors, employees, government, and local communities. Freeman's idea posits that a company may achieve genuine success only when it fulfils the requirements of all its stakeholders, rather than solely prioritising the interests of the shareholders. Jensen (2001) proposed stakeholder management as a strategy to optimise the wealth of shareholders and generate the highest possible amount of sustainable value for them. This management strategy ensures the satisfaction of both the shareholders and all major stakeholders within and outside of the organisation.

Freeman et al. (2007) suggest that stakeholder theory is a framework for creating value, which asserts that a company generates the highest value when it maximises value creation for all stakeholders, without exploiting any stakeholder to benefit another group. The corporation should refrain from prioritising the interests of one stakeholder group over another, as all important stakeholder groups are essential for the organisation to achieve its business objectives. The theoretical framework of this study hinges on the stakeholder theory, which emphasises the collaborative process of value creation to achieve the firm's goals and meet the particular needs of all key stakeholders.

It was immediately evident that, in accordance with the stakeholder approach, a company's goal is to provide value for its stakeholders (Post et al., 2002). Stakeholder theory, according to Argandoña (2011), views a corporation working together with stakeholders to create value. Such a value created can be expressed in both financial and non-financial form. According to Tapaninaho and Kujala (2020), a crucial component of validating business sustainability is comprehending the roles that stakeholders play and how they contribute to value creation. This, in effect, connotes that firms must understand this role and engagement with the stakeholders for the betterment of all parties.

Due to the similarities between stakeholder relations management and sustainable development, the stakeholder approach works well in addressing the economic, social, and environmental issues that are important for various stakeholders, even in the absence of a shared conception of value (Steurer et al. 2005). Hörisch et al. (2014) have recently reinforced stakeholder theory with respect to sustainability by stating that companies ought to endeavour to establish sustainability as a shared value for their stakeholders. However, Clifton and Amran (2011) view the stakeholder approach to be predominantly anthropocentric and stress the perspective of the focal company; thus, it has come under criticism for failing to address genuine sustainability concerns.

The Stakeholder theory suggests that an organisation's market valuation can benefit from integrating ESG practices. This is possible as workers will be more contented and driven at work; clients will become more loyal; contented creditors will provide more facilities, and a happy local community will spread good news about the company. All these factors contribute to a company's improved reputation, improved performance, and better value creation for stakeholders. According to El Ghoul et al. (2017), ESG participation has a good impact on business performance and firm value as it can help managers and stakeholders resolve corporate challenges. Similarly, stakeholder theory suggests that high ESG engagement increases corporate value and demonstrates the organisation's commitment to moral and ethical behaviour (Benlemlih & Bitar, 2018).

Increasing our knowledge of the relationship between environmentally friendly practices and stakeholder value creation, as well as how business sustainability is

validated in stakeholder literature, is crucial for promoting sustainability in mainstream management literature (Hörisch et al. 2014). Stakeholder theory is important because it helps companies create sustainable and ethical practices that balance the interests of different stakeholders. According to Parmar et al. (2010), stakeholder theory can be more effectively applied to address issues related to trade ethics, value creation, and trade, and managerial approach by analysing the relationships that a firm has with individuals or groups that have an impact on each other. In an attempt to meet their own needs, stakeholders rely on the company's business value, created to some extent but not entirely (Wong, 2018). As such, given that stakeholders have the ability to control corporate resources and the capacity to also impact the organisation's goals and survival, corporations are compelled to meet their demands (Ho et al., 2020).

According to Zhang et al. (2020), stakeholder theory underlined the importance of stakeholders in the process of creating value and that, in the right circumstances, they may help a company succeed. Quoted companies such as those on the floor of Bursa Malaysia with high market capitalisation and profitability are more likely to make implementation investments in sustainable development goals and to keep providing stakeholders with sustainability information (Ho et al., 2020). Sustainability information could provide guidance in decisions taken by stakeholders about the company, as it creates a perception of the firm’s reputation and value. ESG practices are a critical component of sustainable development goals, and their strong connection with profitability and market value, as postulated by Ho et al. (2020), commands attention and requires further investigation to ensure better clarity. Consequently, the stakeholder’s theory could be said to relate to this study as a good ESG practice will incorporate implementation and communication of environmental, social and governance issues of the firm to all key stakeholders, which reduces capital constraints (Cheng et al. 2014).

Hörisch et al. (2014) have referred to stakeholder theory as the management theory of the twenty-first century due to its capacity to clearly identify and redefine the roles of sustainability, value creation, and business. Stakeholder value creation studies, especially as it relate to ESG practices, are quite limited, as not many academics have conducted research that combines business value creation, sustainable practices, and governance-related risk (Tapaninaho & Kujala, 2020). Consequently, there is a need for

this study, which aims to investigate whether ESG practices can influence value created for all stakeholders of the company. Stakeholder theory is a good fit for this study as it stresses the business activities that pursue the attainment of the company's goal and create value for all stakeholders, and just the shareholders.

2.11.2 Agency Theory

The application of agent theory is typically regarded as crucial for considering corporate governance issues. The division of labour between ownership and management is the primary cause of the fundamental agency problem facing modern firms (Jensen & Meckling, 1976). This happens when corporate managers fail to effectively discharge their management functions to the attainment of the firm's goal of maximising wealth creation, and thus, exposing the company to agency risk. The agency theory is employed in this study to underpin the distinctive moderating roles of financial risk and agency risk.

According to Wong (2018), a firm serves as a conduit for principals and agents to delegate work or carry out certain responsibilities. Abdallah and Valentine (2009) suggested that agency theory is a foundational theory of corporate governance that describes the interaction between principals, investors or shareholders, and agents, or managers in an organisation. Different aims between the principal and agent, as well as an unsuited joint interest resulting from differing risk preferences, were two significant concerns that the agency theory on the agency relationship explained (Wong, 2018).

The tenets of the agency theory apply directly to how companies are exposed to agency risk and financial risk, which can affect the probable relationship between ESG practices and value creation. Agency risk is anchored on possible losses or problems the company could encounter because managers make decisions that are predominantly self-interest driven (Barnea & Rubin, 2010). Similarly, financial risk is associated with possible losses or the high cost of funds a firm will incur, resulting from decisions made by managers in respect to the funding mix of debt and equity or the financial structure (Realised, 2021). In both scenarios, the risks are associated with the interaction between the managers (agents) and the shareholders (principals), and the executives' failure to fulfil their responsibilities in this relationship. However, corporate decisions causing

agency risk might be deliberate, while those relating to financial risk might be due to incompetence or honest mistakes. Ould Daoud Ellili (2020) established that the agency theory is a concept proposed in the field of corporate governance with primary emphasis on the relationship that develops between shareholders (acting as principals) and managers (acting as agents).

Agency theory acts as a protective measure to guarantee that investors or shareholders obtain a return on their capital (Zogning, 2017). Therefore, it is imperative for firm managers to bear the responsibility of mitigating losses associated with long-term goals and high-risk endeavours, as these have the potential to undermine the development of value for stakeholders in the future. Capital structure theories claim that the most pivotal decision for a corporation is determining the optimal proportion of debt to equity in order to maximise the firm's value and minimise the cost of funds (Gersbach, 2013). Typically, this is attainable when the business reaches its optimal capital mix or structure. When the overall weighted average cost of capital (WACC) reaches its minimum within a specific combination of debt and equity, the capital structure is seen as being at its optimal state (BPP Learning Media, 2014). Brounen et al. (2005) argued that the presence of an optimal or target capital structure in an organisation leads to an increase in shareholder wealth.

The adoption of ESG by firms may create an agency dilemma between managers and shareholders in relation to the agency theory, which results in the agency problem. The agency problem holds that investing in ESG matters is not ideal for shareholders because it directly depletes capital and lowers profitability. This view is equally supported by previous research by Barnea and Rubin (2010), Borghesi et al. (2014), Kao et al. (2018), and Schuler and Cording (2006), which all found evidence of agency issues in corporations.

There are varying ways in the organisation that the agency problems may manifest in relation to ESG activities. This will include when managers spend firm resources to gain private benefits, forgoing profitable projects to embark on certain ESG activities, and the notion of managerial opportunism posits that managers exploit company resources for ESG initiatives in an attempt to deflect criticism and compensate for weak financial outcomes (Lee & Isa, 2020). By masquerading themselves as role models in the organisation at the expense of the shareholders, managers overinvest just

to reap personal rewards (Barnea & Rubin, 2010). This also extends to situations where poor and self-centred business funding decisions are made, leading to a high cost of capital.

According to Vargas-Hernández and Teodoro Cruz (2018), agency theory can support problem-solving in situations when there are disagreements between the principal and the agent. Jin and Lei (2023) support this assertion by proposing that the agency theory revolves around creating an efficient incentive system that motivates agents to maximise their contributions to the firm, align with the firm's objectives, mitigate conflicts of interest, minimise agent costs, and safeguard the firm's interests. This could maintain the agent's loyalty and provide a just remuneration system. To protect their stake in the company and act in their best interests, the shareholders appoint the board of directors to lead the affairs of the business (Chong, 2019). When a manager of the company is appointed as an executive director to the board and has power over management, monitoring, or control procedures are required to safeguard shareholders and management from potential conflicts of interest.

The agency theory monitors managers' actions through internal control mechanisms and pays managers based on performance, with monitoring expenses including rewarding managers, measuring their behaviour, and the cost of control (Wong, 2018). The agency risk faced by firms would increase when there are high monitoring costs resulting from suspicion of high misalignment between the interests of the owners and those of the managers. Agency concerns can be minimised by tying executive compensation to business performance under considerable monitoring from shareholders (Zogning, 2017). This may reduce the tendency of poor and faulty decision-making that exposes the organisation to financial and agency risks, and in turn, affects value creation.

2.12 ESG and Value Creation: Empirical Evidence from Prior Literature

This section presents a thematic synthesis of prior empirical studies examining the relationship between ESG practices and firm value creation. The review supports the interpretation of the study’s empirical findings and helps to identify unresolved issues and gaps in the existing literature. Specifically, it focuses on how ESG practices interact with firm value and financial performance, highlighting areas of convergence

and divergence in prior evidence.

Empirical research on ESG and value creation has gained momentum in recent years, reflecting growing scholarly interest in whether ESG engagement translates into tangible economic benefits. However, the findings remain far from conclusive. Several studies provide evidence that ESG practices can enhance corporate value through risk mitigation, improved information transparency, and strategic alignment.

For example, Wang et al. (2024) reviewed ESG research from risk, information, and strategic perspectives and concluded that ESG practices can contribute to enterprise value creation by lowering financing costs and fostering innovation. Their bibliometric and literature-based analysis suggests that ESG-driven value creation operates through both direct and indirect channels. Similarly, Zheng et al. (2023), using merger and acquisition data from China, found that firms with higher ESG ratings experience superior post-merger performance and higher deal completion likelihood. Their findings support the instrumental stakeholder view that ESG engagement can facilitate value-enhancing corporate outcomes.

Other studies provide much clearer evidence. Fuente et al. (2022) identified a curvilinear relationship between ESG performance and corporate value, with environmental and social dimensions driving growth options, while governance showed no significant effect. This suggests that ESG components may influence value creation differently, depending on their strategic relevance. Zumente and Bistrova (2021), through qualitative content analysis, further showed that ESG contributes to long-term shareholder value not only through financial performance, but also via non-financial channels such as reputation, stakeholder trust, and risk reduction.

Conversely, a number of studies challenge the assumption that ESG practices uniformly enhance firm value. Mishra et al. (2024) found that ESG performance alone does not positively affect corporate value in Indian firms; however, the interaction between ESG and a strong governance climate produces positive value effects. Similarly, Signori et al. (2021) reported that ESG ratings, when used in isolation, are insufficient indicators of stakeholder value creation. Tampakoudis et al. (2021) further documented a negative relationship between ESG performance and shareholder value in merger contexts, particularly during periods of economic crisis such as the COVID-19 pandemic.

Overall, prior empirical evidence on ESG and value creation is mixed. While some studies report positive effects, others find insignificant or negative relationships, and several highlight differences across ESG dimensions. These inconsistencies suggest that ESG practices do not generate value automatically but rather operate under specific organisational and contextual conditions. Moreover, much of the existing literature relies heavily on ESG scores and indices, offering limited insight into how ESG strategies and managerial decisions translate into value creation outcomes.

Accordingly, there is a clear need for research that goes beyond published ESG indices to examine how ESG-related strategies and initiatives influence value creation in practice. This study addresses this gap by incorporating financial risk and agency risk as moderating variables, recognising the role of managerial decision-making, governance structures, and financing conditions in shaping the effectiveness of ESG practices. By doing so, the study provides a more refined and context-sensitive explanation of the ESG-value creation relationship within Malaysian publicly listed companies.

2.12.1 ESG and Financial Performance

The relationship between ESG practices and firms' financial performance has received substantial empirical attention, with many studies reporting a generally positive association. However, the strength, direction, and consistency of this relationship vary across contexts, measurement choices, and firm characteristics.

Several quantitative studies provide evidence that ESG engagement enhances firm financial performance. Ma'in et al. (2022) examined the effects of ESG alongside macroeconomic indicators and found that ESG scores are significantly related to firm performance measured by Tobin's Q. Their findings suggest that ESG engagement contributes positively to market-based performance, although traditional profitability measures were found to be insignificant. Similarly, Chouaibi et al. (2022) reported that ESG strengths increase firm value while ESG weaknesses diminish it. Importantly, their study demonstrated that green innovation fully mediates the ESG performance relationship, indicating that ESG affects financial outcomes indirectly through strategic operational mechanisms.

While these studies report positive effects, they rely heavily on Tobin's Q, a market-based indicator often associated more with firm value than internal financial performance (Cahan et al., 2016). Moreover, the inclusion of mediating variables and mixed performance proxies suggests that ESG's impact on financial performance may be more complex than a direct linear relationship.

Other studies employing accounting-based measures provide further insights. Kalia and Aggarwal (2022), using return on assets and return on equity, found that ESG activities positively influence financial performance in developed economies, but yield negative or insignificant effects in developing economies. This cross-country disparity highlights the role of institutional context in shaping ESG effectiveness. The study underscores that ESG performance outcomes are not uniform and depend on economic and regulatory environments.

Research focusing on Shariah-compliant firms also reports largely positive outcomes. Lee and Isa (2020) found that both aggregate ESG and its individual dimensions positively influence firm performance, supporting stakeholder theory while showing limited association with agency problems. Their later study, Lee and Isa (2023), focusing specifically on Malaysian Shariah-compliant firms, reaffirmed these findings and further demonstrated that enhanced ESG-Shariah screening strengthens the ESG-performance relationship. However, the scope of these findings is largely limited to Shariah-compliant firms and may not generalise to the broader corporate population.

Qualitative and review-based studies further emphasise the conditional nature of the ESG-financial performance relationship. Lee and Suh (2022) argued that ESG integration into business models generally produces positive financial outcomes, but the effects are highly context dependent. Likewise, Saini et al. (2023), through a systematic review, identified stakeholder, legitimacy, and signalling theories as the dominant theoretical foundations explaining ESG and financial performance linkages, while also noting the absence of a clear consensus in empirical findings.

Contrary evidence is provided by Atan et al. (2018), who found no significant relationship between ESG factors and return on equity or Tobin's Q among Malaysian firms. Interestingly, their study revealed that ESG positively influences the cost of capital, suggesting that ESG may affect financial performance indirectly rather than through conventional profitability metrics.

Collectively, these studies reveal that prior research has predominantly focused on ESG scores and ratings as determinants of financial performance. Such outcome-based measures may encourage short-term reporting behaviour and overlook how ESG strategies are formulated and implemented. This study departs from this approach by focusing on ESG practices, namely, firms' plans, strategies, and execution, rather than published ESG scores. By shifting attention from reported outcomes to actual ESG activities, the study aims to provide a deeper understanding of how ESG engagement contributes to financial performance and broader value creation for stakeholders.

2.12.2 ESG and Firm Value

A substantial body of empirical literature has examined the relationship between ESG metrics and firm value, commonly proxied by market-based indicators such as Tobin's Q and market capitalisation. Firm value reflects investors' external assessment of a firm's future prospects and performance (Nuryaman, 2015). Overall, prior findings suggest that combined ESG metrics tend to have a positive association with firm value, although the effects of individual ESG pillars are often mixed or context dependent.

Several studies provide evidence supporting the value-enhancing role of ESG practices. Dkhili (2023) found that ESG performance positively influences firm value, measured by Tobin's Q, and that this relationship is strengthened by competitive advantage. Similarly, Jin and Lei (2023) reported that ESG and its three components significantly improve firm value, with innovation acting as a mediating mechanism and institutional environment serving as a moderator. Their findings further revealed stronger ESG effects among non-state-owned enterprises, highlighting ownership-related heterogeneity. Bukreeva and Grishunin (2023) extended this perspective by demonstrating that investors respond more positively when ESG practices and disclosures are jointly considered, rather than in isolation.

Other studies reinforce the argument that ESG contributes to firm value under specific governance and ownership conditions. Wu et al. (2022) showed that ESG performance enhances firm value, with executive and institutional ownership significantly moderating this relationship. Chang and Lee (2022) similarly reported a positive ESG-firm value relationship, while emphasising that industry characteristics

such as concentration and growth shape the magnitude of this effect. Aydoğmuş et al. (2022) further found that while aggregated ESG scores positively influence firm value, the environmental pillar alone does not exhibit a significant effect, suggesting uneven contributions across ESG dimensions.

Evidence from emerging markets, including Malaysia, generally supports a positive ESG-firm value relationship, though with notable qualifications. Mohamad (2020) and Sadiq et al. (2020) both found that ESG practices are significantly associated with firm value among Malaysian listed firms, particularly when governance quality and financing structures are considered. Ionescu et al. (2019) also reported a value-enhancing effect of ESG, with governance exerting the strongest influence. Aboud and Diab (2018) provided similar evidence from Egypt, showing that firms included in ESG indices tend to exhibit higher market value.

Despite this largely positive evidence, other studies report insignificant or context-sensitive results. Ahmad et al. (2021) found no association between social practices and firm value among Malaysian firms, although environmental and governance practices were significant. Bodhanwala and Bodhanwala (2023) similarly reported that ESG factors did not explain market value during the COVID-19 crisis, suggesting that ESG benefits may weaken under periods of extreme uncertainty.

Collectively, prior studies demonstrate that ESG metrics can influence firm value, but the relationship is neither uniform nor unconditional. Much of the existing literature relies on ESG scores and market-based value proxies, which capture investors' perceptions rather than the broader value created for all stakeholders. While such insights are useful for investment decision-making, they provide a limited understanding of how ESG strategies and practices contribute to sustainable, long-term value creation.

Accordingly, this study extends prior research by moving beyond firm value as a purely market-based construct. Drawing on broader value creation models (Della Corte et al., 2021), it emphasises value creation for all stakeholders rather than shareholders alone. By focusing on ESG practices and examining how they translate into sustained value creation, the study addresses an important gap in the literature and offers a more comprehensive perspective on the strategic role of ESG in corporate sustainability.

2.12.3 Summary of Research Gaps in Prior Literature

The extensive thematic review and analysis of the empirical literature around ESG and value creation conducted by the study unveiled several gaps in the existing literature that this current study set out to address. The identified gaps included; the lack of a consensus on the relationship between ESG practices and value creation, limited investigation by prior research on the individual components of ESG practices and their respective effect on the value creation of firms, the absence of a risk proxy moderating variable that captures corporate executives' strategic decision making around firms ESG initiatives and value creation, Malaysian environmentally sensitive sector-specification, and finally, short-term vs long-term value creation focus. These gaps have been further expanded in the following paragraphs below.

2.12.3.1 Lack of Consensus Findings

Analysing the prior empirical literature on ESG practices and their impact on the value creation of firms revealed divergent findings from different research scholars. A couple of the past studies argued that ESG practices have a positive and significant relationship with value creation (Wang et al., 2024; Zheng et al., 2023; Zumente & Bistrova, 2021), while some others contended that the relationship is either negative or insignificant (Mishra et al., 2024; Tampakoudis et al., 2021). These studies were carried out by sampling countries across Europe and some big Asian countries like China and India. The inconsistency in their findings highlights the need for further investigation in this area, particularly within the context of Malaysian publicly listed firms. The current study contributed to closing the divergence findings and the lack of consensus gap by investigating and providing empirical evidence that is specific to Malaysia, which is an emerging market, and its ESG adoption and reporting of practices may differ from developed economies in Europe and large Asian economies like China and India.

2.12.3.2 Limited Investigation of ESG Components Practices on Value Creation of Firms

The review and analysis of past literature showed that with the exception of a

few studies that considered the individual ESG components (Aydoğmuş et al., 2022; Fuente et al., 2022; Lee & Isa, 2020), most of the other studies mainly investigated the combined ESG practices. This current study addressed that gap by examining both the combined ESG practices and the individual ESG pillars. It investigated the separate effects of the individual components of ESG practices to assess which pillar contributes more to value creation. This was necessary as each of the individual ESG components may carry its own set of implications for the firm's corporate sustainability and value creation. The combined ESG score can provide an aggregate view of a company's sustainability practices; however, understanding the individual contributions of each component pillar could ensure a more accurate assessment to guide effective decisions by corporate managers. That is, it can facilitate the identification of ESG pillars whose relationship with value creation requires improvements, as well as the implementation of appropriate corrective measures in a timely manner.

2.12.3.3 The Absence of a Moderating Variable that Integrates Strategic Decisions with ESG and Value Creation

The analysis of empirical literature on ESG practices and corporate value creation revealed that quite a few studies have attempted to examine the probable effect of a moderating variable in their relationship. These handfuls of studies have focused more on external moderating variables like governance climate (Mishra et al., 2024) and ownership structure (Wu et al., 2022). Moderating variables that are associated with risk exposures, particularly those emanating from internal decisions of corporate executives, have yet to be explored to determine the extent to which they could moderate the ESG and value creation relationship. This current study addressed that gap in the academic literature by introducing financial risk and agency risk as moderating variables, thereby offering a novel perspective on how corporate decision-making and risk management can influence ESG practices and value-creation relationships. This approach was necessary because the choices of ESG activities to be promoted, the funding amount, and the sources of the funds are all subject to the corporate decisions made by executives. Such decisions can also adversely affect the firm's cost of funding, which could reduce profit and funds available for project expansions to create greater value for key stakeholders.

2.12.3.4 Malaysian Environmentally Sensitive Sector-Specific

A considerable number of the existing literature, as revealed by the thematic analysis, has mostly focused on developed economies like the US, Europe, and China, while very limited studies (Atan et al., 2018; Mohamad, 2020) on ESG practices and value creation have focused on emerging economies like Malaysia. Moreover, the few studies that provided empirical evidence from Malaysia were not specific to the environmentally sensitive sectors. This current study has contributed to closing that by contextualising simultaneously five environmentally sensitive sectors in Bursa Malaysia. These are high direct emission sectors under the GHG protocol and consist of construction, transport & logistics, property, power & energy, and manufacturing. Understanding the dynamics around ESG and value creation in these sectors is crucial, as the findings serve as a guide not just to related sectors but to those currently at low levels of GHG direct emissions.

Despite the progress achieved in environmentally conscious sectors in Malaysia, the construction, transport & logistics, energy & utility, property, and manufacturing sectors remain significant areas of concern in terms of environmental, social, and governance (ESG) issues. Therefore, by examining the correlation between ESG practices and the creation of corporate value, taking into account both financial risk and agency risks, the study findings in these sectors provided insights into whether the firms gain advantages from integrating ESG issues into their corporate strategy and implementations.

2.12.3.5 Value Creation Focus (Short-Term vs Long-Term)

The empirical evidence provided by prior literature demonstrated that a considerable number of studies have largely focused on ESG disclosure scores or ratings on value creation, which are measures that are short-term in nature and may be subject to greenwashing and reporting manipulations by firms. Similarly, a couple of studies have mostly relied on Tobin's Q as a measure of value creation, which captures largely the external market perception and can be a short-term focus, rather than focusing on real long-term value creation for stakeholders. This gap was addressed in the current study by investigating the actual ESG practices in firms as reflected in their

performance scores. These actual ESG practices encompass their activities, strategies, and executions around ESG initiatives. Furthermore, the current study employed enterprise value multiple (EVM) and market value added (MVA) as proxies for value creation, which provided a more comprehensive long-term view of value creation rather than just the short-term market perspective. These metrics are less subject to accounting manipulations or adjustments (Damodaran, 2024; McKinsey & Company, 2022).

2.13 Empirical Literature Trend and Study Relevance

As part of the literature review, this study conducted a bibliometric analysis of relevant pieces of literature around ESG and value creation. According to Passas (2024), bibliometric analysis is a scientific approach to meaningfully examine trends, patterns, and impact in a particular research field, using bibliographic data from various research databases. The search for relevant data for the bibliometric analysis was conducted through the Scopus and Web of Science databases. It considers published articles over the last six (6) years, spanning the period between 2019 and 2024. Necessary search combination keywords were employed to obtain the most pertinent and closely related data. These keyword combinations included "ESG and value creation", "sustainability, financial performance and value creation", and "ESG practices, value creation and agency risk moderating effect".

The study conducted a bibliometric analysis to address a number of concerns amongst which were, to identify the key thematic research clusters around ESG, to examine the last six (6) years' trends in ESG research, to understand the geographical context that has dominated research in the identified thematic areas over the years and finally to highlight the implications of the thematic clusters and geographic trends to the current study. The bibliometric analysis utilised the VOSviewer, which is a popular tool for visualising and analysing bibliographic data. The VOSviewer-generated network visualisation images, as shown in Figures 2.1 and 2.2 below, highlight the relationships between the key research areas or terms and patterns extracted from existing ESG literature.

The images are structurally designed with visual nodes and links. The nodes are circles representing key research areas or terms, while the links are lines connecting the nodes, which represent the co-occurrence of the research areas or terms. Key terms are

linked if they frequently jointly appear in the search database publications. The sizes of the nodes often indicate the frequency of occurrence of a key term, with larger nodes connoting the terms which appeared relatively more often in the analysed search database. Similarly, the thickness of the lines would indicate the strength of the co-occurrence, with thicker lines connoting stronger co-occurrence of the research terms.

Furthermore, the nodes are marked in different colours, which represent distinct research clusters. The research clusters are key terms that are frequently associated with each other and thus grouped by the VOSviewer algorithms. Also, the network visualisation image in Figure 2.2 shows a timeline bar at the bottom, with coloured gradients indicating the publication year of the articles capturing the research terms. This assisted the researcher in understanding the evolution of ESG and value creation research over the last six (6) years.

2.13.1 Thematic Research Clusters in ESG

The bibliometric analysis conducted using VOSviewer identified a couple of thematic research clusters in the ESG literature. These clusters, as captured in Figure 2.1, are represented by nodes in the network visualisation, where each node corresponds to a key research area. The analysis identified five (5) crucial areas, which are groups of terms that frequently co-occur in the analysed literature. These thematic areas that have been elaborated in the following paragraphs include ESG and its impact drivers, governance and board characteristics, social sustainability as an ESG dimension, sustainable finance and green innovation, and finally, the presence of moderating effects.

2.13.1.1 ESG and Its Impact Drivers

This cluster encompasses the largest nodes in the network visualisation image (Figure 2.1). These nodes are considered core terms like "ESG Performance", "ESG Practice", "ESG Score", and "Financial Performance". Thus, it indicated a significant concentration on the relationship between ESG (Environmental, Social, and Governance) factors and financial performance, according to recent past literature. The nodes' sizes and link thickness suggest quite substantial research, which has quantified

the ESG impact on financial performance. Prior studies highlight that these financial outcomes have often been considered metrics such as return on capital employed efficiency (ROCE), Tobin's Q, return on asset (ROA), etc. (Ahmad et al., 2021; Aydoğmuş et al., 2022; Jin and Lei, 2023). The studies have also deployed panel regressions, instrumental variable techniques, and other relevant methods to examine the ESG and financial performance relationships.

2.13.1.2 Governance and Board Characteristics

The governance and board characteristics cluster as shown in the network visualisation image (Figure 2.1), considered core terms "Governance Disclosure", "Governance Score", "Governance Performance", "Corporate Board", "Board Gender Diversity", and "Board Size". These areas highlight studies associated with governance mechanisms and structures around ESG implementation. The nodes are relatively smaller, indicating more opportunities for research in these areas, as studies conducted in the last six (6) years are a handful and insufficient to adequately address corporate issues of governance and ESG practices execution. However, a few ESG and sustainability studies in the recent past have considered governance-related parameters like board diversity, board composition and governance structures (Al-Hiyari et al., 2023; E-Vahdati et al., 2023; Wu et al., 2023). These studies have applied governance metrics as core instrumental variables or as moderating variables on ESG relationships.

2.13.1.3 Social Sustainability as an ESG Dimension

The social sustainability as an ESG dimension cluster shown in the network visualisation image, Figure 2.1, considered core terms like "Social Sustainability", "Human Rights", "Social Aspect", and "Health". These terms highlight studies associated with corporate social sustainability issues like human rights, health and safety, which are crucial aspects of ESG implementation. The social sustainability nodes are relatively similar in size to the governance and board characteristics cluster. Thus, connoting the potentiality of more opportunities in research around social sustainability and ESG, as the studies conducted in the last six (6) years are a handful and insufficient to adequately address corporate issues of social sustainability and ESG

practices execution. A couple of studies around ESG have considered social sustainability issues by employing corporate social responsibility (CSR) as a sustainability metric (Bifulco et al., 2023; Chang et al., 2022; E-Vahdati et al., 2023). These studies can be said to highlight a growing interest in the social dimension of sustainability, which goes beyond environmental concerns. This cluster supports studies in social sustainability, which can, in turn assist key stakeholders to enhance their understanding and management of social risks faced by firms and the possible opportunities available.

2.13.1.4 Sustainable Finance and Green Innovation

The sustainable finance and green innovation cluster, as captured in the network visualisation image Figure 2.1, encompasses crucial research areas like "Sustainable Finance", "Green Finance", and "Green Innovation". The relative sizes of the nodes and links in this cluster showed a research area which is still growing and offers more research opportunities to scholars. It could be deduced that over the last six (6) years, research has picked up interest in sustainable and green finance issues, but the volume of scholarly publications from empirical studies in this field is still relatively lower than issues like ESG and financial performance. Thus indicating ample room for new and innovative research in green and sustainable finance.

This cluster could offer a research avenue to explore how firms can actively utilise the financial markets to promote sustainable developmental issues, particularly in areas like green bonds, ESG investing, and related sustainable finance products and services. Green innovation research could also provide opportunities for corporate managers to better understand how corporate departmental functions like research and development (R&D) can be effectively utilised to enhance cost savings and reduce expenditures in non-value-adding activities.

2.13.1.5 The Presence of a Moderating Effect

A unique cluster, which is gaining attention from scholars in recent years, as highlighted in the network visualisation image Figure 2.1, is the incorporation of a moderating effect factor in ESG relationship studies. The "moderating effect" presence

would suggest that the research intends to investigate how or the role a certain factor can play to influence the relationship between ESG and another variable. Figure 2.1 highlights that recent studies around ESG have considered governance-related moderating proxies like “board gender diversity”, “board characteristics”, and “board size” (Al-Hiyari et al., 2023; E-Vahdati et al., 2023; Wu et al., 2023). Outcomes from such studies assist managers and investors in understanding the extent of the likely interaction effects of certain governance metrics on ESG’s association with financial performance. This could, in turn, guide corporate policy formulation by executives and enhance sustainability-related decision-making and investment choices by investors.

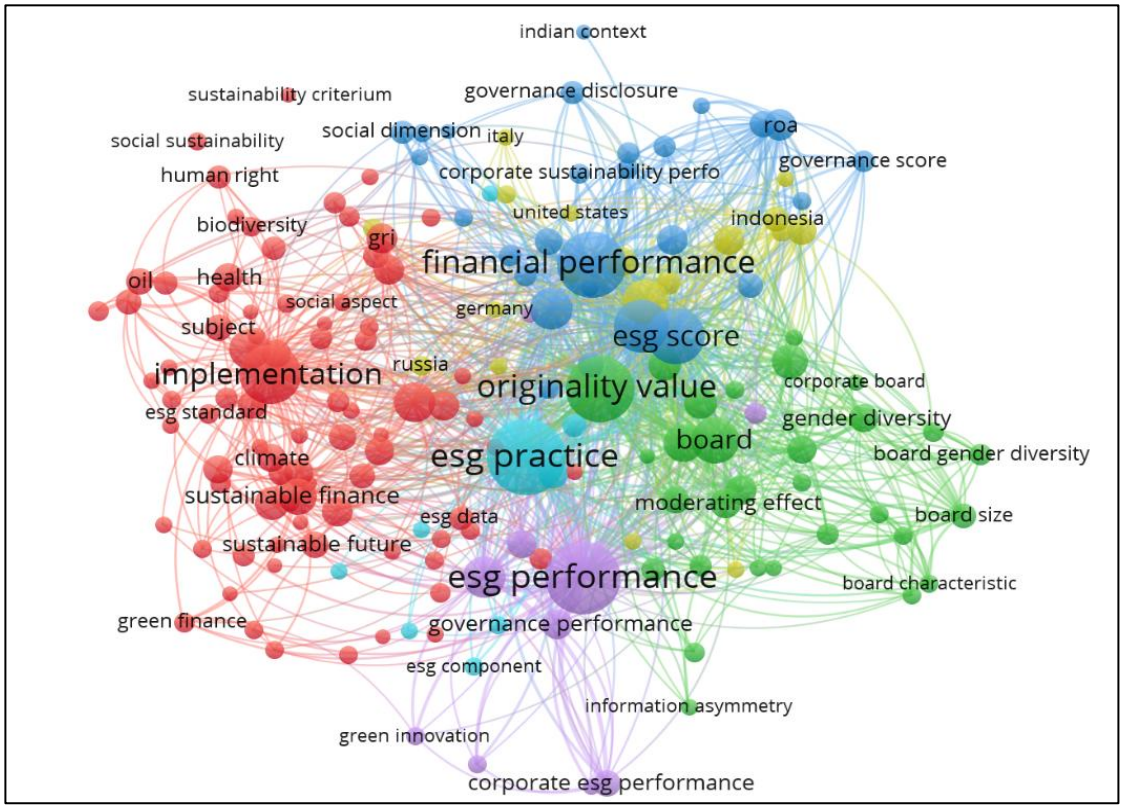

Figure 2.1 VOSviewer: Co-occurrence Key Research Terms

2.13.2 Thematic Trends in ESG Research

The bibliometric analysis also conducted a VOSviewer overlay visualisation to identify the patterns and trends in these ESG and value creation related thematic research clusters over the last six (6) years. Understanding the trends in research also helped to hint at possible research gaps for the current study. The timeline bar with

coloured gradient, which provides insights into the recent movements in these research areas between 2022 to 2024, has been succinctly captured in Figure 2.2 below. The coloured gradient signifies the publication year of the articles with the group terms and is differentiated by the thickness of the green colour, to facilitate analysis on the evolution in ESG research over the period under consideration. The analysis structured the movement in ESG research into the pre-recent trends and the recent trends.

2.13.2.1 The Pre-recent Trends (2019 – 2021)

In the pre recent periods, research around these areas has focused mainly on the elementary aspects of ESG. That is, most of the studies were tailored towards addressing topical issues like ESG scores, understanding basic relationships between ESG disclosures and financial performance, exploring simple CSR relationships with financial variables, etc. During this period, researchers were not focused on delving into the complex relationships and interplay of different variables that can be associated with ESG and sustainability. As such, they were largely interested in exploring simple ESG relationships (Ahmad et al., 2021; Ellili, 2020; Ionescu et al., 2019; Sadiq et al., 2020).

2.13.2.2 The Recent Trends (2022 – 2024)

In recent years, it appears there has been a consistent shift in both topical focus and complexity of the ESG relationships from 2022 to 2024. The timeline bar, as captured in the VOSviewer overlay visualisation image Figure 2.2, showed a persistent change in the thickness of the colour gradient, with the year 2024 featuring the most recent research areas at the time of data collection and bibliometric analysis. Firstly, there has been a shift from areas like ESG scores and financial performance to trending topical issues around sustainable finance, ESG practices, and governance performance. Also, Figure 2.2 shows that ESG components are also gaining attention in the recent period. Such studies go beyond the combined ESG practices to also consider the individual pillars of ESG (Kong et al., 2023; Mutiah & Rusmanto, 2023; Shahrun et al., 2023; Sulaiman et al., 2024).

Secondly, recent years have shown a shift in research towards more complex analysis of ESG relationships. Some studies have introduced variables with mediating

or moderating effects on the relationship between ESG practices and another variable. Figure 2.2 highlights that this shift in recent years has largely employed governance-related metrics to investigate the moderating effects of complex ESG relationships (Al-Hiyari et al., 2023; Choi et al., 2024; Dkhili, 2023; Mishra et al., 2024). This recent trend serves as a guide for current and future study direction, as it ensures that research studies are tailored to practical business and societal needs.

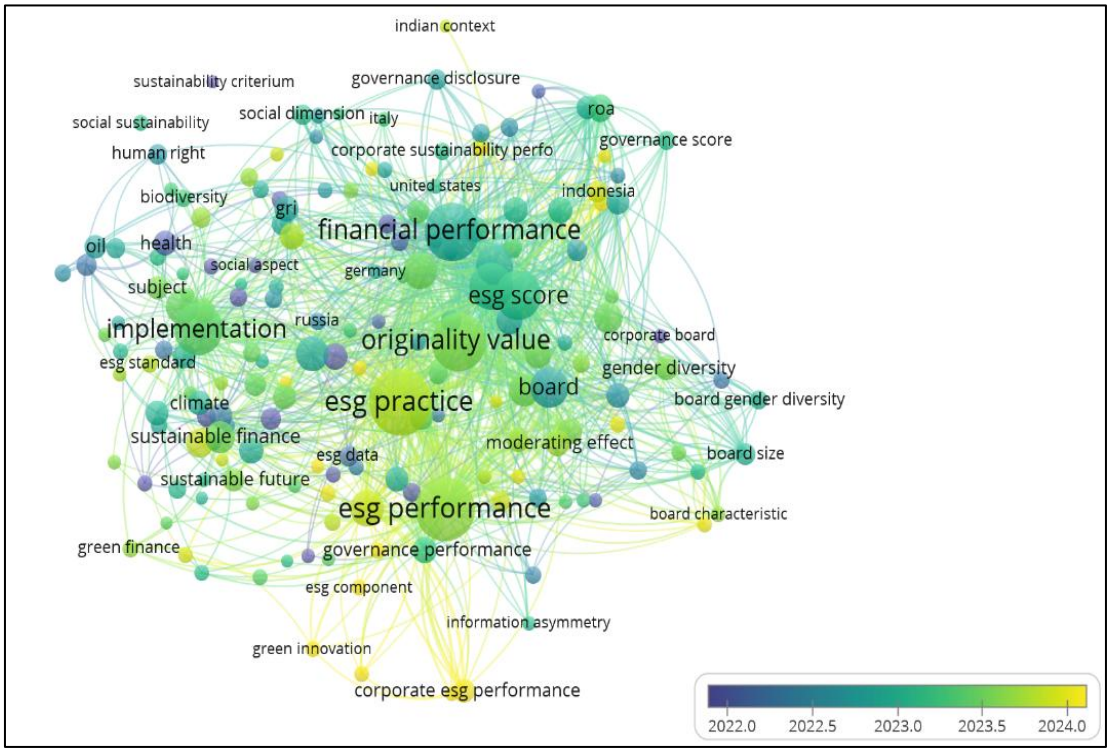

Figure 2.2 VOSviewer - Key Research Term Trends

2.13.3 Geographical Context

The bibliometric analysis was conducted by this study to also understand the geographical context that has dominated ESG and sustainability research in the identified thematic areas over the last six (6) years. The geographical dimension can be seen present in the network visualisation image as captured through the inclusion of terms such as "Indian Context", "United States", "Germany", "Indonesia" and "Russia". This connotes that scholars in recent times are increasingly investigating the ESG and financial metrics relationships across different geographical contexts, represented by countries from Europe, Asia and America. It also suggests that researchers are interested in context-specific factors that influence ESG performance and its relationship with

financial outcomes. Country-specific issues are often shaped by factors such as regulatory environments, cultural norms, and economic conditions. Their inherent nature can have varying geographic-specific influence on ESG and its financial outcomes relationships.

The geographical dimension served as a guide to hint at possible literature gaps for the current study, which contextualises Malaysia and could also support the structuring of future ESG and sustainability studies. Such studies may employ interaction terms to explore how certain institutional factors, or cultural differences, moderate the ESG-financial performance relationship, or compare how ESG relationships differ between developed economies (e.g., Germany) and emerging markets (e.g., Indonesia).

2.13.4 Implications for the Current Study

The bibliometric analysis was conducted on published articles sourced from Scopus and Web of Science databases covering the last six (6) years, spanning the period between 2019 to 2024. The analysis identified the key thematic research clusters around ESG and the trends in ESG research over the last six (6) years. It equally explored the geographical context that has dominated research in the identified thematic areas over the period under consideration. The observations from the bibliometric analysis have several implications for the current study, which focuses on the effect of ESG practices on value creation, with emphasis on the moderating roles of financial risk and agency risk. These implications hint at some of the gaps offered by the current study and its relevance to meeting the expectations of ESG research that aligns with current trends. The implications, as elaborated in the following paragraphs, have been structured under the thematic gap, geographical sensitivity gap, and alignment with recent trends.

2.13.4.1 Thematic Gap

The bibliometric analysis revealed that most of the prior studies initially dealt with simple ESG and financial performance relationships. Some had also largely dwelled on the ESG disclosure scores, and a couple on the ESG practices. However, in

recent times, some studies have introduced moderating effect variables to examine complex ESG relationships with other variables. The node sizes and line thickness of the network visualisation image showed that just very few studies have been conducted in the area, particularly those that captured governance-related moderating impact. Thus, this highlights a thematic gap for more studies to address the current shortfall in the academic literature. This current study also examined complex ESG relationships by incorporating a moderating variable. However, firstly, it went beyond the ESG disclosure scores to consider the performance score, which is based on the actual ESG practices in firms and not just for reporting. Secondly, the current study shifted from the traditional short-term focus on financial performance measures to consider value creation metrics, which are more long-term in focus and align with the expectations of wider stakeholders. Finally, the study introduced a moderating variable related to the governance mechanisms of firms, but considered this variable from the risk dimension, which is unique and a shift from the prior studies.

2.13.4.2 Geographical Sensitivity Gap

This current study shifted the focus from countries and regions that have dominated ESG research in recent times to consider another emerging economy in the Asian region. This contributed to the academic literature by bringing a diverse perspective, which incorporated the country-specific issues that have shaped the sustainability regulatory environments and economic conditions in Malaysia. The study also went further to prioritise environmentally sensitive sectors in Malaysia, like construction, transport & logistics, property, manufacturing, and energy. According to Ge et al. (2024), these sectors are characterised by high direct emissions under the GHG Protocol, making their environmental impact material and highly relevant to ESG research. Furthermore, Hair et al. (2019) postulated that environmentally sensitive sectors may exhibit similarities in their environmental challenges and sustainability regulatory frameworks, which could facilitate more meaningful analysis and generalised conclusions from the multivariate analysis employed by the study. This aligned with the current study, which also adopted a multivariate analysis to address the research question and achieve the set study objectives.

2.13.4.3 Alignment with Recent Trends

The study should align with recent trends in ESG research as it focuses on areas like ESG practices rather than disclosures, and value creation rather than financial performance. It equally employed governance mechanism-related metrics to investigate the moderating effects of complex ESG relationships. The bibliometric analysis revealed these areas as part of the key topical issues shaping the recent trends in ESG and financial metrics research over the last few years.

2.14 Development of Hypotheses

A research hypothesis is a statement formulated by researchers to predict the expected outcome of a study and serves as a fundamental component of any true experimental design, guiding the investigation and shaping data collection and analysis (Mourougan & Sethuraman, 2017). The hypothesis provides a clear, testable proposition that reflects the study's objectives and the underlying theoretical framework. According to Banerjee et al. (2009), hypotheses are generally classified into two types. That is, firstly, the Null Hypothesis (H_0), which is a statement that asserts that there is no significant relationship between the variables being studied. It serves as the default assumption, which researchers aim to test and potentially reject. The second type is the Alternative Hypothesis (H_1), which is a statement that proposes a probable relationship or effect between variables being tested and reflects the expected outcome based on the researcher's theory or observations. It is usually measured against the null hypothesis to ascertain evidence gathered is adequate to support a significant association between the variables.

Hypotheses are categorised according to how they describe the anticipated difference between the research groups, particularly in the context of assessing statistical significance (Banerjee et al., 2009). Consequently, this study developed four main groups of hypotheses, which were tailored towards answering the four research questions posed by the researcher.

2.14.1 ESG Practices Have a Significant Effect on the Value Creation of Firms

The relationship between ESG practices and value creation can be viewed through the strategic lenses of the stakeholder theory. This is because the stakeholder theory has the capacity to incorporate the expectations and interests of a broad spectrum of diverse stakeholders who are affected by and have the potential to influence the actions of a business organisation. In addition, the theory addresses and elucidates the creation of business value beyond the narrow perspective of shareholder value (Freeman, 2010). This aligns with the ESG concept that encapsulates a broader perspective of what represents a firm's corporate value or performance and is a useful tool for firms intending to raise external funding and achieve long-term, sustainable growth. However, the value that ESG practices create for the firm is the ultimate determinant of a company's willingness and approach to ESG implementation (Wang et al., 2024).

The ESG and value creation relationship of this study is underpinned by the stakeholder theory, which emphasises the collaborative process of value creation to achieve the corporation's objectives and address the particular needs of all key stakeholders. Thus, the combined ESG practices have the potential to impact the generation of company value when they are developed and executed through a collaborative approach that includes all important stakeholders. This is supported by the assertions of Porter and Kramer (2011), the originators of the concept of shared value, who proposed a potential correlation between the concepts of ESG and stakeholders' value created. This has been affirmed by a couple of studies, which found that ESG contributes to increased corporate value (Ahmad et al., 2021; Chang & Lee, 2022; Jin & Lei, 2023).

The stakeholder theory has been shown to be applicable to firms that actively support environmental protection, strive to enhance social welfare and community relations, and consistently pursue governance methods that aim at optimising value created for stakeholders (Lee & Isa, 2020). The theory provides valuable insights into the relationship between ESG practices and corporate value creation. Pursuing the shared value (collaborative) perspective of the stakeholder theory will imply recognising the interests of all key stakeholder groups and engaging them in constructive dialogues, which could better align the firm's strategies and

implementation with the stakeholder needs. Thus, it could lead to enhanced corporate value. This view was earlier expressed by Dal Maso et al. (2017) in their assertion that companies with robust stakeholder engagement strategies also created relatively better corporate values.

Several studies have investigated the relationship between ESG practices and value creation. Subject to the variables tested and sample data employed, a few of the past studies have revealed a negative or an insignificant association between ESG metrics and corporate value. However, a couple of other studies have also found a positive relationship based on the available data sample and the structural equation modelling deployed. Consequently, this study is also interested in investigating the likely influence of ESG practices on value creation for Malaysian publicly quoted firms in the environmentally sensitive sectors of construction, property, manufacturing, and energy. This could contribute to closing the gap in academic literature and provide support to corporate and regulatory decision makers.

Given the above, this study has developed a hypothesis to address research question one (1) anchored on the two value creation measures adopted as proxies for the research, as shown in the figure below.

***$H_{1.1}$**: ESG Practices have a significant effect on the enterprise value of firms.*

***$H_{1.2}$**: ESG Practices have a significant effect on firms' market value added.*

2.14.2 ESG Components (Environmental, Social, Governance) Practices Have a Significant Effect on the Value Creation of Firms

In their value creation and ESG study, Semenova and Hassel (2013) suggested that the ESG concept from a corporate view could reveal three fundamental types of business to stakeholder relationships, that is, environmental, social, and governance. The divergence in the findings from some past studies with respect to the individual ESG pillars has motivated this study to separately investigate the effect of ESG components practices on the value creation of Malaysian publicly listed companies. This will assist firms in identifying the specific ESG pillars that are not driving corporate value, and corrective measures to properly align such pillars to the firm's overall corporate plan and objectives can be implemented. This is crucial in firms where

their combined ESG practice has a positive impact on value creation, but a specific ESG pillar does not have a significant effect. For example, Aydoğmuş et al. (2022) found the overall combined ESG to be positive and significantly associated with corporate value. Separately, while the social and governance pillars had a positive and significant relationship, the environmental pillar did not have a significant relationship with corporate value.

Having established the need to examine both the firm's combined ESG practices and the individual components within the categories of environmental practices, social practices, and governance practices, it is also essential to separately investigate the effect of ESG component practices on value creation with the collaborative perspective of the stakeholder theory.

2.14.2.1 Environmental Practices Have a Significant Impact on Value Creation

The firm's policies, procedures, and execution pertaining to the external environment can have an impact on various outcomes of the organisation, including the creation of value. This can be facilitated through strong engagement with key stakeholders, as canvassed by the stakeholder theory and revealed by the study of Dal Maso et al. (2017). Engaging in environmental activities in a collaborative process can help mitigate adverse impacts on the environment by lowering negative externalities. According to Schaltegger et al. (2012), this will provide value for stakeholders and harmonise the business models of enterprises with the sustainable growth of markets and society.

The findings of Ahmad et al. (2021) reveal that there was a significant relationship between the environmental pillar and corporate value. However, Aydoğmuş et al. (2022) in their study found no significant relationship between environmental practices and corporate value. As such, while some studies provided significant association evidence, others have found insignificant relationships. Investigating the effect of environmental practices on value creation through the stakeholder share value perspective could unveil an opportunity for new insight into how firms can collaboratively utilise their environmental practices to formulate winning strategies that will create ultimate value for the firm and its stakeholders. Therefore, the

study has developed hypotheses to address the environmental aspect of research question two (2) as shown below. The hypotheses are formulated to accommodate the value creation metrics of enterprise value and market value added.

$H_{2.1a}$: *Environmental practices have a significant effect on the enterprise value of firms.*

$H_{2.2a}$: *Environmental practices have a significant effect on firms' market value added.*

2.14.2.2 Social Practices Have a Significant Impact on Value Creation

Organisations that adopt social responsibility in alignment with the shared value perspective of the stakeholder theory will experience an enhancement in their reputation, leading to improved financial stability. By adhering to their social duty, firms can significantly enhance the value they generate by bolstering their social capital, ensuring organisational compliance, and effectively mitigating potential future risks. Based on the notion of stakeholder engagement as canvased by the stakeholder theory, a corporation generates value by collaboratively aligning its actions with the interests of its stakeholders. According to Freeman (2017), the total value of a company is measured by the benefits it provides to its community, employees, suppliers, financiers, and customers. Li et al. (2020) found that companies that prioritise social responsibility demonstrate improved economic efficiency and higher returns on investment. To clarify, social investments provide benefits to stakeholders in the now as well as in the future, thereby safeguarding the firm from economic downturns (Fernando et al., 2019).

According to Mervelskemper and Streit (2017), the increase in global awareness of socially responsible initiatives as part of the ESG pillars has fostered the assumption that corporate practices which address the welfare of non-owner stakeholders, like the community, tend to have a positive influence on the firm's value. This view was also supported by Velte (2017), who postulated that non-owner stakeholders such as customers, employees, debtors, and regulatory authorities are provided with greater interest safeguarding opportunities when corporate entities engage in socially responsible practices. This builds trust with the firm and reduces risk, which eventually provides a new path for growth and enhanced corporate value.

While Aydoğmuş et al. (2022) found a positive and significant relationship

between the social practices and corporate value created for stakeholders, Ahmad et al. (2021) found that there was no association between social practices and corporate value. The interaction between social practices and the value created for stakeholders under the shared view perspective of stakeholder theory seems intricate and diverse. Although both positive and negative connections have been noticed, the inconsistent results highlight the necessity for additional investigations through the positivist paradigm. Thus, the study has developed hypotheses to address the social aspect of research question two (2) as shown below. The hypotheses are formulated to accommodate the value creation metrics of enterprise value and market value added.

$H_{2.1b}$: *Social practices have a significant effect on the enterprise value of firms.*

$H_{2.2b}$: *Social practices have a significant effect on firms' market value added.*

2.14.2.3 Governance Practices Have a Significant Impact on Value Creation

Organisational traits and governance structures, if designed through consultative engagement with key stakeholders as enshrined in the stakeholder theory, could have a significant influence on the value-creation role of an organisation's ESG practice. This collaboration is crucial as organisational traits and practices also reflect the internal knowledge and assets of the company to some extent (Wang et al., 2024). The existing governance structure has the potential to guide plans that will efficiently utilise the firm's assets and strategic relationships to create value for its stakeholders. A company's business success can be greatly enhanced by a well-designed corporate governance framework, which can also drastically lower operational costs, deter executives from acting speculatively, and provide them greater flexibility to adapt to changes in the market (Qu-ying, 2012).

A crucial component of long-term corporate development, corporate governance encourages information sharing and helps to eradicate agency behaviour, which in turn helps businesses accomplish their long-term objectives and raise their overall worth. Ahmad et al. (2021) and Aydoğmuş et al. (2022) all found a positive and significant relationship between the governance practices and corporate value created for stakeholders. Adams (2017) emphasised the impact of efficient corporate governance and a proper approach to assessing ESG risks and opportunities on the creation of value for stakeholders, including the associated reporting. Therefore, it

seems that the implementation of governance practices and indices can impact a certain aspect of creating value for stakeholders. As such, this study has developed hypotheses to address the governance aspect of research question two (2) as shown below. The hypotheses are formulated to accommodate the value creation metrics of enterprise value and market value added.

$H_{2.1c}$: *Governance practices have a significant effect on the enterprise value of firms.*

$H_{2.2c}$: *Governance practices have a significant effect on firms' market value added.*

2.14.3 Financial Risk Moderates the Relationship between ESG Practices, ESG Components (Environmental, Social, Governance) Practices and Value Creation

The moderating role of financial risk on the relationship between ESG practices and value creation can be seen from the strategic lenses of the agency theory. Financial risk demonstrates the possible losses or high-cost exposure that stems from the financial structure or the funding mix of a firm as a result of decisions made by managers (Realised, 2021). The allocation of funds for a company's project can provide insights into the logical distribution of its various financing mix of debt to equity, and subsequently, the associated level of financial risk (Wang & Jin, 2021). This acquisition and allocation of funds to projects may result in a high financial cost structure if inefficient and ineffective funding decisions are made by the firm.

According to Wong (2018), in the agency theory relationship, a firm serves as a conduit for principals (shareholders) and agents (corporate executives) to delegate work or carry out certain responsibilities. Corporate managers may fail in this responsibility in their quest to secure corporate funding, such that the company is exposed to high costs due to its capital structure. Hinging on the tenets of the agency theory, high capital expenditure and free cash flows may be said to be an indication of agency costs (Kruger, 2015; Servaes & Tamayo, 2014). In addition, Ferrell et al. (2016) postulated that high financial constraints, as shown by high cost of debt and equity mix, would assist in mitigating managerial agency problems due to close shareholder and market

monitoring.

However, from a broader stakeholder value creation perspective, a huge financial obligation resulting from corporate executives' capital mix decision could restrict available funds to debt servicing rather than promoting ESG activities and other profitable projects for better corporate value to all stakeholders. Capital structure theories claim that the most pivotal decision for a corporation is determining the optimal proportion of debt to equity in order to maximise the firm's value and minimise the cost of funds (Gersbach, 2013). Typically, this is attainable when the business reaches its optimal capital mix or structure. Otherwise, a high cost of capital may reduce retained profits that can be ploughed back into high-yielding ventures and essential, environmentally sensitive initiatives that would create stakeholder value.

A firm's value creation can be influenced by its ESG practices and activities, as moderated by its financial risk metrics. A greater value could potentially be linked to a reduced risk profile, as it reflects the balance between risk and reward. This is consistent with the findings of Sassen et al. (2016), who identified a negative correlation between business risk and ESG performance, as predicted in their research. In their study, Giese et al. (2019) investigated the correlation between ESG performance and risk metrics. They discovered that enhanced ESG performance is linked to a reduction in risk for businesses. This may be ascribed to avoidance of potential value destroyers like high clean-up costs, low employee morale, huge regulatory fines, and poor corporate image.

Considering the discussions above, this study has developed hypotheses to answer research question three (3). These hypotheses are derived from the adopted value creation metrics, the combined ESG practices, and the ESG components practices employed in this study, as seen below.

$H_{3.1}$: *Financial risk moderates the relationship between ESG Practices and the enterprise value of firms.*

$H_{3.1a}$: *Financial risk moderates the relationship between environmental practices and the enterprise value of firms.*

$H_{3.1b}$: *Financial risk moderates the relationship between social practices and the enterprise value of firms.*

$H_{3.1c}$: *Financial risk moderates the relationship between governance practices and the enterprise value of firms.*

$H_{3.2}$: *Financial risk moderates the relationship between ESG Practices and firms' market value added.*

$H_{3.2a}$: *Financial risk moderates the relationship between environmental practices and firms' market value added.*

$H_{3.2b}$: *Financial risk moderates the relationship between social practices and firms' market value added.*

$H_{3.2c}$: *Financial risk moderates the relationship between governance practices and firms' market value added.*

2.14.4 Agency Risk moderates the Relationship between ESG Practices and ESG components (Environmental, Social, Governance) Practices and Value creation.

The tenets of the agency theory apply directly to how companies are exposed to agency risk, which can affect the probable relationship between ESG practices and value creation. Agency risk refers to the potential danger that managers may not prioritise the interests of the owners of the business (Sheedy, 2010). This may entail participating in self-directed imprudent decisions, such as opting for exceedingly low-risk investments, resorting to unethical conduct, and compensating corporate executives with exorbitant remuneration. Agency risk is anchored on possible losses or problems the company could encounter because managers make decisions that are predominantly self-interest driven (Barnea & Rubin, 2010).

Lee and Isa (2020) described managerial actions geared at personal gain as the agency problem that leads to a decline in value. It has the potential to influence both value creation and ESG practices, and thus, affects their possible relationship. Such managerial behaviour and actions are against the core traits of the agency theory relationship, where, according to Chong (2019), shareholders appoint the board of directors to lead the affairs of the firm by protecting their stake in the company and acting in their best interests. However, conflicts of interest by managers can instigate disregard of profitable ventures that clash with the personal interests of senior executives or financing of ESG activities with little or no overall corporate benefit. This could diminish the overall profitability of the corporation and potentially impact on the value created for shareholders and other significant stakeholders.

Furthermore, corporate executives could finance ESG initiatives out of self-interest rather than where and when they are needed, leading to a waste of financial resources of the firm. This is supported by an earlier study conducted by Kruger (2015), which found results consistent with the agency theory that managers tend to overinvest in social initiatives and practices to promote their personal reputation, rather than that of the firm. Thus, it would be pertinent to investigate the extent to which these managerial behaviours leading to agency risk exposures can moderate the relationship between ESG practices and value creation for all stakeholders of the firm.

In light of the discussions provided above, the study formulated hypotheses to answer research question three (4). These hypotheses are derived from the adopted value creation proxies, combined with ESG practices and ESG components practices employed in this study, as seen below.

$H_{4.1}$: *Agency risk moderates the relationship between ESG Practices and the enterprise value of firms.*

$H_{4.1a}$: *Agency risk moderates the relationship between environmental practices and the enterprise value of firms.*

$H_{4.1b}$: *Agency risk moderates the relationship between social practices and the enterprise value of firms.*

$H_{4.1c}$: *Agency risk moderates the relationship between governance practices and the enterprise value of firms.*

$H_{4.2}$: *Agency risk moderates the relationship between ESG Practices and firms' market value added.*

$H_{4.2a}$: *Agency risk moderates the relationship between environmental practices and firms' market value added.*

$H_{4.2b}$: *Agency risk moderates the relationship between social practices and firms' market value added.*

$H_{4.2c}$: *Agency risk moderates the relationship between governance practices and firms' market value added.*

2.15 Conceptual Framework of ESG Practices, Value Creation, and the Moderating Roles of Financial Risk and Agency Risk

The framework of this study provides a diagram representation of both the foundational theories and the key thoughts and ideas that were conceptualised from the explored literature pertaining to ESG practices, value creation, and moderating constructs, through financial risk and agency risk.

Figure 2.3 illustrates that value creation is the dependent variable, which is an area or a pursuit that has attracted the interest of business stakeholders and also researchers in academia. This is because value creation has been identified as one of the key factors that can assist in addressing the problem of businesses failing and the non-survival of firms (Ting & Lean, 2011; Zin & Sulaiman, 2011). Also, ESG practices have been recognised as a corporate activity that is attracting the attention of scholars due to their potential to impact the creation of corporate value for stakeholders. The ESG practices represented the independent variable of the study, as an increase or decrease in their performance scores could affect corporate value creation by firms. This aspect of the study is underpinned by the stakeholder theory, which posits that the execution of ESG activities and creation of corporate value are ultimately targeted for the benefit of all stakeholders involved.

However, due to divergence in the findings of previous research and the need to close relevant identified theoretical and conceptual gaps, the study introduces moderating variables to ascertain the extent to which they could impact the relationship between ESG practices and value creation. The goal is to enhance understanding and offer more suitable recommendations for corporate managers, regulatory authorities, and research scholars. Financial risk and agency risk were employed as moderating variables. The moderating variable is underpinned by the agency theory, as these risks can be associated with managers' failure to effectively discharge their responsibilities in the agency relationship, leading to the non-achievement of corporate goals and exposing the firm to long-term sustainability issues.

Thus, as illustrated in Figure 2.3 below, ESG practices and their components (environmental, social, and governance) practices are hypothesised to have a direct effect on corporate value creation, measured using enterprise value multiple (EVM) and market value added (MVA).

The framework further incorporates financial risk and agency risk as two distinct moderating variables of the ESG-value creation relationships. Financial risk is operationalised using the weighted average cost of capital (WACC), reflecting firms' exposure to the cost of funding and the capital market. Agency risk is operationalised using executive compensation, representing managerial incentive alignments and their potential agency conflicts.

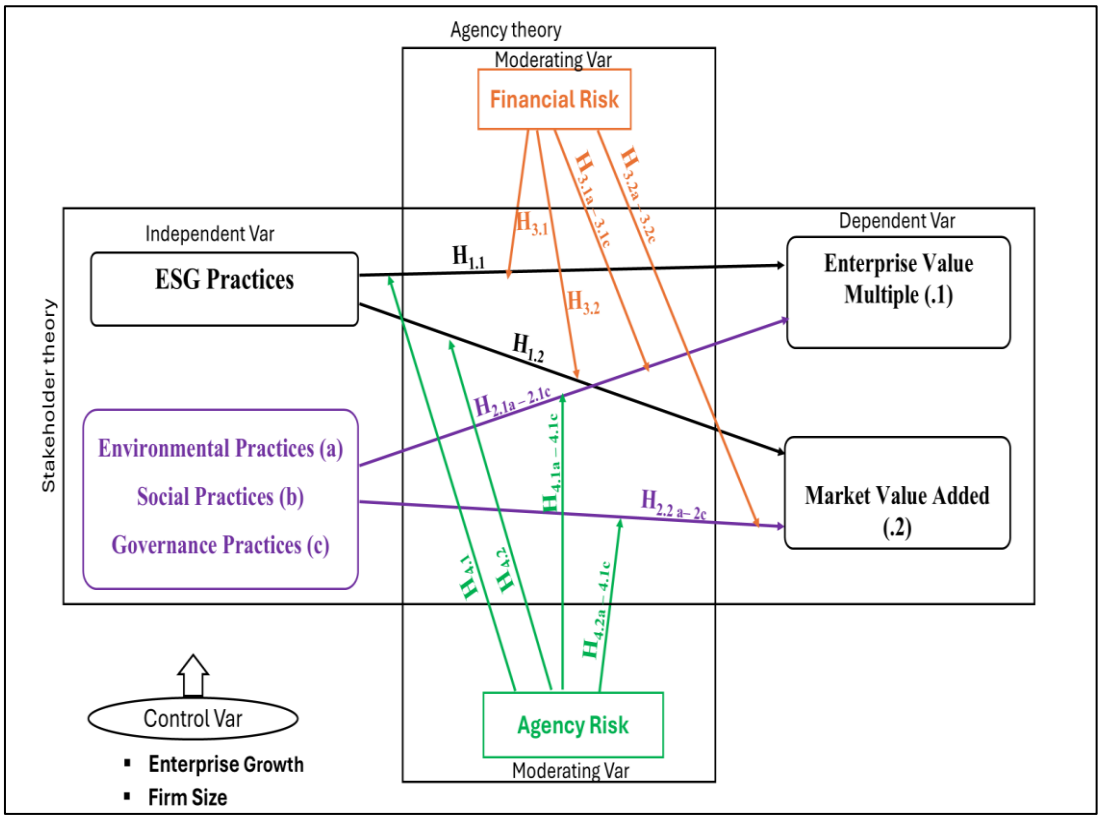

Figure 2.3 Conceptual Framework of ESG, Value creation and Risk

2.16 Theoretical Integration of ESG, Risk, and Value Creation

This study is grounded in an integrated theoretical framework that combines stakeholder theory and agency theory to explain how ESG practices translate into corporate value creation under varying organisational risk conditions. Stakeholder theory provides the foundational logic for ESG practices, while agency theory explains the governance and financing constraints that shape their effectiveness.

From a stakeholder theory perspective, firms are expected to create value not

only for shareholders but also for a broader set of stakeholders, including employees, customers, regulators, communities, and the environment (Freeman, 2015). ESG practices operationalise this responsibility by embedding environmental stewardship, social responsibility, and sound governance into corporate strategy and operations. Prior studies argue that when ESG practices are credibly implemented, they can enhance reputation, strengthen stakeholder trust, reduce operational and regulatory risks, and ultimately support long-term value creation (Porter & Kramer, 2011; Eccles & Klimenko, 2019). In this sense, ESG practices represent a strategic mechanism through which firms align stakeholder interests with sustainable value outcomes.

However, stakeholder theory alone does not fully explain why ESG practices generate value in some firms but fail to do so in others. This study addresses this limitation by incorporating agency theory to account for internal decision-making frictions. ESG initiatives are strategic decisions subject to managerial incentives and financing constraints. Agency theory explains how managerial self-interest may distort ESG implementation. The theory highlights conflicts of interest between managers and principals, which arise when executives pursue personal objectives rather than maximising corporate value (Jensen & Meckling, 1976). In the ESG context, such conflicts may result in symbolic ESG adoption or "greenwashing", where sustainability initiatives are undertaken for reputational gains without substantive value creation (Liao et al., 2019). These behaviours expose firms to agency risk, which can weaken the credibility and effectiveness of ESG strategies.

In addition, agency theory extends to financing decisions that influence firms' capacity to sustain ESG investments. Financial risk, arising from capital structure and financing choices, affects the cost of capital and the availability of resources needed for long-term ESG initiatives (Realised, 2021; Al Amosh et al., 2022). Firms with high financing costs or suboptimal capital structures may struggle to support ESG activities, even when stakeholder expectations are strong. As such, financial risk acts as a structural constraint on ESG-driven value creation.

By integrating stakeholder theory and agency theory, this study reconceptualises ESG practices as conditional value-creation mechanisms. ESG initiatives create value when stakeholder-oriented strategies are supported by effective governance incentives and sound financial structures. This integrated framework explains how agency risk and

financial risk jointly shape the ESG-value creation relationship, thereby offering a more refined and theoretically grounded explanation of ESG effectiveness in emerging market contexts such as Malaysia. ESG practices are often treated as inherently value-enhancing. As such, this assumption overlooks the organisational conditions under which sustainability strategies are formulated and executed. By jointly examining agency risk and financial risk, this study positions ESG as a conditional value-creation mechanism rather than an automatic outcome.

2.17 Chapter Summary

The chapter unveiled relevant concepts that should be considered when discussing the stated research topic and included the value creation, market value added, enterprise value, environmental practices, social practices, governance practices, financial risk, and agency risk. The review of various literature, as shown above, revealed the possibility of a relationship between ESG practice and value creation. As a result, managers of companies and policy makers of regulatory bodies, in their decision-making and policy formulation, could consider guidelines that will encourage seamless compliance and investments that promote environmental sustainability practices by firms. The chapter also considered historical perspectives and events that have shaped the adoption of ESG and sustainability practices both in Malaysia and in the global market. This was followed by a comprehensive review of empirical literature that has dominated research around ESG practices and value creation, and how it has impacted the current study. The study hypotheses were developed and integrated into the relevant theories underpinning the research. Finally, the chapter prepared a research framework for the study, which diagrammatically summarised key relationships under investigation and underpinning theories. This study was underpinned by stakeholder theory and agency theory. It also contextualised Malaysia as an emergent market in Southeast Asia, with particular focus on environmentally sensitive sectors, amongst which were construction, transport & logistics, energy & utility, property, and manufacturing, so as to contribute to closing possible sectoral gaps of ESG research in Malaysia.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines various approaches that have been adopted to achieve the objectives of this study. This chapter begins with an introduction in Section 3.1, restatement of the research aims and questions in Section 3.2, research paradigm in Section 3.3 and research design in Section 3.4. Section 3.5 extensively explains the population of the study and the sample formation adopted for this study. Sections 3.6 and 3.7 explain the sources of data collection and the methods of data collection, respectively. Section 3.8 provides the measurement of variables, followed by the statistical model specification in Section 3.9. Procedures for data analysis that have been applied in this study are explained in Section 3.10. Section 3.11 presents the ethical considerations of this study. Finally, this chapter ends with a summary of Chapter 3 in Section 3.12.

3.2 Research Aim and Questions

This study aims to conduct a quantitative investigation on the effect of ESG practices on value creation, while also considering the moderating influence of financial risk and agency risk for publicly traded companies in Malaysia. To fulfil the objective of the research, this study was formulated to address the following research questions:

i. What are the effects of ESG practices on value creation (i.e., EVM and MVA) in the Malaysian publicly listed companies?
ii. What are the effects of ESG components (Environmental, Social, Governance) practices on value creation in the Malaysian publicly listed companies?
iii. Does financial risk moderate the relationship between ESG practices, ESG components (Environmental, Social, Governance) practices and value creation in the Malaysian publicly listed companies?
iv. Does agency risk moderate the relationship between ESG practices, ESG components (Environmental, Social, Governance) practices and value creation

in the Malaysian publicly listed companies?

The aim of the study and research questions have been restated to directly connect the study methodology to the research aim and to clearly highlight how the chosen methods and research procedures were tailored to sufficiently address the research questions. Moreover, the study, in order to facilitate the attainment of its set objectives and answer the research questions, had earlier four groups of study hypotheses, which were formulated in their alternative form. These hypotheses considered the independent, dependent and control variables, and were duly tested following the collection of relevant data for the study.

3.3 Research Paradigm

A research paradigm represents the philosophical foundation that guides how a study is designed and conducted. It shapes the researcher's assumptions about reality (ontology), knowledge (epistemology), the role of values (axiology), and the choice of research methods (Park et al., 2020). Accordingly, the selection of an appropriate research paradigm is crucial, as it determines how research questions are framed, how data are collected and analysed, and how findings are interpreted.

Broadly, social science research is commonly situated within paradigms such as positivism, interpretivism, and pragmatism. Interpretivist approaches, including phenomenological methodology, are typically qualitative in nature and focus on understanding individuals' lived experiences and subjective meanings (Struwig & Stead, 2007). Phenomenological studies rely on in-depth interviews, observations, and textual analysis to explore how social actors perceive and interpret phenomena within specific contexts. While such approaches are valuable for gaining rich insights into perceptions, motivations, and experiences, they are less suited for hypothesis testing or examining causal relationships across large populations.

In contrast, this study adopts a positivist research paradigm. Positivism assumes that reality is objective, measurable, and independent of the researcher, and that knowledge can be generated through empirical observation and statistical analysis (Blumberg et al., 2011). This paradigm is particularly appropriate for studies that seek to test theoretically grounded hypotheses using quantitative data. Positivism follows a

deductive logic, whereby hypotheses are derived from existing theories and empirically tested using observable data.

Consistent with this orientation, the present study employs secondary quantitative panel data to examine the relationship between environmental, social, and governance (ESG) practices and value creation among Malaysian publicly listed companies. The study further evaluates the moderating effects of financial risk and agency risk, enabling a systematic assessment of how risk conditions influence the ESG-value creation relationships. According to Park et al. (2020), positivist research commonly applies the hypothetico-deductive method, which prioritises structured data and statistical techniques to identify cause-and-effect relationships while minimising researcher bias.

The use of a positivist paradigm is also theoretically aligned with the study's underpinning frameworks, namely stakeholder theory and agency theory. These theories lend themselves to empirical testing through measurable constructs such as ESG practices, value creation metrics, and risk indicators. Trochim (2006) argues that positivism is particularly suitable when research progresses from established theory toward empirical validation, as is the case in this study.

Overall, the adoption of a positivist research paradigm allows for a rigorous, objective, and generalisable examination of how ESG practices contribute to corporate value creation, while accounting for the moderating influence of financial and agency risks. This paradigm is therefore well-suited to addressing the study's research questions and achieving its stated objectives.

3.4 Research Design

Following the choice of research philosophy, the next step was to determine the research design. Research design is essentially a framework for organising the different approaches and procedures that a researcher uses to conduct research and to answer the study's research questions. In other terms, it is an organised collection of information or data that has been investigated through the formulation of a hypothesis and the subsequent generation of meaningful conclusions, while addressing validity, reliability, and ethical considerations (Creswell & Creswell, 2022).

Following the adoption of a positivistic research philosophy, this study

employed an ex-post facto and analytical design in order to collect data on the current nature of the research study to provide and describe the nature of the relationship between the study variables over a substantial period of five years. The ex-post facto design is structured such that causal relationships are investigated after the events have occurred, to observe outcomes without any manipulation of the variables under consideration (Creswell & Creswell, 2018). It is based on observation, using already available data to make inferences on patterns or causality. This is further developed into an analytical research design where the variables are compared systematically to test for or identify trends and causal associations (Babbie, 2016). The current study examines past data over the last five (5) years, from 2019 to 2023. Thus, it properly aligns with the ex-post facto design, which is tailored towards examining outcomes based on prior conditions and events.

The study involved data collection about the ESG practices variables (independent variable), value creation variables (dependent variable), and financial risk and agency risk variables (moderating variable) of quoted construction, transport & logistics, energy & utility, property, and manufacturing firms on Bursa Malaysia. This study design is employed to address the study objectives, which investigate the relationship between the variables through analysis of the data collected from FTSE Bursa Malaysia EMAS Index firms, Refinitiv ESG practice scores, published annual reports, and share prices from the stock market. Additionally, the study employed analytical research designs to analyse the data, which included techniques like descriptive statistics, Spearman rank correlation matrix, pooled ordinary least squares (OLS) regression analysis, robust least squares dummy variable regression analysis, fixed effect regression analysis and random effect regression analysis. The regression methods were chosen by employing the model dynamic tests, like the Hausman test and the Breusch-Pagan LM test, as elucidated under the procedure for data analysis.

3.5 Sample Formation

3.5.1 Population of Study

To ensure a relevant and data-rich sample relevant ESG participant companies and gather sufficient data for the research, all publicly listed companies under the FTSE

Bursa Malaysia EMAS Index were considered as possible target population. The FTSE Bursa Malaysia EMAS Index is a broad market index that represents the performance of eligible firms listed in the Main Market and ACE Market of Bursa Malaysia, which provides investors with a tool for benchmarking investments and guiding their decision-making. It captures all the constituents from the FTSE Bursa Malaysia Top 100 Index and the FTSE Bursa Malaysia Small Cap Index. Thus, position the FTSE Bursa Malaysia EMAS Index as a well-suited index for the Malaysian context due to its broader firm inclusion. The FTSE Bursa Malaysia Top 100 Index represents the large capitalisation market, while the FTSE Bursa Malaysia Small Cap Index represents the small capitalisation market, comprising firms within the top 98% of the Bursa Malaysia Main Market, excluding the Top 100 Index.

According to the ESG rating report released by Bursa Malaysia in 2024, capturing firms in the FTSE Bursa Malaysia EMAS Index that were assessed in line with the FTSE4Good Bursa Malaysia review cycle for December 2023, showed a total of 237 companies. The listed firms in the EMAS Index that form the target population of the study are assessed under the FTSE Russell ESG Ratings Methodology. Table 3.1 below unveils the target population distribution, showing the number of firms in their respective sector categories.

Table 3.1
FTSE4Good Bursa Malaysia EMAS Index Listed Firms Distribution

S/N	SECTORIAL CATEGORY	NUMBER OF FIRMS
1	Construction	11
2	Manufacturing (Consumer & Industrial Goods)	102
3	Energy & Utilities	20
4	Financial Services	18
5	Health Care	10
6	Plantation	13
7	Property	17
8	Real Estate Investment Trusts	3
9	Technology	24
10	Telecommunications & Media	8
11	Transportation & Logistics	11
	Total Firms in All Sectors	**237**

3.5.2 Sample Selection

This study sampled all the listed firms in the environmentally sensitive sectors of Bursa Malaysia. These sectors included construction, transport & logistics, property, energy & utility, and manufacturing. They are sectors which are characterised by high direct emissions under the GHG Protocol, making their environmental impact material and highly relevant to ESG research (Ge et al., 2024). Moreover, Drempetic et al. (2020), in their study of the effect of firm size on the ESG performance, highlighted that the environmentally sensitive sector firms have significant impacts on the environment given their geographical positioning and considerable firm sizes, which could command notable ESG impacts.

Also, publicly listed Malaysian companies operating within these industries are under intense regulatory and stakeholder pressure to adopt sustainable practices, which is further exacerbated by Malaysia's National Climate Change Policy 2.0 and the Net Zero Carbon vision by 2050 (NRES, 2025). This pressure could translate to enhanced transparency and implementation of ESG initiatives, providing better quality data for analysis and ESG research like the current study. Additionally, these sectors offer substantial opportunities for value creation through cost savings, operational efficiency, and strategy alignment, such as green infrastructure and collaborative strategic decisions (Porter & Kramer, 2011; Zhang et al, 2018). Focusing on these sectors ensured the study tailored its investigation to how ESG practices translated into value creation for sustainability-conscious stakeholders, such as improved market value and reduced risk exposures.

Furthermore, environmentally sensitive sectors may exhibit similarities in their environmental challenges and sustainability regulatory frameworks, which could facilitate more meaningful analysis and generalised conclusions from the multivariate analysis employed by the study (Hair et al., 2019). This differs from an all-sector sample study that includes low-impact sectors, where ESG practices may be less material and under less stakeholder pressure. The findings from these sectors are also highly relevant to guide policymaking and investment decisions around sustainability. For instance, the Prime Minister's office released the Malaysian Green Technology Road Map (2019), capturing the Green Technology Plan of the Ministry of Energy, Green Technology and Water. The Master plan emphasises sector-specific strategies to achieve sustainability

goals and also encourages cross-sectoral collaborations across various crucial sectors.

Moreover, global investors are increasingly prioritising ESG and sustainability in high-impact sectors, as reported by the Global Sustainable Investment Alliance (2022). The focus of sampling the environmentally sensitive sectors aligns this study with both Malaysia's government policy direction and global investor interests. Thus, providing actionable insights into the value-creation implications of ESG practices and financial and agency risk exposures in Malaysia's environmentally critical sectors.

Also, given that the EMAS Index captures both the FTSE Bursa Malaysia Top 100 Index and the FTSE Bursa Malaysia Small Cap Index, it ensured a broader range of companies in the target population and sample of the study. With the consideration of a larger range of sampled companies operating in the Malaysian market, the study findings could be adjudged to support a more informed and precise decision-making. This is because a larger sample size ensures a more adequate representative perspective of the firms in the target population.

3.5.3 Sample Period

This study covers a five-year sample period from 2019 to 2023. The selected period is considered appropriate for addressing the research questions, which examine the relationship between ESG practices and value creation under varying risk conditions. This timeframe captures recent developments in ESG implementation and reporting, including increased regulatory attention, enhanced disclosure practices, and growing stakeholder scrutiny, thereby providing a relevant context for analysing firms' ESG practices and their value implications.

The period also encompasses significant economic and market disruptions, including the COVID-19 pandemic and subsequent recovery phase, which are particularly relevant for assessing how ESG practices interact with financial and agency-related risks in influencing value creation. This allows the study to observe ESG-related effects across both stressed and relatively stable market conditions, strengthening the robustness of the empirical analysis.

Methodologically, the five-year period is consistent with prior ESG studies that employed panel data to examine firm-level performance and value outcomes (Bukreeva

& Grishunin, 2023; Wu et al., 2022; Rahi, 2022). In addition, a five-year horizon provides sufficient longitudinal variation to detect meaningful changes in ESG practices and value creation metrics while minimising structural breaks associated with longer time spans. This is equally aligned with the traditional 5-year standardised period of summary financial results often adopted by publicly listed firms and multilateral organisations like the World Bank and OECD.

Overall, the chosen sample period is well-aligned with the study's objectives and provides an appropriate balance between data relevance, analytical robustness, and empirical comparability.

3.5.4 Final Sample

The final sample of this study comprises all listed firms operating in environmentally sensitive sectors on Bursa Malaysia over five years from 2019 to 2023. As presented in Table 3.1, the construction sector consists of eleven (11) firms, transport and logistics eleven (11) firms, property seventeen (17) firms, energy and utilities twenty (20) firms, and manufacturing one hundred and two (102) firms. This results in a total sample of one hundred and sixty-one (161) firms, yielding eight hundred and five (805) firm-year observations.

The selection of environmentally sensitive sectors is directly aligned with the research questions, which examine the effect of ESG practices on firm value creation and the moderating roles of financial risk and agency risk. Firms in these sectors face higher environmental exposure, stricter regulatory requirements, and stronger stakeholder expectations, which heighten the relevance of ESG practices and increase their potential impact on value creation outcomes. At the same time, these firms are more likely to encounter financial constraints and agency-related challenges when implementing ESG initiatives, making them appropriate for examining risk-based contingencies.

Unlike prior ESG panel studies in Malaysia and China that employed broad market samples without sectoral sensitivity (Ismail et al., 2019; Wu et al., 2022), this study adopts a sector-focused approach to enhance contextual precision. Similarly, while previous studies in developed markets concentrated primarily on industrial or

energy sectors (Bukreeva & Grishunin, 2023; Rahi, 2022), the present study extends the analysis to multiple environmentally sensitive sectors within an emerging market context. This sampling approach strengthens the study's ability to capture cross-sectoral variations in ESG practices and improves the robustness of conclusions regarding value creation under differing financial and agency risk conditions.

3.6 Sources of Data Collection

To collect pertinent, adequate, and trustworthy data that are required to meet study objectives, this study employed secondary sources of information. The researcher's rationale for employing secondary data approaches to empirically investigate the correlation between ESG practices and value creation was influenced by prior scholarly research on the subject matter. Boyer and Swink (2008), in their study, acknowledged the rapid increase in the availability of data collected by various entities such as corporations, government agencies, news agencies, and industry groups. They also highlight the expanding use of communication and information systems for data collection, which has opened up numerous research opportunities that utilise secondary data. Pre-existing secondary data might be obtained from a database or alternative sources. The data used in secondary research were not originally collected specifically for the researcher's study (Struwig & Stead, 2007).

Employing the use of secondary data in ESG panel data research, like the current study, has its associated benefits and drawbacks. Some of the advantages of secondary data collection include its convenience and accessibility, as information has already been gathered and does not require direct interaction with respondents. The data collected for ESG and value creation metrics by this study were already available at various information sources like the Bursa Malaysia website, the individual firms' websites, published annual reports and Refinitiv workspace. Additionally, secondary data collection is a cost-effective method of data collection, as earlier expressed by Boyer and Swink (2008).

Nevertheless, employing secondary data also entails a drawback, particularly that the data lacks the intentional design and collection to align with the researcher's unique objectives. This could potentially provide challenges for evaluating the reliability, validity, and utility of the data. (Zikmund et al., 2013). For example,

sustainability reports provided data on firms' policies and execution of ESG initiatives, but not the actual performance scores. As such, where such a performance score is not readily available, the researcher had to deploy a content analysis of the annual ESG report of the sampled firms.

Considering the sample size of one hundred and sixty-one (161) listed firms for over 5 years, the study collected data for eight hundred and five (805) observations across five sectors for the independent, dependent, moderating and control variables. Relevant data was sourced from the Refinitiv Eikon database (currently named LSEG Data & Analytics), and also from the annual reports and websites of the sampled companies under consideration. As presented below in Table 3.2, approximately 72% of the ESG data (independent variable) was sourced from the Refinitiv Eikon database, while the remaining 28% was sourced by content analysis of the sustainability and governance reports of the sampled firms using an adapted Refinitiv scoring methodology.

Table 3.2
ESG Data Collection

Data Source	**Number of Observations**
Content Analysis Data (2019-2020)	227
Refinitiv ESG Data (2019-2023)	578
Total Sampled Observations	**805**
Content Analysis ESG Data	28%
Refinitiv ESG Data	72%

3.6.1 Refinitiv Eikon

Refinitiv (formerly known as Thomson Reuters Asset4 ESG) is a prominent global provider of financial markets data and technology, catering to more than 40,000 institutional users in around 190 countries. It offers premier data and analysis, trading platforms, and open data and technology platforms that facilitate connections among a flourishing global financial markets community. It is owned by the London Stock Exchange Group (LSEG), alongside its FTSE Russell business. The Refinitiv Eikon's

data workspace offers substantial economic and financial data as well as information on environmental, social, and governance (ESG) parameters pertaining to sustainability indices across various capital markets, including firms listed on Bursa Malaysia. This positions Refinitiv Workspace as a suitable source of data for the current study, which contextualises publicly listed firms in the FTSE Bursa Malaysia EMAS Index. Prior scholars conducting investigations around ESG and sustainability have extensively utilised the Refinitiv workspace to access reliable data (Bodhanwala & Bodhanwala, 2023; Lee & Isa, 2023; Ma'in et al., 2022).

Relevant data required for proxies of the dependent variables (enterprise value multiple (EVM) and market value added (MVA), and weighted average cost of capital (WACC) for the moderating variable were all sourced from the Refinitiv Eikon workspace. Also, a substantial portion of the secondary data required for ESG practices (independent variable) was collected through Refinitiv Eikon workspace, which provides historical financial data and records various companies, including publicly listed corporations on the FTSE Bursa Malaysia EMAS Index for several years.

Sampled firms whose 2019 and 2020 ESG reports were not submitted to Refinitiv, leading to non-availability of score data, have been addressed by deploying a content analysis that was adapted after the Refinitiv Methodology 2023. This accounted for approximately 28% of the ESG data collected for the study. This initially posed a challenge, as it slowed down the data collection process. However, it was later overcome by employing a content analysis for those missing years, in a structured binary scoring process as extensively captured in section 3.7 (method of data collection) below. Beyond the content analysis, the study also conducted the Mann-Whitney U nonparametric test to ascertain if there was any significant difference between the ESG data from Refinitiv and that from the content analysis, as shown in section 3.8 (reliability and validity of data) below.

3.6.2 LSEG-Refinitiv ESG Criteria

The ESG Data Model developed by LSEG Refinitiv generates scores and indices that provide an unbiased assessment of ESG exposure and performance across various practices. The Refinitiv ESG scores are based on empirical data and consider the most

crucial industry indicators while minimising biases associated with firm size and transparency. The scores are determined by comparing the ESG practices (environmental and social) performance of the company with its sector and place of incorporation (governance). LSEG Refinitiv's approach evaluates companies' exposure to a comprehensive range of significant environmental, social, and governance issues.

These issues are grouped into ten (10) ESG categories and are supported by over one hundred and eighty-six (186) specific quantitative and qualitative thematic practices and indicators as depicted in Figure 3.1 (LSEG-Refinitiv ESG Data Model). The process captures and calculates various company-level ESG measures across different industries and sectors globally. The Refinitiv ESG criteria employ a "bottom-up" methodology to evaluate the level of environmental, social, and governance (ESG) concerns that companies encounter from their practices. The category scores are consolidated into three pillar scores, namely environmental, social, and governance ratings. A relative sum of the category weights, which vary per industry for the environmental and social categories, constitutes the ESG pillar score. Weights for the governance remain the same across all industries. The pillar weights are standardised to percentages running from 0 to 100. As shown below, the environmental pillar is grouped into three categories (resource use, emissions and innovation), while the social pillar and the governance pillar are grouped into four (workforce, human rights, community and product responsibility) and three (management, shareholders and CSR strategy) categories, respectively.

(Refinitiv Eikon, 2023)

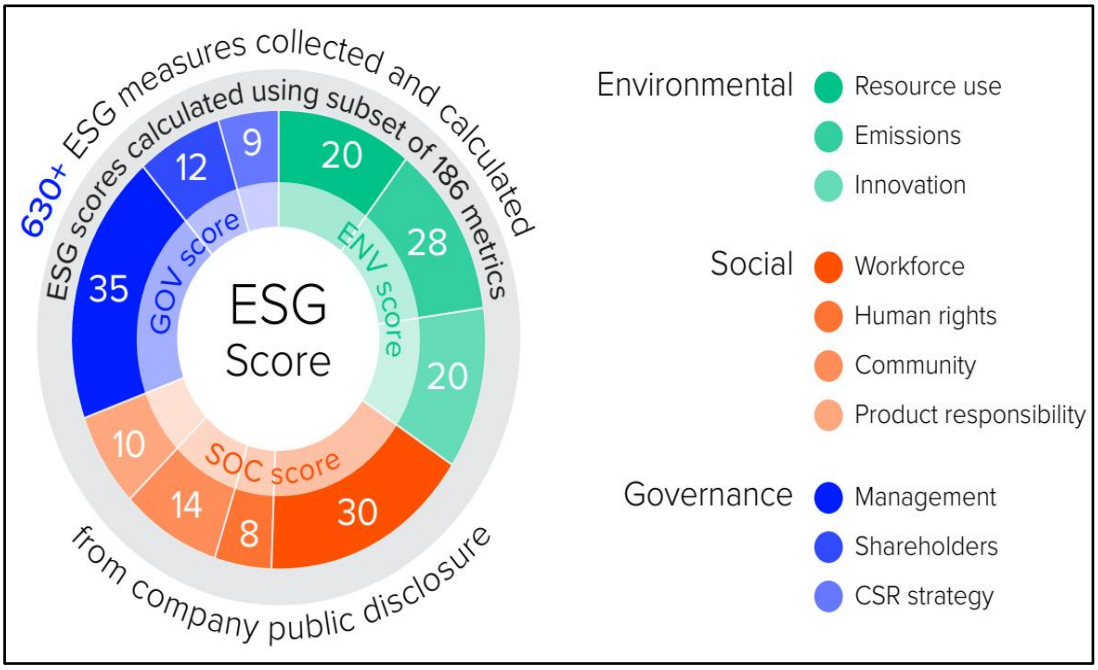

Figure 3.1 LSEG-Refinitiv ESG Data Model:

https://www.lseg.com/en/data-analytics/sustainable-finance/esg-scores#methodology

3.6.3 Annual Reports

A company's annual report is a formal document that summarises its operations and financial situation for the preceding year. The published annual reports were crucial as they served both as a principal source of data for some of the metrics and as a corroborative source for others. The corroborative confirmations were conducted to improve confidence in the data source and ensure there is consistency in the collected data. This is also a standard initial quality check in study data to ensure reliability and validity. As such, relevant data required for proxies of the control variable (Firm Size and Enterprise Growth) and Executive Compensation as part of the Moderating variable were collected from the published annual reports of the firms sampled for their respective financial years. These included data on total assets, total sales revenue, total employee compensation, total key management staff and board compensation.

The enterprise value multiple (EVM) and market value added (MVA), which represented proxies for value creation, were computed for corroborative purposes using the information that is obtainable from the annual report. Share price, number of ordinary shares, total shareholders' equity, debt, EBITDA (earnings before interest, tax, depreciation and amortisation), remuneration and sales revenue are just a few of the

details it offers. Data on share prices and market capitalisation can be obtained in the Board Chairman's Statement or the Summary Financial Performance sections. The section of the analysis of shareholders reveals the number of shares, with a table indicating the number of shares held by each shareholder. Total equity and total assets can be found in the statement of financial position, while sales and EBITDA information can be found in the statement of profit or loss.

The sustainability and governance sections of the annual reports provided a valuable source of information for the content analysis conducted by the study. It captured relevant data on the sampled firms' activities and policies around environmental, social and governance issues.

3.6.4 Summary of Data Collection Sources

Table 3.3, as presented below, maps each variable employed in the study to its precise data source. It shows data sources that were used as principal sources by the study and those used for corroborative confirmation of collected data.

Table 3.3
Data Collection Sources

Variable Name	**Data Source**
Enterprise Value Multiple (EVM)	Principal Source – Refinitiv Workspace Screener Corroborative Source – Annual Reports (Financial Position, Profit or Loss Statements)
Market value added (MVA)	Principal Source – Refinitiv Workspace (Market capitalisation) Principal Source – Annual Reports (Total Equity from Statement of Financial Position)
ESG Practices (ESGP)	Principal Source – Refinitiv Workspace (72%) Principal Source – Annual Reports: Sustainability and Governance Sections (28%, 2019 to 2020 for 113 firms)

Variable Name	Data Source
Environmental Practices (EP) Social Practices (SP) Governance Practices (GP)	Principal Source – Refinitiv Workspace (72%) Principal Source – Annual Reports: Sustainability and Governance Sections (28%, 2019 to 2020 for 113 firms)
Weighted Average Cost of Capital (WACC)	Principal Source – Refinitiv Workspace Screener
Executive Compensation (EC)	Principal Source – Annual Reports (Notes on Employee and Board Compensation)
Enterprise Growth (EGR)	Principal Source – Annual Reports (Total Sales from Profit or Loss Statement)
Firm Size (FSize)	Principal Source – Annual Reports (Total Assets from Statement of Financial Position)

3.7 Methods of Data Collection

A substantial portion of the secondary data (72%) required for ESG practices (independent variable) was collected through Refinitiv Eikon workspace database, while the remaining 28% was obtained through content analysis of firms' annual and sustainability reports. The study deployed content analysis to get ESG data for those observations in 2019 and 2020 that Refinitiv did not have published ESG scores, due to non-submission of required sustainability reports. The content analysis adapted the Refinitiv scoring methodology and made use of thematic practices provided in the Refinitiv scoring checklist. The adapted methodology employed a binary scoring system as used in the study of Sulaiman et al. (2024), which evaluated ESG practice among Malaysian public-listed construction companies using the FTSE Russell rating model. However, the current study went beyond the adapted FTSE Russell rating model to also employ the specific individual firms' weightings used by Refinitiv for the three pillars of ESG and their corresponding categorical sub-pillars.

The binary scoring system ensured that possible bias that could occur during the scoring process, resulting from subjectivity, is eliminated. This is because the thematic practices were assessed based on predefined objective indicators, using 1= available

and 0 = not available. As such, the scores assigned were based on thematic practices of information available on the companies' websites and published sustainability and governance reports. Furthermore, the weightings used for firms in each sector were taken from the same used by the Refinitiv scoring system, which ensured uniformity for all the collected ESG data.

3.7.1 Content Analysis

ESG scores were computed from a content analysis which assessed the company's ESG performance and practices based on verifiable reported data in the public domain from the firms' websites, annual reports, corporate governance reports and sustainability reports. The process involved manually reading through these reports for each year and scoring the thematic practices based on a binary scoring system. The content analysis methodology was adapted from Refinitiv Scoring Methodology 2023. As such, the ESG Pillars, sub-pillars (categories), and the thematic practices were all sourced from the Refinitiv Scoring Methodology. Similarly, the firms' specific weights for the ESG Pillars and sub-pillars (categories) that were combined with the thematic scores from the binary scoring were all obtained from the ESG section of the Refinitiv Workspace.

The adapted methodology captured and calculated over fifty-five (55) company-level ESG thematic practices and deployed a qualitative binary scoring for the content analysis. These thematic practices were grouped into ten (10) categories or sub-pillars, which reformulate the three pillar scores and the final ESG score. The final ESG score reflected the company's ESG performance, commitment and effectiveness on sustainability based on publicly reported information.

The category scores are rolled up into three pillar scores of environmental, social and governance. For example, as presented in Table 3.4, the Environmental pillar has three sub-pillars or categories (resource use, emission, and innovation). Resource use has seven thematic practices, emissions have eight thematic practices, while innovation has two thematic practices.

The binary scoring system employed assigned "1" if a company demonstrated implementation of each particular thematic practice or a "0" if otherwise. The total

thematic scores assigned to all the practices in a sub-pillar or category (for example, emission) are then used to compute its final category score. That is the category score is the sum of the binary scores for all thematic practices in that sub-pillar, divided by its sample size (total number of possible scores) of that category, and expressed as a percentage of 100. This same process was done for all the sub-pillars under the environmental pillar, likewise, the social pillar and the governance pillar.

After computing the final sub-pillar or category scores, the next step was to compute a weighted category weight, using the weightings obtained from the Refinitiv workspace, which is company/sector specific. This was calculated by dividing each category weight by the sum of the category weights of its respective pillar, expressed as a percentage (%). For example, dividing the given weighting of resource use by the sum of the given category weighting in the environmental pillar.

Then, the next step was to calculate ESG individual pillar scores by multiplying final sub-pillar or category scores by their weighted category weight and summing under each pillar. In other words, the pillar score is the sum of the product of the weighted category weights and the final category scores. For example, multiplying the final sub-pillar scores and the weighted category weight of resource use, emission, and innovation, and then summing them to compute the environmental pillar score.

This is followed by the weighted combined ESG score, which was then computed by taking the sum of the three (3) ESG pillar scores and their respective pillar weights as extracted from the Refinitiv workspace.

The category and the pillar weights are normalised to percentages ranging between 0 and 100, as computed by Refinitiv based on the magnitude weights of all ten (10) categories. This differed based on the sector or industry of the sampled firm under consideration. This, however, remained the same for governance practices across all industries and sectors.

The content analysis score card, which was adapted from the Refinitiv methodology score card, is shown below in Table 3.4, capturing the three (3) ESG pillars, which are grouped into ten (10) categories or sub-pillars and further grouped into over fifty-five (55) company-level ESG thematic practices.

Table 3.4
Content Analysis ESG Score Card

Pillar	Category	Thematic Practices
Environmental	**Resource Use**	Policy on Water Efficiency
		Policy Energy Efficiency
		Target Water Efficiency
		Environment Management Team
		Policy on Environmental Supply Chain
		Target Energy Efficiency
		Environmental Supply Chain Management
	Emissions	Policy Emissions
		Targets Emissions
		Biodiversity Impact Reduction
		Climate Change Risks Awareness
		e-Waste Reduction
		Environmental Restoration Initiatives
		Staff Transportation Impact Reduction
		Environmental Partnerships
	Innovation	Environmentally Friendly Products
		Sustainability Certifications
[redacted]		
Social	**Workforce**	Health & Safety Policy
		Training and Development Policy
		Diversity and Equal Opportunity Policy
		Employees' Health & Safety Team
		Day Care Services
		Flexible Working Hours
		Supplier ESG training
	Human Rights	Policy Freedom of Association
		Policy on Child Labour
		Policy Forced Labour
		Policy on Human Rights
		Human Rights in Supplier Sourcing
	Community	Policy Fair Competition
		Policy Bribery and Corruption
		Policy Business Ethics (PBE)
		Policy Community Involvement
		Business Ethics Improvement Tools
		Whistleblower Protection
		Corporate Responsibility Awards

	Product Responsibility	Policy Customer Health & Safety
		Policy Data Privacy
		Product Responsibility Monitoring
		Quality Management Systems
Governance	**Management**	Board Functions Policy
		Board Structure Policy
		Internal Audit Department Reporting
		Audit Committee Mgt. Independence
		Executive Compensation Policy
		Reports on Senior Executives' Compensation
	Shareholders	Shareholder Rights Policy
		Directors Elected by Majority Vote
		Shareholders Vote on Executive Pay
	CSR strategy	CSR Sustainability Committee
		Integrated Strategy in MD&A
		Stakeholder Engagement
		CSR Sustainability Reporting
		CSR Sustainability External Audit
		GRI Report Guidelines

Furthermore, the content analysis scoring procedure can be exemplified using an extract from EcoWorld's 2020 annual sustainability report, as depicted in Figure 3.2 below. Ecoworld is one of the firms in the property sector, sampled by this study.

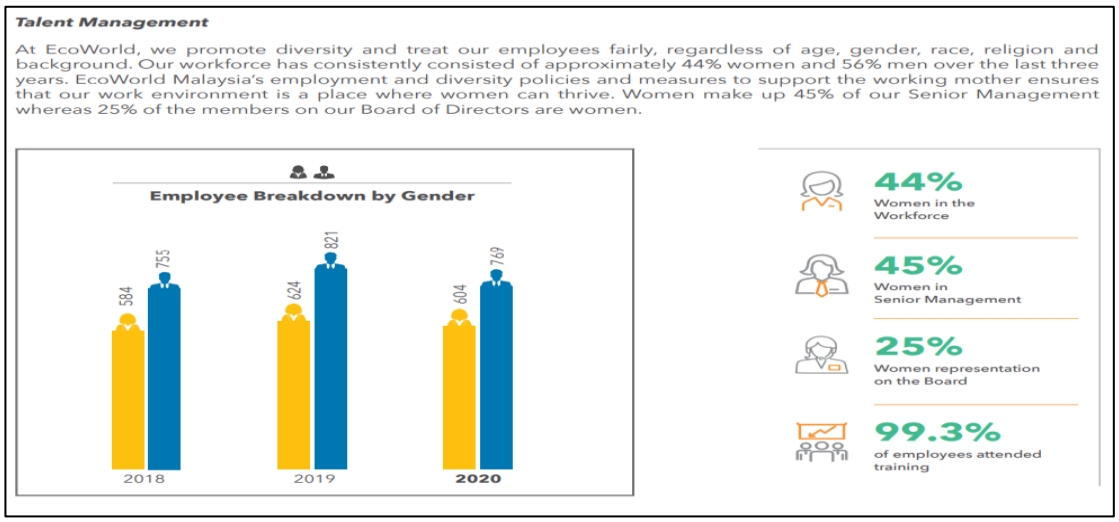

Figure 3.2 EcoWorld 2020 Sustainability Report Extract for Training, Diversity and Equal Opportunity.

In light of the above extract, using the content analysis score card and binary scoring procedure as shown in Tables 3.4 and 3.5, respectively, EcoWorld was assigned a score of 1 for employee training policy and 1 for diversity and equal opportunity. This is because the extract demonstrated implementation of these thematic practices under the category of workforce, which is a sub-pillar of social practices.

Table 3.5
Content Analysis Binary Scoring Procedure

Score	Description of Score
0	Thematic practice is not available
1	Thematic practice is implemented

3.8 Reliability and Validity

The information for both the combined ESG and the individual pillars' performance scores was substantially sourced from the Refinitiv Eikon database, which is renowned for gathering financial data from numerous businesses worldwide and is globally recognised, dependable, and trustworthy. The Refinitiv Eikon workspace is a widely used database by researchers, which provides both a comprehensive platform for the assessment of corporate performance and is among the most comprehensive and sought-after ESG databases, ranking companies covering various industries and sectors across the globe (Al-Hiyari et al., 2023; Bodhanwala & Bodhanwala, 2023; Signori et al., 2021).

The remaining approximately 28% of ESG data was obtained from content analysis, which also put in place necessary procedures to ensure the reliability and validity of the collected data. This included adapting and adopting Refinitiv methodology and weightings to ensure uniformity in all collected ESG data, deploying a binary scoring system at the thematic practice scoring level to reduce bias that could result from subjectivity, and making use of thematic practices provided in the Refinitiv scoring checklist, which has already passed through their rigorous expert review processes.

A substantial amount of data was also collected from the annual reports of the sampled firms. These annual reports are prepared by listed firms as required by law and equally audited by licensed external auditors before being published on the firms' websites or submitted to Bursa Malaysia as a regulator of publicly quoted companies. According to Field (2013), ESG scores have been demonstrated to have strong content validity and test-retest reliability, and they are normed for both domestic and foreign organisations. To support the reliability and validity of the collected data and models for this study, three diagnostic checks were performed to cut across the data, the variables and the models adopted. These included the test of normality of data, the multicollinearity test and the heteroscedasticity test.

The data diagnostics checked for the normality of the data gathered for the study. The normality of the data was examined using multivariate and univariate normality tests in the confirmatory factor analysis model prior to moving on to the measurement model. Such tests included the skewness test, the Kurtosis test and the Shapiro-Wilk test.

The variables' diagnostics checked for stationarity and collinearity of the variables by performing the augmented variance inflation factor (VIF) test. While the model diagnostics checked for heteroscedasticity using the Groupwise Wald test and Breusch- Pagan LM test for the fixed effect and the random effect regression models, respectively.

3.8.1 Validity Test for ESG Content Analysis

Further to the relevant procedures put in place to ensure the reliability and validity of the collected ESG data, as highlighted above, the study also conducted a time-stability check to ascertain whether differences are consistent across the sampled period. This was necessary as the content analysis only captured the ESG performance score for 2019 to 2020 of 113 firms, while 2021 to 2023 were all available on Refinitiv. As such, the study performed a Mean Difference test to investigate any significant difference between the Refinitiv and content analysis performance scores. Given that the skewness test, kurtosis test and Shapiro-Wilk test all pointed out that the study data are non-normally distributed, the researcher employed the Mann-Whitney U test.

The Mann-Whitney U test is a nonparametric test usually deployed for a non-normal distribution dataset used to determine the significant differences between independent variables (Refugio & Delmo, 2018). The Mann-Whitney U test is a non-parametric equivalent of the independent samples t-test. According to Nachar (2008), the Mann-Whitney U test can be used to address concerns around potential differences between two groups of independent variables in a non-normally distributed dataset. The test was initially proposed by Wilcoxon in 1945 to cater for two samples of the same size, but was jointly refined by Mann and Whitney in 1947 to cater for various sample sizes.

The test procedure categorised the ESG dataset for the 113 affected firms into two groups. That is, group 1 for content analysis (2019-2020) and group 2 for Refinitiv (2021-2022). This ensured an equal and even comparison period of 2 years each, giving a total of 452 sampled observations used for the Mann-Whitney U test of mean differences. The study employed IBM SPSS 27 to run the test and found the following results, as presented in Table 3.6 below.

Table 3.6
The Mann-Whitney U Test Result

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of ESGP is the same across categories of CA/Refinitiv.	Independent-Samples Mann-Whitney U Test	0.348	Retain the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

Independent-Samples Mann-Whitney U Test Summary	
ESGP across CA/Refinitiv	
Total N (Sample Size)	452
Mann-Whitney U	26840.000
Wilcoxon W	52491.000
Test Statistic	26840.000
Standard Error	1388.567
Standardised Test Statistic (Z)	0.938
Asymptotic Sig. P-value (2-sided test)	0.348

The results, as shown in Table 3.6 above, revealed a U value of 26,840 and a p-value of 0.348, which is much greater than 0.05 and fails to reject the null hypothesis. Thus, there is no significant difference between ESG scores derived from content analysis (2019-2020) and Refinitiv (2021-2022). It connotes that both the ESG scores from content analysis and Refinitiv are statistically similar in distribution. Furthermore, the Z-score of 0.938, which is close to 0, shows a negligible size effect, equally supporting the validity of combining both the content analysis and Refinitiv ESG data sources for the longitudinal panel data analysis of the study.

3.9 Study Variables and Model Specification

3.9.1 Variables of the Study

A variable, as defined by the American Psychological Association (2018), is a condition in an experiment that can assume different categories or values and which can be quantified or measured. The variables deployed for the study were grouped into independent, dependent, moderating and control variables.

3.9.1.1 Dependent Variables

Dependent variables are observable and quantifiable variables anticipated to indicate the effect of the intervention implemented in an experiment or empirical investigation. The variables are the outcome factors that assess the impact of independent variables resulting from an occurrence or change (American Psychological Association, 2018). This study adopted value creation as the dependent variable, which is proxied by enterprise value multiple (EVM) and market value added (MVA). The study prioritised EVM and MVA over traditional accounting measures like ROA, ROI and Tobin's Q, as they are popular metrics often used for corporate valuation and capital market research, which are more long-term focused and less subject to accounting manipulations or adjustments (Damodaran, 2024; McKinsey & Company, 2022).

Enterprise Value Multiple (EVM): Enterprise value can also be referred to as corporate value, as it is a precise representation of a firm's intrinsic value. According to Bradburd and Richards (2013) and Gorenak and Košir (2012), enterprise value is an

economic metric that represents the whole value of a corporation and goes beyond the market capitalisation value. The aggregate consists of the claims of all security holders, including debt holders, preferred shareholders, minority shareholders, ordinary equity holders, and other parties. A firm's enterprise value can be expressed as a multiple of sales revenue or as a multiple of EBITDA (earnings before interest, tax, depreciation and amortisation)

Market Value Added (MVA): Market value added (MVA) may be described as an external or market measurement of a firm's performance, which assesses a firm's value and, by extension, value created for key stakeholders (Kaczmarek, 2018). According to Brigham and Houston (2010), it can be said to reflect the difference between the market value of the shares held by the company and the book value of stock that a shareholder has invested in the firm. Corporate managers can be inferred to create shareholder wealth when market value added is positive (MVA > 0); inversely, when MVA is negative (MVA < 0), it suggests an erosion in shareholders' capital value.

3.9.1.2 Independent Variables

An independent variable is a variable in an empirical investigation that is deliberately modified or observed before the dependent variable, or outcome variable, to evaluate its effect or influence on the dependent variable. Independent variables may or may not exhibit a causal relationship with the dependent variable (American Psychological Association, 2018). ESG practices represent the independent variable and are proxied by the individual pillars of environmental practice metrics, social practice metrics and governance practice metrics, and also by the combined ESG practice performance score.

ESG Practices (Environmental, Social, and Governance): ESG practices are based on a wide range of activities of the firm to enhance corporate sustainability in and around the organisation. They are categorised under the environmental, social and governance activities and practices as captured in Bursa Malaysia Sustainability Reporting Guide (2015). The "E" in the ESG acronym, according to Ting et al. (2019), represents the environmental practices, which encompass activities relating to waste management, pollution, climate change, insufficient water resources, and energy efficiency. While social practices are symbolised by the letter "S" in ESG and

encompass aspects of working conditions, human rights, interactions with the community, and health and safety. Finally, the letter "G" in the ESG acronym stands for a collection of guidelines, procedures, and regulations pertaining to the corporate governance of the firm.

3.9.1.3 Moderating Variables

A moderating variable is a variable that impacts the intensity and direction of the association between two variables. According to the American Psychological Association (2018), the moderating effect is the influence of a third variable that alters the relationship between a predictor and an outcome, as observed mostly in multiple regression studies. Financial risk and agency risk are distinctively deployed as the moderating variables to investigate the association between ESG practices and value creation. These were respectively proxied by the weighted average cost of capital and executive compensation.

Weighted Average Cost of Capital (WACC): The WACC, or cost of capital, is the aggregate amount of a firm's capital utilised in the ratio of debt to equity. It is regarded as one of the crucial considerations in business decision-making and corporate valuation (Battisti et al., 2020). WACC is also a key indicator of a firm's capital structure, which reflects the financing mix of the sources of funds, and its complexity is one of the most highly contested subjects in the corporate finance literature (Khan et al., 2020).

Executive Compensation (EC)*:* According to Windsor (2017), executive compensation is the price a business pays to the top management and executives for their labour or in exchange for their services. Chung et al. (2015) postulated that there exists a negative correlation between excessive executive compensation and corporate performance and value. However, this correlation can be mitigated through voluntary disclosure of compensation-related and financial data. Similarly, Wang and Huang (2006, cited in Zhu et al., 2020) found an inverse U-shaped association between executives' equity incentives and firm value.

3.9.1.4 Control Variables

A control variable is a variable that has been observed to impact the response measure in an experimental process, although it is not of primary concern to the researcher (American Psychological Association, 2018). Two firm-specific control variables, namely enterprise growth and firm size, were employed in the testing and interpretation of the collected data for the study.

Enterprise Growth (EGR)*:* Enterprise growth can be described as a change in the level or development process of an enterprise from one stage to another. It embodies an increase or enhancement in quantity and quality of the enterprise scale, such as sales volumes, market share, and technology efficiency (Mao, 2009). High-growth enterprises typically enjoy a significant market share and little competition. According to Margaritis and Psillaki (2010), enterprise growth can significantly enhance corporate performance and value. However, the risk of investment failure is higher when a company is growing quickly, which could, in turn, destroy corporate value.

Firm Size (FSize)*:* The firm size of an organisation is measured by taking the logarithm of its total assets. It is a popular variable that has been deployed in considering a company's size as a control variable by past studies around ESG and corporate value (Lee & Isa, 2020; Wu et al., 2022; Zheng et. al, 2023). According to Hillman and Keim (2001), large firms could have better profitability, which might have been influenced by the level of stakeholder expectations and concerns pertaining to socially responsible activities.

Summarised definition and measurements of dependent, independent, moderating and control variables employed in the study are shown in Table 3.7 below.

Table 3.7
Description of Variables

Variable Name	Variable Type	Measurement	Source
Enterprise Value Multiple (EVM)	Dependent Variable	*EVM = Enterprise Value (EV) divided by EBITDA.* (EV= Market value + Debt – Cash & Cash equivalent)	CFA Institute (2023); Ammirati (2022); Kennon (2021)

Variable Name	Variable Type	Measurement	Source
Market value added (MVA)	Dependent Variable	*MVA=Total Market Value of Equity – Total Book Value of Equity.* 1=Positive, -1=Negative	Hall (2023); Udiyana et al. (2022); Siburian and Yohanes (2019)
ESG Practices	Independent Variable	*Content analysis based on the FTSE Bursa Malaysia EMAS Index Rating from Refinitiv Eikon Workspace.*	Ma'in et al. (2022); Lee and Isa (2023)
▪ Environmental Practices ▪ Social Practices ▪ Governance Practices	Independent Variable	*Content analysis based on the FTSE Bursa Malaysia EMAS Index Rating from Refinitiv Eikon Workspace.*	Ma'in et al. (2022); Lee and Isa (2023)
Weighted Average Cost of Capital (WACC)	Moderating Variable	*WACC=Weighted Cost of Debt + Weighted Cost of Equity.*	Battisti et al. (2020); Mohamad (2020)
Executive Compensation (EC)	Moderating Variable	*C-suite and Board Pay ÷ Total Employee Compensation*	Wole (2021)
Enterprise Growth (EGR)	Control Variable	*EGR=(Current year sales – previous year sales) ÷ previous year sales*	Wu et al. (2022)
Firm Size (FSize)	Control Variable	*Natural Logarithm of Total Assets*	Zheng et al. (2023)

3.9.2 Mathematical Model Specification

To empirically investigate the impact of ESG practices on value creation and the moderating roles of financial risk and agency risk for Malaysian listed companies,

the study specified four groups of econometric models, formulated in line with the hypothesis. To achieve appropriate model formulation and observation of the relationship between the variables, a modified version of the panel data regression analysis model of $\mathbf{Y_{it} = \beta_0 + \beta_{it} + e_{it}}$ was employed. This study modifies similar models applied in past studies of Al-Hiyari et al. (2023), Dkhili (2023) and Wu et al. (2022).

In line with these previous studies and the current study objectives, the functional form of the model has been created for the two measures of enterprise value multiple (EVM) and market value added (MVA) of value creation and the moderating effects of the financial risk and agency risk. Consequently, the four main groups of mathematical models have been formulated in conjunction with the study hypothesis, as follows.

H_1: ESG Practices have a significant effect on the value creation of firms.

$VC_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it}$ …… *(Model 1)*

The model 1 equation is subsequently broken into two sub-models reflecting the specific value creation metrics adopted for the study:

$EVM_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it}$ …… *($Model_{1.1}$)*

$MVA_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it}$ …… *($Model_{1.2}$)*

H_2: ESG Components (Environmental, Social, Governance) Practices have a significant effect on the value creation of firms.

$VC_{it} = \beta_0 + \beta_1 EP_{it} + \beta_2 SP_{it} + \beta_3 GP_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it}$ …… *(Model 2)*

The model 2 equation was subsequently broken into sub-models reflecting the individual components and the separate specific value creation metrics, namely, enterprise value multiple (EVM) and market value added (MVA), for the study:

$EVM_{it} = \beta_0 + \beta_1 EP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it}$ …… *($Model_{2.1a}$)*

$EVM_{it} = \beta_0 + \beta_1 SP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it}$ …… *($Model_{2.1b}$)*

$EVM_{it} = \beta_0 + \beta_1 GP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it}$ …… *($Model_{2.1b}$)*

$$MVA_{it} = \beta_0 + \beta_1 EP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it} \ldots\ldots\ldots\ldots\ldots\ldots \text{ (Model}_{2.2a}\text{)}$$

$$MVA_{it} = \beta_0 + \beta_1 SP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it} \ldots\ldots\ldots\ldots\ldots\ldots \text{ (Model}_{2.2b}\text{)}$$

$$MVA_{it} = \beta_0 + \beta_1 GP_{it} + \beta_2 EGR_{it} + \beta_3 FSize_{it} + e_{it} \ldots\ldots\ldots\ldots\ldots\ldots \text{ (Model}_{2.2b}\text{)}$$

H_3: Financial risk moderates the relationship between ESG practices, ESG components practices and value creation.

ESG Practices and Financial Risk Interactions:

$$VC_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 WACC_{it} + \beta_3 ESGP_{it} \times WACC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots \text{(Model 3)}$$

The model 3 equation was subsequently broken into sub-equation groups, each corresponding to specific value creation metrics adopted by the study:

$$EVM_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 WACC_{it} + \beta_3 ESGP_{it} \times WACC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots. \text{(Model}_{3.1}\text{)}$$

$$MVA_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 WACC_{it} + \beta_3 ESGP_{it} \times WACC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots. \text{(Model}_{3.2}\text{)}$$

ESG Component Practices and Financial Risk Interactions:

$$VC_{it} = \beta_0 + \beta_1 EP_{it} + \beta_2 SP_{it} + \beta_3 GP_{it} + \beta_4 WACC_{it} + \beta_5 EP_{it} \times WACC_{it} + \beta_6 SP_{it} \times WACC_{it} + \beta_7 GP_{it} \times WACC_{it} + \beta_8 EGR_{it} + \beta_9 FSize_{it} + e_{it} \ldots\ldots\ldots\ldots\ldots\

(Model$_{4.1c}$)

$MVA_{iit} = \beta_0 + \beta_1 EP_{it} + \beta_2 WACC_{it} + \beta_3 EP_{it} \times WACC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots$ *(Model$_{4.1a}$)*

$MVA_{iit} = \beta_0 + \beta_2 SP_{it} + \beta_2 WACC_{it} + \beta_3 SP_{it} \times WACC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots$ *(Model$_{4.1b}$)*

$MVA_{iit} = \beta_0 + \beta_2 GP_{it} + \beta_2 WACC_{it} + \beta_3 GP_{it} \times WACC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots$ *(Model$_{4.1c}$)*

H_4: Agency risk moderates the relationship between ESG practices, ESG components practices and value creation.

ESG Practices and Agency Risk Interactions:

$VC_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 EC_{it} + \beta_3 ESGP_{it} \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots$*(Model 5)*

The model 5 equation was subsequently broken into sub-equation groups, each corresponding to specific value creation metrics adopted by the study:

$EVM_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 EC_{it} + \beta_3 ESG_{it}P \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots$ *(Model$_{5.1}$)*

$MVA_{it} = \beta_0 + \beta_1 ESGP_{it} + \beta_2 EC_{it} + \beta_3 ESGP_{it} \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots$ *(Model$_{5.2}$)*

ESG Component Practices and Agency Risk Interactions:

$VC_{it} = \beta_0 + \beta_1 EP_{it} + \beta_2 SP_{it} + \beta_3 GP_{it} + \beta_4 EC_{it} + \beta_5 EP_{it} \times EC_{it} + \beta_6 SP_{it} \times EC_{it} + \beta_7 GP_{it} \times EC_{it} + \beta_8 EGR_{it} + \beta_9 FSize_{it} + e_{it} \ldots\ldots\ldots\ldots$ *(Model 6)*

The model 6 equation was subsequently broken into sub-models reflecting the individual components' interaction effect and the separate specific value creation metrics, enterprise value multiple (EVM) and market value added (MVA) for the study:

$EVM_{it} = \beta_0 + \beta_1 EP_{it} + \beta_2 EC_{it} + \beta_3 EP_{it} \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots$

(Model$_{6.1a}$)

$$EVM_{it} = \beta_0 + \beta_2 SP_{it} + \beta_2 EC_{it} + \beta_3 SP_{it} \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots\ldots \text{(Model}_{6.1b}\text{)}$$

$$EVM_{it} = \beta_0 + \beta_2 GP_{it} + \beta_2 EC_{it} + \beta_3 GP_{it} \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots\ldots$$

(Model$_{6.1c}$)

$$MVA_{iit} = \beta_0 + \beta_1 EP_{it} + \beta_2 EC_{it} + \beta_3 EP_{it} \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots\ldots$$

(Model$_{6.1a}$)

$$MVA_{iit} = \beta_0 + \beta_2 SP_{it} + \beta_2 EC_{it} + \beta_3 SP_{it} \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots\ldots$$

(Model$_{6.1b}$)

$$MVA_{iit} = \beta_0 + \beta_2 GP_{it} + \beta_2 EC_{it} + \beta_3 GP_{it} \times EC_{it} + \beta_4 EGR_{it} + \beta_5 FSize_{it} + e_{it} \ldots\ldots\ldots$$

(Model$_{6.1c}$)

Where:

VC = Value Creation

EVM = Enterprise Value Multiple

MVA = Market Value Added

ESGP = Environmental, Social and Governance Practices

EP = Environmental Practices

SP = Social Practices

GP = Governance Practices

WACC = Weighted Average Cost of Capital

EC = Executive Compensation

EGR = Enterprise Growth (EGR)

FSize = Firm Size

β_0 = Constant

$\beta_1 \ldots\ldots \beta_9$ = Coefficient to be estimated, where $\beta_1 \ldots\ldots \beta_9 > 0$

it = Cross-section of listed companies at a time variant

e = error terms

Furthermore, as applied in the results and findings section (chapter four) of this study, the formulated mathematical models were also referred to as:

Model 1	Model $_{1.1}$	EVM $_{ESGP}$
	Model $_{1.2}$	MVA $_{ESGP}$
Model 2	Model $_{2.1a}$	EVM $_{EP}$
	Model $_{2.1b}$	EVM $_{SP}$
	Model $_{2.1c}$	EVM $_{GP}$
	Model $_{2.2a}$	MVA $_{EP}$
	Model $_{2.2b}$	MVA $_{SP}$
	Model $_{2.2c}$	MVA $_{GP}$
Model 3	Model $_{3.1}$	$EVM_{ESGP*FR}$
	Model $_{3.2}$	$MVA_{ESGP*FR}$
Model 4	Model $_{4.1a}$	EVM_{EP*FR}
	Model $_{4.1b}$	EVM_{SP*FR}
	Model $_{4.1c}$	EVM_{GP*FR}
	Model $_{4.2a}$	MVA_{EP*FR}
	Model $_{4.2b}$	MVA_{SP*FR}
	Model $_{4.2c}$	MVA_{GP*FR}
Model 5	Model $_{5.1}$	EVM $_{ESGP*AR}$
	Model $_{5.2}$	MVA $_{ESGP*AR}$
Model 6	Model $_{6.1a}$	EVM $_{EP*AR}$
	Model $_{6.1b}$	EVM $_{SP*AR}$
	Model $_{6.1c}$	EVM $_{GP*AR}$
	Model $_{6.2a}$	MVA $_{EP*AR}$
	Model $_{6.2b}$	MVA $_{SP*AR}$
	Model $_{6.2c}$	MVA $_{GP*AR}$

3.10 Procedure for Data Analysis

The data analysis procedure of this study captures the step-by-step process undertaken in testing, analysing and interpreting collected data, and then drawing appropriate conclusions from the findings obtained. The study collected five years of cross-sectional annual observations between the period 2019 to 2023 for 161 sample firms across five sectors. The secondary data collected for the dependent and independent variables was examined using descriptive summary statistics, descriptive trend yearly analysis, descriptive sectorial average analysis, correlation analysis, panel regression, and post-regression diagnostic test on variables using statistical software

Stata 14.2. The procedure followed a chronological process as discussed below.

3.10.1 Descriptive Summary Statistics

The data analysis procedure commenced with computing summary statistics indices for the 805 observations collected for each of the variables under consideration. The indices computed included the mean, median, minimum, maximum and standard deviation. The summary statistics were used to better understand the structure and attributes of the collected dataset. It also assisted with the ascertainment of the data diagnostic check for normality, whether the data collected contained tails and outliers, by deploying the skewness, kurtosis and Shapiro-Wilk tests.

The mean score revealed the average observations of the data set in each variable type, while the median revealed the middle observations when the data set was arranged from the lowest to the highest observation. The minimum showed the lowest observation, while the maximum observation showed the highest observation. The standard observation showed the level of dispersion from the mean observations. A high deviation or function, where there exists a huge gap between the highest and lowest observations, could indicate signs of outliers in the dataset collected. Outliers are extreme observations within a data set which are too high or too low from the general data pattern and may distort the dataset's information flow (Wada, 2020).

3.10.2 Descriptive Yearly Trend Analysis

After the summary statistics, a descriptive yearly trend analysis was conducted with the dataset. This data analysis procedural step helped to reveal the yearly trend and movements of the observations in each variable type. The process computed the yearly trend of the observations of the study variables and analysed them into 5 groupings. They were grouped into independent variable 1 (ESG), independent variable 2 (ESG Components), dependent variables (EVM and MVA), moderating variables (WACC and EC) and control variables (FSize and EGR).

The year-on-year movement in the ESG observations and the value creation proxies observations assisted in corroborative interpretations of the results obtained

from the test hypotheses. Similarly, the yearly trend analysis of the moderating variables assisted in the corroborative interpretations of the moderating effects of the financial risk and agency risk on ESG practices and value creation. The yearly movement pattern in the ESG components revealed which of the ESG pillars was relatively performing better on a year-on-year basis, and which pillar is equally substantially driving the overall combined ESG performance scores.

3.10.3 Descriptive Sectoral Average Analysis

This study went further to perform a descriptive sectoral average analysis to ascertain the sectoral characteristics and behaviour traits of the sampled firms' ESG practices, value creation metrics and financial and agency risk exposures. Similar to the trend analysis, the process computed the sectoral averages of the observations of the study variables and analysed them into 5 groupings. These groupings included independent variable 1 (ESG), independent variable 2 (ESG Components), dependent variables (EVM and MVA), moderating variables (WACC and EC) and control variables (FSize and EGR).

The ESG sectoral averages revealed which of the environmentally sensitive sectors was performing best with respect to sustainability drives and practices in the Malaysian business environment. The ESG component practices sectorial averages revealed how the sectors were performing relative to each other in their respective pillars. It showed their specific pillars of ESG competitive competence and weaknesses, which could be of interest to the executive management in their corporate decision-making and strategic planning. The analysis of the sectoral value creation proxies revealed the sectors that were performing better in creating value relative to the other sectors. The analysis of the sectoral, financial risk and agency risk proxies revealed sectors that were exposed to more risk due to top executive management decisions and actions.

3.10.4 Cluster Analysis

Following the descriptive sectoral analysis, the study carried out a cluster

analysis of the dataset. The cluster analysis was conducted to identify the different groups of firms' observations in the dataset collected based on their ESG practices performance and distinct value creation patterns. Moreover, the analysis facilitated the examination of financial and agency risk exposures of the different firms' grouping based on their ESG performances and value creation indices. Consequently, the study deployed two popular clustering techniques, that is, the hierarchical method and the k-means method. Both techniques were crucial as one was used initially to determine the appropriate number of clusters for the collected dataset, while the other was used to group the dataset into the various clusters restricted to the determined number of clusters.

The hierarchical method was used to perform the cluster ranking in order to determine the appropriate number of clusters relevant to the study dataset. This was then followed by the k-Means clustering method, which was used to group the dataset into identifiable clusters, capturing observations with similar traits and patterns, to support better interpretation and comprehension of the hypothesis testing results. The clustering of the dataset was conducted in three separate analyses under the themes of ESG and value creation clustering, ESG and risk clustering, and finally, value creation and risk clustering.

3.10.5 Data Diagnostics - Normality Test of Residuals

The next step following the cluster analysis was conducting the data diagnostics. Given that the study dealt with considerable cross-sectional data from 161 firms over 5 years across five sectors, it was necessary to check the distribution pattern of the collected dataset. This helped to ascertain whether the data distribution pattern was a normal or a non-normal distribution. The study performed three statistical checks by computing and analysing the skewness, kurtosis and Shapiro-Wilk test values for each of the variable measurements.

The process revealed a non-normal distribution pattern in the collected dataset for all the variables, with the exception of market value added (MVA). This corroborated some of the outliers observed during the analysis of the descriptive summary statistics for the minimum and maximum observed values. However, this did

not pose an issue on the significance test and confidence level of the regression outcomes, given the considerably large size of 805 sampled observations. A more cautious perspective in research would deem sample sizes of over 250 or 300 as sufficiently large enough to necessitate effective size estimates for practical significance in addition to statistical significance (Khalilzadeh & Tasci, 2017; Memon et al., 2020).

Furthermore, the study considered logarithmic data transformation of the variables. However, this did not lead to any consequential change in the regression predictors or outcomes. This aligns with the arguments of Cohen et al. (2002), which postulated that, where the research data distribution contravenes the normality assumption, it does not necessarily induce bias in the estimation of regression coefficients and also does not influence significance tests and confidence intervals when the sample the study sample is large enough. Their postulation has been supported by subsequent studies. In fact, the assumption of normality generally barely influences the regression estimators and the outcomes of significance tests (Gelman et al. 2020; Wooldridge, 2018).

The outcome from the normality tests guided the choice of an appropriate correlation analysis technique as captured in section 3.10.6 below. It equally instigated further diagnostic tests like the multicollinearity test and the heteroskedasticity test, and ultimately the use of robust regressions by the study to correct any inference on F-tests, p-values, and confidence intervals.

3.10.6 Correlation Analysis

The next step that followed the determination of the data set distribution pattern was the computation of the correlation matrix and its analysis. The correlation matrix was used to investigate the degree of association between the variables. This assisted in the corroborative interpretations of the results obtained from testing the hypotheses of the formulated mathematical models. The study employed the use of the Spearman rank correlation Matrix.

The Spearman rank correlation analysis was deemed appropriate for use to assess the relationship between the study variables, which are all continuous variables except for market value added (MVA), which is a nominal binary variable (with values

of either -1 or 1). The choice of the Spearman rank correlation matrix is because the data diagnostics revealed a non-normal distribution and the presence of some outliers in the dataset. This aligned with the argument of Schober et al. (2018), which recommended that to properly measure a monotonic association between two variables, a Spearman rank correlation matrix can be deployed to ordinal data, non-normally distributed continuous data, or data that has substantial outliers.

The use of the Spearman rank correlation coefficient averted any possible misspecification that could lead to inappropriate results regarding the degree of association between the dependent and independent variables. It was also appropriate to separately observe the monotonic relationship between each dependent variable and an independent variable at a time. That is to ascertain whether an increase in any of the independent variables under consideration will lead to an increase or a decrease in one of the dependent variables, and vice versa.

3.10.7 Variable Diagnostics - Multicollinearity Test

After the correlation analysis, the next step was to perform a variable diagnostic. The variable diagnostic was intended to check the presence of any multicollinearity in the formulated models before choosing appropriate regression models for the study. Multicollinearity signifies an occurrence wherein two or more explanatory variables in a multiple regression model exhibit interrelationships with one another and also with the response variable (Akinwande et al., 2015). A variance inflation factor (VIF) was employed as a diagnostic of the variables to check for multicollinearity problems. Variance inflation factors assess the increase in the variances of the parameter estimations caused by collinearity among the predictor or independent variables. It was necessary to check if any two independent variables are highly correlated with each other, which could inflate standard errors in the regression coefficients and lead to unreliable estimates.

To execute this check, a pooled panel regression was initially conducted using Stata 14.2, then followed by a variance inflation factor (VIF) test, to investigate how the independent variables affect each other, and how they equally affect the dependent, moderating and control variables. Variance inflation factor (VIF) tests were performed

separately for the two distinct groups of independent variables: ESG Practices and ESG component practices. This distinction was essential because the formulated mathematical models were organised into these two categories of independent variables, and no model incorporated both ESG Practices and ESG component practices within a single equation. Conducting separate tests ensured the mitigation of potential false multicollinearity issues, thereby safeguarding the integrity of the variable diagnostics performed. Combining both highly correlated independent variables showed a very high multicollinearity, which did not reflect the practicality of the formulated mathematical models used in the analysis of the study dataset.

3.10.8 Model Diagnostics - Pooled OLS, Fixed Effect and Random Effect

The next step that followed the variable diagnostics was conducting a model diagnostic to ascertain which regression models or techniques are more appropriate for use in testing the study hypotheses. As a result, longitudinal panel regression analysis was also performed for the pooled ordinary least squares (OLS), fixed effect and random effect regression models. This was performed for each of the formulated mathematical models using the Hausman specification test and the Breusch Pagan test.

The Hausman specification test was used to decide whether the fixed effect model or the random effect model should be chosen, while the optimal pooled OLS model or the random effect model for the study was determined using the Breusch Pagan test. The process was carried out in Stata 14.2, such that, firstly, a panel regression model was carried out using the fixed effect model and the random effect model. This was then followed by conducting the Hausman test, and finally, the Breusch-Pagan LM test was conducted before the appropriate regression model was chosen. The model diagnostics ensured the correct regression modelling technique was adopted and appropriate results reflecting the realities of the data set could be obtained and interpreted.

3.10.9 Post-Model Diagnostics - Test for Heteroskedasticity

After choosing the appropriate regression modelling techniques, the next step

taken was to conduct a post-model diagnosis check. Consequently, a heteroskedasticity test was performed for each of the formulated mathematical models in their appropriate specified regression technique. The heteroskedasticity test is designed to investigate whether there is any systematic change in the spread of the residuals over the range of the eight hundred and five (805) observations collected for each variable. To check for heteroskedasticity, the Breusch-Pagan test of heteroskedasticity and the Groupwise Wald test were conducted on the appropriate regression models chosen earlier from the model diagnostics. The Breusch-Pagan test was employed for the random effect models, while the Groupwise Wald test was employed for the fixed effect models.

The presence of a heteroskedasticity problem was revealed in the models, given that there was a systematic change in the spread of the residuals of the observed parametric measures. This could be a result of a few extreme values in the data set collected, as corroborated by the summary statistics results presented. To address this problem, the study employed the use of robust regression models as adopted by several past studies (Aboud & Diab, 2018; Al-Hiyari et al., 2023; Bodhanwala & Bodhanwala, 2023; Tampakoudis et al., 2021). Consequently, the appropriate regression models chosen earlier were robust with standard errors.

3.10.10 Robust Regression and Hypothesis Testing

The study, after establishing the appropriate regression models and also the need to robustify them, performed the final step in the data analysis procedure, which involved conducting the robust regressions using Stata 14.2, testing the hypotheses, analysing them and drawing appropriate conclusions. During the robust regression process, the presence of fixed effects in the Model MVA_{ESGP}, Model EVM_{GP}, Model MVA_{SP}, Model $MVA_{ESGP*FR}$, Model EVM_{GP*FR}, Model MVA_{SP*FR}, Model $MVA_{ESGP*AR}$, Model EVM_{SP*AR}, Model MVA_{EP*AR}, and Model MVA_{SP*AR} adversely impacted the standard errors, hence compromising the model's fit to the obtained sample data. As a result, the study utilised a robust least squares dummy variable (LSDV) regression technique to get optimal and well-fitted findings for the dataset, as demonstrated in previous research (Amil et al. 2023; Appiah et al. 2020; Orazalin & Mahmood, 2020). Appiah et al. (2020) asserted that the least squares dummy variable

regression technique presumes the individual effect of the residuals remains constant over time within each cross-section, whereas the fixed effect regression model is essential for analysing cross-sectional heterogeneity in the dataset. Consequently, individual heterogeneity can be elucidated by the LSDV regression model employing dummy variables.

3.11 Ethical Considerations

The conduct of this study adhered strictly to the ethical guidelines prescribed by Universiti Teknologi MARA (UiTM) Research Ethics. As the study relied exclusively on secondary data obtained from publicly available sources, an exemption from full ethical review approval was formally sought and granted by the UiTM Ethics Committee in accordance with standard operating procedures (Approval Reference: FERC (R)/AC/08/2024). The use of secondary data eliminated direct ethical risks related to human subjects, such as informed consent, confidentiality, or participant harm.

Notwithstanding the exemption, ethical rigour was maintained throughout the research process. All data sources were transparently acknowledged and appropriately cited to prevent plagiarism and misrepresentation. The ESG data were sourced from Refinitiv Workspace, while financial and market data were obtained from audited annual reports, company websites, and official records published by Bursa Malaysia. These sources are widely recognised for their reliability, credibility, and suitability for academic research, thereby ensuring data integrity and authenticity.

Potential conflicts of interest were also carefully considered and mitigated. The researcher has no financial, professional, or personal relationships with any of the sampled firms, regulatory bodies, or data providers that could influence the objectivity of the study. The selection of firms, variables, and analytical methods was guided solely by theoretical relevance and research objectives, rather than by any vested interest. To further minimise bias, the study applied consistent data collection procedures, objective proxy measurements, and established econometric techniques across all sampled firms and periods.

In addition, the interpretation and reporting of findings were conducted with academic neutrality. Both significant and insignificant results were reported

transparently, without selective emphasis or data manipulation to support preconceived expectations. The study also avoided the misuse of ESG performance scores or financial indicators by clearly explaining their limitations and contextual relevance.

Overall, by ensuring transparency in data sourcing, independence in research design, neutrality in analysis, and full disclosure of methodological limitations, this study upholds high ethical standards and mitigates potential conflicts of interest, thereby enhancing the credibility and trustworthiness of its findings.

3.12 Chapter Summary

An outline of the research methodology was given in this chapter. The study's aim, research questions, hypothesis, research paradigm, research design, target population, sample size, sampling strategy, data source and collection techniques, validity and reliability, model-specific processes, and ethical considerations were all covered. The variables that served as research proxies were all specified in the chapter and were divided into dependent, independent, moderating and control variables. A detailed step-by-step process of the data analysis procedure was comprehensively discussed in this chapter. This was sufficiently captured to reflect the results presented and analysed in the next chapter, Chapter Four of this study.

CHAPTER 4
RESULTS AND FINDINGS

4.1 Introduction

This chapter focuses on the presentation and description of the results and findings obtained from analysing the study data collected. Data collected for the study were analysed using Stata 14.2 statistical software by employing various econometric techniques, spanning across several crucial estimation areas. The chapter begins with an introduction in Section 4.1, descriptive statistics in Section 4.2 and cluster analysis in Section 4.3. This is then followed by data diagnostics in Section 4.4, which test normality of residuals, and correlation analysis in Section 4.5. Next, the regression analysis and hypotheses results are presented in Sections 4.6 and 4.7, respectively. The regression analysis captured variable diagnostic test of multicollinearity in Section 4.6.1, model diagnostic tests (Hausman specification test and the Breusch Pagan test) in Section 4.6.2 and post-model diagnostic test of heteroskedasticity in Section 4.6.3. Finally, this chapter ends with a summary of the chapter in Section 4.8.

4.2 Descriptive Statistics and Results

The study deployed descriptive statistics to facilitate quick visualisation and understanding of the research data collected. This unveiled the characteristics and behaviours of the data, which helped to simplify interpretations of the observed patterns and trends across the different sectors under consideration in the study. The results presented here commenced with the summary of statistics, followed by a descriptive analysis of the data by yearly trend and sectoral averages. These aspects of descriptive statistics were necessary to understand the pattern and structure of the collected data, thereby assisting in identifying possible extreme values that could distort the panel regression results. It provided a baseline reference point for corroborative interpretations of regression results when assessed alongside the descriptive results like the mean, yearly trends and sectoral trends. Thus, ensuring that the results and findings are statistically meaningful and applicable to business and corporate decision-making.

4.2.1 Descriptive Results by Summary Statistics

Table 4.1 below presents a summary of the statistical results for 161 publicly listed companies on Bursa Malaysia across five category sectoral groupings for a period of five years from 2019 to 2023. The statistics capture ten key variables deployed in the study, which served as proxies for the independent, dependent, moderating and control variables. It equally calculated descriptive results for the mean, minimum, maximum, and standard deviation of the collected data, as summarised in the table.

Table 4.1
Summary Statistic Results

Variable	Obs.	Mean	Std. Dev.	Min	Max
EVM	805	17.86	35.01	-3.86	319.12
MVA	805	0.01	1.001	-1.00	1.00
ESGP	805	41.75	17.57	7.64	91.64
EP	805	31.43	22.24	0.00	94.47
SP	805	44.64	21.27	3.59	97.41
GP	805	50.18	20.01	4.46	95.43
WACC	805	7.54	3.44	-3.17	33.76
EC	805	8.51	10.94	0.01	92.16
FSize	805	9.78	1.60	6.08	14.54
EGR	805	12.41	58.27	-97.95	1091.84

The enterprise value multiple (EVM) showed a calculated mean of approximately RM17.86 from 805 observations considered in the study. The highest EVM stood at RM319.12 while the lowest stood at -RM3.86, with a considerable standard deviation of 35.01, approximately indicating the level of spread or dispersion from the mean in the dataset. EVM's standard deviation is far above the average value observed, which reflects a less concentrated movement around the mean. Market value added (MVA) presents a calculated mean of 0.01 and has a maximum value of 1 and a minimum value of -1, with a standard deviation of 1.001 from both sides of the mean

value.

The highest ESG performance score from the 805 observations was 91.64%, while the lowest was 7.64%. The mean value, which shows the average ESG practices performance of the observations, stood at 41.75%, with a dispersion of approximately 18%, showing the level of distribution around the average observation. Looking at the ESG component practices, the highest performance score observed amongst the three (3) pillars is 97.41% from the social practices, while the lowest ESG pillar performance score observed was 0% from the environmental practices. Governance practices showed the largest mean of 50.18%, while the environmental practices pillar had the largest standard deviation of 22.24% from the mean amongst the components of ESG practices in the dataset collected.

The weighted average cost of capital (WACC) had a maximum value of 33.76% and a minimum value of -3.17%, with a mean of 7.54% and a dispersion from the mean of 3.44%. The lowest value here indicates some of the sampled firms may have operated at a point in time with a negative cost of fund acquisition. This is noted in line with the postulation that the WACC of a firm is its cost of capital and embodies the aggregate deployment in the mix of debt and equity, which is used to gauge the overall corporate cost of raising funds (Gupta & Aggarwal, 2023; Mohamad, 2020). The executive compensation (EC), which measured the board and executive pay to the total employee emoluments, had a maximum value of 92.16% and a minimum value of 0.01%. Its average observation stood at 8.51% with a dispersion of 10.94%, which is quite higher than its counterpart moderating variable.

The highest firm size value (FSize) from the 805 observations was 14.54, while the lowest firm size was 6.08, with a mean value of 9.78 and a standard deviation value of 1.60, which is quite low and the lowest amongst all the study variables when compared to their average value. The FSize dispersion indicates a much-concentrated distribution around the mean value of its observations. On the other hand, the enterprise growth (EGR) showed a huge maximum value of 1091.84% and quite a small minimum value of -97.95%. Its calculated mean stood at 12.41% with a substantial standard deviation of 58.27%, ranking the highest dispersion around the mean recorded from the observations of all the variables considered in the study.

4.2.2 Descriptive Results by Yearly Trend

The descriptive analysis of the data collected for the study also considered the yearly movement in the observations, such that the trend of the selected variables can be analysed over the study period of five years. This is as summarised in Table 4.2 below.

Table 4.2
Yearly Trend Summary

YEARLY SUMMARY

	ESGP	EP	SP	GP	EVM	MVA	WACC	EC	FSize	EGR
2019	36.91	25.98	39.97	45.59	16.88	0.08	6.31	8.81	9.65	9.91
2020	39.89	28.83	43.04	48.66	20.84	0.06	8.05	8.61	9.68	2.96
2021	40.90	30.37	43.69	49.79	20.42	0.06	8.40	8.65	9.78	12.12
2022	43.89	34.28	46.48	52.09	16.49	-0.04	7.56	8.28	9.86	25.51
2023	47.15	37.70	50.00	54.78	14.67	-0.11	7.41	8.21	9.92	11.54

This analysis has been presented and grouped into independent variable 1 (ESG), independent variable 2 (ESG Components), dependent variables (EVM and MVA), moderating variables (WACC and EC) and control variables (FSize and EGR).

Considering the ESG 5-year trend of the study data collected as elucidated in Figure 4.1 below, it can be observed that the sampled firm's performance in executing ESG practices over the last 5 years has shown an increasing pattern for firms operating in the environmentally sensitive sectors of the Bursa Malaysia. This has moved from an average performance score of 36.91% in 2019 to 47.15% in 2023, which could be said to average at approximately 2% per year over the 5-year period under consideration. The increasing trend, as shown in Figure 4.1 below, can be a demonstration that more and more companies over the years are beginning to appreciate the need to adopt and implement ESG practices as part of their overall corporate and business strategies.

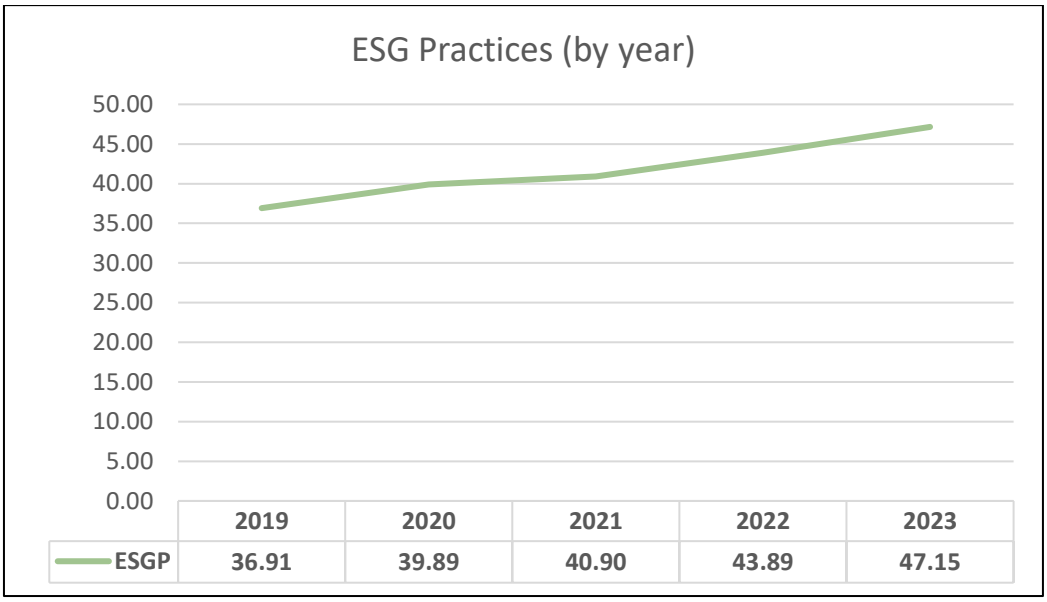

Figure 4.1 ESG 5-Year Trend

A further look at the components of ESG performance scores was necessary to ascertain which of the individual pillars contributed significantly to the increasing trend. Figure 4.2 below shows that the governance practices (GP) have contributed most to the increasing ESG performance over the years. The GP score over the 5-year period has increased from 45.59% in 2019 to 54.78% in 2023. This is followed by social practices (SP), which increased from approximately 40% in 2019 to 50% in 2023. The average environmental practices (EP) performance scores, though the lowest, have equally experienced an increasing trend over the last 5 years for all the sample sectors captured in the study. That is from 25.98% in 2019 to 37.7% in 2023.

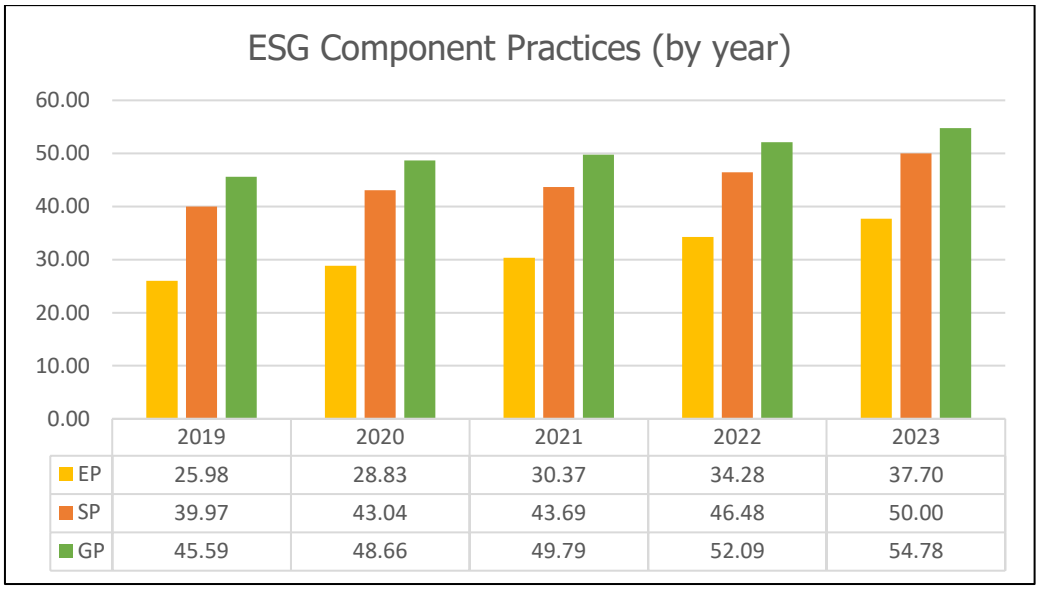

Figure 4.2 ESG Components 5-Year Trend

The enterprise value multiple (EVM), as shown in Figure 4.3 below, has been fairly fluctuating around an average value of approximately 18 over the 5-year period. Overall, the enterprise value multiple (EVM) initially experienced an increasing trend but later saw a decrease in its trend. That is, it started with 16.88 in 2019, then increased to 20.84 in 2020, then a slight decreased slightly to 20.42 in 2021 and continues to fall to 16.49 and 14.67 in 2022 and 2023, respectively. Similarly, the market value added (MVA) started with a positive value return in 2019, continued in 2020 and 2021, but saw a negative or decrease in value added in 2022 and 2023.

With respect to the above, it can be deduced that, while the average ESG practices performance scores for listed firms in the environmentally sensitive sectors of Bursa Malaysia were increasing over the last 5 years, their average enterprise value and market value added were experiencing some noticeable decline in their overall trend. This may require further investigation to ascertain the causes or drivers of the behaviour patterns in these corporate value variables.

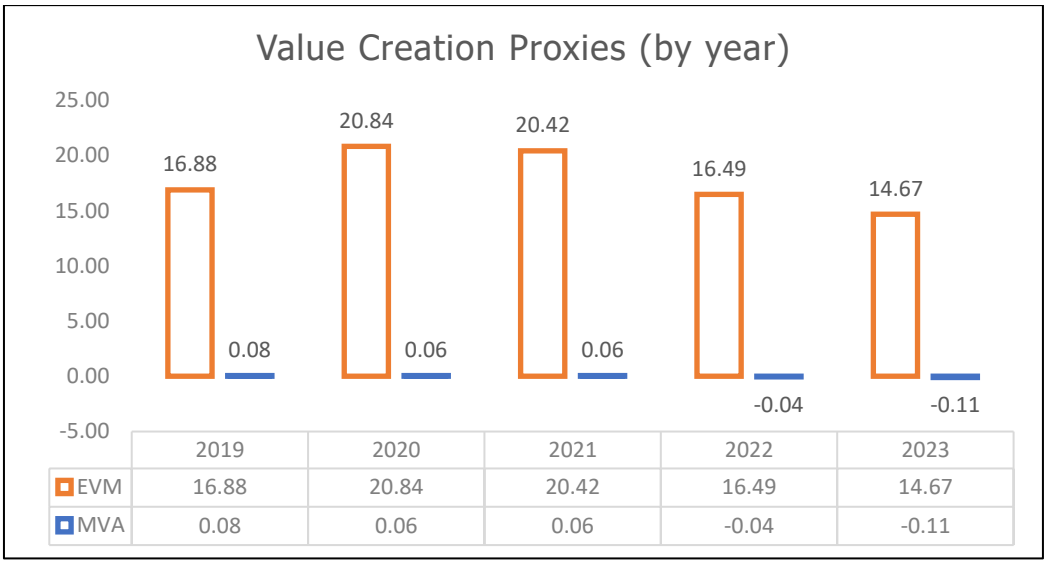

Figure 4.3 EVM and MVA 5-Year Trend

A trend analysis of the weighted average cost of capital (WACC), as illustrated in Figure 4.4 below, showed that it witnessed an increase in its overall movement from an average of 6.31% in 2019 to 7.41% in 2023. This indicated an approximately 18% increase in the weighted average cost of accessing funds by firms over the study period. Conversely, the executive compensation (EC) fell slightly from 8.81% in 2019 to 8.21% in 2023. This demonstrates that, as the enterprise value multiple and market value added were declining, the average board and executive pay as a ratio of the total employees' pay also fell slightly in the same period under consideration.

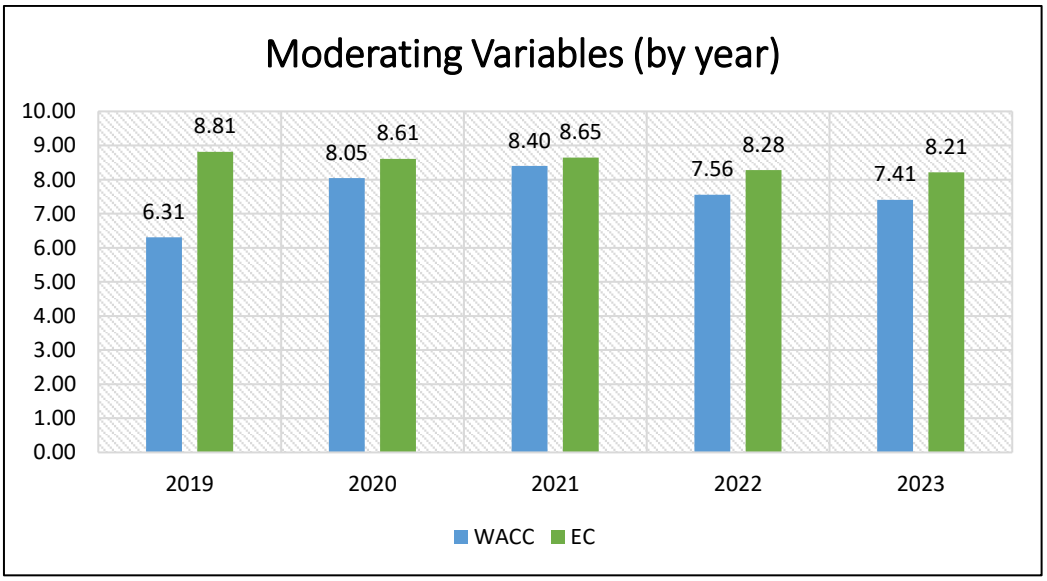

Figure 4.4 WACC and EC 5-Year Trend

Figure 4.5 below depicts that the firm size (FSize) and enterprise growth (EGR)

in the overall saw an increasing trend over the 5-year period. However, EGR experienced huge fluctuations around its overall yearly trend during the 5-year period. That is, it significantly decreased from 9.91% to 2.96% between 2019 and 2020. It then increased significantly to 12.12% and 25.51% in 2021 and 2022, respectively, and then fell to 11.54% in 2023. On the other hand, the FSize, which is the natural log of the total assets, was quite stable over the period, revolving in an average range of between 9 and 10 as observed in the figure below. That is, it slightly increased from 9.65 in 2019 to 9.92 in 2023, considering the 805 observations of the study.

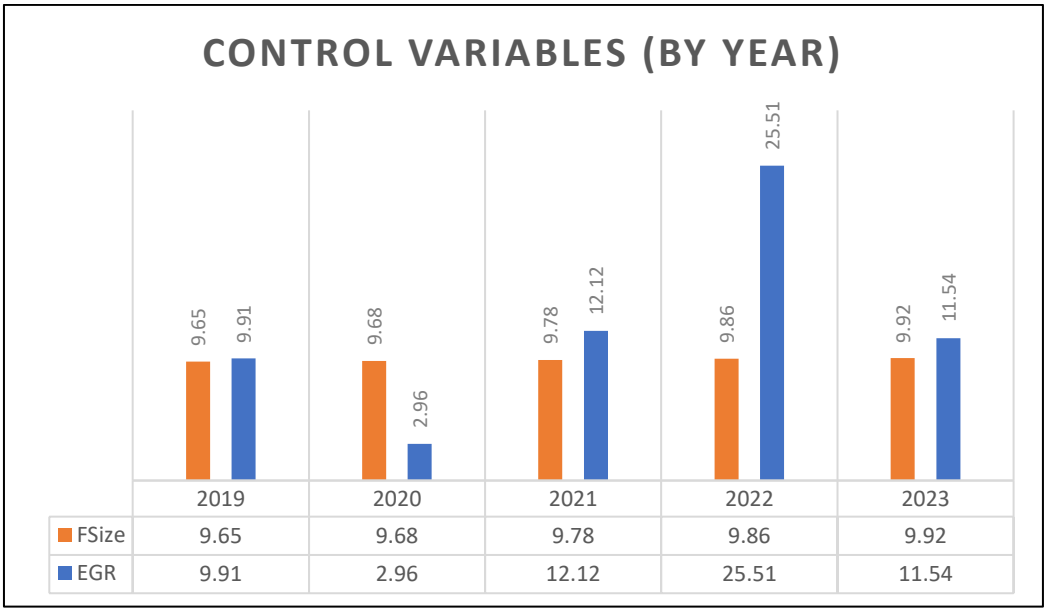

Figure 4.5 Firm Size and Enterprise Growth 5-Year Trend

4.2.3 Descriptive Results by Sectoral Average

The study also considered a descriptive analysis of the collected dataset, which analysed and presented the sectoral averages of the observations in the selected variables as shown in Table 4.3 below. This analysis highlighted the differences between patterns exhibited by each environmentally sensitive sector for the collected dataset. Thus, it reveals how the sectors are relatively performing against each other in terms of their ESG execution and value creation indices.

Table 4.3
Sectoral Average Summary

SECTORIAL SUMMARY

	ESGP	EP	SP	GP	EVM	MVA	WACC	EC	FSize	EGR
TL	44.59	34.11	47.90	51.53	18.80	1.00	7.09	3.60	10.37	12.70
Con	40.47	31.71	40.80	51.64	19.20	-0.42	7.67	12.61	10.43	1.66
Prop	55.85	48.73	61.99	56.57	21.42	-0.67	6.86	14.75	10.73	35.14
EU	47.88	41.56	52.23	49.44	9.25	-0.36	7.88	7.57	10.71	14.76
Man	38.03	26.24	40.32	48.96	18.71	0.25	7.63	7.75	9.30	9.29

Note: TL = Transport & Logistics, Con = Construction, Prop =Property, EU= Energy & Utility, Man = Manufacturing.

The ESG practices' performance scores were analysed by the sectoral averages as presented in Figure 4.6 below. The results showed that the property sector recorded the highest average performance score of 55.85%, followed by the energy & utility sector (47.88%), and then the transport & logistics sector (44.59%). The manufacturing sector performed the lowest with a score of 38.03%, slightly below the construction sector with a score of 40.47%. With the exception of the property sector, all the other environmentally sensitive sectors under consideration performed below a 50% performance score. This is an indication that there is still more to be done with respect to the adoption and implementation of ESG practices as part of the corporate and business strategies for the publicly listed firms in Bursa Malaysia operating in these sectors.

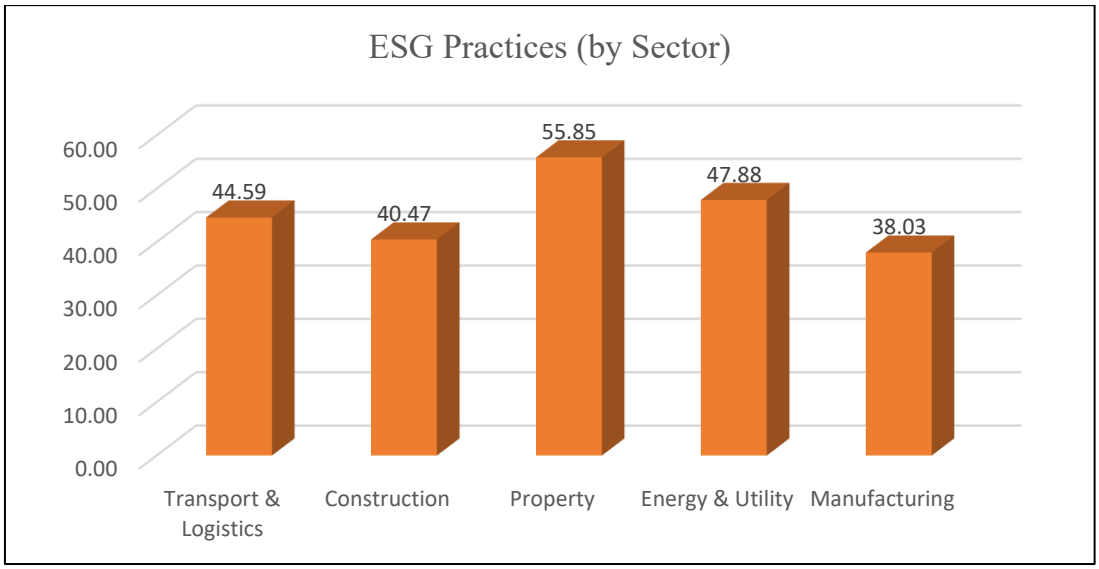

Figure 4.6 ESG by Sector

Similarly, the average performance scores for the ESG components by sector, as captured in Figure 4.7 below, showed that the property sector, with a score of 48.73%, performed highest in implementing environmental practices, while the manufacturing sector performed lowest in this ESG pillar with a score of 26.24%. Similarly, while the property sector scored highest at 61.99% and 56.57% for social practices and governance practices, respectively, the manufacturing sector scored 40.32% and 48.96%, performing lowest amongst all the sectors. The manufacturing sector performed the lowest both at the combined ESG practices and at the individual ESG component practices over the study sample period. This indicates that there is still a huge need for growth in the planning and execution of sustainability initiatives for listed firms in Bursa Malaysia in the manufacturing sector. However, the energy & utility sector, which ranked second best performance for environmental practices and social practices, was outperformed by the construction sector (51.64%) and the transport & logistics sector (51.53%) for governance practices, given its performance score of 49.44%.

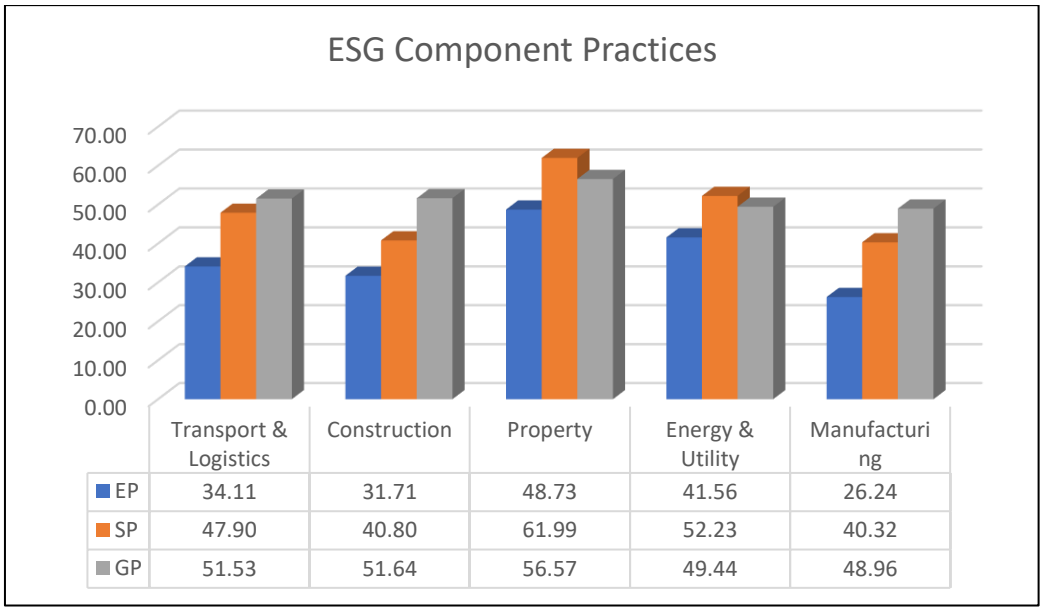

Figure 4.7 ESG Components by Sector

The enterprise value multiple (EVM) by sector, as demonstrated in Figure 4.8 below, positions the property sector at the top of the performance rank, which was followed by the construction sector, and then closely by the transport & logistics sector. The energy & utility sector's average for enterprise value multiple was the lowest amongst all the environmentally sensitive sectors considered by the study. The market value added (MVA), as also shown on Figure 4.8 below, revealed that the transport & logistics sector and manufacturing sector returned to a positive added market value, while the other sectors returned a negative and a decrease in added market value.

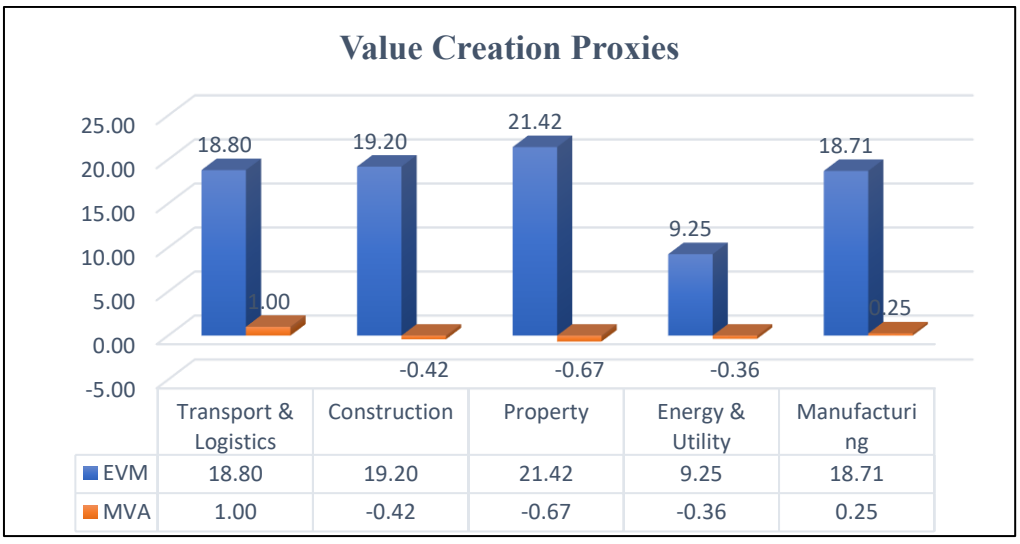

Figure 4.8 EVM and MVA by Sector

The descriptive statistics presentation for sectoral averages of weighted average cost of

capital (WACC), as illustrated in Figure 4.9 below, showed that the energy & utility sector had the highest cost of funds at an average of 7.88%, which is closely followed by the construction sector at an average of 7.67%, over the 5 years under consideration. These values (7.88% and 7.67%) can also be said to demonstrate the average minimum rate of return in the energy & utility sector and the construction sector, respectively. According to BPP Learning Media (2014), the WACC of a firm signifies the rate of return that it should pay fund providers and reflects the risk associated with fund acquisition. The property sector showed the lowest WACC at 6.86%, and thus the lowest riskiness of funds provided.

On the other hand, Figure 4.9 below also captures that the property sector had the highest executive compensation (EC) ratio at 14.75, indicating that the board and executives earn approximately 15% of total employee pay. This is followed by the construction sector at 12.61, with the lowest relative executive pay being the transport & logistics sector at 3.60.

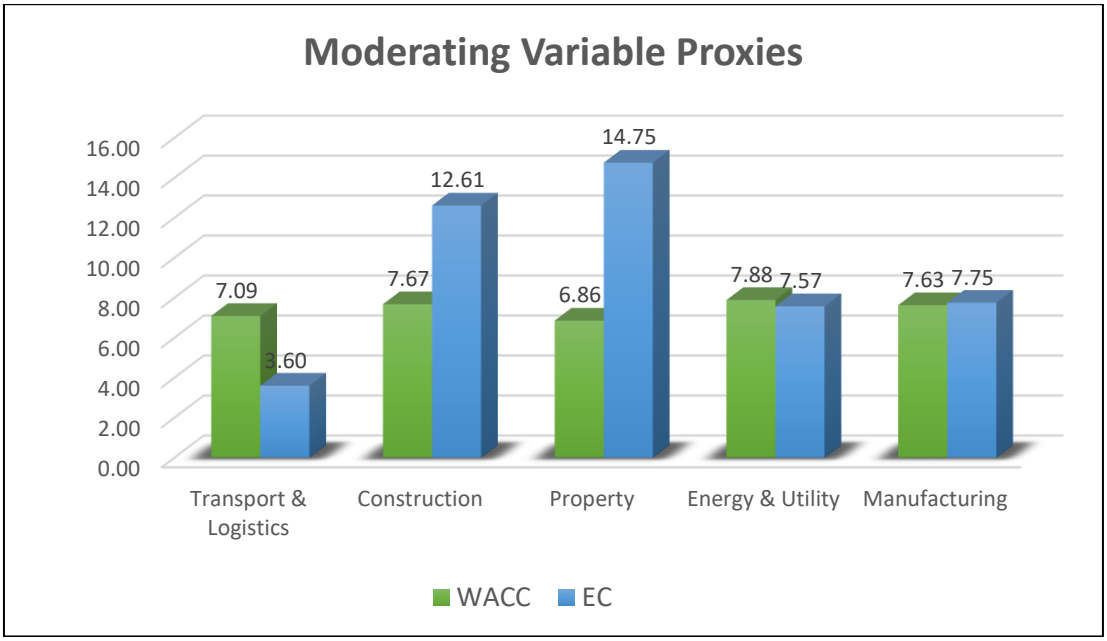

Figure 4.9 WACC and EC by Sector

The sectoral analysis also took a look at the firm size (FSize) and noticed, as presented in Figure 4.10 below, that in terms of the natural log of total assets, the property sector had the largest FSize at 10.73, while the manufacturing sector had the smallest at 9.30. The FSize interestingly revealed that the average natural log of total assets for all the sectors, except for manufacturing, ranged between 10.37 to 10.73.

Thus, indicating relatively similar sizes of firms in terms of their total asset base. In the same vein, Figure 4.10 below equally depicts that the property sector had the highest enterprise growth (EGR) at 35.14%. However, the construction sector had the lowest EGR at approximately 1.66%.

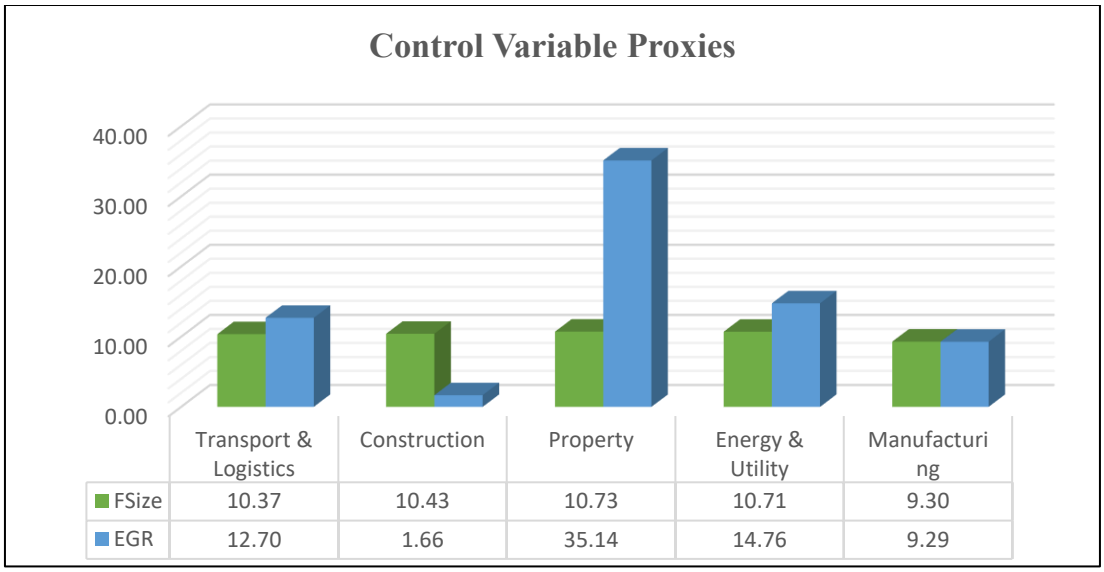

Figure 4.10 Firm Size and Enterprise Growth by Sector

4.2.4 Cluster Analysis Results

Cluster analysis is a quantitative classification method that uses mathematical decision rules to assign a heterogeneous collection of objects to a series of related data subsets or clusters, based on similarity measures (Rousseaux & Gad, 2013; Wen, 2022). It is a widely used technique in various fields to identify patterns and relationships within complex datasets. Cluster analysis has two primary classification procedures, among which are density-based and distance-based methods. The density-based grouping of objects includes the relatedness of the objects in a population based on their distribution, while the distance-based grouping of objects depends on their similarity or closeness with other objects (Hofstetter et al., 2014). These approaches enable researchers to identify meaningful structures in collected data sets and thus facilitate more informed analysis and decision-making.

Cluster analysis is an exploratory technique used to classify data sets into a preferably small number of groups based on their scores on observed values (Hofstetter et al., 2014). It reduces a large number of observations across different variables into a

smaller number of profiles or clusters by assessing the interrelationships between variables. The focus of clustering is to separate users into different groups based on their similarities and to guide the interpretation of the collected dataset and draw appropriate conclusions.

Several techniques can be used in clustering research data sets. This study deployed two popular clustering techniques, namely the hierarchical method and the k-means method. In the hierarchical technique, classes are subclassified into groups, with the process being repeated at several levels to produce a tree, with the defined groups as branches, and also gives sufficient definition to the groups (Rousseaux & Gad, 2013). The k-means technique assigns cluster positions using an algorithmic approach, starting with a first iteration, where the observations are assigned to the nearest cluster, and at the second iteration, where the cluster centres are updated for the assigned observations (Zahra et al., 2015).

This study conducted a cluster analysis to identify the different groups of firms in the dataset collected based on their ESG practices performance and distinct value creation patterns. In addition, the cluster analysis equally facilitated the examination of the financial and agency risk exposures of the different firms' grouping based on their ESG performances and value creation indices. This uncovers hidden patterns within the dataset, which are equally affecting the results of the hypotheses tested. Consequently, using Stata 14.2, the hierarchical and k-means methods were deployed in clustering the 805 observations as earlier adopted in the studies of Hofstetter et al. (2014) and Zahra et al. (2015).

4.2.4.1 Clustering of the Dataset (Hierarchical and K-Means Methods)

The Hierarchical method was used to perform the cluster ranking in order to determine the appropriate number of clusters relevant to the study dataset. This was then followed by the K-Means clustering method, which was used to group the dataset into identifiable clusters, capturing observations with similar traits and patterns, to support better interpretation and comprehension of the hypothesis testing results. The use of hierarchical clustering helped to determine the optimal number of clusters (k) from dendrograms, so as to avoid the limitation of K-means, which requires the number

of clusters to be known ahead. Furthermore, hierarchical clustering was crucial as it identifies natural grouping in complex or oddly shaped data, which guides the applicability of K-means.

This hybrid approach employed by the study enhanced the stability and precision of the cluster analysis by way of integration and cross-validation of clustering methods. Thereby ensuring appropriate groupings of the sampled observations for effective interpretation and decision making. The clustering of the study dataset was conducted in three separate analyses, namely, ESG and value creation clustering (theme 1), ESG and risk clustering (theme 2), and value creation and risk clustering (theme 3).

The results of the hierarchical method are shown in dendrograms, which are visual representations of hierarchical clustering. Firms' observations of the variables are grouped into clusters based on their similarities, while the vertical axis in the dendrogram highlights the dissimilarities in the observed variables. Thus, at higher dissimilarities, the clusters are deemed to be further apart from each other as shown in Figures 4.11, 4.12 and 4.13.

1. Results for ESG and Value Creation Clustering (Theme 1)

This study employed the hierarchical clustering method to determine the optimum number of appropriate clusters to effectively investigate the relationship between ESG practices and value creation. Considering the jump in the dissimilarity measure as depicted by the vertical axis of the dendrogram in Figure 4.11 below, the study identified three clusters as appropriate for the collected dataset. These clusters are well separated from each other and highlight three distinct group classifications of the firm's observations. While two of the optimum clusters, as shown on the dendrogram, are quite broad, one of the three identified clusters is quite narrow.

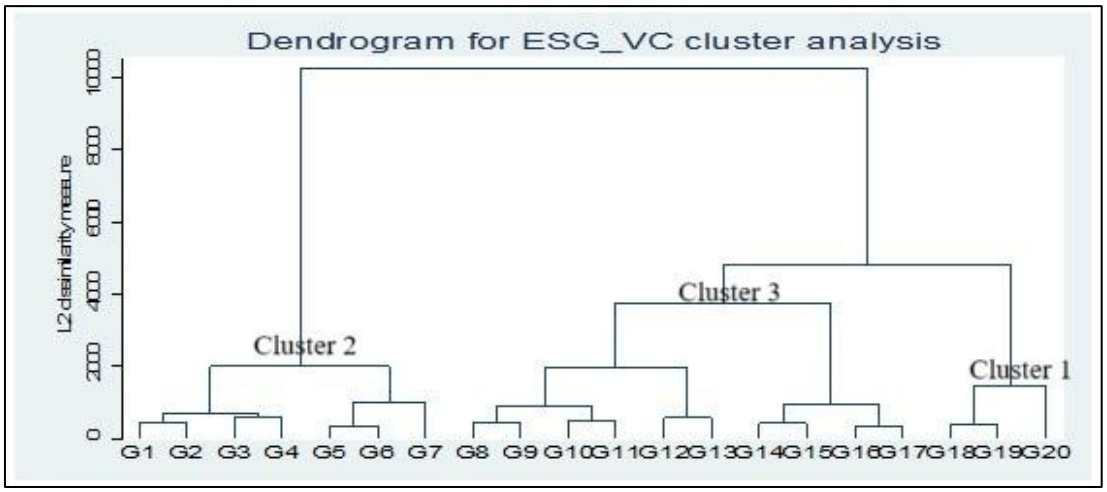

Figure 4.11 Dendrogram for ESG and Value Creation Clustering (Theme 1)

These three clusters (Figure 4.11) have been grouped to highlight the respective similarities in the relationship between the ESG practices and value creation of the sampled firms considered in the study. The grouping of the sampled observations was performed by employing the k-means clustering method. Their relative sizes and grouping are presented in Table 4.4 below. Cluster 1, as shown in the table, captured firms' observations with moderate ESG practice scores and high-value creation indices. This constituted just about 1.99% of the total observations. Cluster 2, which captured firms' observations with high ESG practice scores and moderate value creation indices, constituted 39.75% of the total observations. Cluster 3 captured firms' observations with low ESG practice scores, which also have low value creation indices. This cluster constituted 58.26% of the total observations.

The K-means cluster results in Table 4.4 demonstrated that over the last 5 years, more than half of the listed companies operating in the environmentally sensitive sectors in Malaysia had a low ESG performance score and only created relatively low corporate value for their stakeholders. However, firms with high ESG performance scores (approximately 40%) within the same sectors were only able to create relatively moderate corporate value for stakeholders.

Table 4.4
ESG and Value Creation, k-means Clustering

Cluster	Frequency	Percentage (%)	Cum. Freq.
Cluster 1 (Moderate ESG, High VC)	16	1.99	1.99
Cluster 2 (High ESG, Moderate VC)	320	39.75	41.74
Cluster 3 (Low ESG, Low VC)	469	58.26	100
Total Observations	**805**	**100**	

2. Results for ESG and Risk Clustering (Theme 2)

The hierarchical clustering analysis was conducted to determine the optimum number of clusters appropriate to effectively investigate the relationship between ESG practices and risk exposures of the sampled firms. Similarly, in considering the jump in the dissimilarity measure as depicted by the vertical axis of the dendrogram in Figure 4.12 below, the study identified three appropriate clusters which provided a good balance of simple and meaningful categorisation of the dataset. These clusters are well separated from each other and highlight three distinct group classifications of the firms' observations with different cluster sizes.

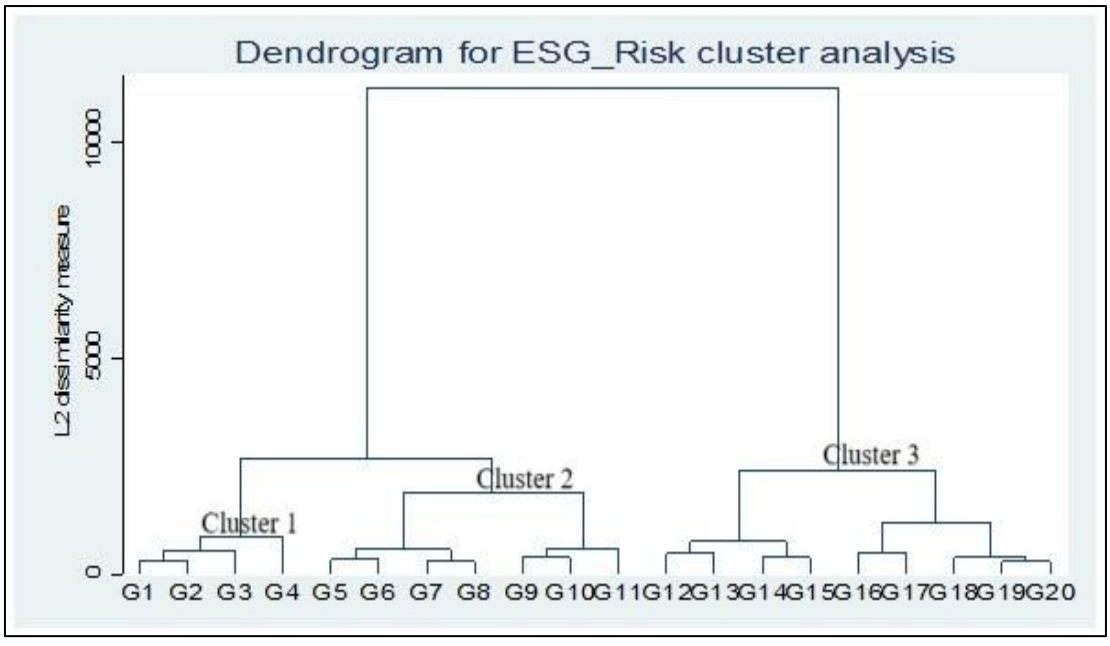

Figure 4.12 Dendrogram for ESG and Risk Clustering

Following the identification of the appropriate number of samples using the hierarchical method, the grouping of the sampled observations was conducted using the k-means clustering technique. The k-means clustering grouped firms' observations in a manner that highlighted the underlying similarities in their ESG practices and their respective relationships with financial and agency risk exposures. As illustrated in Table 4.5, Cluster 1 captured firms' observations characterised by high ESG practice scores and low-to-moderate financial and agency risk exposures, representing approximately 23.75% of the total observations. Cluster 2, on the other hand, comprised firms with moderate ESG practice scores and low financial and agency risk exposure indices, accounting for about 33.29% of the total observations. Cluster 3 captured firms' observations with low ESG practice scores but high financial and agency risk exposure indices, constituting 42.98% of the total observations.

The results further indicate that, cumulatively, approximately 57.02% of the listed companies operating in environmentally sensitive sectors on Bursa Malaysia exhibited moderate-to-high ESG performance scores alongside relatively low financial and agency risk exposures. In contrast, firms with low ESG performance scores within the same sectors were associated with higher levels of financial and agency risk exposure over the five-year observation period.

Table 4.5
ESG and Risk, k-means Clustering

Cluster	Frequency	Percentage (%)	Cum. Freq.
Cluster 1 (High ESG, Low-Moderate Risk)	191	23.73	23.73
Cluster 2 (Moderate ESG, Low Risk)	268	33.29	57.02
Cluster 3 (Low ESG, High Risk)	346	42.98	100
Total Observations	**805**	**100**	

3. Results for Value Creation and Risk Clustering (Theme 3)

The relationship between value creation and risk exposures of the sampled firms was equally examined by deploying cluster analysis. The hierarchical clustering

analysis was carried out to determine the optimum number of clusters appropriate to effectively investigate the association between these variables. Given the jump in the dissimilarity measure of the clusters as depicted by the vertical axis of the dendrogram in Figure 4.13 below, the study identified 4 appropriate clusters, which provided a more in-depth categorisation of the dataset and revealed more subtle differences in the value creation and risk exposures of the sampled firms. The hierarchical clustering facilitated the identification of firm groupings with low-value creation, mixed (low-moderate) value creation, moderate value creation, and finally high-value creation, with their associated risk exposure categorisation.

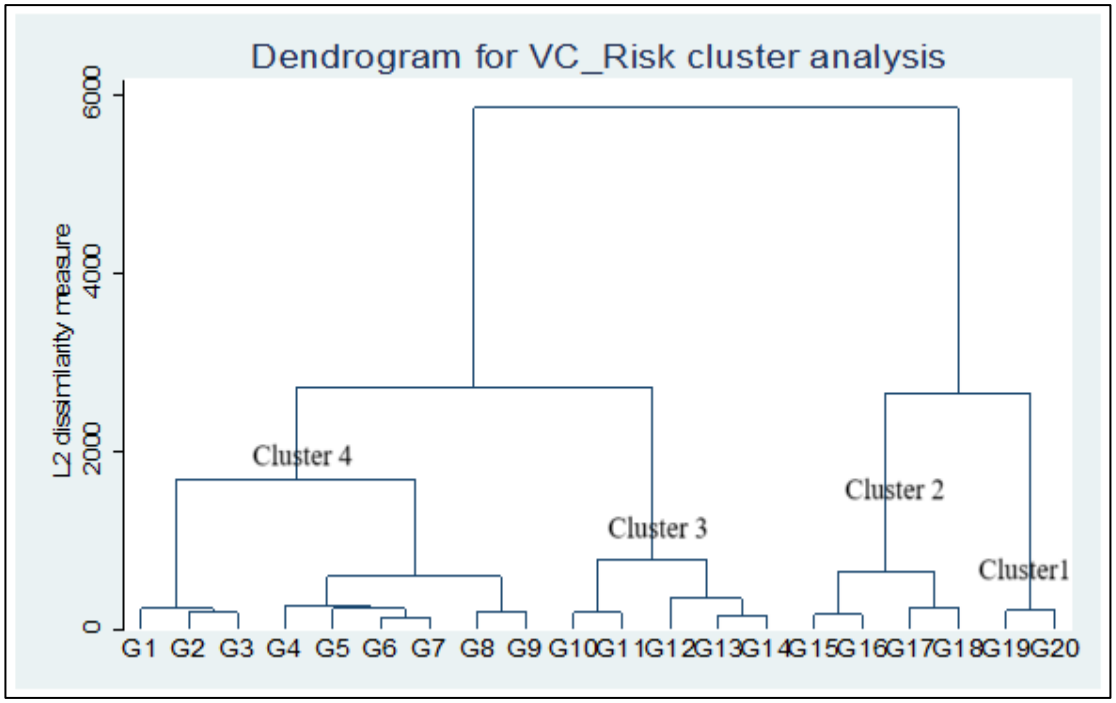

Figure 4.13 Dendrogram for Value Creation and Risk Clustering

Using the k-means clustering method, these 4 clusters have been grouped to highlight the underlying similarities around the value creation of the sampled firms and their respective relationships with the financial and agency risk exposures of these firms. As illustrated in Table 4.6, cluster 1 captured firms' observations with high value creation and moderate risk exposures, which constituted just about 1.378% of the total observations. Cluster 2, on the other hand, captured firms' observations with moderate value creation and low-moderate risk exposure metrics. These firms constituted about 4.97% of the total observations. While Cluster 3, with a larger firm observation of 17.14%, grouped firms' observations with low value creation, but high financial and

agency risk exposure indices. Cluster 4 is the largest cluster with a total firm observation of 76.52%. This cluster captured firms with low to moderate value creation and low financial and agency risk exposures.

The results demonstrate that the majority of the listed companies operating in the environmentally sensitive sectors in Bursa Malaysia are only able to create a low-to-moderate corporate value for their stakeholders, and these firms are exposed to low financial and agency risk exposures. Moreover, a considerable number of firms with very low value creation over the last 5 years within the same sectors have exhibited high exposures to financial and agency risks.

Table 4.6
VC and Risk, k-means Clustering

Cluster	Frequency	Percentage (%)	Cum. Freq.
Cluster 1 (High VC, Moderate Risk)	11	1.37	1.37
Cluster 2 (Moderate VC, Low-Moderate Risk)	40	4.97	6.34
Cluster 3 (Low VC, High Risk)	138	17.14	23.48
Cluster 4 (Low-Moderate VC, Low Risk)	616	76.52	100
Total Observations	**805**	**100**	

4.2.4.2 Descriptive Analysis of Clusters

A descriptive analysis of each of the separate cluster analyses has been performed in this study. The analysis considered the computed mean of each cluster and the mean of the total observations for the variables under investigation. This facilitated a relative comparison between each cluster and the whole dataset to identify unique cluster characteristics and patterns that guided hypothesis interpretation and supported conclusions drawn from study results.

I. ESG and Value Creation Clustering (Theme 1)

Table 4.7 presents a summary of the results of the k-means clustering analysis,

which groups observations based on their environmental, social, and governance practices and value creation indices. The clusters are characterised by the mean values of the sampled variables under consideration, as shown in the table.

Cluster 1, which grouped observations with moderate ESG practice scores and high-value creation, reveals a very high enterprise value multiple (EVM) mean value of 228.13, relative to the other clusters. Its average market value added (MVA) value is a positive return of 0.00, which could suggest an equivalent market value relative to the capital invested by the firms in this cluster. Also, the cluster shows a moderate ESG performance mean score of 44.51. This is the same for the environmental practice average (mean) score of 35.57, the social practice mean score of 47.24, and the governance practice mean score of approximately 51. The cluster unveils firms with moderate ESG performance but exceptionally high-value creation. The high EVM could connote that these firms are efficient in creating enterprise value, possibly due to the right choices of social and governance initiatives, which are showing promising performance, considering ESG adoption in Malaysia is still in the growing phase. On the other hand, the neutral MVA at 0.00 may indicate that the market is yet to fully recognise the value creation of these firms, potentially due to their overall moderate ESG performance. This may, however, not be a reflection of the whole dataset, as this cluster constitutes approximately just 2% of the total firm's observations.

Cluster 2 grouped firms with high ESG practice scores and moderate-value creation metrics. As illustrated in Table 4.7**,** the cluster has a moderate EVM mean value of 14.61, which is higher than cluster 3 but much lower than cluster 1. Its MVA means value of -0.02 is slightly negative but close to a neutral metric. The cluster has the relatively highest ESGP mean value of 59.63, with the social practice performance score contributing the most at 66.13. Similarly, its environmental practice performance score and governance practice performance score are relatively the highest amongst the clusters at 52.31 and 60.84, respectively. As such, this cluster's mean results highlight firms with the highest ESG performance but only moderate value creation. The strong ESGP, EP, SP, and GP scores demonstrate these firms' commitment to sustainability and governance issues. However, the moderate EVM and slightly negative MVA may suggest that these firms are yet to fully translate their ESG efforts into considerable enterprise and market values for their stakeholders.

Cluster 3 grouped firms with low ESG practice scores and low-value creation metrics. The mean value of its EVM (12.92) is the lowest compared to the other clusters, while its MVA, with a mean value of 0.03, is slightly positive and quite close to neutral. The ESG cluster's mean value stands at 29.46, which is the relatively lowest performance score and far below the average score of the total data set observations at 41.75. This cluster's mean results highlight firms with the lowest ESG performance and the weakest value creation. The low EVM and ESGP may suggest that poor ESG practices could be associated with lower creation of enterprise value and market value.

Table 4.7
ESG and VC, k-means - Summary Statistics: Mean

Cluster	ESGP	EP	SP	GP	EVM	MVA
Cluster 1 (Moderate ESG, High VC)	44.51	35.57	47.24	51.00	228.13	0.00
Cluster 2 (High ESG, Moderate VC)	59.63	52.31	65.13	60.84	14.61	-0.02
Cluster 3 (Low ESG, Low VC)	29.46	17.04	30.56	42.88	12.91	0.03
Total Observations Mean	**41.75**	**31.43**	**44.64**	**50.18**	**17.86**	**0.01**

II. ESG and Risk Clustering (Theme 2)

Table 4.8 presents a summary of the results of the k-means clustering analysis, which groups observations based on their environmental, social, and governance practices and financial and agency risk metrics. The clusters are characterised by the mean values of the sampled variables under consideration, as shown in the table.

Cluster 1, which grouped observations with high ESG practice scores and low-moderate financial and agency risk exposures, showed the highest ESGP mean value of 66.24, relative to the other clusters and far above the mean value of the total data set observations, which stood at 41.75. Similarly, its environmental practice, social practice and governance practice all showed considerably high mean performance scores at 62.06, 71, 29.46 and 63.69, respectively. These are also far above the mean values of the total data set observations for each of the environmental, social and governance

pillars, which stood at 31.43, 44.64 and 50.18, respectively. For the risk exposures, this cluster showed a WACC mean value of 6.77, which is lower than the average of the total observations and may suggest a low exposure to financial risk from the financing mix. On the other hand, the executive compensation metric (EC) showed a moderate exposure to agency risk with its mean value of 8.12 relative to the other clusters and the total firms' observation. This cluster's mean results highlight firms with high ESG performance and low to moderate financial and agency risk exposures. The high ESGP, EP, SP, and GP scores, alongside their associated risk exposures, could suggest that firms that make sufficient commitment to ESG planning and execution may face relatively lower financial and agency risk exposures.

Cluster 2 grouped firms with moderate ESG practice scores, but relatively low financial and agency risk exposure metrics. The cluster has a moderate ESG performance mean value of 45.36, which is relatively higher than that of Cluster 3. Similarly, its moderate EP, SP, and strong GP mean values are all relatively higher than cluster 3. Furthermore, cluster 2 showed a WACC mean value of 7.43, which is a little lower than the average of the total observations at 7.54. Thus, suggesting a low exposure to financial risk from firms' financing mix. Similarly, the executive compensation metric (EC) showed the lowest exposure to agency risk, with a mean value of 7.01 relative to the other clusters and the total firms' observation. This cluster's mean results highlight firms with moderate ESG performance but relatively low financial and agency risk exposures. Its social practice means score and governance practice mean score of approximately 50 and 54, respectively, though relatively lower than cluster 1, are well above the average for the total firms' observation. Thereby connoting a good sustainability performance, which could suggest that the social practices and the governance practices of the firms in this cluster are relatively robust. However, the overall relatively moderate ESG performance scores unveil possible opportunities for these firms to improve their environmental, social, and governance pillars. The relatively lower WACC and EC indicate that these firms face considerably lower financial and agency risks, potentially due to their funding mix strategy and certain top executive decisions.

Cluster 3, which grouped firms' observations with low ESG practice scores and high financial and agency risk exposures, revealed the lowest ESGP mean value of

25.43, relative to the other clusters and far below the mean value of the total data set observations, which stood at 41.75. Similarly, its environmental practice, social practice and governance practice all showed low mean performance scores (13.44, 25.81 and 39.42), which are far below the mean values of the total data set observations, which stood at 31.43, 44.64 and 50.18, respectively. Furthermore, cluster 3 showed a relatively high WACC mean value of 8.06, which is equally higher than the average of the total observations (7.54) and may suggest a higher exposure to financial risk from the financing mix. Similarly, the executive compensation metric (EC) showed a higher exposure to agency risk with its mean value of 9.89 relative to the other clusters and the total firms' observation (8.51). This cluster's mean results highlight firms with low ESG performance and high financial and agency risk exposures. The low ESGP, EP, SP, and GP scores could suggest that these firms are not making a sufficient commitment to sustainability and governance issues. The higher WACC and EC may connote that these firms face relatively higher financial and agency risks than the other cluster firms, possibly due to their lower commitment to ESG initiatives.

Table 4.8
ESG and Risk, k-means - Summary Statistics: Mean

Cluster	ESGP	EP	SP	GP	WACC	EC
Cluster 1 (High ESG, Low-Moderate Risk)	66.24	62.06	71.46	63.96	6.77	8.12
Cluster 2 (Moderate ESG, Low Risk)	45.36	32.83	49.82	54.25	7.43	7.01
Cluster 3 (Low ESG, High Risk)	25.43	13.44	25.81	39.42	8.06	9.89
Total Observations Mean	**41.75**	**31.43**	**44.64**	**50.18**	**7.54**	**8.51**

III. Value Creation and Risk Clustering (Theme 3)

Table 4.9 presents a summary of the results of the k-means clustering analysis, which groups observations based on their value creation and financial and agency risk indices. The value creation and risk cluster analysis grouped the firms' observations into 4 clusters and characterised them by the mean values of their sampled variables under consideration, as shown in the table.

Cluster 1, which grouped observations with high value creation and moderate financial and agency risk exposures, revealed the highest EVM mean value of 265.71, relative to the other clusters and far above the mean value of the total data set observations, which stood at 17.86. Similarly, the MVA mean value for these firms stood at 0.09, suggesting a positive and better market value relative to capital invested by the firms in this cluster. Cluster 1 equally showed a WACC of 8.78 and an EC of 5.10, which combinedly are relatively higher than clusters 2 and 4, but below cluster 3, suggesting a moderate exposure to financial risk and agency risk by the cluster firms. This cluster result highlights firms with exceptionally high-value creation but moderate financial and agency risk exposures. The high EVM could connote that these firms are efficient in creating enterprise value, while the positive MVA highlights that the market equally fully appreciates the value creation of these firms, potentially due to their moderate exposure to financial and agency risks. This may, however, not reflect the whole dataset, as this cluster constitutes approximately just 1.37% of the total firm's observations.

Cluster 2, as shown in Table 4.9 below, grouped firms' observations with moderate value creation and low-moderate risk metrics. The cluster showed a substantially moderate EVM mean value of 89.43, which is considerably higher than the average mean of the total observations, but far lower than that of cluster 1. Its positive MVA mean value of 0.10 suggests a better market value return relative to capital invested by the firms in this cluster. Furthermore, the cluster equally showed a WACC of 7.59 and an EC of 5.42, which combinedly reflects the relatively lower financial and agency risk exposure compared to clusters 1 and 3, suggesting a moderate exposure to financial risk and a low agency risk by the firms captured in the cluster. The results highlight that firms in this cluster are creating moderate corporate value for their stakeholders, and the market is responding positively to their value-creation initiatives. Moreover, their combined lower WACC and EC may suggest better management of financial and agency risk exposures, thus contributing to their value creation.

Cluster 3 grouped firms with low-value creation and high financial and agency risk metrics. The cluster's EVM mean value of 7.94 is the lowest value created compared to the other clusters. Its MVA, mean value of -0.12, suggests a lower market

value return in relation to capital invested by these firms. The cluster WACC mean value of 7.36 indicates a moderate financial risk, but its EC of 27.36 indicates the highest agency risk exposure amongst all the clusters. Thus, reflecting a high combined financial and agency risk exposure. The cluster's results highlight that the firms in this cluster are weak in creating corporate value for their stakeholders, which may partly be due to the high financial and agency risk exposures they face. The high-risk exposures stem largely from self-interest actions in the agency relationship and some of the top management's decisions around the funding mix.

Cluster 4, as shown in Table 4.9 below, grouped firms' observations with low-moderate value creation and low financial and agency risk metrics. The cluster's EVM mean value of 11.40 captures a large number of firms with a mix of low to moderate value creation. Its slightly positive MVA mean value of 0.03 suggests a better market value return relative to capital invested by the firms in this cluster. Furthermore, the cluster equally showed a WACC of 7.56 and an EC of 4.55, which combinedly reflect the relatively lowest metrics and suggest a low exposure to financial and agency risks compared to the other clusters. The results highlight that a substantial number of the sampled firms were creating low to moderate corporate value for their stakeholders, and the market is gradually responding positively to their value-creation initiatives. This may significantly reflect on the whole dataset, as this cluster constitutes about 76.52% of the total firm's observations.

Table 4.9
VC and Risk, k-means - Summary Statistics: Mean

Cluster	EVM	MVA	WACC	EC
Cluster 1 (High VC, Moderate Risk)	265.71	0.09	8.78	5.10
Cluster 2 (Moderate VC, Low-Moderate Risk)	83.43	0.10	7.59	5.42
Cluster 3 (Low VC, High Risk)	7.94	-0.12	7.36	27.36
Cluster 4 (Low-Moderate VC, Low Risk)	11.40	0.03	7.56	4.55
Total Observations Mean	**17.86**	**0.01**	**7.54**	**8.51**

4.3 Normality Test of Residuals - Data Diagnostics

The study performed diagnostics on the dataset collected by testing the normality of the residuals. In this regard, three diagnostic tests of normality were deployed, among which were the skewness test, the kurtosis test, and the Shapiro-Wilk test. The results obtained are presented below.

Table 4.10
Normality Test: Skewness and Kurtosis Result

				Joint	
Variable	**Obs.**	**Pr(Skewness)**	**Pr(Kurtosis)**	**chi2(2)**	**Prob>chi2**
EVM	805	0.0000	0.0000	.	0.0000
MVA	805	0.0000	0.0000	.	0.0000
ESGP	805	0.0000	0.0000	35.73	0.0000
EP	805	0.0000	0.0006	47.16	0.0000
SP	805	0.0018	0.0000	72.09	0.0000
GP	805	0.6088	0.0000	69.89	0.0000
WACC	805	0.0000	0.0000	.	0.0000
EC	805	0.0000	0.0000	.	0.0000
FSize	805	0.0000	0.2560	31.92	0.0000
EGR	805	0.0000	0.0000	.	0.0000

The use of the skewness test and kurtosis test in a data set enables the researcher to determine the shape and the central tendency of the collected data and facilitates analysis of the distributions of the test scores (Garren & Osborne, 2021). The null hypothesis assumes that distributions of sample data are normal, and thus, a p-value greater than 0.05 at a 95% confidence interval and 5% significance level will be deemed insignificant and fail to reject the null hypothesis.

As illustrated in Table 4.10 above, the computed Pr(kurtosis) values for all the variables are less than 0.05, which rejects the null hypothesis that distributions are normal. Similarly, the Pr(skewness) values, with the exception of governance practices (GP), were all significant, indicating a non-normal distribution in the dataset. The joint probability of chi2 for skewness and kurtosis of all the study variables corroborated this,

as each is less than 0.05, thereby confirming the data pattern to be abnormally distributed. The abnormal distribution in the dataset could signify the presence of some outliers in the collected dataset caused by a couple of extremely high or extremely low values.

The study went further to deploy the Shapiro-Wilk test to obtain further evidence and stronger confirmation on the distribution pattern of the research dataset. The result is shown in the table below.

Table 4.11
Normality Test: Shapiro-Wilk Result

Variable	Obs.	W	V	z	Prob>z
EVM	805	0.3917	314.908	14.117	0.0000
MVA	805	0.9999	0.054	-7.152	1.0000
ESGP	805	0.9737	13.626	6.41	0.0000
EP	805	0.9442	28.886	8.255	0.0000
SP	805	0.9731	13.918	6.462	0.0000
GP	805	0.9820	9.325	5.48	0.0000
WACC	805	0.8822	60.981	10.088	0.0000
EC	805	0.7547	127.00	11.889	0.0000
FSize	805	0.9710	15.027	6.651	0.0000
EGR	805	0.5139	251.654	13.567	0.0000

The Shapiro-Wilk test result, as presented in Table 4.11 above, illustrated and confirmed a non-normal distribution, as the observed probability of each of the variables is below 0.05, except for MVA with a probability of 1.000. This affirms the presence of heavy outliers in the collected dataset. Outliers in a data set are usually associated with considerably extreme observations, which could be negative or positive values.

The abnormal distribution did not pose a threat to the significance test and confidence level of the regression outcomes, given the considerably large size of 805 sampled observations. Past studies have argued that a more cautious perspective in research would deem sample sizes of over 250 or 300 as sufficiently large enough to necessitate effective size estimates for practical significance in addition to statistical

significance (Khalilzadeh & Tasci, 2017; Memon et al., 2020). The researcher was initially concerned that the abnormal distribution could affect the regression inferences. However, Gelman et al. (2020) and Wooldridge (2018) have all argued that the assumption of normality distribution generally barely influences the regression estimators and the outcomes of significance test results. This is true particularly when suitable choices of correlation matrix techniques and regression models are applied to interpret and analyse the non-normal distribution dataset. Consequently, the study proceeded with the appropriate correlation analysis and regression analysis, while making considerations for the relevant variable and model diagnostic tests required.

4.4 Correlation Analysis Results

Correlation is designed to investigate the degree of association between two variables under examination. The measure to quantify this level of relationship between the variables is the correlation coefficient (Senthilnathan, 2019). Correlation coefficients are expressed on a scale from -1 to +1, such that a value of 0 denotes no linear or monotonic relationship between the variables (Schober et. al, 2018). In correlation analysis, a change in one variable's magnitude can be attributed to a change in another variable's magnitude, either in the same direction or in the opposite one.

The results from the skewness test, the kurtosis test, and the Shapiro-Wilk test all indicated the presence of heavy tails and outliers in the study dataset. The abnormality in the data set may produce spurious relationships when applying the Pearson correlation, which measures the linear relationship between two normally distributed variables. Consequently, the study adopted the postulation of Schober et al. (2018), which recommended that when measuring a monotonic association between two variables, a Spearman rank correlation can be deployed to ordinal data, non-normally distributed continuous data, or data that has substantial outliers. The result from the Spearman rank correlation that was conducted is presented below in Table 4.12.

Table 4.12
Spearman Rank Correlation Result

Variable	EVM	MVA	ESGP	EP	SP	GP	WACC	EC	FSize	EGR
EVM	1.000									
MVA	0.290	1.000								
ESGP	0.139	0.022	1.000							
EP	0.139	-0.085	0.874	1.000						
SP	0.144	0.040	0.907	0.756	1.000					
GP	0.036	0.089	0.608	0.316	0.363	1.000				
WACC	-0.184	-0.101	-0.080	-0.092	-0.103	0.015	1.000			
EC	-0.080	-0.072	-0.017	-0.022	-0.043	0.022	0.004	1.000		
FSize	0.076	-0.338	0.514	0.561	0.486	0.133	-0.151	-0.012	1.000	
EGR	-0.006	0.114	0.056	0.042	0.059	0.029	-0.007	-0.011	0.005	1.000

Spearman evm mva esgp ep sp gp wacc ec fsize egr, stats(rho), (Obs. = 805)

Table 4.12 above revealed that ESG practices have positive associations with the dependent variables, though these relationships showed a weak correlation for enterprise value multiple (EVM) at 0.14 and a negligible correlation for market value added (MVA) at 0.02 approximately. Similarly, Social practices (SP) have a weak but positive correlation with EVM and MVA. Environmental practices (EP), as obtained from the results, are also shown to have a weak positive association with EVM and a negative association with MVA. However, governance practices (GP) can be said to have weak but positive associations with EVM and MVA. The moderating variables (WACC and EC) all showed a negative association with the dependent and independent variables. That is, an increase in the financial risk and/or agency risk will lead to a decrease in ESG practices and deteriorate value creation for the listed firms under consideration. The control variables demonstrated varying relationships with the dependent and independent variables, ranging from very weak, weak and moderately positive and negative correlations. The correlation results have shown that there are some associations between the dependent, independent and the moderating variables. However, how significant these relationships are can be better explained by testing their respective hypotheses with appropriate regression models.

Furthermore, it can be observed from Table 4.12 above that there was no perfect correlation between any of the independent variables of the same model or group. That is, none of the associations between EP, SP and GP were above 80%, which could pose a challenge of singularity or multi-collinearity between the independent variables. This was, however, further tested to ensure the assertion is true by deploying the variance inflation factor (VIF), which is an advanced econometric technique for testing the likelihood of multi-collinearity amongst independent variables of a research model.

4.5 Regression Analysis Results

This study utilised regression analysis to investigate the possible relationship between ESG practices and value creation as moderated by financial risk and agency risk. According to prior studies (Lo et al., 2020; Sarstedt and Mooi, 2014; Sufi et al., 2022), regression analysis is among the most popular tools used in business research, which allows researchers to examine the relationship between one independent variable and one dependent variable. It can be used to determine whether the independent

variables have a significant relationship with a dependent variable and then make appropriate predictions and conclusions.

To ensure accurate regression analysis results were obtained, the study commenced the process by performing a variable diagnostic test to check for multicollinearity. This was achieved by performing a pooled OLS regression model in Stata and then applying the VIF code. After the multicollinearity check, the next phase in the regression analysis was followed by running the fixed effect and random effect regression models, in order to conduct model diagnostics for all the formulated mathematical models of the study. This helped to determine which regression model technique is the best fit to interpret the study data and communicate appropriate findings. Finally, post-diagnostics tests were conducted for all the models to check for the possibility of heteroskedasticity in the selected models, which could negatively impact model fitness and the interpretation of results.

4.5.1 Multicollinearity Test - Variable Diagnostics

The variance inflation factor (VIF) tests were conducted for the two groups of independent variables. That is, ESG Practices and ESG Component Practices. It was necessary to conduct separate tests as all the formulated models were grouped into these two categories, and none of the models had both ESG Practices and ESG Component Practices in a single mathematical equation. This helped to avert the potential of false multicollinearity due to the singularity or perfect linear association of the independent variables. The test results for each group are presented in Table 4.13 below.

Table 4.13
Variance Inflation Factor (VIF) Test Result

Combined ESG Observation			**ESG Components Observation**		
Variable	**VIF**	**1/VIF**	**Variable**	**VIF**	**1/VIF**
FSize	1.36	0.734534	EP	2.75	0.363919
ESGP	1.36	0.735230	SP	2.60	0.384890
WACC	1.03	0.969833	FSize	1.47	0.678600
EC	1.02	0.976959	GP	1.17	0.857346
EGR	1.02	0.984581	EC	1.03	0.970041
			WACC	1.03	0.970049
			EGR	1.02	0.980921
Mean VIF	**1.16**		**Mean VIF**	**1.58**	

The results from Table 4.13 above showed that for the models under the ESG group, multi-collinearity was not a problem as the VIF values ranged from 1.02 to the highest at 1.36, which are all far below the conventional benchmark of 10 for multi-collinearity to be deemed present amongst the independent variables in the model. Similarly, the results under the ESG Components group also showed values much less than the conventional benchmark of 10. This ranged from 1.02 (EGR) to the highest at 2.75 (EP). The mean values for the ESG group and the ESG Components group were also below the conventional benchmark at 1.16 and 1.58, respectively.

Considering that all the VIF values, including the mean VIF values obtained from Table 4.13 above, are much below 10, the study can comfortably assert that multi-collinearity amongst the independent variables was not an issue for all the mathematical models formulated in this study. Thus, it will not pose any challenge in fitting the regression models and interpreting the study results. According to Senthilnathan (2019), the existence of multicollinearity in a model makes it more difficult to investigate the appropriate predictor variable in a study because the standard errors are high, and the partial regression coefficient cannot be computed with accuracy.

4.5.2 Pooled OLS, Fixed Effect and Random Effect - Model Diagnostics

The study performed model diagnostics to ascertain which model is most appropriate between the pooled OLS, fixed effect and random effect regression models. This process was conducted for all the mathematical models designed for the study using Stata 14.2. Firstly, a panel regression model was carried out using the fixed effect model and the random effect model. This was then followed by the Hausman test to check which is more appropriate between the fixed effect model and the random effect model. Finally, the Breusch-Pagan LM test was conducted to determine which is more appropriate between the pooled OLS model and the random effect model. The test results are presented in Table 4.14 below.

Table 4.14
Hausman Test and Breusch-Pagan LM Test Results

Main	Sub-Model	Hausman Test		Breusch-Pagan LM Test		Appropriate Model
		chi2	Prob>chi2	chibar2	Prob > chibar2	
Model 1	EVM_{ESGP}	12.46	0.0060	110.75	0.0000	Fixed Effect
	MVA_{ESGP}	14.90	0.0019	629.65	0.0000	Fixed Effect
Model 2	EVM_{EP}	9.75	0.0208	111.03	0.0000	Fixed Effect
	EVM_{SP}	10.38	0.0156	111.17	0.0000	Fixed Effect
	EVM_{GP}	6.30	0.0980	115.54	0.0000	Fixed Effect
	MVA_{EP}	13.44	0.0038	665.99	0.0000	Fixed Effect
	MVA_{SP}	16.19	0.0010	624.54	0.0000	Fixed Effect
	MVA_{GP}	3.50	0.3208	677.84	0.0000	Random Effect
Model 3	$EVM_{ESGP*FR}$	14.63	0.0121	108.02	0.0000	Fixed Effect
	$MVA_{ESGP*FR}$	20.25	0.0004	600.82	0.0000	Fixed Effect
Model 4	EVM_{EP*FR}	11.35	0.0448	108.84	0.0000	Fixed Effect
	EVM_{SP*FR}	11.79	0.0378	110.88	0.0000	Fixed Effect
	EVM_{GP*FR}	12.00	0.0348	107.88	0.0000	Fixed Effect
	MVA_{EP*FR}	19.26	0.0017	635.77	0.0000	Fixed Effect
	MVA_{SP*FR}	21.34	0.0007	594.36	0.0000	Fixed Effect
	MVA_{GP*FR}	10.51	0.0621	639.28	0.0000	Random Effect
Model 5	$EVM_{ESGP*AR}$	13.89	0.0163	106.67	0.0000	Fixed Effect
	$MVA_{ESGP*AR}$	18.41	0.0025	594.03	0.0000	Fixed Effect

Main	Sub-Model	Hausman Test		Breusch-Pagan LM Test		Appropriate Model
		chi2	Prob>chi2	chibar2	Prob > chibar2	
Model 6	EVM_{EP*AR}	13.75	0.0173	106.27	0.0000	Fixed Effect
	EVM_{SP*AR}	13.95	0.0159	105.62	0.0000	Fixed Effect
	EVM_{GP*AR}	9.24	0.0998	104.45	0.0000	Random Effect
	MVA_{EP*AR}	14.03	0.0154	631.19	0.0000	Fixed Effect
	MVA_{SP*AR}	19.59	0.0015	588.69	0.0000	Fixed Effect
	MVA_{GP*AR}	5.85	0.3212	665.24	0.0000	Random Effect

Significance levels are at 5% (0.05) and 10% (0.1)

The model diagnostics were performed for the six main mathematical models formulated by the study, grouped into sub-models in each main model, which were categorised in line with the two proxies of value creation (enterprise value multiple and market value added) and the individual components of ESG. The results in Table 4.14 showed that the fixed effect regression model was chosen as appropriate for Model EVM_{ESGP}, Model MVA_{ESGP}, Model EVM_{EP}, Model EVM_{SP}, Model EVM_{GP}, Model MVA_{EP}, Model MVA_{SP}, Model $EVM_{ESGP*FR}$, Model $MVA_{ESGP*FR}$, Model EVM_{EP*FR}, Model EVM_{SP*FR}, Model EVM_{GP*FR}, Model MVA_{EP*FR}, Model MVA_{SP*FR}, Model $EVM_{ESGP*AR}$, Model $MVA_{ESGP*AR}$, Model EVM_{EP*AR}, Model EVM_{SP*AR}, Model MVA_{EP*AR}, and Model MVA_{SP*AR}. The Prob>chi2 of the Hausman test results for these models, except for Model EVM_{GP}, were all less than 0.05, which rejected the null hypothesis that the random effect is appropriate and accepted the alternative hypothesis that the fixed effect model is appropriate. Hausman test results for Model EVM_{GP} suggested a random effect at 5% significance, but the model failed the overall model fitness test of the dataset. However, the fixed effect model best fitted the collected dataset at a 10% significance level.

Moreover, the Prob>chibar2 results of the Breusch-Pagan LM test conducted for these mathematical models were equally lower than the 0.05 significance level. Thus, the results reject the null hypothesis that the pooled OLS is appropriate and accept the alternative hypothesis that the random effect model is appropriate. As such, given that the Breusch-Pagan test preferred the random effect model, but the Hausman test chose the fixed effect over the random effect, the study resolved to employ the fixed

effect for these formulated mathematical models.

Furthermore, the Table 4.16 results as presented above also revealed that the random effect regression model was chosen as appropriate for Model MVA_{GP}, Model MVA_{GP*FR}, Model EVM_{GP*AR}, and Model MVA_{GP*AR}. The Prob>chi2 of the Hausman test results for these models were greater than 0.05, which accepted the null hypothesis that the random effect is suitable and rejected the alternative hypothesis that the fixed effect model is preferred. In addition, the Prob>chibar2 results of the Breusch-Pagan LM test carried out for these mathematical models were lower than the 0.05 significance level. This rejected the null hypothesis that the pooled OLS is appropriate and accepted the alternative hypothesis that the random effect model is appropriate. Therefore, given that both the Breusch-Pagan test and the Hausman test preferred the random effect model over the fixed effect and the pooled OLS, the study resorted to employing the random effect for these formulated mathematical models as it best fit the sample data collected.

4.5.3 Test for Heteroskedasticity Result: Post-Model Diagnostics

The study performed a heteroskedasticity check for each of the mathematical models formulated to ascertain if there is any systematic change in the spread of the residuals over the range of the 805 observations collected. This was necessary as the least square regressions assume all the residuals for a study are taken from a population that is homoscedastic (that is, has constant variation). As a result, the study conducted the Groupwise Wald test for fixed effect models and the Breusch-Pagan test for the random effect models, and then recommended appropriate corrections to address any heteroskedasticity problem. The results from the heteroskedasticity tests conducted are presented in Table 4.15 below.

Table 4.15
Groupwise Wald Test and Breusch-Pagan Test of Heteroskedasticity

Main	Sub-Model	chi2	Prob>chi2	Joint Significance	Correction/Remark
Model 1	EVM_{ESGP}	5.7e+07	0.0000	Yes	Robust Fixed Effect
	MVA_{ESGP}	4.9e+09	0.0000	Yes	Robust LSDV
Model 2	EVM_{EP}	4.9e+08	0.0000	Yes	Robust Fixed Effect
	EVM_{SP}	8.1e+07	0.0000	Yes	Robust Fixed Effect
	EVM_{GP}	6.7e+07	0.0000	Yes	Robust LSDV
	MVA_{EP}	5.6e+08	0.0000	Yes	Robust Fixed Effect
	MVA_{SP}	2.6e+09	0.0000	Yes	Robust LSDV
	MVA_{GP}	677.84	0.0000	Yes	Robust Random Effect
Model 3	$EVM_{ESGP*FR}$	4.5e+07	0.0000	Yes	Robust Fixed Effect
	$MVA_{ESGP*FR}$	4.4e+09	0.0000	Yes	Robust LSDV
Model 4	EVM_{EP*FR}	4.9e+08	0.0000	Yes	Robust Fixed Effect
	EVM_{SP*FR}	2.0e+08	0.0000	Yes	Robust Fixed Effect
	EVM_{GP*FR}	7.3e+07	0.0000	Yes	Robust LSDV
	MVA_{EP*FR}	8.7e+08	0.0000	Yes	Robust Fixed Effect
	MVA_{SP*FR}	4.7e+09	0.0000	Yes	Robust LSDV
	MVA_{GP*FR}	639.28	0.0000	Yes	Robust Random Effect
Model 5	$EVM_{ESGP*AR}$	1.1e+08	0.0000	Yes	Robust Fixed Effect
	$MVA_{ESGP*AR}$	6.2e+09	0.0000	Yes	Robust LSDV
Model 6	EVM_{EP*AR}	4.4e+08	0.0000	Yes	Robust Fixed Effect
	EVM_{SP*AR}	1.1e+08	0.0000	Yes	Robust LSDV
	EVM_{GP*AR}	104.45	0.0000	Yes	Robust Random Effect
	MVA_{EP*AR}	8.3e+08	0.0000	Yes	Robust LSDV
	MVA_{SP*AR}	2.2e+09	0.0000	Yes	Robust LSDV
	MVA_{GP*AR}	665.24	0.0000	Yes	Robust Random Effect

The results from the Breusch-Pagan test and Groupwise Wald test of heteroskedasticity, as shown in Table 4.15 above for all the formulated models, revealed that there is a systematic change in the spread of the residuals over the range of the observable values being measured. Thus, the heteroskedasticity problem was present in all the models, which could distort the statistical results and findings of the study. The heteroskedasticity problem may have been due to the large range between the maximum value and the minimum value, as noticed in a couple of the observations in the summary statistics from the sample data collected. This is particularly noticeable for observations

of variables like the enterprise value multiple (EVM) and the enterprise growth (EGR).

To correct the problem of heteroskedasticity, the study resorted to performing regression models with robust standard errors in order to remove the systematic change in the variations of the error term across the residuals. This aligns with the adoption of several prior studies (Aboud & Diab, 2018; Al-Hiyari et al., 2023; Bodhanwala & Bodhanwala, 2023; Tampakoudis et al., 2021). As such, the robust random effect and the robust fixed effect as shown in the table above were opted for by the study with the exception of Model MVA_{ESGP}, Model EVM_{GP}, Model MVA_{SP}, Model $MVA_{ESGP*FR}$, Model EVM_{GP*FR}, Model MVA_{SP*FR}, Model $MVA_{ESGP*AR}$, Model EVM_{SP*AR}, Model MVA_{EP*AR}, and Model MVA_{SP*AR}, where the robust least square dummy variable (LSDV) regression was preferred as the most suitable.

This is because the presence of fixed effects in these models had a damaging effect on the standard errors and thus affected the model's fitness to the sample data collected. Consequently, the study resorted to employing the least squares dummy variable (LSDV) regression technique to ensure more appropriate and best-fit results for the dataset as deployed by past studies (Amil et al., 2023; Appiah et al., 2020; Bodhanwala & Bodhanwala, 2023; Orazalin & Mahmood, 2020). This is in line with the postulation of Appiah et al. (2020), which expressed that the least squares dummy variable regression technique assumes the individual effect of the residuals is fixed over time in each cross-section, while the fixed effect regression model is a necessary specification for examining cross-sectional heterogeneity in the dataset. Thus, the individual heterogeneity can be explained by the least squares dummy variable (LSDV) regression model through its use of time and company identification dummy variables. In light of the above, the study adopted the robust least squares dummy variable (LSDV) regression to control the fixed effect that was present in MVA_{ESGP}, Model EVM_{GP}, Model MVA_{SP}, Model $MVA_{ESGP*FR}$, Model EVM_{GP*FR}, Model MVA_{SP*FR}, Model $MVA_{ESGP*AR}$, Model EVM_{SP*AR}, Model MVA_{EP*AR}, and Model $MVA_{SP*AR,}$ to effectively correct their heteroscedasticity problem.

4.6 Hypotheses Results

This section of the study presents the results and findings from the test of the hypotheses formulated to address the study's research questions. The study had earlier

formulated four main groups of hypotheses, which considered all the variables under investigation, and were subdivided into the two proxies of value creation (that is, EVM and MVA) and the components of ESG practices. Mathematical models were equally formulated to express the hypotheses and tested using Stata 14.2 statistical software.

To ensure that proxies of ESG and moderating variables capable of potentially impacting value creation are not let out, the study set the maximum type I error rate (alpha) at 10%, relaxing from Fisher's 5% traditional rate. Fisher asserted that at 5% type I error rate, a one in twenty chance represents an unusual sampling occurrence (Moore & McCabe, 1993). However, there is no scientific basis for this assertion (Lehmann & Romano, 2005; These et al., 2016). Therefore, the rate that minimises the probability or, on occasion, the cost of making any meaningful error should be the logical decision-making significance threshold (Mudge et al., 2012).

Furthermore, Kim and Choi (2021) argued that it is conventional and widely accepted to set the significance level or the type I error rate (alpha) for a research study at any of the 1%, 5%, and 10% levels. As such, this study adopted a cut-off rate of 10% for determining the significance level of the tested hypotheses, which is in line with and widely used by several previous social science research studies (Handy et al., 2005; Ma & Cao, 2019; Ramli et al., 2021; Shi et al., 2022). The hypothesis testing has been presented below in line with the four groups of formulated hypotheses and research questions.

4.6.1 Testing the Relationship between ESG Practices and Value Creation of Firms

To test the relationship between ESG Practices and value creation, two mathematical models were developed to reflect the value creation proxies of enterprise value multiple (EVM) and market value added (MVA). The results from the separate testing are presented in Tables 4.16 and 4.17 below.

The results of the robust fixed effects regression, as shown in Table 4.16 below, revealed a significant p-value of F = 0.0207, indicating that the model is statistically adequate and fits in explaining the relationship between ESG practices and the enterprise value multiple (EVM) of the sampled firms. The rho value of 0.4041 further

indicates that approximately 40% of the variations in EVM are attributable to firm-specific effects, thereby justifying the appropriateness of the fixed-effect estimation technique for the model. Table 4.16 shows that ESG practices have a coefficient of -0.469 with a p-value of 0.002, which is statistically significant at both the 1% and 5% levels. The findings lead to the rejection of the null hypothesis and support the alternative hypothesis that:

$H_{1.1}$: ESG Practices have a significant effect on the enterprise value of firms.

However, the negative coefficient suggests that, within the sampled period and context, increased ESG practices are associated with a reduction in the enterprise value multiple. This finding implies that ESG-related investments and implementation costs may exert short-term pressure on enterprise value, particularly in environmentally sensitive sectors where compliance and sustainability expenditures are relatively high. It also suggests that the value implications of ESG practices may not be immediately reflected in enterprise-based valuation measures such as EVM.

In contrast, firm size (FSize) recorded a positive coefficient of 3.906 but remained statistically insignificant ($p = 0.487$), indicating that firm size does not exert a meaningful influence on enterprise value multiple within this model. Similarly, enterprise growth (EGR) exhibited a negative but insignificant coefficient (-0.014; $p = 0.517$), suggesting that growth variations alone do not significantly explain changes in EVM among the sampled firms during the study period.

Overall, these findings suggest that while ESG practices significantly influence enterprise value, the direction and magnitude of this effect depend on how ESG initiatives interact with firms' cost structures and valuation frameworks. The result further supports the argument that ESG-driven value creation is conditional and may materialise differently across alternative value creation measures and time horizons.

Table 4.16
EVM Model (EVM_{ESGP})

Robust Fixed-Effect Regression

Variables	Coefficient	P-value
ESGP	**-0.469*****	0.002
	(0.150)	
FSize	**3.906**	0.487
	(5.611)	
EGR	**-0.014**	0.517
	(0.022)	
Constant	**-0.592**	0.991
	(53.933)	
Observation(N)	805	
Rho	0.4041	
Prob > F	0.0207	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

For the relationship between ESG practices and market value added (MVA), the results presented in Table 4.17 show that the robust least squares dummy variable (LSDV) model is statistically fit to examine this relationship, as evidenced by a highly significant Prob > F value of 0.0000. This indicates that, collectively, the explanatory variables included in the model are relevant in explaining variations in market value added among the sampled firms.

However, the individual regression results reveal that ESG practices have a positive coefficient of 0.004 but remain statistically insignificant, with a p-value of 0.270. This implies that ESG practices do not exert a statistically meaningful effect on market value added at both the 5% and 10% significance levels. Consequently, the findings do not reject the null hypothesis and also do not support the alternative hypothesis that:

$H_{1.2}$: ESG Practices have a significant effect on firms' market value-added

This finding suggests that capital market participants may not fully capitalise ESG practices into market-based value measures such as MVA, particularly in the short to medium term. One plausible explanation is that market value added reflects investors'

expectations and perceptions, which may be influenced more by immediate financial signals, macroeconomic conditions, or sector-specific dynamics than by firms' ESG implementation efforts. In environmentally sensitive sectors, ESG activities may be perceived as compliance-driven or cost-intensive, thereby limiting their immediate translation into excess market value.

Similarly, firm size (FSize) and enterprise growth (EGR) were found to have insignificant effects on market value added, with p-values of 0.557 and 0.198 and coefficients of 0.080 and 0.001, respectively. These results indicate that neither firm scale nor short-term growth dynamics significantly influence market value added within the sampled period. Overall, the MVA findings reinforce the notion that the value relevance of ESG practices is context-dependent and varies across different measures of value creation, particularly between enterprise-based and market-based indicators.

Table 4.17
MVA Model (MVA_{ESGP})
Robust Least Squares Dummy Variable (LSDVR)

Variables	Coefficient	P-value
ESGP	**0.004**	0.270
	(0.004)	
FSize	**0.080**	0.557
	(0.135)	
EGR	**0.001**	0.198
	(0.000)	
Constant	**-1.775**	-1.390
	(1.281)	
Observation(N)	805	
R-squared	0.7601	
Prob > F	0.0000	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Table 4.18 below summarises the findings from investigating the relationship between ESG practices and value creation, showing that the results rejected the null hypothesis and supported the alternative hypothesis for the effect of ESG practices on enterprise value created. But it failed to reject the null hypothesis and also does not

support the alternative hypothesis for the effect of ESG practices on market value added.

Table 4.18
ESG Practices on VC Hypothesis Result

Variable Type	EVM Model (EVM_{ESGP})	MVA Model (MVA_{ESGP})
ESG Practices	S	NS
S = Support, **NS = Not Support**		

4.6.2 Testing the Relationship between ESG Components (Environmental, Social, Governance) Practices and Value Creation of Firms

The relationship between individual Components of ESG Practices and value creation was also investigated by this study. The examination was conducted through the use of six mathematical models developed by the study to reflect the value creation proxies of enterprise value multiple (EVM) and market value added (MVA) for each of the individual ESG pillars. The findings from the separate tests performed are presented in Table 4.19 and Table 4.20 below.

The robust fixed effect model, which was conducted to test the relationship between the environmental practices (EP) and enterprise value multiple (EVM), was significant and best fit to investigate the possible association, given its overall Prob>F = 0.0139 as illustrated in Table 4.19 below. The results showed a rho = 0.3983, indicating that approximately only 40% of the changes in enterprise value multiple can be caused by changes in environmental practices (EP), firm size (FSize) and enterprise growth (EGR). The specific results revealed that environmental practices (EP), with a coefficient of -0.349 and P values of 0.002, have a significant negative effect on enterprise value multiple at the 1% significance level. Thus, the study findings rejected the null hypothesis and supported the alternative hypothesis that:

$H_{2.1a}$: Environmental practices have a significant effect on the enterprise value of firms.

The firm size (FSize) and the enterprise growth (EGR) were insignificant as

observed in Table 4.2, given their respective P values of 0.543 and 0.509, at the 5% and 10% significance level.

Similarly, the robust fixed effect model, which was conducted to test the relationship between the social practices (SP) and enterprise value multiple (EVM), was significant and best fit to investigate the possible association, given its overall Prob>F = 0.0792 as illustrated in Table 4.19 below. The results showed a rho = 0.3988, indicating that approximately only 40% of the changes in enterprise value multiple can be caused by changes in social practices (SP), firm size (FSize) and enterprise growth (EGR). The specific results revealed that social practices (SP), with a coefficient of -0.360 and P values of 0.011, have a significant negative effect on enterprise value multiple at the 5% significance level. Thus, the study findings rejected the null hypothesis and supported the alternative hypothesis that:

$H_{2.1b}$: Social practices have a significant effect on the enterprise value of firms.

The firm size (FSize) and the enterprise growth (EGR) were insignificant as observed in Table 4.19, given their respective P values of 0.605 and 0.488, at the 5% and 10% significance level.

Furthermore, the robust least squares dummy variable (LSDV) model, which was conducted to test the relationship between the governance practices (GP) and enterprise value multiple (EVM), was significant and best fit to investigate the possible association, given its overall Prob>F = 0.0000 as illustrated in Table 4.19 below. The results showed an R-squared = 0.4220, indicating that approximately only 42% of the changes in enterprise value multiple can be caused by changes in governance practices (GP), firm size (FSize) and enterprise growth (EGR). The specific results revealed that governance practices (GP), with a coefficient of 0.167 and P values of 0.076, have a significant positive effect on enterprise value multiple at the 10% significance level. Thereby rejecting the null hypothesis and supporting the alternative hypothesis that:

$H_{2.1c}$: Governance practices have a significant effect on the enterprise value of firms.

The firm size (FSize) and the enterprise growth (EGR) were insignificant as observed in Table 4.19, given their respective P values of 0.576 and 0.554, at the 5%

and 10% significance level.

Table 4.19
EVM Models ($EVM_{EP, SP, GP}$)
Robust Fixed-Effect and LSDV Regressions

	Model EVM_{EP}		**Model EVM_{SP}**		**Model EVM_{GP}**	
Variables	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
EP	**-0.349***** *(0.113)*	0.002				
SP			**-0.360**** *(0.140)*	0.011		
GP					**0.167*** *(0.094)*	0.076
FSize	**3.628** *(5.948)*	0.543	**2.830** *(5.466)*	0.605	**3.447** *(6.156)*	0.576
EGR	**-0.014** *(0.022)*	0.509	**-0.015** *(0.021)*	0.488	**0.012** *(0.020)*	0.554
Constant	**-6.453** *(56.694)*	0.910	**6.442** *(52.981)*	0.903	**-6.418** *(61.340)*	0.917
Observation(N)	805		805		805	
rho/R-squared	0.3983		0.3988		0.4220	
Prob > F	0.0139		0.0792		0.0000	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Furthermore, this study in separate models investigated the relationship between the components of ESG practices and market value added (MVA). As such, a robust fixed-effect model was conducted to investigate the relationship between the environmental practices (EP) and market value added (MVA). The model's overall Prob>F = 0.0551 showed that it was significant at 10% and best fit to investigate the possible association between the variables. Its rho of 0.7147, as illustrated in Table 4.20 below, indicates that approximately only 71% of the changes in the market value added (MVA) can be jointly explained by changes in environmental practices (EP), firm size (FSize) and enterprise growth (EGR). Specifically, the results revealed that the environmental practices (EP) of the sampled firms, with a regression coefficient = -0.008 and a P value = 0.034, have a negatively significant effect on their market value added at the 5% significance level. Therefore, the study result rejected the null

hypothesis and supported the alternative hypothesis that:

$H_{2.2a}$: Environmental practices have a significant effect on firms' market value added.

The firm size (FSize) and the enterprise growth (EGR) were insignificant as observed in Table 4.20, given their respective P values of 0.999 and 0.240, at the 5% and 10% significance level.

Conversely, the robust least squares dummy variable (LSDV) model, which was conducted to test the relationship between the social practices (SP) and market value added (MVA), revealed an insignificant effect, given the coefficient of 0.002 and a P value of 0.592 at the 5% and 10% significance levels. As illustrated in Table 4.20 below, the model was found to be the best fit to examine the possible relation between independent and dependent variables, with its overall Prob>F = 0.0000. The study findings failed to reject the null hypothesis and also did not support the alternative hypothesis that:

$H_{2.2b}$: Social practices have a significant effect on firms' market value added.

Similarly, the firm size (FSize) and the enterprise growth (EGR) were also insignificant as observed in Table 4.20, given their respective P values of 0.538 and 0.196, at the 5% and 10% significance level.

However, the robust random-effect regression model that was conducted, as presented in Table 4.20, showed that governance practices (GP) have a significant effect on market value added (MVA), given its P value = 0.063 and coefficient of 0.002, which is significant at the maximum threshold of 10% significance level. The model was found to be the best fit to examine the possible relation between the independent and the dependent variables, with its overall Prob>chi2 = 0.0000. The model also recorded a rho = 0.6556, indicating that approximately 66% of the changes in the market value added (MVA) can be jointly explained by changes in governance practices (GP), firm size (FSize) and enterprise growth (EGR). Therefore, the study result rejected the null hypothesis and supported the alternative hypothesis that:

$H_{2.2c}$: Governance practices have a significant effect on firms' market value added.

Firm size (FSize) with a P value less than 1% (0.000) was found by the model to have a strong, significant effect on market value added (MVA), while enterprise growth (EGR) with a P value = 0.228 was insignificant at the maximum 10% significance level.

Table 4.20
MVA Models ($MVA_{EP, SP, GP}$)
Robust Fixed-Effect, LSDV and Random-Effect Regressions

	Model MVA_{EP}		**Model MVA_{SP}**		**Model MVA_{GP}**	
Variables	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
EP	**-0.008****	0.034				
	(0.004)					
SP			**0.002**	0.592		
			(0.003)			
GP					**0.004***	0.063
					(0.002)	
FSize	**0.000**	0.999	**0.083**	0.538	**-0.189*****	0.000
	(0.174)		*(0.135)*		*(0.040)*	
EGR	**0.000**	0.240	**0.001**	0.196	**0.001**	0.228
	(0.000)		*(0.000)*		*(0.000)*	
Constant	**0.240**	0.885	**-1.754**	0.173	**1.676*****	0.000
	(1.651)		*(1.285)*		*(0.386)*	
Observation(N)	805		805		805	
rho/R-squared	0.7147		0.7598		0.6556	
Prob > chi2 / F	0.0551		0.0000		0.0000	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

The relationship between the components of ESG practices and value creation, as revealed by the hypothesis investigation, has been summarised in Table 4.21 below, showing that environmental practices and governance practices supported the alternative hypothesis for market value added (MVA), while social practices did not support the alternative hypothesis for MVA. However, all the pillars (environmental practices, social practices, and governance practices) rejected the null hypothesis and

supported the alternative hypothesis for enterprise value multiple (EVM).

Table 4.21
ESG Component Practices on VC Hypothesis Result

Variable Type	EVM Models ($EVM_{EP, SP, GP}$)	MVA Models ($MVA_{EP, SP, GP}$)
Environmental Practices	S	S
Social Practices	S	NS
Governance Practices	S	S
S = Support, **NS = Not Support**		

4.6.3 Testing the Moderating Role of Financial Risk on the Relationship between ESG Practices, ESG Components Practices, and Value Creation

This study extensively investigated the moderating role of financial risk (FR) on the relationship between ESG practices and value creation, and separately also on the relationship between the components of ESG practices and value creation. The investigation in each scenario was performed using formulated mathematical models, which are subdivided into the proxies of value creation. That is, enterprise value multiple (EVM) and market value added (MVA).

4.6.3.1 Moderating Effect of Financial Risk on the Relationship between ESG Practices and Value Creation Result

Table 4.22 examined the moderating role of financial risk on the relationship between ESG practices and enterprise value multiple (EVM). The results from the robust fixed effect regression model showed that the model was the best fit with a Prob>F = 0.0101. The rho = 0.4082 also implied that approximately 41% of the changes in the dependent variable (EVM) can be explained jointly by changes in the ESG practices, weighted average cost of capital (WACC), firm size (FSize) and enterprise growth (EGR). Specifically, the model recorded that the interaction of ESG practices and financial risk had an insignificant effect on enterprise value multiple, given its

coefficient = 0.021 and P value =0.502 at both 5% and 10% significance levels. This result failed to reject the null hypothesis and also did not support the alternative hypothesis that:

$H_{3.1}$: *Financial risk moderates the relationship between ESG Practices and the enterprise value of firms*

Table 4.22
EVM Model ($EVM_{ESGP*FR}$)
Robust Fixed-Effect Regression

Variables	Coefficient	P-value
ESGP	**-0.638****	0.020
	(0.273)	
WACC	**-1.170**	0.230
	(0.971)	
ESGP*WACC	**0.021**	0.502
	(0.032)	
FSize	**4.512**	0.422
	(5.607)	
EGR	**-0.014**	0.520
	(0.022)	
Constant	**2.926**	0.957
	(54.144)	
Observation(N)	805	
Rho	0.4082	
Prob > F	0.0101	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

The moderating role of financial risk on the relationship between ESG practices and market value added (MVA) was equally investigated by conducting a robust least squares dummy variable (LSDV) model as presented in Table 4.23 below. The results showed the model was the best fit to explain the moderating influence of financial risk on the relationship based on its significant Prob>F = 0.0000. However, the interaction of financial risk and ESG practices revealed an approximate coefficient = -0.001, and with a P value = 0.354, which was insignificant at the maximum 10% significance level. Therefore, the findings presented in Table 4.23 from the LSDV regression model failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{3.2}$: *Financial risk moderates the relationship between ESG Practices and the firms' market value added.*

Table 4.23
MVA Model ($MVA_{ESGP*FR}$)
Robust Least Squares Dummy Variable (LSDV)

Variables	Coefficient	P-value
ESGP	**0.010**	0.176
	(0.007)	
WACC	**0.019**	0.570
	(0.033)	
ESGP*WACC	**-0.001**	0.354
	(0.001)	
Fsize	**0.073**	0.591
	(0.135)	
EGR	**0.001**	0.224
	(0.000)	
Constant	**-1.857**	0.150
	(1.289)	
Observation(N)	805	
R-squared	0.5509	
Prob > F	0.0000	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

The findings and results obtained from investigating the moderating role of financial risk on the relationship between ESG practices and value creation are summarised in Table 4.24 below. It showed that the interaction of financial risk and ESG practices failed to reject the null hypothesis for enterprise value multiple (EVM) and market value added (MVA).

Table 4.24
ESG Practices and FR Interaction on VC Hypothesis Result

Variable Type	EVM Model ($EVM_{ESGP*FR}$)	MVA Model ($MVA_{ESGP*FR}$)
ESG Practices x FR	NS	NS
S = Support, **NS = Not Support**		

4.6.3.2 Moderating Effect of Financial Risk on the Relationship between ESG Component Practices and Value Creation Result

The study went further to investigate the extent to which financial risk can influence the relationship between the individual components of ESG practices and value creation. This was separately examined for two proxies of value creation (enterprise value multiple and market value added), and for each of the environmental, social and governance pillars.

As such, the effect of the individual components of ESG practices on enterprise value multiple (EVM) was examined within a context where this relationship is moderated by the financial risk exposure of the firms considered in the sample. The results of the separate regression model deployed are captured below in Table 4.25. A robust fixed-effect regression model was deployed to examine the effect of financial risk interactions with environmental practices (EP) on enterprise value multiple (EVM). The model was deemed fit to investigate this relationship based on its significant Prob> F = 0.0258. Its R-squared (rho) was 0.4031, indicating that approximately 40% of the changes in enterprise value multiple (EVM) are jointly caused by changes in environmental practices (EP), weighted average cost of capital (WACC), firm size (FSize) and enterprise growth (EGR). Specifically, results obtained as illustrated in Table 4.27 below revealed that financial risk interactions with environmental practices (EP) have an insignificant effect on enterprise value multiple (EVM) at both the 5% and the 10% significance levels, given its P values of 0.442 and coefficient of 0.022. Thus, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{3.1a}$: Financial risk moderates the relationship between environmental practices and the enterprise value of firms.

Similarly, the robust fixed-effect regression model that was conducted to examine the effect of financial risk interactions with social practices (SP) on enterprise value multiple (EVM) revealed an insignificant effect at both 5% and 10% significance levels, given its P values of 0.366 and coefficient of 0.024. The model was deemed fit to investigate this relationship based on its overall significant Prob> F = 0.0498, as illustrated in Table 4.27 below. Its R-squared (rho) was 0.4038, indicating that

approximately 40% of the changes in enterprise value multiple (EVM) are jointly caused by changes in social practices (SP), weighted average cost of capital (WACC), firm size (FSize) and enterprise growth (EGR). Thus, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{3.1b}$: Financial risk moderates the relationship between social practices and the enterprise value of firms.

This was also the case for the robust least squares dummy variable (LSDV) model that was conducted to examine the effect of financial risk interactions with governance practices (GP) on enterprise value multiple (EVM). The model was deemed fit to investigate the relationship based on its overall significant Prob> F = 0.0000. The results, as presented in Table 4.25 below, showed that financial risk interactions with governance practices (GP) have an insignificant effect on enterprise value multiple (EVM) at both the 5% and the 10% significance levels, given its P values of 0.965 and coefficient of -0.001. Therefore, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

*$H_{3.1c}$**:** Financial risk moderates the relationship between governance practices and the enterprise value of firms.*

Table 4.25
EVM Models ($EVM_{EP, SP, GP * FR}$)

Robust Fixed-Effect and LSDV Regressions

	Model EVM_{EP*FR}		**Model EVM_{SP*FR}**		**Model EVM_{GP*FR}**	
Variables	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
EP	**-0.525****	0.040				
	(0.254)					
SP			**-0.545**	0.019**		
			(0.230)			
GP					**-0.163**	0.534
					(0.262)	
WACC	**-0.885**	0.209	**-1.337**	0.160	**-0.845**	0.503
	(0.701)		*(0.948)*		*(1.259)*	
EP*WACC	**0.022**	0.442				
	(0.029)					
SP*WACC			**0.024**	0.366		
			(0.026)			
GP*WACC					**-0.001**	0.965
					(0.033)	
FSize	**4.459**	0.461	**3.576**	0.510	**3.803**	0.538
	(6.036)		*(5.419)*		*(6.170)*	
EGR	**-0.014**	0.524	**-0.014**	0.499	**-0.012**	0.535
	(0.022)		*(0.021)*		*(0.019)*	
Constant	**-7.352**	0.896	**9.820**	0.855	**-4.130**	0.946
	(56.296)		*(53.530)*		*(60.833)*	
Observation(N)	805		805		805	
rho/R-squared	0.4031		0.4038		0.4246	
Prob > F	0.0258		0.0498		0.0000	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Furthermore, the study examined the effect of individual ESG components on market value added (MVA) under the moderating influence of financial risk exposure. As reported in Table 4.26, the robust fixed-effect regression model for environmental practices was statistically adequate, with an overall Prob > F value of 0.0906, indicating model significance at the 10% level. The reported rho value of 0.7113 suggests that approximately 71% of the variation in market value added is jointly explained by environmental practices, weighted average cost of capital (WACC), firm size (FSize), and enterprise growth (EGR), highlighting the strong role of firm-specific

characteristics in shaping market-based value outcomes.

More importantly, the interaction term between environmental practices and financial risk reveals a statistically significant negative effect on market value added at the 10% significance level, with a coefficient of -0.001 and a p-value of 0.097. Thus, the results rejected the null hypothesis and supported the alternative hypothesis that:

$H_{3.2a}$: Financial risk moderates the relationship between environmental practices and firms' market value added.

This indicates that while environmental practices may contribute to sustainability objectives, their impact on market value is weakened when firms are exposed to higher financial risk. In such circumstances, investors may perceive environmental investments as adding financial strain, particularly through higher financing costs, thereby dampening their contribution to excess market value.

The rejection of the null hypothesis and support for the alternative hypothesis ($H_{3.2a}$) suggest that financial risk plays a meaningful moderating role in the environmental practices value creation relationship. This finding implies that the capital market response to environmental initiatives is not unconditional but depends on the firm's financial risk profile. For firms operating in environmentally sensitive sectors, the effectiveness of environmental practices in enhancing market value may therefore hinge on their ability to manage financing costs and maintain financial stability alongside sustainability commitments.

On the contrary, the robust least squares dummy variable (LSDV) model that was conducted to examine the effect of financial risk interactions with social practices (SP) on market value added (MVA) revealed an insignificant effect at both the 5% and the 10% significance levels, given its P values of 0.511 and a coefficient of 0.000. The model was deemed fit to investigate this relationship based on its overall significant Prob> F = 0.0000, as illustrated in Table 4.26 below. Therefore, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{3.2b}$: Financial risk moderates the relationship between social practices and firms' market value added.

This was similar to the robust random effect model that was conducted to

examine the effect of financial risk interactions with governance practices (GP) on market value added (MVA), revealing an insignificant effect at both the 5% and the 10% significance levels, given its P values of 0.905 and a coefficient of approximately -0.001. The model was deemed fit to investigate this relationship based on its overall significant Prob>chi2 = 0.0000, as illustrated in Table 4.26 below. Therefore, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{3.2c}$: Financial risk moderates the relationship between governance practices and the firms' market value added.

Table 4.26
MVA Models ($MVA_{EP, SP, GP * FR}$)
Robust Fixed-Effect, LSDV and Random-Effect Regressions

	Model MVA_{EP*FR}		**Model MVA_{SP*FR}**		**Model MVA_{GP*FR}**	
Variables	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
EP	**0.001**	0.826				
	(0.006)					
SP			**0.005**	0.405		
			(0.006)			
GP					**0.004**	0.422
					(0.005)	
WACC	**0.016**	0.452	**0.010**	0.755	**-0.010**	0.754
	(0.021)		*(0.031)*		*(0.032)*	
EP*WACC	**-0.001***	0.097				
	(0.001)					
SP*WACC			**0.000**	0.511		
			(0.001)			
GP*WACC					**-0.001**	0.905
					(0.001)	
FSize	**-0.012**	0.948	**0.079**	0.558	**-0.192*****	0.000
	(0.180)		*(0.135)*		*(0.040)*	
EGR	-	-	**0.001**	0.218	**0.001**	0.240
	-		*(0.000)*		*(0.000)*	
Constant	**0.215**	0.898	**-1.791**	0.167	**1.777*****	0.000
	(1.670)		*(1.293)*		*(0.482)*	
Observation(N)	805		805		805	
rho/R-squared	0.7113		0.7601		0.6448	
Prob > chi2 / F	0.0906		0.0000		0.0000	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

The findings and results obtained from separately investigating the individual interactions of financial risk and ESG component practices showed that social practices and governance practices failed to reject the null hypothesis for enterprise value multiple (EVM) and market value added (MVA). However, while the individual interaction of financial risk and environmental practices failed to reject the null hypothesis for enterprise value multiple (EVM), it did reject the null hypothesis and supported the alternative hypothesis for market value added (MVA) as summarised in Table 4.27 below.

Table 4.27
ESG Component Practices and FR Interaction on VC Hypothesis Result

Variable Type	**EVM Model ($EVM_{EP, SP, GP * FR}$)**	**MVA Model ($MVA_{EP, SP, GP * FR}$)**
Environmental Practices x FR	NS	S
Social Practices x FR	NS	NS
Governance Practices x FR	NS	NS
S = Support, NS = Not Support		

4.6.4 Testing the Moderating Role of Agency Risk on the Relationship between ESG Practices, ESG Components Practices, and Value Creation

The study considered the moderating influence of agency risk (AR) on the relationship between ESG practices and value creation in order to examine corporate risk from a perspective where the risk exposure is a result of self-interested executives, and not necessarily due to their technical competence or unintentional decision, as may be the case for financial risk. In this regard, the study extensively investigated the moderating role of agency risk on the relationship between ESG practices and value creation, and also separately on the relationship between ESG components practices and value creation. The inquiry in each scenario was accomplished by employing formulated mathematical models, which were subdivided into the proxies of value creation (enterprise value multiple (EVM) and market value added (MVA).

4.6.4.1 Moderating Effect of Agency Risk on the Relationship between ESG Practices and Value Creation Result

Table 4.28 presents the results obtained from the robust fixed effect model conducted to investigate the moderating influence of agency risk on the relationship between ESG practices and enterprise value multiple (EVM). The model recorded an overall Prob>F = 0.0755, indicating that the mathematical model was fit at the 10% significance level to explain the tested relationship. It equally recorded a rho = 0.4021, indicating that approximately 40% of the changes in the dependent variable (EVM) can be jointly explained by changes in ESG practices and agency risk exposure (executive compensation), firm size, and enterprise growth. Specifically, the table also illustrates that the interaction of agency risk and ESG practices was insignificant on enterprise value multiple (EVM), with a coefficient of 0.012 and a P value of 0.193, which is insignificant at the maximum threshold of a 10% significance level. Thus, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{4.1}$: *Agency risk moderates the relationship between ESG Practices and the enterprise value of firms.*

Table 4.28
EVM Model ($EVM_{ESGP*AR}$)
Robust Fixed-Effect Regression

Variables	Coefficient	P-value
ESGP	**-0.551*****	0.004
	(0.189)	
EC	**-0.518**	0.176
	(0.381)	
ESGP*EC	**0.012**	0.193
	(0.009)	
FSize	**4.274**	0.454
	(5.690)	
EGR	**-0.016**	0.456
	(0.021)	
Constant	**-0.484**	0.993
	(54.275)	
Observation(N)	805	
Rho	0.4021	
Prob > F	0.0755	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Furthermore, the moderating influence of agency risk on the relationship between ESG practices and market value added (MVA) was examined by performing a robust least squares dummy variable (LSDV) model. The results obtained, as shown in Table 4.29 below, revealed Prob>F = 0.0000, confirming the model was fit to analyse the relationship. It equally showed that agency risk's interaction with ESG practices had an insignificant influence on market value added (MVA), given its P value of 0.746 and a coefficient of 0.000. Thus, the findings did not reject the null hypothesis and also did not support the alternative hypothesis that:

$H_{4.2}$: *Agency risk moderates the relationship between ESG Practices and the firms' market value added.*

Table 4.29
MVA Model ($MVA_{ESGP*AR}$)
Robust Least Squares Dummy Variable (LSDV)

Variables	Coefficient	P-value
ESGP	**0.003**	0.402
	(0.004)	
EC	**-0.007**	0.517
	(0.011)	
ESGP*EC	**0.000**	0.746
	(0.000)	
FSize	**0.081**	0.545
	(0.134)	
EGR	**0.001**	0.169
	(0.000)	
Constant	**-1.752**	0.172
	(1.281)	
Observation(N)	805	
R-squared	0.7603	
Prob > F	0.0000	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

The findings and results obtained from investigating the moderating role of agency risk on the relationship between ESG practices and value creation are

summarised in Table 4.30 below. It showed that agency risk's interaction with ESG practices failed to reject the null hypothesis and also did not support the alternative hypothesis for enterprise value multiple (EVM) and market value added (MVA).

Table 4.30
ESG Practices and AR Interaction on VC Hypothesis Result

Variable Type	EVM Model ($EVM_{ESGP*AR}$)	MVA Model ($MVA_{ESGP*AR}$)
ESG Practices x AR	NS	NS

S = Support, NS = Not Support

4.6.4.2 Moderating effect of Agency Risk on the relationship between ESG Component Practices and Value Creation Result

A further area of interest in this study was to examine the moderating influence of the interaction of agency risk and the individual components of ESG practices and value creation. This was separately investigated for two proxies of value creation (enterprise value multiple and market value added), and for each of the environmental, social, and governance pillars.

In this regard, the effect of the individual components of ESG practices on enterprise value multiple (EVM) was examined within a context where this relationship is moderated by the agency risk exposure of publicly listed firms in the environmentally sensitive sectors of Bursa, Malaysia. The results, as presented in Table 4.31 below, indicate that the robust fixed-effect regression model was appropriate for examining the relationship between environmental practices and enterprise value multiple (EVM), as evidenced by an overall significant Prob > F value of 0.0341 at the 5% significance level. The rho value of 0.3993 further suggests that approximately 40% of the variation in EVM is jointly explained by environmental practices, executive compensation (EC), firm size (FSize), and enterprise growth (EGR), underscoring the relevance of internal governance and firm characteristics in shaping enterprise-level value creation. More specifically, the interaction between agency risk and environmental practices (EP) exhibits a statistically significant positive effect on EVM at the 10% significance level,

with a coefficient of 0.015 and a p-value of 0.074. This led to the rejection of the null hypothesis and supported the alternative hypothesis that:

$H_{4.1a}$: Agency risk moderates the relationship between environmental practices and the enterprise value of firms.

This finding implies that when agency-related mechanisms, such as executive compensation structures, are aligned with environmental objectives, environmental practices are more likely to enhance enterprise value. In this context, agency risk appears to operate as a disciplining mechanism that incentivises managers to pursue environmental initiatives that are economically justified and value-enhancing rather than symbolic or opportunistic. The rejection of the null hypothesis and support for the alternative hypothesis ($H_{4.1a}$) therefore suggest that agency risk plays a meaningful moderating role in strengthening the environmental practices-enterprise value relationship. This outcome highlights the importance of governance structures in ensuring that environmental strategies are implemented in ways that are consistent with shareholder interests and long-term value creation.

On the contrary, the robust least squares dummy variable (LSDV) model that was conducted to examine the effect of agency risk interactions with social practices (SP) on enterprise value multiple (EVM), revealed an insignificant effect at both the 5% and the 10% significance levels, given its P values of 0.752 and a coefficient of 0.003. The model was deemed fit to investigate this relationship based on its overall significant Prob> F = 0.0000, as illustrated in Table 4.31 below. Its R-squared (rho) was 0.4236, indicating that approximately 42% of the changes in enterprise value multiple (EVM) are jointly caused by changes in social practices (SP), executive compensation (EC), firm size (FSize) and enterprise growth (EGR). Thus, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{4.1b}$: Agency risk moderates the relationship between social practices and the enterprise value of firms.

However, this was not the case for the robust random-effect model conducted to examine the interaction between agency risk and governance practices (GP) on enterprise value multiple (EVM). The model was considered suitable for analysing this relationship, as indicated by its overall significant Prob > F value of 0.0706 at the 10% significance level. This suggests that variations in EVM are meaningfully associated

with the combined influence of governance practices, agency risk, and the specified control variables. The specific results presented in Table 4.31 reveal that the interaction between agency risk and governance practices has a statistically significant positive effect on EVM at the 10% level, with a coefficient of 0.015 and a p-value of 0.060. Therefore, the findings rejected the null hypothesis and supported the alternative hypothesis that:

$H_{4.1c}$: Agency risk moderates the relationship between governance practices and the enterprise value of firms.

This finding implies that governance practices contribute more effectively to enterprise value creation when agency-related mechanisms, such as executive compensation incentives, are present to align managerial actions with shareholder interests. In this sense, agency risk moderates the governance-value relationship by reinforcing accountability and reducing opportunistic managerial behaviour. Accordingly, the rejection of the null hypothesis and support for the alternative hypothesis ($H_{4.1c}$) confirm that agency risk plays a moderating role in the relationship between governance practices and enterprise value. This outcome reinforces the agency theory perspective that effective governance structures, when combined with appropriate incentive mechanisms, can enhance firm value by mitigating conflicts between managers and owners.

Table 4.31
EVM Models ($EVM_{EP, SP, GP * AR}$)
Robust Fixed-Effect, LSDV, and Random-Effect Regressions

	Model EVM_{EP*AR}		**Model EVM_{SP*AR}**		**Model EVM_{GP*AR}**	
Variables	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
EP	**-0.460*****	0.002				
	(0.144)					
SP			**-0.352**	0.129		
			(0.231)			
GP					**-0.172***	0.068
					(0.094)	
EC	**-0.474***	0.078	**-0.138**	0.789	**-0.907**	0.013
	(0.267)		*(0.515)*		*(0.365)*	
EP*EC	**0.015***	0.074				
	(0.008)					
SP*EC			**0.003**	0.752		
			(0.010)			
GP*EC					**0.015***	0.060
					(0.008)	
FSize	**4.176**	0.489	**3.962**	0.511	**0.035**	0.974
	(6.027)		*(6.029)*		*(1.093)*	
EGR	**-0.019**	0.348	**-0.013**	0.508	**-0.004**	0.856
	(0.020)		*(0.020)*		*(0.021)*	
Constant	**-8.170**	0.887	**-12.916**	0.830	**27.695****	0.026
	(57.294)		*(60.102)*		*(12.457)*	
Observation(N)	805		805		805	
rho/R-squared	0.3993		0.4236		0.2591	
Prob > chi2 / F	0.0341		0.0000		0.0706	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Furthermore, the study was interested in ascertaining the moderating influence of the interaction of agency risk and the individual components of ESG practices on market value added (MVA). The results of the separate regression models deployed are captured below in Table 4.32. A robust least squares dummy variable (LSDV) model was deployed to examine the effect of agency risk interactions with environmental practices (EP) on market value added (MVA). The model was deemed fit to investigate this relationship based on its significant Prob> F = 0.0000. The specific results obtained, as illustrated in Table 4.32 below, revealed that agency risk interactions with environmental practices (EP) have an insignificant effect on enterprise value multiple (EVM) at both the 5% and the 10% significance levels, given its P values of 0.774 and

coefficient of 0.000. Thus, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{4.2a}$: Agency risk moderates the relationship between environmental practices and firms' market value added.

In the same vein, the robust least squares dummy variable (LSDV) model that was conducted to examine the effect of financial risk interactions with social practices (SP) on market value added (MVA) revealed an insignificant effect at both the 5% and the 10% significance levels, given its P values of 0.828 and coefficient of 0.000. The model was deemed fit to investigate this relationship based on its overall significant Prob> F = 0.0000, as illustrated in Table 4.32 below. Therefore, the findings failed to reject the null hypothesis, and also did not support the alternative hypothesis that:

$H_{4.2b}$: Agency risk moderates the relationship between social practices and firms' market value added.

However, a contrary result was found for the robust random effect model that was conducted to examine the effect of agency risk interactions with governance practices (GP) on market value added (MVA). The model was deemed fit to investigate the relationship based on its overall significant Prob> F = 0.0000 at the 1 % level. Its rho of 0.6530 indicates that approximately 65% of the changes in market value added (MVA) are jointly explained by changes in governance practices (GP), executive compensation (EC), firm size (FSize) and enterprise growth (EGR). The specific results, as presented in Table 4.32 below, showed that agency risk interactions with governance practices (GP) significantly affect market value added (MVA) at the 10% significance level, given its P values of 0.058 and a coefficient of approximately 0.0003. Therefore, the findings rejected the null hypothesis and supported the alternative hypothesis that:

$H_{4.2c}$: Agency risk moderates the relationship between governance practices and firms' market value added.

Firm size (FSize) was also recorded by the model to be significant, given its P value = 0.000 as shown in Table 4.32 below, while the enterprise growth (EGR) was found to be insignificant, given its P value = 0.208 at both the 5% and 10% significance levels.

Table 4.32
MVA Model ($MVA_{EP, SP, GP * AR}$)
Robust LSDV and Random-Effect Regressions

	Model MVA_{EP*AR}		**Model MVA_{SP*AR}**		**Model MVA_{GP*AR}**	
Variables	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
EP	**-0.002**	0.510				
	(0.003)					
SP			**0.002**	0.610		
			(0.004)			
GP					**0.001**	0.565
					(0.002)	
EC	**-0.003**	0.690	**-0.003**	0.803	**-0.021****	0.025
	(0.009)		*(0.011)*		*(0.009)*	
EP*EC	**0.000**	0.774				
	(0.000)					
SP*EC			**0.000**	0.828		
			(0.000)			
GP*EC					**0.0003***	0.058
					(0.0002)	
FSize	**0.092**	0.498	**0.084**	0.533	**-0.187*****	0.000
	(0.135)		*(0.134)*		*(0.040)*	
EGR	**0.001**	0.142	**0.001**	0.154	**0.001**	0.208
	(0.000)		*(0.000)*		*(0.000)*	
Constant	**-1.780**	0.167	**-1.746**	0.174	**1.822*****	0.000
	(1.286)		*(1.282)*		*(0.392)*	
Observation(N)	805		805		805	
rho/R-squared	0.7602		0.7600		0.6530	
Prob > chi2 / F	0.0000		0.0000		0.0000	

Note: Standard errors are in parentheses, while ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

The findings and results obtained from investigating the moderating role of agency risk on the relationship between the components of ESG practices and value creation are summarised in Table 4.33 below. It showed that the individual interactions of agency risk and environmental practices failed to reject the null hypothesis for enterprise value multiple (EVM) but rejected the null hypothesis for market value added (MVA). It equally shows that the interaction of agency risk and social practices did not reject the null hypothesis for both enterprise value multiple (EVM) and market value added (MVA). However, the interaction of agency risk and governance practices rejected the null hypothesis and supported the alternative hypothesis for both enterprise

value multiple (EVM) and market value added (MVA).

Table 4.33
ESG Component Practices and AR Interaction on VC Hypothesis Result

Variable Type	**EVM Model ($EVM_{EP, SP, GP * AR}$)**	**MVA Model ($MVA_{EP, SP, GP * AR}$)**
Environmental Practices x AR	S	NS
Social Practices x AR	NS	NS
Governance Practices x AR	S	S
S = Support, NS = Not Support		

4.7 Chapter Summary

The above chapter four sections of this study have extensively presented the results and findings from all the various statistical analyses and tests performed in the analysis of the study data collected. This involved deploying various statistical estimation and analysis techniques, which included descriptive statistics, cluster analysis, correlation analysis, regression analysis, data diagnostics, variable diagnostics and model diagnostics. The summary statistics considered the 805 observations across 161 publicly listed companies in the FTSE Bursa Malaysia EMAS Index. It observes the highest ESG practices performance recorded to be 91.64%, while the lowest was 7.64%. Social practices had the highest ESG components practices at 97.41%, while the lowest individual pillar performance score observed was 0% from the environmental practices. Enterprise growth (EGR) recorded the highest dispersion from the observations of all the variables considered in the study, given its calculated mean that stood at 12.41% with a standard deviation of 58.27%. The skewness test, the kurtosis test, and the Shapiro-Wilk test were conducted to check for the normality of the collected data; all exhibited a non-normal distribution due to the presence of some outliers and tails in the sampled dataset.

A descriptive analysis was conducted, which considered yearly movements and sectoral averages of the observations. Both the ESG practices and their component practices showed an increasing trend, while enterprise value multiple and market value

added showed a slight decrease in their overall trends. The sectoral average analysis ranked the property sector highest with an average performance score of 55.85 for ESG practices, and the components of ESG score of 48.73, 62%, 61.99%, and 56.57% for the environmental practices, social practices and governance practices, respectively. This was followed by a cluster analysis of the dataset, which grouped the firms' observations into different clusters with similar ESG, value creation and financial and agency risk attributes. The correlation analysis and variance inflation factor revealed there was no multi-collinearity problem, while the test for heteroscedasticity showed it was a problem which could be corrected with a robust regression model.

Section 4.6 of this chapter, which captured the tests of hypotheses, presented the results of the robust regression models conducted for each of the formulated mathematical models. The regression analysis findings rejected the null hypothesis for ESG practices, ESG components practices and enterprise value multiple (EVM). Similarly, it also rejected the null hypothesis for environmental and governance practices on market value added (MVA) but failed to reject the null hypothesis for ESG practices and social practices on market value added (MVA).

Furthermore, the study failed to reject the null hypothesis on the moderating influence of financial risk on ESG practices, ESG components practices and enterprise value multiple (EVM). Similarly, it failed to reject the null hypothesis on the moderating influence of financial risk on ESG practices, social practices and governance practices, on market value added (MVA), but to reject the null hypothesis on the interaction effect of financial risk on the environmental practices and market value added (MVA) relationship.

The study also failed to reject the null hypothesis on the moderating influence of agency risk on ESG practices, social practices and enterprise value multiple (EVM) relationships. But the null hypothesis on environmental practices and governance practices on enterprise value multiple (EVM) was rejected, and the alternative hypothesis was supported. Finally, the study failed to reject the null hypothesis on the moderating influence of agency risk on ESG practices, environmental practices and social practices, on market value added (MVA), but to reject the null hypothesis on the interaction effect of agency risk on the governance practices and market value added (MVA) relationship.

CHAPTER 5
DISCUSSION OF RESULTS AND FINDINGS

5.1 Introduction

This chapter seeks to provide a comprehensive discussion of the results and findings as presented under the descriptive and regression analyses tests of hypotheses in the previous chapter, Chapter Four. The discussions are structured into four core themes, and eventually, it concludes with the unveiling of new insights on the ESG value creation relationships. The chapter begins with an introduction in Section 5.1, which is then followed by a discussion on the relationships between ESG practices and value creation in Section 5.2, and a discussion on the relationship between the components of ESG practices and value creation in Section 5.3. Next, the chapter considered a discussion on the moderating role of financial risk of the separate relationships between ESG practices, ESG components practices, and value creation in Section 5.4, and a thematic discussion on the moderating role of agency risk on the separate relationships between ESG practices, ESG components practices, and value creation in Section 5.5. A synthesis of findings on ESG-value creation and risk interactions is discussed in Section 5.6, while the theoretical novelty of the study is discussed in Section 5.7. Finally, this chapter concludes with a chapter summary in Section 5.8.

5.2 Discussion of the Relationship between ESG Practices and Value Creation of Firms

The empirical investigation into the relationship between ESG practices and value creation by this study revealed two key findings. First, ESG practices have a significant and negative effect on enterprise value multiple ($\beta = -0.469$, $p < 0.01$ and 0.05), as summarised in Table 5.1. Second, ESG practices have an insignificant positive effect on market value added ($\beta = 0.004$, $p > 0.10$). These results indicate that while ESG initiatives may adversely affect firms' enterprise value in the short term, it does not yet significantly influence shareholder wealth as measured by market value added.

The significant negative relationship between ESG practices and enterprise value multiple aligns with the findings of Bifulco et al. (2023), who sampled European listed firms and reported that ESG initiatives impose substantial implementation costs that negatively impact short-term market value. Similarly, Mishra et al. (2024), in the context of Indian non-financial firms, also observed a negative association, which can be attributed to the foregoing of short-term profitability objectives in order to comply with ESG requirements. However, this result contradicts studies such as Kong et al. (2023), which focused on the top global firms in the technology sector, and Fang et al. (2023), which examined firms listed on mainland China's stock exchanges, both of which reported a positive impact of ESG practices on corporate value. The difference in these outcomes may stem from regional differences in regulatory pressure, stage of ESG implementation, investor expectations, and sector-specific cost structures.

Regarding market value added, the insignificant relationship observed is consistent with the conclusions of dos Santos and Uçá (2024), whose study of banking sector firms across emerging economies of Latin America, Caribbean, Africa, Asia, Europe and the Middle East found no significant influence of ESG practices on corporate and shareholder value in the short term. Similarly, Signori et al. (2021), focusing on multiple sector European listed companies, noted that ESG performance can not influence stakeholder value creation, as market perceptions may delay recognition of internal ESG improvements. In contrast, Jin and Lei (2023), who studied Chinese listed companies, and Mohamad (2020), who examined FTSE4Good Bursa Malaysia listed firms, all reported significant positive effects of ESG practices on market value creation. These contradictory findings suggest that market value responses to ESG initiatives may be influenced by firm visibility, investor ESG awareness, and national disclosure requirements.

The divergence in findings across regions and sectors highlights the importance of contextual factors. This study, which focuses on environmentally sensitive sectors within Malaysian publicly listed companies under the Bursa Malaysia EMAS Index, captures firms in sectors such as construction, energy and utilities, transport and logistics, manufacturing, and property sectors, which are often characterised by high greenhouse gas (GHG) emissions and stringent sustainability expectations. The observed negative impact on enterprise value creation may reflect the high upfront costs

of compliance, reporting, and restructuring associated with ESG implementation in these sectors. Meanwhile, the insignificant effect on market value added suggests that external market participants may not yet fully recognise the ESG performance in their valuation decisions, possibly due to a time lag or inconsistent ESG communication strategies.

These results may also reflect the ineffectiveness or misalignment of ESG strategy design and implementation among the sampled firms. Factors such as poor stakeholder engagement, insufficient funding allocation, weak monitoring systems, or selecting ESG initiatives that do not resonate with investor or community expectations may limit the value-creation potential of ESG practices. Ziolo et al. (2023) stress the importance of adopting integrated strategies that involve sustainable supply chains, stakeholder collaboration, and innovative eco-friendly systems. Moreover, Kong et al. (2023) argued that engaging stakeholders in ESG planning improves alignment between ESG activities and value expectations, which enhances corporate value. In this study, however, the increasing ESG scores over the five-year period were not accompanied by growth in value creation metrics, indicating a possible disconnect between ESG input and corporate value output.

This is highlighted by the trend analysis, which shows that even as ESG performance scores steadily increased over the five-year period, enterprise value multiple (EVM) showed a slight decline, and market value added remained negative overall. This pattern reinforces the earlier observation that ESG improvements do not necessarily translate into immediate value gains, especially if not strategically aligned with broader business goals or communicated effectively to stakeholders.

Further evidence from the cluster analysis strengthens this argument. The cluster analysis results highlighted that high ESG performance practices do not necessarily translate to higher value creation in the short term. About 40% of the sampled firms (cluster 2) had a high ESG performance score but only created a relatively moderate value for stakeholders, while just 2% of the sampled firms (cluster 1) created high value for stakeholders, despite their moderate ESG performance scores. Also, over 50% of the sampled firms (cluster 3) had a low ESG performance and low value creation metrics, highlighting that ignoring ESG does not benefit corporate value creation either. The high value created by cluster 1 firms with moderate ESG could also indicate that

excessive ESG focus may negatively impact value creation in the short term. Thus, a balanced and strategic ESG implementation approach by firms could offer better value creation outcomes.

Overall, these results emphasise the need for stakeholder-aligned and performance-driven ESG strategies. ESG investments should be integrated with firms' broader corporate strategies, supported by effective governance and transparent reporting systems. For firms in environmentally sensitive sectors, ESG should not be treated as a side activity or compliance formality but as a core component of value-focused strategic planning. Only when ESG practices are designed to reflect stakeholder needs and matched with appropriate resource allocation can they meaningfully contribute to the long-term value creation of firms.

Table 5.1
Summary - ESG Practices on VC Result Significance

Variable Type	EVM Model ($EVM_{ESGP*AR}$)	MVA Model ($MVA_{ESGP*AR}$)
ESG Practices	Significant	Not Significant

5.3 Discussion of the Relationship between ESG Component Practices and Value Creation of Firms

The relationship between the components of ESG practices and value creation was worth investigating because there are circumstances where firms combined ESG practices may not have an effect on value creation, but some of the components have a significant effect. The lack of comprehensive information on EGS influences could lead to poor decision-making. This was observed in the study of Aydoğmuş et al. (2022), where the combined ESG practices had a significant effect on value creation, but some of the components of ESG practices had an insignificant effect on the value creation of firms. Their study sampled 1720 listed firms globally, captured in the Bloomberg database. Similarly, Zheng et al. (2022), who sampled the non-financial listed firms in China, found that the combined ESG practices had a significant effect on corporate value, while the governance practices showed an insignificant impact. In light of the

above, the results discussions in this section have been considered under the three pillars of environmental, social, and governance.

5.3.1 Environmental Pillar and Value Creation

As summarised in Table 5.2, the relationship between environmental practices and value creation was found to be consistently significant and negative for both enterprise value multiple (EVM) and market value added (MVA). Specifically, the regression results indicate that environmental practices have a statistically significant negative coefficient ($\beta = -0.349$, $p < 0.01$ and 0.05 for EVM; $\beta = -0.008$, $p < 0.01$ and 0.05 for MVA), suggesting that increases in environmental performance scores are associated with reductions in both shareholder and overall corporate value.

These findings align with the results of Bifulco et al. (2023), who examined 600 European listed firms and found a significant negative association between ESG initiatives and corporate value. Similarly, Shahrun et al. (2023) reported that environmental practices negatively affect corporate value among Malaysian listed companies. However, this result deviates from the findings of Aydoğmuş et al. (2022), who found no significant relationship, and Mutiah and Rusmanto (2023), who found a significant, but positive impact of the environmental practices on corporate value in a sample of firms from five ASEAN countries.

From a theoretical perspective, the results can be viewed through the lens of the agency theory. That is, cost-intensive environmental investments, especially when poorly aligned with corporate strategy or lacking transparent accountability, may be driven more by executive self-interest (such as reputation enhancement or greenwashing) than shareholder value maximisation. This misalignment can lead to increased agency costs and reduced value creation. Additionally, the stakeholder theory suggests that firms strive to serve a wide range of stakeholder interests, including environmental and societal. As such, they may incur short-term costs that are not immediately appreciated by capital markets, particularly if the benefits are intangible or realisable in the long term.

The significant negative effect on enterprise value may be partly attributed to the high cost of environmental investments, such as carbon neutrality programmes or

compliance with sustainability regulations, which increase capital expenditure without immediate financial return. As noted by Wong et al. (2021), firms with high ESG spending may struggle to access low-cost sustainable capital unless their initiatives are strategically aligned and effectively communicated to investors. This aligns with prior postulation by Cheng et al. (2014) supporting the view that poor alignment in ESG narratives can affect the cost of accessing capital and hinder corporate value creation.

Enterprise value, as postulated by Bradburd and Richards (2013) and more recently supported by Damodaran (2024), is an econometric measure that reflects the total value of the entire firm and goes beyond the market capitalisation value to incorporate debt obligations and available cash reserves. Misguided or inefficient environmental initiatives by firms may fail to attract capital inflows, thereby stalling growth in their market capitalisation and eventual enterprise value.

Similarly, market value added, which reflects the cumulative value created for shareholders over time (Bognárová, 2019; Carini et al., 2017), is likely to decline when capital is diverted toward environmental projects that do not immediately enhance operational efficiency or profitability. This suggests that among environmentally sensitive sectors in Malaysia, environmental practices may have been pursued without adequate integration into corporate value-generation strategies. However, as Kuo et al. (2022) argued, with proper alignment and employee engagement, environmental strategies can become a source of sustainable competitive advantage in the long run, through engagement in consumer-conscious green practices.

5.3.2 Social Pillar and Value Creation

As summarised in Table 5.2, the social pillar of ESG practices was found to have a significant negative effect on enterprise value multiple ($\beta = -0.360$, $p < 0.05$), while exhibiting no significant effect on market value added ($\beta = 0.002$, $p > 0.05$ and 0.10). This indicates that although firms actively engaged in social sustainability initiatives, investments in these activities were associated with a decline in the holistic corporate enterprise value and had no observable impact on shareholder value as measured by market value added.

The findings on enterprise value diverges from the study by Ahmad et al. (2021),

which examined 65 firms in Malaysia and found no significant association between social practices and firm value, as well as from Mutiah and Rusmanto (2023), whose cross-country ASEAN sample (including Indonesia, Malaysia, Singapore, Thailand, and the Philippines) showed a significant, but positive impact of social practices on corporate value. The findings of this study on market value added align with the results of Shahrun et al. (2023), who reported that social practices had an insignificant effect on market value metrics like Tobin's Q, in a study of Malaysian publicly listed firms. However, it differs from the results of Aydoğmuş et al. (2022), who sampled large listed firms globally and reported that social practices have a significant positive effect on the market value of firms.

These inconsistencies may arise due to contextual differences. For example, the current study focuses specifically on environmentally sensitive sectors in Malaysia (e.g., energy, logistics, construction, manufacturing, etc.), where regulatory and stakeholder pressures for visible social outcomes are high. In such contexts, the cost burden of social investments such as employee welfare programmes, training and local community development can be substantial. However, these expenditures may not yield immediate economic value, thereby reducing enterprise value in the short term. The lack of significance of the market value added could suggest that shareholders and investors have yet to perceive these social efforts as materially beneficial to the firm's capital market performance

From a theoretical perspective, stakeholder theory provides a foundation for understanding why firms continue to invest in social practices despite limited short-term returns. As proposed by Freeman (2017), firms have obligations beyond shareholders, and long-term value is built through nurturing relationships with all stakeholders, which include employees, customers, and communities. Social practices such as corporate social responsibility (CSR) and employee development can build goodwill, reduce reputational risk, and strengthen stakeholder loyalty, but these benefits are often intangible and may be delayed.

Conversely, from the lens of agency theory, such social initiatives may sometimes be driven by managerial discretion rather than strategic alignment. Executives may pursue socially responsible initiatives for reputation-building, even if these do not generate immediate shareholder returns. This may partially explain the

significant negative impact on enterprise value, where resource allocations may be seen as inefficient in the short term.

This assertion equally aligns with the trend analysis results in Chapter 4, which revealed that while ESG performance scores improved steadily from 2019 to 2023, both EVM and MVA peaked around 2021, then deteriorated in 2022 and 2023. This divergence suggests that although ESG and, particularly, social efforts were intensified during the period, their costs may have begun to outweigh short-term gains in corporate value. This pattern highlights that without careful targeting and cost-efficiency, social practices may strain financial resources before long-term benefits are reflected in the creation of corporate value.

In light of the above, while the social practices may enhance firms' sustainability performance scores, their current implementation appears to create financial pressure on enterprise value in the short term, with no immediate reward to shareholders (market value added). This underscores the need for corporate executives, especially in the environmentally sensitive sectors, to reassess and strategically refine their social initiatives to ensure they are cost-effective, stakeholder-aligned, and integrated into the firm's long-term value creation strategy.

5.3.3 Governance Pillar and Value Creation

As summarised in Table 5.2, governance practices were found to have a significant and positive effect on value creation for the sampled firms. The regression results show that governance is positively associated with both enterprise value multiple ($\beta = 0.167$, $p < 0.10$) and market value added ($\beta = 0.004$, $p < 0.10$). These findings suggest that the governance mechanisms in place for the sampled firms, such as internal controls, shareholder rights, leadership integrity, and board oversight, play a crucial role in enhancing both stakeholder and shareholder value.

This result supports the assertion by Ting et al. (2019) that effective governance encompasses a comprehensive framework of policies, processes, and institutional norms that promote transparency, accountability, and strategic control. Elements such as well-structured boards, strong internal audit systems, and shareholder engagement likely contribute to better decision-making, corporate risk mitigation, and boost investor

confidence, which are essential components of sustainable value creation.

The positive findings of this study are in line with the work of Wu et al. (2023), who analysed listed firms in China's manufacturing sector and found that corporate governance had a significant positive effect on firm valuation. Similarly, Ahmad et al. (2021), in a study of Malaysian listed companies, and Kong et al. (2023), who studied 64 top global technology firms, both reported that governance practices, especially board independence and transparency, have a positive significance on corporate value. These studies suggest that robust governance structures act as a strategic asset that supports growth and market trust, particularly in emerging markets where institutional strength may vary.

However, the findings differ from those of Zheng et al. (2022), which sampled the non-financial sector listed firms in China and found no significant relationship between governance practices and corporate value, likely due to already high baseline governance compliance, leading to negligible observable effects. Mutiah and Rusmanto (2023), using a mixed sector across five ASEAN countries, and Shahrun et al. (2023), focusing on Bursa Malaysia-listed firms, also reported insignificant results. These discrepancies could stem from sectoral differences in governance maturity, the degree of enforcement of regulatory frameworks, or the lag time between governance improvements and observable value creation outcomes.

From a theoretical standpoint, the findings of this study align with agency theory, which posits that sound governance mechanisms reduce conflicts of interest between managers and shareholders by enforcing accountability and transparency. Effective governance reduces agency costs by limiting managers' opportunism and aligning executive actions with shareholder interests. For instance, mechanisms such as board oversight and independent audits ensure that strategic decisions serve long-term value creation rather than short-term managerial gains.

Furthermore, the stakeholder theory perspective highlights that strong governance is essential for balancing the interests of diverse stakeholder groups, including shareholders, employees, regulators, and communities. Governance frameworks that protect stakeholder rights, encourage ethical leadership, and support inclusive decision-making contribute not only to reputational strength but also to sustainable value creation. The positive impact of governance practices on market value

added, as shown by the results of this study, reflects that the capital market participants would reward firms that exhibit responsible and transparent management.

This has crucial implications for firms, particularly those operating in environmentally sensitive sectors. That is, continued investment in strong governance structures is vital for sustained value creation. This includes maintaining effective internal control mechanisms, protecting shareholder rights, ensuring leadership accountability, and aligning corporate objectives with ethical governance principles. While governance alone may not resolve all ESG challenges, it serves as the backbone through which environmental and social strategies are authorised, monitored, and integrated into the broader corporate strategy.

Overall, the results reinforce the centrality of the governance pillar in the ESG framework. Unlike the environmental and social pillars, which may experience delayed or indirect financial outcomes, governance delivers more immediate and measurable impacts on corporate value creation through its influence on risk management, investor confidence, and operational transparency.

Table 5.2
Summary of the Results of ESG Component Practices on Value Creation

Variable Type	**EVM Model ($EVM_{EP, SP, GP}$)**	**MVA Model ($MVA_{EP, SP, GP}$)**
Environmental Practices	Significant	Significant
Social Practices	Significant	Not Significant
Governance Practices	Significant	Significant

5.4 Discussion of the Moderating Role of Financial Risk on the Relationships between ESG Practices, ESG Components Practices, and Value Creation

The findings from the moderating influence of financial risk exposure are separately discussed and analysed under two themes. That is, for ESG practices and value creation, and ESG components practices and value creation.

5.4.1 ESG Practices and Financial Risk Interaction on Value Creation

This study found no significant moderating effect of financial risk on the relationship between ESG practices and value creation among firms listed in the environmentally sensitive sectors of the Bursa Malaysia EMAS Index (refer to Table 5.3). This was coherent when investigated for both the enterprise value multiple and the market value added. In other words, financial risk exposures associated with the high cost of finance due to corporate executives' decisions on the funding mix of debt and equity will not influence the extent to which ESG practices will affect value creation in the sampled firms. This contradicts the argument put forward by Goss and Roberts (2011) that firms with major environmental issues paid significantly higher interest rates on their funding cost than those with minor environmental issues. As such, high funding costs may reduce profits and also funds available to promote ESG activities due to capital rationing. However, the divergence could stem from the fact that Goss and Roberts' (2011) study investigated the direct relationship between sustainability initiatives and cost of funds, while the current study is focused on the interaction effects of financial risk.

In separate studies conducted by Jia et al. (2020) and Shiu and Yang (2017), evidence has been found to support the assertion that incorporating ESG initiatives into firms' corporate strategy can mitigate risk and safeguard corporate performance against future disruptions, thereby improving stakeholder value creation. However, the findings of the current study suggest that while ESG practices are increasingly adopted, there remains a huge gap in the alignment between ESG strategies and firms' financial risk management approaches. This gap may manifest in several ways, for instance, through the insufficient integration of ESG risk factors into financial planning and capital structure decisions. Many firms may treat ESG and financial risk planning as parallel but disconnected processes, limiting the strategic coherence required to optimise long-term value creation. Bridging this gap by incorporating ESG-related risks, such as environmental liabilities, regulatory changes, and social acceptability pressures, into financial risk frameworks may be essential for translating ESG efforts into tangible economic value for stakeholders. This is crucial in aligning stakeholders' value expectations with the firm's financial risk management and long-term value objectives.

Table 5.3
Summary of the Results of ESG Practices and Financial Risk (FR) Interaction on Value Creation.

Variable Type	EVM Model ($EVM_{ESGP*FR}$)	MVA Model ($MVA_{ESGP*FR}$)
ESG Practices x FR	Not Significant	Not Significant

5.4.2 ESG Component Practices and Financial Risk Interaction on Value Creation

The analysis of the interaction between ESG component practices and financial risk on value creation provides nuanced insights into how financial constraints condition the effectiveness of sustainability-related investments. As reported in Table 5.4, financial risk does not significantly moderate the relationships between social practices and value creation, nor between governance practices and value creation. This result is consistent across both enterprise value multiple (EVM) and market value added (MVA). However, a contrasting pattern emerges for environmental practices, where financial risk significantly and negatively moderates the relationship with market value added ($\beta = -0.001$, $p < 0.10$), while remaining insignificant for enterprise value multiple.

This finding suggests that the value relevance of environmental practices is highly sensitive to firms' financial risk exposure. In firms characterised by high financial risk, increased investments in environmental practices may be interpreted unfavourably by capital markets, leading to a reduction in shareholder value as measured by MVA. Market value added reflects investors' forward-looking assessment of a firm's ability to generate returns above the cost of capital. Therefore, when financially constrained firms undertake capital-intensive environmental initiatives, investors may perceive these actions as value-destroying rather than value-enhancing in the short to medium term.

This outcome aligns with the argument that environmental practices often involve substantial upfront costs, including investments in emissions reduction technologies, energy-efficient infrastructure, waste management systems, and regulatory compliance. While such initiatives may generate long-term operational

efficiencies and reputational benefits, their immediate financial burden can be significant. For firms with high financing costs or weak capital structures, these expenditures may exacerbate liquidity pressures, increase leverage, or crowd out profitable investment opportunities, thereby undermining market-based value creation.

From a stakeholder theory perspective, ESG practices are expected to create value by aligning corporate activities with the interests of multiple stakeholder groups, including investors, employees, regulators, and communities. Environmental practices, in particular, are often justified because they enhance legitimacy, reduce long-term environmental liabilities, and strengthen stakeholder trust. However, the negative moderating effect of financial risk on the relationship between environmental practices and MVA suggests that the market's evaluation of stakeholder-oriented investments is conditional on firms' financial capacity to support them. When firms face high financial risk, stakeholder groups like investors may prioritise financial stability over long-term environmental commitments, resulting in weaker market-based value creation.

This outcome can also be explained through agency theory, which emphasises conflicts between managers and shareholders, particularly in the allocation of corporate resources. Environmental initiatives typically involve substantial upfront capital expenditure with uncertain or delayed financial returns. In firms with high financial risk exposure, such investments may intensify agency concerns, as shareholders may perceive managers' environmental spending as overinvestment or as serving reputational or personal objectives rather than shareholder value maximisation. As a result, the market may discount the firm's value, leading to lower market value added.

Ng and Rezaee (2015) provide a useful theoretical lens for interpreting this result by emphasising the link between ESG performance and the cost of capital. Firms with strong financial fundamentals are better positioned to internalise the long-term benefits of environmental investments without compromising shareholder value. Conversely, financially risky firms may lack the flexibility to absorb ESG-related costs, resulting in adverse market reactions. This supports the view that ESG practices do not operate in isolation but are contingent on firms' underlying financial conditions.

The role of capital structure decisions further reinforces this interpretation. Brounen et al. (2005) and Gersbach (2013) argue that executive decisions regarding leverage and financing mix are central to value optimisation. Firms with suboptimal

debt-to-equity structures may face higher borrowing costs, increased refinancing risk, and reduced access to sustainable financing. Under such conditions, environmental investments, particularly those with delayed payback may be perceived as misaligned with shareholders' immediate value expectations. In contrast, firms that manage financial risk effectively can leverage environmental initiatives as strategic assets that enhance credibility with investors and reduce long-term capital costs.

From a practical perspective, these findings underscore the importance of sequencing and alignment in ESG strategy formulation. Firms with high financial risk exposure may need to prioritise financial restructuring and risk mitigation before scaling environmental initiatives. Measures such as optimising capital structure, improving cash flow stability, or securing lower-cost green financing can enhance the market's receptiveness to environmental investments. Without such alignment, even well-intentioned environmental practices may generate unintended negative valuation effects.

The insignificance of financial risk moderation in the relationships involving social and governance practices suggests that these ESG components may be less capital-intensive or more immediately value-relevant. Social initiatives, such as workforce development or community engagement, and governance practices, such as board oversight and transparency, may be perceived as enhancing organisational stability and risk management without imposing excessive financial strain. This relative resilience may explain why their value effects remain stable regardless of financial risk exposure.

These findings are particularly relevant in the context of growing global ESG capital flows. The Global Sustainable Investment Alliance (GSIA, 2020) reports that ESG-aligned investments exceeded USD30 trillion globally, indicating strong investor demand for sustainable firms. However, access to this capital increasingly depends on firms' ability to demonstrate both ESG commitment and financial discipline. Firms that combine environmental ambition with prudent financial risk management are more likely to convert ESG initiatives into sustainable value creation.

Overall, the moderation results indicate that environmental practices require careful financial calibration to deliver positive market outcomes. While ESG practices are often promoted as universally value-enhancing, this study demonstrates that their

effectiveness depends on firms' financial risk profiles. Environmental initiatives, in particular, must be strategically integrated within firms' financial risk management frameworks to avoid short-term value erosion and to support long-term value creation for shareholders and other stakeholders.

Table 5.4
Summary of the Result of ESG Component Practices and Financial Risk (FR) Interaction on Value Creation.

Variable Type	EVM Model ($EVM_{EP\ SP\ GP^*\ FR}$)	MVA Model ($MVA_{EP\ SP\ GP^*\ FR}$)
Environmental Practices x FR	Not Significant	Significant
Social Practices x FR	Not Significant	Not Significant
Governance Practices x FR	Not Significant	Not Significant

5.5 Discussion of the Moderating Role of Agency Risk on the Relationship between ESG Practices, ESG Components Practices and Value Creation

The study has grouped the discussion of the findings from the moderating influence of agency risk exposure under two separate themes to capture the combined pillar and the individual pillars of ESG. That is, for ESG practices and value creation, and ESG components practices and value creation.

5.5.1 ESG Practices and Agency Risk Interaction on Value Creation

The empirical results presented in Table 5.5 reveal that agency risk does not have a statistically significant moderating effect on the relationship between combined ESG practices and value creation, as measured by both enterprise value multiple (EVM) and market value added (MVA). This lack of significant interaction suggests that the integration of ESG strategies with the agency risk profile of the sampled firms does not meaningfully enhance or diminish value creation outcomes. Despite an observed upward trend in ESG performance scores across the sampled firms over the five-year

period, these improvements have not translated into measurable increases in stakeholder value creation, as reflected in the EVM and MVA metrics.

This result may point to a weak alignment between ESG initiatives and executive accountability mechanisms in the sampled firms. In line with Sheedy's (2010) conceptualisation of agency risk, the absence of alignment between managerial incentives and shareholder interests can undermine the effectiveness of ESG strategies. Specifically, if ESG initiatives are implemented without appropriate oversight or incentive structures, they may fail to generate tangible value, becoming more symbolic than substantive. This concern is reflected in the potential for greenwashing, a practice where firms overstate or misrepresent their ESG efforts to maintain reputational legitimacy without making material changes to operations. Lee and Suh (2022) describe this as the intentional dissemination of misleading environmental claims for reputational advantage. The lack of a significant moderation effect found in this study may suggest that such symbolic ESG strategies, which are not tied to performance-based accountability by the executives, could be prevalent in the observed firms, thereby limiting their potential to contribute to value creation.

These study results can also be contextualised within the broader literature. Recent studies, such as those by Zhao et al. (2025), have argued that for ESG investments to translate value returns, they must be underpinned by robust corporate governance frameworks that align the executives' actions and behaviour with long-term stakeholder interests. Without such alignment, ESG strategies are susceptible to becoming isolated from the core corporate strategy, resulting in underperformance in terms of value creation. The study findings highlight this concern, where improved ESG performance scores, in the presence of weak agency alignment, do not appear to drive corporate financial value.

These findings imply that ESG strategies, no matter how well-articulated, may not be effective in delivering stakeholder value if not rooted within a governance framework that holds executives accountable for long-term performance. Malaysian firms operating in environmentally sensitive sectors may need to strengthen their internal control systems, including incentive schemes, executive performance metrics, and transparency in ESG reporting, to ensure that ESG efforts are not only genuine but also value-driven. In this regard, reducing agency risk is not merely a matter of

corporate ethics but a strategic imperative for opening the full potential of ESG-driven value creation.

Table 5.5
Summary of the Results of ESG Practices and Agency Risk (AR) Interaction on Value Creation

Variable Type	EVM Model ($EVM_{ESGP*AR}$)	MVA Model ($MVA_{ESGP*AR}$)
ESG Practices x AR	Not Significant	Not Significant

5.5.2 ESG Component Practices and Agency Risk Interaction on Value Creation

The analysis presented in Table 5.6 provides important insights into the moderating role of agency risk in the relationship between ESG component practices and corporate value creation. The results reveal three key patterns. First, agency risk does not significantly moderate the relationship between social practices and either enterprise value multiple (EVM) or market value added (MVA). Second, while agency risk does not significantly influence the relationship between environmental practices and MVA, it exerts a significant and positive moderating effect on the relationship between environmental practices and EVM ($\beta = 0.015$, $p < 0.10$). Third, agency risk significantly and positively moderates the relationship between governance practices and both EVM ($\beta = 0.015$, $p < 0.10$) and MVA ($\beta = 0.0003$, $p < 0.10$). Collectively, these findings indicate that agency risk plays a critical conditioning role in determining whether environmental and governance practices translate into meaningful value creation, while its influence on social practices remains limited.

From an agency theory perspective, these results suggest that ESG practices do not operate in isolation but are strongly shaped by the quality of managerial incentives, monitoring mechanisms, and control structures within firms. Environmental practices often require substantial capital commitments and involve long implementation periods. In the absence of effective agency risk controls, such investments may be perceived as managerial overinvestment or as actions driven by personal reputation, regulatory compliance, or non-financial objectives rather than shareholder value maximisation.

This interpretation is consistent with Barnea and Rubin (2010), who argue that ESG investments can exacerbate agency problems when managers pursue them for private benefits.

However, the positive moderating effect of agency risk on the environmental practices-EVM relationship indicates that when agency risk is effectively managed, environmental initiatives can become value-enhancing rather than value-destroying. Although the standalone effect of environmental practices on EVM was negative, the interaction result suggests that robust governance and incentive alignment structures enable firms to convert long-term environmental investments into enterprise-level value creation. This implies that agency risk mitigation serves as a governance filter that distinguishes value-oriented environmental strategies from inefficient self-serving strategies. In this context, agency theory provides a strong explanation for why environmental practices lead to the creation of different value outcomes across firms.

The consistently positive and significant moderation effects observed for governance practices further reinforce this argument. Governance practices are intrinsically linked to agency risk reduction, as they shape executive monitoring, board oversight, disclosure quality, and accountability structures. The positive interaction between governance practices and agency risk across both EVM and MVA suggests a reinforcing structure in which effective governance not only directly reduces agency conflicts but also amplifies the value creation potential of ESG-related governance initiatives. This finding aligns with Ramly and Rashid (2010), who emphasise that sound governance frameworks mitigate agency costs and enhance firm value by improving decision-making discipline and transparency.

Recent evidence from Zhao et al. (2025) further supports this interpretation by demonstrating that governance mechanisms play a central role in aligning ESG initiatives with shareholder interests, particularly in environments characterised by complex stakeholder demands and heightened sustainability expectations. In the context of environmentally sensitive sectors, where regulatory scrutiny and capital intensity are high, governance practices appear to be especially critical in ensuring that ESG strategies are implemented efficiently and credibly. The findings of this study suggest that governance practices and agency risk operate as complementary variables, jointly strengthening the ESG-value creation relationship.

In contrast, the absence of significant moderation effects for social practices may reflect the nature of social initiatives themselves. Social practices, such as employee welfare, community engagement, and workplace safety, often generate value through softer channels, including trust, morale, and reputational capital. These benefits, while important, may be less directly tied to executive opportunism or agency conflicts and therefore less sensitive to variations in agency risk. From a stakeholder theory perspective, social practices are frequently embedded in relational and normative expectations that extend beyond managerial discretion, reducing their dependence on agency risk conditions for value creation.

Importantly, the interaction between agency risk and ESG practices highlights the integrative role of stakeholder theory and agency theory in this study. Stakeholder theory posits that firms create sustainable value by balancing the interests of diverse stakeholder groups, while agency theory cautions that managerial actions may deviate from shareholder value maximisation in the absence of effective controls. The findings of this study demonstrate that ESG practices, particularly environmental and governance initiatives, contribute most strongly to value creation when stakeholder-oriented objectives are pursued within governance structures that mitigate agency conflicts. This integration offers a more refined explanation of ESG outcomes than either theory could provide independently.

From a practical standpoint, these results carry important implications for corporate decision-makers. Firms should not assume that ESG adoption automatically leads to value creation. Instead, ESG strategies must be embedded within strong governance systems that align managerial incentives with long-term value objectives. Boards and shareholders should pay particular attention to executive compensation structures, oversight mechanisms, and performance evaluation criteria when approving ESG investments. For firms operating in environmentally sensitive sectors, where ESG pressures are especially pronounced, the alignment between ESG initiatives and agency risk management becomes even more critical.

Overall, the findings of this section underscore that agency risk is not merely a background control variable but a central mechanism through which ESG practices influence value creation. By demonstrating that agency risk strengthens the value relevance of environmental and governance practices, this study provides empirical

support for a theoretically integrated ESG-value creation framework. This contribution responds directly to calls in the literature for deeper exploration of the conditions under which ESG practices generate sustainable corporate value.

Table 5.6
Summary of the Results of ESG Component Practices and Agency Risk (AR) Interaction on Value Creation.

Variable Type	**EVM Model ($EVM_{EP\ SP\ GP^*\ AR}$)**	**MVA Model ($MVA_{EP\ SP\ GP^*\ AR}$)**
Environmental Practices x AR	Significant	Not Significant
Social Practices x AR	Not Significant	Not Significant
Governance Practices x AR	Significant	Significant

5.6 Synthesis of Findings: ESG-Value Creation and Risk Interactions

This section presents a holistic insight and synthesis of the study's empirical findings on the relationship between ESG practices, individual ESG component practices, and value creation, together with the moderating effects of financial risk and agency risk. The discussion draws directly from the hypothesis testing of all mathematical models formulated for the study, reinforced by descriptive trends and cluster analysis results. Thus, it provides a consolidated view and a concise summary of the observed relationships, indicating where the results supported or contradicted the research framework outlined in Chapter Two.

Table 5.7 summarises these findings by categorising the tested relationships as either supporting or contradicting the alternative hypotheses derived from the study's research framework.

Table 5.7
Summary of Empirical Findings: Support or Contradiction of the Research Framework

	Model Name	
Variable Type	**Model EVM_{ESGP}**	**Model MVA_{ESGP}**
ESG Practices	S	C
Variable Type	**Models $EVM_{EP, SP, GP}$**	**Models $MVA_{EP, SP, GP}$**
Environmental Practices	S	S
Social Practices	S	C
Governance Practices	S	S
Variable Type	**Model $EVM_{ESGP* FR}$**	**Model $MVA_{ESGP* FR}$**
ESG Practices x FR	C	C
Variable Type	**Models $EVM_{EP, SP, GP * FR}$**	**Models $MVA_{EP, SP, GP * FR}$**
Environmental Practices x FR	C	S
Social Practices x FR	C	C
Governance Practices x FR	C	C
Variable Type	**Model $EVM_{ESGP* AR}$**	**Model $MVA_{ESGP* AR}$**
ESG Practices x AR	C	C
Variable Type	**Models $EVM_{EP, SP, GP * AR}$**	**Models $MVA_{EP, SP, GP * AR}$**
Environmental Practices x AR	S	C
Social Practices x AR	C	C
Governance Practices x AR	S	S
S = Supported Relationships, C = Contradicted Relationships		

As shown in Table 5.7 above, the results revealed that hypothesis testing of the mathematically formulated models, which examined the ESG practices and value creation relationships, supported the study-designed research framework for enterprise value multiple, while it contradicts market value added. That is, it demonstrated a significant association with the enterprise value multiple and an insignificant relationship with market value added.

Similarly, hypothesis testing of the formulated mathematical models, which examined the individual ESG components practices and value creation relationships, all

supported the study-designed research framework for enterprise value multiple, while only the social practice pillar contradicts the study-designed research framework for its relationship with market value added.

The market value added and ESG relationships revealed that the combined ESG practices contradict the study-designed research framework, while the individual ESG components of environmental practices and governance practice supports it. This indicates that the insignificant impact of the combined ESG practices on value creation could be associated with the social practices of the firms. These practices over the 5 years under consideration alone constituted over 35% of the overall ESG practices performance scores as revealed by the descriptive yearly trend analysis. The environmental practices and governance practices constituted 25% and 40%, respectively, of the overall performance. Therefore, if the sustainable social investment plans of firms are executed, such that huge costs are spent on programmes and activities that will take a long time for their cumulative effect to have on the capital indices, their market value added could also exhibit the same traits.

These hypothesised ESG-value creation relationships unveiled by the study findings are further reinforced by the descriptive patterns revealed through the cluster analysis in Section 4.3 of this study. As revealed by the analysis, Cluster 1 captured firms with moderate ESG performance but exceptionally high value creation, which demonstrated that high value creation is not necessarily tied to high ESG performance scores, but rather to crucial balance and efficient implementation of ESG practices. On the other hand, Cluster 2, which represented firms with high ESG performance scores but only moderate value creation, indicated that excessive ESG investments without effective governance alignment or corporate risk management may reduce value created in the short run. Cluster 3, which captured the majority of firms with low ESG performance and poor value creation, further highlights that ESG practices are still crucial for firms to maintain baseline value creation for their stakeholders. As such, these differentiated cluster patterns emphasise the non-linear and context-dependent nature of the ESG and value creation relationship, thereby justifying the study result insights, which emphasise differentiated ESG component effects and the moderating roles of financial risk and agency risk.

Furthermore, the hypothesis testing of the formulated mathematical models,

which examined financial risk interactions with ESG practices, their individual component practices, and value creation relationships, all contradict the study-designed research framework, except for the interaction effect on the environmental practices and market value added. Similarly, the agency risk interaction effect on ESG practices and value creation contradicts the study-designed research framework. However, the interaction effect of agency risk on the individual components of ESG practices and value creation is contradictory in some pillars and supportive in others.

Specifically, the results revealed that the moderating effect of agency risk on the separate relationships between environmental practices and enterprise value, and between governance practices and enterprise value, all support the study-designed research framework. Similarly, the moderating effect of agency risk on the relationship between governance practices and market value added supports the study-designed research framework.

Thus, it can be inferred that both the financial risk and the agency risk moderate the environmental practices' effect on value creation, while agency risk alone moderates the effect of governance practices on value creation. Firms are exposed to financial risk and agency risk because of the decisions and choices made at the top governance level of the organisation (Chaffai & Dietsch, 2015). As such, addressing these risk exposures could lead to the planning and execution of effective sustainable governance activities that will greatly drive the overall firm’s ESG practices for significant value creation.

In light of the above, the study’s hypothesised results on the ESG-value creation relationships unveil new insights in ESG and value creation research, which supports knowledge development in the academic community, as well as assists corporate and regulatory decision-making.

The results summary insights demonstrated that the relationship between ESG practices and value creation is significant through some aspects of their proxies or components. As such, it highlights that only the relationship between the ESG practices and enterprise value multiple as a proxy of value creation is significant, as the relationship with the market value-added is found to be insignificant from hypothesis tests. This relationship is not moderated by the proxies of financial risk and agency risk.

However, the individual components' findings showed that environmental practices and governance practices have a significant relationship with enterprise value

multiple, which is also moderated by agency risk, while social practices have an unmoderated significant relationship with enterprise value multiple. Furthermore, environmental practices have a significant relationship with market value added, which is moderated by financial risk. Similarly, governance practices have a significant relationship with market value added, which is moderated by agency risk

Therefore, there exist significant relationships between ESG practices and value creation (enterprise value), and between the individual ESG component practices and value creation, which can be observed from the strategic spectrum of the stakeholder theory, as an underpinning theory for the study's ESG-value creation research framework. In addition, the moderating influence of financial risk and agency risk on these relationships can be viewed from the strategic spectrum of the agency theory. Also, research investigation around the ESG-value creation relationships can be conducted under the control of firm size (control variable), as depicted by the hypothesised study results.

5.7 Theoretical Novelty

The hypothesised results of this study indicate that financial risk and agency risk moderate the relationship between firms' environmental and governance practices and value creation for stakeholders. The moderating roles of financial risk and agency risk are grounded in Agency Theory. Applying Agency Theory to examine financial and agency risk within the ESG context provides a clearer understanding of how governance arrangements, managerial decisions, and value creation are connected. Traditionally, Agency Theory has been used to explain conflicts of interest between owners and managers, particularly where managers may not always act in the best interests of shareholders (Jensen & Meckling, 1976). In the context of ESG practices, this study extends the theory by demonstrating how weaknesses in governance structures and financing decisions can influence the effectiveness of ESG initiatives and their contribution to corporate value.

Allan and Beer (2017) describe risk exposure as conditions that can threaten a firm's ability to achieve its objectives, often arising from decisions made by top executives. Agency risk emerges when managers prioritise personal interests over those of shareholders, leading to inefficient decisions and potential value loss. Financial risk,

on the other hand, arises when poor capital structure decisions increase financing costs and reduce organisational flexibility. In such situations, managers may focus on short-term performance targets or personal rewards while neglecting the long-term consequences associated with higher agency and financial risk exposure. These behaviours can undermine both governance quality and sustainable value creation.

ESG initiatives are typically integrated into firms' corporate planning, budgeting, and resource allocation processes. As firms commit financial and organisational resources to ESG activities, differences in objectives, incentives, and risk preferences between managers and shareholders may intensify agency problems. At the same time, firms facing high financial risk may encounter funding constraints that limit their capacity to sustain ESG investments over the long term. Wong (2018) identifies this tension as a key concern within the agency framework, particularly when managerial discretion over strategic and financial decisions is high. Without effective monitoring and alignment mechanisms, ESG initiatives may fail to deliver their intended benefits.

This study demonstrates that the principles of Agency Theory can be extended to explain how agency risk and financial risk shape the effectiveness of ESG practices in creating corporate value. Strong governance mechanisms can help reduce agency conflicts, while sound financing decisions can lower financial risk and free up resources for ESG-related investments. Together, these factors improve the likelihood that environmental and governance practices contribute positively to value creation. By incorporating financial and agency risk into the agency-based explanation of ESG outcomes, this study provides a clearer and more coherent account of ESG-related decision-making. This contribution enhances existing understanding of how governance quality, financing choices, and risk exposure jointly influence sustainable value creation, thereby enriching the broader literature on corporate governance, risk management, and ESG-driven corporate performance.

The study demonstrated an insightful perspective of the Stakeholder theory by contextualising the relationship between ESG practices and value creation as a collaborative interplay. A firm could create sustainability-driven value for its stakeholders when ESG practices are executed, such that the interests of all the key stakeholders are taken into consideration. This would ensure the right ESG initiatives

and activities are implemented for effective value creation. The study went further to underpin the Stakeholder theory in this ESG and value creation interplay at the level of the individual ESG pillars of environmental, social, and governance. Thus, unveiling practical scenarios where the value creation impact of a firm's collaborative ESG practice execution could be stalled by particular pillars in the ESG component practices. This has implications for corporate ESG strategists, policymakers, and investors in the Malaysian business environment, as it offers a better understanding of the fact that effective ESG performance requires not only being holistic but also being dependent on the quality of the execution of individual ESG pillars.

5.8 Chapter Summary

This chapter has extensively discussed the results and the findings obtained from the presentation of test hypotheses. The discussions were elucidated under four themes, which considered the relationship between ESG practices and value creation, the relationship between ESG components practices and value creation, and separately the moderating role of financial risk and agency risk on the relationships between ESG practices, ESG components practices and value creation. The findings were significant for ESG practices relationships with value creation (enterprise value multiple), and ESG component practices relationships with value creation, except for the social practices and market value added. The relationships were moderated by financial risk and agency risks, and were all synthesised to uncover new insights on the ESG-value creation relationships for the study.

CHAPTER 6
SUMMARY AND CONCLUSION

6.1 Introduction

This chapter, which commenced with an introduction in Section 6.1, is sectioned to provide a summary of the study findings in Section 6.2 and then draw relevant study implications in Section 6.3. It also identifies and discusses the appropriate theoretical and practical contributions of the study in Section 6.4. The chapter went further to elaborate on the identified limitations of the study in Section 6.5 and finally discusses suggestions and recommendations for future research in ESG practices, value creation, financial risk and agency risk relationships in Section 6.6.

6.2 Summary of Findings

This study sets out to investigate the effects of ESG practices on value creation, as moderated by the financial and agency risk exposures of firms. The study context focused on firms listed in the environmentally sensitive sectors of the Bursa Malaysia EMAS Index, over a 5-year period between 2019 and 2023. Risk exposure was examined from two distinct aspects that can manifest from top executives' decision failures. That is, financial risk and agency risk, and their moderating influences, are separately investigated.

Furthermore, this study, as part of its core objectives, intended to separately observe how the ESG performance practices and each of the individual components of ESG practices will impact the value creation of firms. Thus, relevant proxies were selected for the independent, dependent, moderating, and control variables. Two proxies were deployed for the dependent variable (enterprise value multiple and market value added), which were then used to sub-group the formulated mathematical models. The following summary findings were obtained from the descriptive statistical analysis and robust regression analysis performed.

The descriptive statistics yearly trend analysis revealed that the performance scores in implementing ESG practices and their components consistently increased on

a yearly basis, over the last 5 years, for the sampled companies operating in the environmentally sensitive sectors of Bursa Malaysia. However, over the same period, their average yearly enterprise value multiple initially increased in the early 3 years and later declined in the recent 2 years. Similarly, the average yearly market value added showed a positive return in the early 3 years, and then in the recent 2 years, it returned a negative value (decreasing). The descriptive statistics analysis by sectoral averages revealed that the property sector performed the highest in the area of ESG practices implementation, while the manufacturing sector performed the lowest in this ESG pillar, which was largely contributed to by its low environmental practices performance score. The construction sector and the energy & utility sector performed the lowest when considering the social practices and governance practices, respectively.

The results obtained from the final robust regressions conducted found that combined ESG practices have a significantly negative effect on the enterprise value created by firms. However, ESG practices do not have a significant effect on the market value added of firms. The negative significant impact could result from investment in EGS initiatives, which are highly cost-intensive, such as carbon neutrality programmes, employee skill enhancement, and other sustainability compliance projects. Such expenditure would improve the ESG performance score, but would deteriorate firm profitability in the short term and would eventually reduce the value creation. It would also take a considerable period of time for their cumulative effect to reflect on the market value of the firm. These findings were supported by the cluster analysis, which revealed that firms with moderate ESG engagement achieved the highest enterprise value creation, while those with the highest ESG performance scores underperformed in value creation metrics.

ESG components practices had a mixed effect on value creation. Environmental practices showed a significantly negative effect on the enterprise value multiple and the market value added. On the other hand, social practices revealed a significant negative effect on enterprise value multiple, but their effect on market value added was insignificant. However, governance practices were found to have a significant and positive effect on both the enterprise value multiple and the market value added of firms.

Financial risk was found to have an insignificant moderating influence on the relationship between ESG practices and value creation. Individually, the separate

relationships between social practices, governance practices, and value creation were also insignificantly moderated by financial risk. However, while the relationship between environmental practices and enterprise value multiple was found to be insignificantly moderated by financial risk, the relationship between environmental practices and market value added was significantly influenced by financial risk.

Finally, agency risk was found to have an insignificant moderating influence on the relationship between ESG practices and value creation. Results on the individual ESG component practices found that the relationship between social practices and value creation was insignificantly moderated by agency risk. The moderating influence of agency risk on environmental practices and enterprise value multiple was positively significant, while the same influence was insignificant on the relationship between social practices and market value added. On the other hand, agency risk significantly moderated the relationship between governance practices and value creation (both the enterprise value multiple and the market value added).

6.3 Implications of the Study

This study has conducted in-depth separate investigations into the effect of ESG practices and their component practices on firm value creation. It has also distinctively explored the moderating roles of financial risk and agency risk. The study was guided by four key objectives and corresponding research questions, all of which have been addressed and answered, as summarised in the findings above.

The results indicate that the combined ESG practices have a significantly negative effect on the enterprise value created, while it has an insignificant effect on the market value added to firms. However, when examining the individual components of ESG, distinct patterns emerge. Environmental practices were found to have a significant negative effect on value creation, as measured, suggesting that firms focusing on environmentally cost-intensive initiatives may face challenges translating these practices into immediate value benefits. On the other hand, social practices exhibited a significant negative effect on value creation, particularly in terms of enterprise value Multiple (EVM), highlighting the need for social initiatives that can drive both short-term and long-term corporate value for stakeholders.

In contrast, governance practices have a significantly positive effect on value

creation, indicating that governance-related ESG activities would directly influence the enterprise value created and market value added of publicly listed firms in the Bursa Malaysia EMAS Index. These findings suggest that while the ESG governance practices component contributes positively to value creation, others, like environmental practices and social practices, require further exploration to understand their complex relationships with the short and long-term value creation of firms.

The findings on the moderating impact of risk exposures reveal that financial risk does not significantly influence the overall relationship between ESG practices and value creation. Moreover, financial risk does not notably affect the individual components of ESG, namely social and governance practices, in their contribution to value creation. However, a significant moderating effect was observed on environmental practices, suggesting that financial risk can be managed to enhance the effectiveness of environmentally related ESG activities, to attract climate-related low-cost funds and eventually drive improved long-term value creation.

In contrast, the results regarding agency risk indicate that it does not significantly moderate the relationship between ESG practices and value creation. Although agency risk does not significantly influence the impact of social practices on value creation, it has a notable moderating effect on environmental and governance practices. Specifically, agency risk exerts positive and significant influences on the separate relationships between environmental practices and value creation, and between governance practices and value creation. These findings suggest that agency risk plays a critical role in shaping how different pillars of ESG affect value creation.

The study revealed that environmental practices significantly affect value creation when moderated by financial risk or agency risk, while governance practices significantly affect value creation when moderated by only agency risk. This finding underscores the critical importance of integrating corporate risk management processes with a firm's sustainable governance initiatives and structures. It suggests that the effectiveness of governance and environmental practices in driving value creation is contingent upon the firm's ability to effectively manage it financial and agency risk exposures. This highlights the interconnectedness between corporate decision-making structures and risk management in fostering long-term corporate value creation.

Furthermore, this study introduces a novel perspective on corporate value

creation by aligning corporate sustainability strategies with corporate risk management approaches. Integrating these dimensions offers a more comprehensive framework for value creation, suggesting that firms can enhance their performance by proactively managing environmental practices, governance practices, financial risk and agency risk exposures. This insight has significant implications for corporate executives, regulatory authorities, and policymakers. For executives, it emphasises the need to develop corporate decision-making structures that are sustainable and resilient to financial and agency risks. For regulators and policymakers, it calls for the promotion of frameworks that encourage firms to integrate financial and agency risk management with their environmental and governance practices, which could potentially lead to a more sustainable and robust corporate value creation.

In conclusion, this study provides sound empirical evidence that the relationship between ESG practices and value creation is a complex interplay and is context-dependent. While combined ESG practices were found to negatively influence enterprise value, they had no significant effect on market value added. A further component analysis also revealed that governance and environmental practices are crucial drivers of value creation, especially when moderated by financial risk and agency risk. Furthermore, the cluster analysis overcovers a critical layer of insight by revealing that firms with moderate ESG performance achieved the highest enterprise value, while those with excessively high or low ESG performance underperformed in value creation metrics. This non-linear pattern highlights the perspective that an effective ESG strategy is not just about achieving high ESG performance scores, but rather about aligning ESG focus in crucial areas, particularly governance and environmental, with the firm's risk exposures and management strategy. To this end, the execution of ESG practices will be viewed as an approach to maximise the firm's value creation, rather than just to fulfil regulatory compliance requirements.

6.4 Contributions of the Study

This study successfully achieved its objectives and answered the research questions posed at the commencement. It made a couple of contributions, which can be grouped into theoretical and practical contributions.

6.4.1 Theoretical Contributions

This study adopts stakeholder and agency theories as its theoretical underpinnings, reflecting the foundations of previous research within this subject area (Lee & Isa, 2020; Jin & Lei, 2023; Windsor, 2017; Zheng et al., 2023). While previous studies have primarily applied agency theory to explain managerial behaviour and decision-making within the principal-agent relationship, this study introduces an innovative extension of the agency theory. It shifts focus from the conventional agency relationship to consider corporate entities' financial and agency risk exposures. Specifically, this study uncovers the corporate executive decision-related risk dimensions of financial risk and agency risk, which are crucial in understanding how firms' utilisation of risk management can influence their environmental practices, governance practices and value creation.

Financial risk pertains to risks that are tied to the company's choices on funding structure and capital mix, such as weighted cost of capital. This may considerably determine the funds allocated for ESG initiatives, thereby shaping the effectiveness of a firm's ESG practices and its impact on the value created for stakeholders. On the other hand, agency risk reflects the potential for conflicts between shareholders and management, particularly in the context of strategic decisions, such as those involving sustainability initiatives or the pursuit of firms' ESG targets. Agency risk arises when management decisions are guided by personal interests rather than aligning with the broader interests of shareholders and other stakeholders.

By incorporating financial risk and agency risk perspectives into the agency theory framework, this study has provided a novel perspective on how corporate governance structures and practices can be designed to mitigate these risks and enhance long-term corporate value. The research highlights the importance of integrating risk management with environmental and governance practices to ensure ESG strategies effectively align with value-creation objectives. The study suggests that effective risk management, which captures both financial and agency risks, can enhance decision-making processes that drive corporate performance, stakeholder satisfaction, and value creation within the considerations of ESG initiatives. This approach expands the scope of agency theory, providing valuable insights into how firms can navigate the complexities of financial and agency risks in pursuing sustainable value creation for all

their stakeholders.

Similarly, the stakeholder theory was extensively explored and applied by this study to examine the complex relationships that exist between ESG practices and value creation, and also between the individual components of ESG practices and value creation. The theory postulated that value creation for stakeholders can be viewed through the strategic lenses of the stakeholder theory. As such, value creation by firms can be said to be a collaborative effort from all stakeholders. That is, understanding the diverse needs and requirements of the different key stakeholder groups and designing appropriate, sustainable and implementable plans to address them both in the short term and in the long term. The stakeholder theory, as unveiled in this study, recognises that ESG initiatives and practices can be planned and executed to create corporate value through active stakeholder engagement at all levels of the organisation.

6.4.2 Practical Contributions

The study, through its conceptual design, testing, and findings, made a couple of contributions beneficial to corporations, regulators, and beyond. Firstly, the study sought to investigate the combined ESG practices on value creation and separately investigate the individual ESG components' practices on value creation. This led to practical revelations that while the combined ESG practices had an insignificant effect on market value added, they had a significantly negative effect on enterprise value created by the firm. The individual components of ESG practices had significant effects on corporate value creation, except for social practices on market value added. The cluster analysis also corroborated these findings by highlighting that high ESG performance does not necessarily translate into growth in firms' value creation in the short run. Thus, corporate managers are expected to adopt a balanced and strategic ESG implementation approach that could offer better value creation outcomes to their firms.

Secondly, it distinctively investigated the moderating influences of financial risk and agency risk. It was found that agency risk had a significant negative influence on the relationship between governance practices and value creation. It also found financial risk and agency risk to have separate significant influences on the relationship between environmental practices and value creation. These findings have strengthened the call

for corporate executives to design and implement policies and procedures that would guide the board's strategic decision-making processes, mitigate exposures to financial and agency risks, and align ESG strategies with the short-term and long-term corporate value expectations of the firm in order to create sustainable value for all stakeholders.

Furthermore, the hypothesised research findings of the study were synthesised to unveil new insights on ESG-value creation relationships as captured in section 5.6, which could serve as a reference to guide future academic researchers, policy, and decision-makers in corporations and government regulatory agencies. Moreover, the study focused mainly on firms listed in five environmentally sensitive sectors of the Bursa Malaysia EMAS Index, which have not been jointly considered by previous studies. These sectors have high direct emissions under the greenhouse gas (GHG) protocol; therefore, findings from their ESG relationship with value creation are critical to guide the implementation of sustainability initiatives by firms in these sectors and beyond.

The new insights on the ESG-value creation relationships unveiled by this study could provide a guide to both practitioners and regulators in the ESG and sustainability sector to better comprehend the interplay between the ESG practices of firms, their strategic risk management, and value creation for key stakeholders. This can facilitate the continuous development of ESG initiatives, improve practices frameworks and regulatory guides, particularly relevant to environmentally sensitive sectors in Malaysia and beyond, as their high-impact direct emission poses a threat to the global climate and ecosystem.

6.5 Limitations of the Study

This study successfully achieved its stated objectives and addressed the research questions; however, several inherent limitations should be acknowledged, as they may have implications for the interpretation of the findings.

Firstly, the study is cross-sectional in nature, with sample panel data over five years collected across 161 firms and 5 environmentally sensitive sectors, which restricts the potential for easily arriving at causal conclusions that effectively apply to each sector. As a result, the estimated relationships between ESG practices, financial risk, agency risk, and value creation can be interpreted as associative rather than strictly

causal.

Secondly, the sample data collected could have been expanded from a 5-year to a 10-year trend, as initially envisaged by the study. However, given that ESG adoption and implementation are still in their early and growing stages in the Malaysian business environment, not very many firms in the Bursa Malaysia EMAS Index have available ESG data or sustainability reports stretching to 10 years. The relatively short data period, given that Malaysia is still a growing ESG market, may partly explain the mixed and sometimes insignificant results observed, particularly for environmental practices that typically yield benefits over longer investment periods.

Third, the study focused exclusively on listed firms in environmentally sensitive sectors in Malaysia. This sectoral and geographical focus enhances internal validity but limits the generalisability of the findings to non-listed firms, non-environmentally sensitive industries, or firms operating in different institutional and regulatory contexts. Consequently, the moderating effects of financial and agency risks identified in this study may manifest differently in other markets or governance environments.

Despite these limitations, the study extensively investigated the effect of ESG practices on value creation as moderated by financial and agency risks and produced interesting findings. It went further to make relevant recommendations and laid a solid foundation for future research and practical decision-making.

6.6 Suggestions for Future Research

Building upon the findings of this study, several recommendations for future research are proposed. These suggestions address firm-level practices, stakeholder alignment, corporate governance structures, and methodological considerations, all within the context of ESG performance practices, value creation, financial risk and agency risk exposures.

First, the property sector recorded the highest ESG and ESG components performance scores. It also had the highest enterprise value multiple (EVM) but returned an overall negative market value added (MVA). This indicates a potential disconnection between sustainability performance and market perception. Future research could explore which sustainability initiatives most directly and immediately influence market valuation. Corporate executives in this sector are encouraged not only

to sustain ESG initiatives but also to prioritise those with a measurable impact on the cumulative market value of the firms. Researchers may consider a sector-specific investigation into how ESG performance scores influence investor confidence and firm valuation.

Second, the manufacturing sector showed the weakest combined ESG practices and the individual pillars of environmental practices, social practices and governance practices. Future studies could focus on identifying sector-specific ESG adoption barriers and assessing the efficacy of ESG improvement strategies tailored to high-emission or high-impact industries. It could be beneficial to conduct longitudinal case studies or comparative analyses between manufacturing firms with differing ESG maturity levels.

Third, based on the overall findings, it is recommended that corporate ESG strategies be explicitly aligned with short-term and long-term corporate value expansion strategies, thereby meeting stakeholder expectations and enhancing the holistic value creation of firms. Future studies may explore this alignment through the lens of stakeholder theory or legitimacy theory, investigating how stakeholder-oriented ESG practices influence not only financial metrics but also social and reputational capital. Researchers could use multi-stakeholder interviews or surveys to understand perceived value drivers and competing ESG priorities across different interest groups.

Fourth, future research may qualitatively further examine how agency risk moderates the ESG-value creation relationship. Firms are advised to adopt governance mechanisms and policies that reduce agency problems and curb their agency risk exposures. This may include enforcing remuneration caps, implementing stronger internal audit controls, governance structures and ESG reporting policies. Qualitative case studies could delve into how internal governance controls shape ESG implementation and strategic decision-making, particularly in firms with concentrated ownership.

Fifth, the role of financial risk resulting from the consequences of top executive decisions and choices also calls for close attention and deeper investigation. Corporations should implement capital structure mix policies and procedures to guide the board's strategic decision-making process and curb possible exposures of financial risks. Researchers should also consider how capital structure policies, funding cost

controls, and financial leverage interact with ESG strategies to influence corporate value. Future studies could employ scenario analysis to assess how risk exposure at the structural level conditions the impact of ESG practices.

Sixth, the current study employed a quantitative methodology to investigate the relationship between ESG practices and value creation. Future studies could deploy mixed-mode research, particularly in value creation, to measure corporate value creation's non-financial and qualitative aspects. Semi-structured interviews can be conducted with institutional investors, customers, and regulators to ascertain their key value drivers and expectations and how ESG practices can support in addressing their needs.

Seventh, subsequent research, when conducted much later, when ESG adoption and implementation in Malaysia have advanced further, could explore the long-term impact by employing a 10-year period of cross-sectional data with more sectors considered or even go beyond Malaysia to consider Southeast Asian firms. As such, mathematical models can be formulated and grouped into Southeast Asian countries or regions to appreciate their similarities and differences.

Eighth, future studies may address possible endogeneity concerns that can affect the strict causality of the variables by employing more rigorous econometric techniques, such as instrumental variable (IV) estimation, system Generalised Method of Moments (GMM), or natural experiment designs. These approaches would help establish stronger causal inferences between ESG practices, risk exposures, and value creation outcomes.

Finally, future studies could utilise a qualitative approach in exploring the complex interplay between ESG practices and value creation as moderated by financial and agency risk exposures of firms. Such can refer to the new insights on the ESG-value creation relationships unveiled by this study, which synthesises the significant findings and highlights the differentiated ESG component effects and the distinct moderating role of financial risk and agency risk. Such a qualitative approach can deploy both a systematic qualitative review of past literature and semi-structured interviews to uncover new insights that could be of great benefit to academic researchers, corporate managers, and regulatory policymakers.

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APPENDICES

APPENDIX 1

Variance Inflation Test: Variable Diagnostics

```
. reg evm ep sp gp wacc ec fsize egr
```

Source	SS	df	MS	Number of obs	=	805
				F(7, 797)	=	1.13
Model	9668.64796	7	1381.23542	Prob > F	=	0.3432
Residual	975996.072	797	1224.58729	R-squared	=	0.0098
				Adj R-squared	=	0.0011
Total	985664.72	804	1225.95114	Root MSE	=	34.994

evm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ep	.0869839	.0919832	0.95	0.345	-.0935741	.2675419
sp	.0465082	.0935198	0.50	0.619	-.137066	.2300823
gp	-.0336065	.0666097	-0.50	0.614	-.1643578	.0971447
wacc	.0775977	.3641821	0.21	0.831	-.6372717	.7924671
ec	-.2467743	.1145917	-2.15	0.032	-.4717115	-.0218371
fsize	-1.269102	.9347333	-1.36	0.175	-3.103931	.5657283
egr	.0096656	.0213831	0.45	0.651	-.0323083	.0516394
_cons	28.541	9.65129	2.96	0.003	9.596051	47.48595

```
. vif
```

Variable	VIF	1/VIF
ep	2.75	0.363919
sp	2.60	0.384890
fsize	1.47	0.678600
gp	1.17	0.857346
ec	1.03	0.970041
wacc	1.03	0.970049
egr	1.02	0.980921
Mean VIF	1.58	

```
. reg mva ep sp gp wacc ec fsize egr
```

Source	SS	df	MS	Number of obs	=	805
				F(7, 797)	=	26.39
Model	151.477233	7	21.6396048	Prob > F	=	0.0000
Residual	653.461897	797	.819902004	R-squared	=	0.1882
				Adj R-squared	=	0.1811
Total	804.93913	804	1.00116807	Root MSE	=	.90548

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ep	-.0032014	.0023801	-1.35	0.179	-.0078734	.0014706
sp	.0122816	.0024199	5.08	0.000	.0075315	.0170316
gp	.0030413	.0017235	1.76	0.078	-.0003419	.0064246
wacc	-.0409539	.0094233	-4.35	0.000	-.0594514	-.0224564
ec	-.010075	.0029651	-3.40	0.001	-.0158954	-.0042547
fsize	-.2763205	.0241865	-11.42	0.000	-.3237974	-.2288437
egr	.0007993	.0005533	1.44	0.149	-.0002868	.0018853
_cons	2.49503	.2497304	9.99	0.000	2.004823	2.985237

```
. vif
```

Variable	VIF	1/VIF
ep	2.75	0.363919
sp	2.60	0.384890
fsize	1.47	0.678600
gp	1.17	0.857346
ec	1.03	0.970041
wacc	1.03	0.970049
egr	1.02	0.980921
Mean VIF	1.58	

```
. reg evm esgp wacc ec fsize egr
```

Source	SS	df	MS	Number of obs	=	805
				F(5, 799)	=	1.36
Model	8342.17463	5	1668.43493	Prob > F	=	0.2356
Residual	977322.546	799	1223.18216	R-squared	=	0.0085
				Adj R-squared	=	0.0023
Total	985664.72	804	1225.95114	Root MSE	=	34.974

evm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
esgp	.1154489	.0818634	1.41	0.159	-.0452439	.2761417
wacc	.0765744	.3640135	0.21	0.833	-.6379613	.7911102
ec	-.2437987	.1141197	-2.14	0.033	-.4678086	-.0197888
fsize	-1.010762	.8979239	-1.13	0.261	-2.77333	.7518067
egr	.0110108	.0213311	0.52	0.606	-.0308608	.0528823
_cons	24.28445	8.736757	2.78	0.006	7.134742	41.43416

```
. vif
```

Variable	VIF	1/VIF
fsize	1.36	0.734534
esgp	1.36	0.735230
wacc	1.03	0.969833
ec	1.02	0.976959
egr	1.02	0.984581
Mean VIF	1.16	

```
. reg mva esgp wacc ec fsize egr
```

Source	SS	df	MS	Number of obs	=	805
				F(5, 799)	=	34.91
Model	144.317942	5	28.8635883	Prob > F	=	0.0000
Residual	660.621189	799	.826809999	R-squared	=	0.1793
				Adj R-squared	=	0.1742
Total	804.93913	804	1.00116807	Root MSE	=	.90929

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
esgp	.0131057	.0021284	6.16	0.000	.0089279	.0172836
wacc	-.0408878	.009464	-4.32	0.000	-.0594651	-.0223106
ec	-.010701	.002967	-3.61	0.000	-.016525	-.0048769
fsize	-.290213	.0233452	-12.43	0.000	-.3360381	-.2443879
egr	.0007725	.0005546	1.39	0.164	-.0003161	.0018612
_cons	2.689063	.2271473	11.84	0.000	2.243187	3.134939

```
. vif
```

Variable	VIF	1/VIF
fsize	1.36	0.734534
esgp	1.36	0.735230
wacc	1.03	0.969833
ec	1.02	0.976959
egr	1.02	0.984581
Mean VIF	1.16	

APPENDIX 2

Hausman Test and Breusch-Pagan PLM Test: Model Diagnostics

Model 1: EVM_{ESGP}

```
. xtreg evm esgp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0109                                         min =         5
     between = 0.0186                                         avg =       5.0
     overall = 0.0027                                         max =         5

                                                F(3,641)           =      2.35
corr(u_i, Xb)  = -0.3800                        Prob > F           =    0.0711
```

evm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
esgp	-.4685401	.1831277	-2.56	0.011	-.8281427	-.1089374
fsize	3.905785	5.121675	0.76	0.446	-6.151503	13.96307
egr	-.014144	.0196128	-0.72	0.471	-.0526571	.0243692
_cons	-.5915873	48.27416	-0.01	0.990	-95.38619	94.20302
sigma_u	24.559348					
sigma_e	29.824708					
rho	.40408104	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 641) = 2.90                     Prob > F = 0.0000

. estimate store fe


. xtreg evm esgp fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0014                                         min =         5
     between = 0.0028                                         avg =       5.0
     overall = 0.0001                                         max =         5

                                                Wald chi2(3)       =      0.13
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.9877
```

evm	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
esgp	-.00515	.1044751	-0.05	0.961	-.2099173	.1996174
fsize	-.1946055	1.242393	-0.16	0.876	-2.629651	2.24044
egr	-.0055665	.0190977	-0.29	0.771	-.0429973	.0318643
_cons	20.04741	10.93404	1.83	0.067	-1.382914	41.47773
sigma_u	18.095698					
sigma_e	29.824708					
rho	.26907397	(fraction of variance due to u_i)				

```
. estimate store re
```

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
esgp	-.4685401	-.00515	-.4633901	.1504018
fsize	3.905785	-.1946055	4.10039	4.968703
egr	-.014144	-.0055665	-.0085775	.0044655

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 12.46
Prob>chi2 = 0.0060

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

evm[id,t] = Xb + u[id] + e[id,t]

Estimated results:

	Var	sd = sqrt(Var)
evm	1225.951	35.01359
e	889.5132	29.82471
u	327.4543	18.0957

Test: Var(u) = 0
chibar2(01) = 110.75
Prob > chibar2 = 0.0000

Model 1: MVA_{ESGP}

```
. xtreg mva esgp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0050                                         min =         5
     between = 0.0540                                         avg =       5.0
     overall = 0.0415                                         max =         5

                                                F(3,641)           =      1.08
corr(u_i, Xb)  = 0.0904                         Prob > F           =    0.3558

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |    -.00343   .0034074    -1.01   0.314     -.010121     .003261
       fsize |  -.0518461   .0952972    -0.54   0.587    -.2389785    .1352863
         egr |   .0004596   .0003649     1.26   0.208     -.000257    .0011762
       _cons |   .6531107   .8982202     0.73   0.467    -1.110699     2.41692
-------------+----------------------------------------------------------------
     sigma_u |  .85065838
     sigma_e |  .55493779
         rho |  .70147031   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 9.92                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg mva esgp fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0008                                         min =         5
     between = 0.1733                                         avg =       5.0
     overall = 0.1286                                         max =         5

                                                Wald chi2(3)       =     29.89
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

mva	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
esgp	.0044608	.0027032	1.65	0.099	-.0008374	.009759
fsize	-.2080726	.0393778	-5.28	0.000	-.2852516	-.1308936
egr	.0005129	.0003635	1.41	0.158	-.0001995	.0012252
_cons	1.850517	.3594443	5.15	0.000	1.146019	2.555015
sigma_u	.7410011					
sigma_e	.55493779					
rho	.64067434	(fraction of variance due to u_i)				

```
. estimate store re


. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
esgp	-.00343	.0044608	-.0078907	.0020744
fsize	-.0518461	-.2080726	.1562265	.086781
egr	.0004596	.0005129	-.0000533	.0000328

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =       14.90
              Prob>chi2 =      0.0019

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                             |         Var      sd = sqrt(Var)
                    ---------+------------------------------
                         mva |    1.001168        1.000584
                           e |     .307956        .5549378
                           u |    .5490826        .7410011

        Test:   Var(u) = 0
                                  chibar2(01) =    629.65
                              Prob > chibar2 =    0.0000
```

Model 2: EVM_{EP}

```
. xtreg evm ep fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0079                                         min =         5
     between = 0.0177                                         avg =       5.0
     overall = 0.0032                                         max =         5

                                                F(3,641)           =      1.69
corr(u_i, Xb)  = -0.3622                        Prob > F           =    0.1673

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |   -.349425   .1635266    -2.14   0.033    -.6705375   -.0283125
       fsize |   3.628244   5.186954     0.70   0.484    -6.557231    13.81372
         egr |  -.0143944   .0196438    -0.73   0.464    -.0529683    .0241795
       _cons |  -6.453129   49.20925    -0.13   0.896    -103.0839    90.17768
-------------+----------------------------------------------------------------
     sigma_u |  24.304736
     sigma_e |  29.870415
         rho |  .39833809   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 2.88                     Prob > F = 0.0000

. estimate store fe

. xtreg evm ep fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0001                                         min =         5
     between = 0.0056                                         avg =       5.0
     overall = 0.0013                                         max =         5

                                                Wald chi2(3)       =      0.20
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.9776

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |   .0229811   .0866483     0.27   0.791    -.1468463    .1928086
       fsize |  -.4002527   1.280655    -0.31   0.755     -2.91029    2.109785
         egr |  -.0057945   .0191032    -0.30   0.762    -.0432361     .031647
       _cons |   21.12363   11.48761     1.84   0.066    -1.391665    43.63893
-------------+----------------------------------------------------------------
     sigma_u |  18.117825
     sigma_e |  29.870415
         rho |  .26895233   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ep	-.349425	.0229811	-.3724061	.1386832
fsize	3.628244	-.4002527	4.028497	5.026372
egr	-.0143944	-.0057945	-.0085999	.0045767

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 9.75
Prob>chi2 = 0.0208

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |         Var     sd = sqrt(Var)
             ---------+-----------------------------
                 evm |    1225.951        35.01359
                   e |    892.2417        29.87041
                   u |    328.2556        18.11782

        Test:   Var(u) = 0
                             chibar2(01) =   111.03
                          Prob > chibar2 =   0.0000
```

Model 2: EVM$_{SP}$

```
. xtreg evm sp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0086                                         min =         5
     between = 0.0175                                         avg =       5.0
     overall = 0.0029                                         max =         5

                                                F(3,641)           =      1.86
corr(u_i, Xb)  = -0.3612                        Prob > F           =    0.1353
```

evm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
sp	-.3598718	.1599183	-2.25	0.025	-.6738989	-.0458447
fsize	2.829523	5.05256	0.56	0.576	-7.092046	12.75109
egr	-.014826	.0196389	-0.75	0.451	-.0533903	.0237383
_cons	6.442061	48.04088	0.13	0.893	-87.89446	100.7786
sigma_u	24.316863					
sigma_e	29.858897					
rho	.39876213	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 641) = 2.88                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg evm sp fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0000                                         min =         5
     between = 0.0018                                         avg =       5.0
     overall = 0.0005                                         max =         5

                                                Wald chi2(3)       =      0.15
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.9846
```

evm	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
sp	.0135044	.0861177	0.16	0.875	-.1552831	.1822919
fsize	-.3101597	1.225451	-0.25	0.800	-2.711999	2.09168
egr	-.0056804	.019095	-0.30	0.766	-.043106	.0317452
_cons	20.36087	10.95599	1.86	0.063	-1.112475	41.83421
sigma_u	18.119398					
sigma_e	29.858897					
rho	.26913817	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
sp	-.3598718	.0135044	-.3733762	.1347502
fsize	2.829523	-.3101597	3.139682	4.901696
egr	-.014826	-.0056804	-.0091456	.0045896

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       10.38
                Prob>chi2 =      0.0156


. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var      sd = sqrt(Var)
                 --------+------------------------------
                     evm |    1225.951        35.01359
                       e |    891.5538         29.8589
                       u |    328.3126         18.1194

        Test:   Var(u) = 0
                                 chibar2(01) =   111.17
                              Prob > chibar2 =   0.0000
```

Model 2: EVM$_{GP}$

```
. xtreg evm gp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0054                                         min =         5
     between = 0.0037                                         avg =       5.0
     overall = 0.0000                                         max =         5

                                                F(3,641)           =      1.17
corr(u_i, Xb)  = -0.1867                        Prob > F           =    0.3218

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |  -.1915047   .1107861    -1.73   0.084    -.4090522    .0260429
       fsize |   1.134998   4.941173     0.23   0.818    -8.567843    10.83784
         egr |  -.0134417   .0196691    -0.68   0.495    -.0520654    .0251821
       _cons |   16.53968   47.80746     0.35   0.729    -77.33848    110.4178
-------------+----------------------------------------------------------------
     sigma_u |  23.107773
     sigma_e |  29.906986
         rho |  .37382406   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 2.88                     Prob > F = 0.0000

. estimate store fe

. xtreg evm gp fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0052                                         min =         5
     between = 0.0031                                         avg =       5.0
     overall = 0.0000                                         max =         5

                                                Wald chi2(3)       =      0.69
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.8762

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |  -.0561572   .0752863    -0.75   0.456    -.2037156    .0914012
       fsize |  -.1153924   1.105327    -0.10   0.917    -2.281793    2.051008
         egr |  -.0055854    .019075    -0.29   0.770    -.0429718     .031801
       _cons |    21.8761   11.11368     1.97   0.049     .0936923     43.6585
-------------+----------------------------------------------------------------
     sigma_u |  18.215714
     sigma_e |  29.906986
         rho |  .27059321   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+------------------------------------------------------------
          gp |   -.1915047    -.0561572       -.1353475        .0812745
       fsize |    1.134998    -.1153924        1.250391        4.815957
         egr |   -.0134417    -.0055854       -.0078562        .0047977
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        6.30
                Prob>chi2 =      0.0980

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var      sd = sqrt(Var)
                 --------+------------------------------
                     evm |    1225.951        35.01359
                       e |    894.4278        29.90699
                       u |    331.8122        18.21571

        Test:   Var(u) = 0
                                 chibar2(01) =    115.54
                              Prob > chibar2 =    0.0000
```

Model 2: MVA_{EP}

```
. xtreg mva ep fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0132                                         min =         5
     between = 0.0044                                         avg =       5.0
     overall = 0.0054                                         max =         5

                                                F(3,641)           =      2.86
corr(u_i, Xb)  = -0.1097                        Prob > F           =    0.0363

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.0076077   .0030255    -2.51   0.012    -.0135489   -.0016666
       fsize |    .000251   .0959681     0.00   0.998    -.1881989    .1887009
         egr |   .0004516   .0003634     1.24   0.214    -.0002621    .0011653
       _cons |   .2397513   .9104611     0.26   0.792    -1.548095    2.027598
-------------+----------------------------------------------------------------
     sigma_u |  .87475914
     sigma_e |  .55265727
         rho |  .71472027   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 10.54                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg mva ep fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0043                                         min =         5
     between = 0.1287                                         avg =       5.0
     overall = 0.0977                                         max =         5

                                                Wald chi2(3)       =     25.91
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

mva	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ep	-.0007823	.0023328	-0.34	0.737	-.0053544	.0037899
fsize	-.1741771	.0412494	-4.22	0.000	-.2550244	-.0933298
egr	.0005214	.0003618	1.44	0.150	-.0001878	.0012306
_cons	1.729819	.3809482	4.54	0.000	.9831741	2.476464
sigma_u	.76465023					
sigma_e	.55265727					
rho	.65686643	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ep	-.0076077	-.0007823	-.0068254	.0019267
fsize	.000251	-.1741771	.1744281	.0866509
egr	.0004516	.0005214	-.0000698	.000034

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =       13.44
              Prob>chi2 =      0.0038

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                     mva |    1.001168       1.000584
                       e |    .3054301       .5526573
                       u |      .58469       .7646502

        Test:   Var(u) = 0
                                 chibar2(01) =   665.99
                              Prob > chibar2 =   0.0000
```

Model 2: MVA$_{SP}$

```
. xtreg mva sp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0053                                         min =         5
     between = 0.0447                                         avg =       5.0
     overall = 0.0348                                         max =         5

                                                F(3,641)           =      1.14
corr(u_i, Xb)  = 0.0586                         Prob > F           =    0.3310

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.0032465   .0029717    -1.09   0.275     -.009082     .002589
       fsize |  -.0547132   .0938904    -0.58   0.560    -.2390831    .1296566
         egr |   .0004531   .0003649     1.24   0.215    -.0002635    .0011698
       _cons |   .6829358   .8927309     0.76   0.445    -1.070095    2.435966
-------------+----------------------------------------------------------------
     sigma_u |  .85261317
     sigma_e |  .55485994
         rho |   .7024894   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 9.84                     Prob > F = 0.0000

. estimate store fe

. xtreg mva sp fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0006                                         min =         5
     between = 0.1810                                         avg =       5.0
     overall = 0.1339                                         max =         5

                                                Wald chi2(3)       =     30.66
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |    .004149   .0022842     1.82   0.069     -.000328    .0086261
       fsize |  -.2090098   .0388665    -5.38   0.000    -.2851868   -.1328329
         egr |     .00052   .0003636     1.43   0.153    -.0001927    .0012326
       _cons |    1.86063   .3584551     5.19   0.000     1.158071    2.563189
-------------+----------------------------------------------------------------
     sigma_u |  .73739939
     sigma_e |  .55485994
         rho |  .63849267   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
sp	-.0032465	.004149	-.0073955	.0019009
fsize	-.0547132	-.2090098	.1542966	.0854681
egr	.0004531	.00052	-.0000668	.0000315

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 16.19
Prob>chi2 = 0.0010

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

mva[id,t] = Xb + u[id] + e[id,t]

Estimated results:

	Var	sd = sqrt(Var)
mva	1.001168	1.000584
e	.3078695	.5548599
u	.5437579	.7373994

Test: Var(u) = 0
chibar2(01) = 624.54
Prob > chibar2 = 0.0000

Model 2: MVA_{GP}

```
. xtreg mva gp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0049                                         min =         5
     between = 0.1555                                         avg =       5.0
     overall = 0.1164                                         max =         5

                                                F(3,641)           =      1.06
corr(u_i, Xb)  = 0.2296                         Prob > F           =    0.3666

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |   .0019909   .0020558     0.97   0.333     -.002046    .0060279
       fsize |  -.0943163   .0916911    -1.03   0.304    -.2743675    .0857349
         egr |   .0004554    .000365     1.25   0.213    -.0002613    .0011721
       _cons |   .8253117   .8871414     0.93   0.353    -.9167427    2.567366
-------------+----------------------------------------------------------------
     sigma_u |  .82339556
     sigma_e |  .55497039
         rho |  .68762601   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 10.40                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg mva gp fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0046                                         min =         5
     between = 0.1530                                         avg =       5.0
     overall = 0.1156                                         max =         5

                                                Wald chi2(3)       =     29.92
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

mva	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gp	.0035246	.0017861	1.97	0.048	.000024	.0070252
fsize	-.1892735	.0368506	-5.14	0.000	-.2614994	-.1170476
egr	.000509	.0003612	1.41	0.159	-.0001989	.0012168
_cons	1.676126	.366131	4.58	0.000	.9585223	2.393729
sigma_u	.76569146					
sigma_e	.55497039					
rho	.65559594	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
gp	.0019909	.0035246	-.0015337	.001018
fsize	-.0943163	-.1892735	.0949572	.08396
egr	.0004554	.000509	-.0000535	.0000526

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =        3.50
              Prob>chi2 =      0.3208

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                     mva |    1.001168       1.000584
                       e |    .3079921       .5549704
                       u |    .5862834       .7656915

        Test:   Var(u) = 0
                                chibar2(01) =    677.84
                              Prob > chibar2 =    0.0000
```

Model 3: EVM$_{ESGP*FR}$

```
. xtreg evm esgp wacc c.esgp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0129                                         min =         5
     between = 0.0162                                         avg =       5.0
     overall = 0.0019                                         max =         5

                                                F(5,639)           =      1.67
corr(u_i, Xb)  = -0.3951                        Prob > F           =    0.1407

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.6384193   .3319132    -1.92   0.055    -1.290192    .0133531
        wacc |  -1.170078   1.222506    -0.96   0.339    -3.570693    1.230537
             |
c.esgp#c.wacc |   .0211769   .0352791     0.60   0.549    -.0481001    .0904538
             |
       fsize |   4.512395   5.152799     0.88   0.382     -5.60607    14.63086
         egr |  -.0140236   .0196447    -0.71   0.476    -.0525995    .0245523
       _cons |    2.92567   48.65907     0.06   0.952    -92.62534    98.47668
-------------+----------------------------------------------------------------
     sigma_u |  24.785005
     sigma_e |  29.841519
         rho |  .40822121   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.89                     Prob > F = 0.0000

. estimate store fe


. xtreg evm esgp wacc c.esgp#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0015                                         min =         5
     between = 0.0018                                         avg =       5.0
     overall = 0.0015                                         max =         5

                                                Wald chi2(5)       =      1.19
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.9463

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.1894709   .2182583    -0.87   0.385    -.6172493    .2383075
        wacc |  -.9831009   .9588548    -1.03   0.305    -2.862422     .89622
             |
c.esgp#c.wacc |   .0253146   .0267073     0.95   0.343    -.0270307    .0776599
             |
       fsize |  -.1918855   1.245271    -0.15   0.878    -2.632571     2.2488
         egr |  -.0049397   .0191233    -0.26   0.796    -.0424208    .0325413
       _cons |   27.39111    13.1512     2.08   0.037     1.615239    53.16699
-------------+----------------------------------------------------------------
     sigma_u |   18.09764
     sigma_e |  29.841519
         rho |  .26889457   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
esgp	-.6384193	-.1894709	-.4489483	.2500593
wacc	-1.170078	-.9831009	-.186977	.7583662
c.esgp# c.wacc	.0211769	.0253146	-.0041377	.0230507
fsize	4.512395	-.1918855	4.704281	5.000064
egr	-.0140236	-.0049397	-.0090839	.0044957

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 14.63
Prob>chi2 = 0.0121

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

evm[id,t] = Xb + u[id] + e[id,t]

Estimated results:

	Var	sd = sqrt(Var)
evm	1225.951	35.01359
e	890.5162	29.84152
u	327.5246	18.09764

Test: Var(u) = 0
chibar2(01) = 108.02
Prob > chibar2 = 0.0000

Model 3: $MVA_{ESGP*FR}$

```
. xtreg mva esgp wacc c.esgp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0081                                         min =         5
     between = 0.0759                                         avg =       5.0
     overall = 0.0576                                         max =         5

                                                F(5,639)           =      1.04
corr(u_i, Xb)  = 0.1296                         Prob > F           =    0.3921

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |   .0033817   .0061725     0.55   0.584    -.0087391    .0155026
        wacc |   .0228965   .0227346     1.01   0.314    -.0217471    .0675401
             |
c.esgp#c.wacc |  -.0008725   .0006561    -1.33   0.184    -.0021608    .0004158
             |
       fsize |  -.0563949   .0958253    -0.59   0.556    -.2445654    .1317756
         egr |   .0004362   .0003653     1.19   0.233    -.0002811    .0011536
       _cons |   .5073133   .9049001     0.56   0.575    -1.269624    2.284251
-------------+----------------------------------------------------------------
     sigma_u |   .8451095
     sigma_e |  .55495498
         rho |  .69870914   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 9.63                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg mva esgp wacc c.esgp#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0030                                         min =         5
     between = 0.1921                                         avg =       5.0
     overall = 0.1428                                         max =         5

                                                Wald chi2(5)       =     35.58
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |   .0115599   .0051899     2.23   0.026     .0013878    .0217319
        wacc |   .0169972   .0209438     0.81   0.417     -.024052    .0580463
             |
c.esgp#c.wacc |  -.0009531   .0005955    -1.60   0.109    -.0021202     .000214
             |
       fsize |  -.2138672   .0389982    -5.48   0.000    -.2903023    -.137432
         egr |   .0004839   .0003643     1.33   0.184    -.0002301    .0011979
       _cons |   1.774103   .3854634     4.60   0.000     1.018609    2.529597
-------------+----------------------------------------------------------------
     sigma_u |  .72766757
     sigma_e |  .55495498
         rho |   .6322577   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re

. hausman fe re

Note: the rank of the differenced variance matrix (4) does not equal the number of coefficients being t
        is what you expect, or there may be problems computing the test.  Examine the output of your es
        unexpected and possibly consider scaling your variables so that the coefficients are on a simil

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+----------------------------------------------------------------
       esgp  |    .0033817     .0115599       -.0081781        .0033413
       wacc  |    .0228965     .0169972        .0058993        .0088442
    c.esgp#  |
    c.wacc   |   -.0008725    -.0009531        .0000806        .0002754
      fsize  |   -.0563949    -.2138672        .1574723        .0875307
        egr  |    .0004362     .0004839       -.0000477        .0000275
------------------------------------------------------------------------------
                     b = consistent under Ho and Ha; obtained from xtreg
          B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =       20.25
              Prob>chi2 =      0.0004
              (V_b-V_B is not positive definite)

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |         Var      sd = sqrt(Var)
             ---------+-----------------------------
                 mva |    1.001168        1.000584
                   e |     .307975         .554955
                   u |    .5295001        .7276676

        Test:   Var(u) = 0
                                 chibar2(01) =    600.82
                              Prob > chibar2 =    0.0000
```

Model 4: EVM_{EP*FR}

```
. xtreg evm ep wacc c.ep#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0099                                         min =         5
     between = 0.0145                                         avg =       5.0
     overall = 0.0021                                         max =         5

                                                F(5,639)           =      1.28
corr(u_i, Xb)  = -0.3800                        Prob > F           =    0.2690

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.5253803   .2940749    -1.79   0.074    -1.10285    .0520897
        wacc |  -.8848067   .7702019    -1.15   0.251    -2.397239    .6276259
             |
 c.ep#c.wacc |   .0220289    .030727     0.72   0.474    -.0383092    .0823671
             |
       fsize |     4.4591   5.244985     0.85   0.396     -5.84039    14.75859
         egr |  -.0140524   .0196814    -0.71   0.475    -.0527005    .0245957
       _cons |  -7.352451    49.2533    -0.15   0.881    -104.0703    89.36544
-------------+----------------------------------------------------------------
     sigma_u |  24.559217
     sigma_e |  29.885649
         rho |  .40309581   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.86                     Prob > F = 0.0000

. estimate store fe

. xtreg evm ep wacc c.ep#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0006                                         min =         5
     between = 0.0075                                         avg =       5.0
     overall = 0.0031                                         max =         5

                                                Wald chi2(5)       =      1.33
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.9323

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.1419967   .1857112    -0.76   0.445     -.505984    .2219905
        wacc |  -.6102664    .616058    -0.99   0.322    -1.817718    .5971852
             |
 c.ep#c.wacc |   .0228016   .0229781     0.99   0.321    -.0222347    .0678378
             |
       fsize |  -.3314697   1.288204    -0.26   0.797    -2.856303    2.193363
         egr |   -.005109   .0191254    -0.27   0.789    -.0425941     .032376
       _cons |   25.08039   12.42579     2.02   0.044     .7262896    49.43449
-------------+----------------------------------------------------------------
     sigma_u |  18.163335
     sigma_e |  29.885649
         rho |  .26973906   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re

                 ---- Coefficients ----
                |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                |       fe           re          Difference          S.E.
----------------+----------------------------------------------------------------
             ep |   -.5253803    -.1419967       -.3833836        .2280162
           wacc |   -.8848067    -.6102664       -.2745404         .462259
  c.ep#c.wacc |    .0220289     .0228016       -.0007726        .0203999
          fsize |      4.4591    -.3314697        4.790569        5.084328
            egr |   -.0140524     -.005109       -.0089434        .0046453
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       11.35
                Prob>chi2 =      0.0448


. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |       Var      sd = sqrt(Var)
             ---------+------------------------------
                 evm |    1225.951        35.01359
                   e |     893.152        29.88565
                   u |    329.9067        18.16333

        Test:   Var(u) = 0
                                chibar2(01) =   108.84
                             Prob > chibar2 =   0.0000
```

Model 4: EVM$_{SP*FR}$

```
. xtreg evm sp wacc c.sp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0110                                         min =         5
     between = 0.0176                                         avg =       5.0
     overall = 0.0025                                         max =         5

                                                F(5,639)           =      1.43
corr(u_i, Xb)  = -0.3815                        Prob > F           =    0.2131

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.5452049   .2822306    -1.93   0.054    -1.099416    .0090067
        wacc |  -1.337031   1.181235    -1.13   0.258    -3.656603    .9825408

 c.sp#c.wacc |   .0235608    .030384     0.78   0.438    -.0361037    .0832254

       fsize |   3.575786   5.089896     0.70   0.483    -6.419158    13.57073
         egr |  -.0143897   .0196785    -0.73   0.465     -.053032    .0242526
       _cons |   9.820272   48.25889     0.20   0.839    -84.94491    104.5855
-------------+----------------------------------------------------------------
     sigma_u |  24.583931
     sigma_e |  29.869308
         rho |  .40384324   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.89                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg evm sp wacc c.sp#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs     =       805
Group variable: id                              Number of groups  =       161

R-sq:                                           Obs per group:
     within  = 0.0015                                         min =         5
     between = 0.0000                                         avg =       5.0
     overall = 0.0004                                         max =         5

                                                Wald chi2(5)      =      0.64
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.9859
```

evm	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
sp	-.0880494	.1886444	-0.47	0.641	-.4577857	.2816869
wacc	-.6448462	.9268685	-0.70	0.487	-2.461475	1.171783
c.sp#c.wacc	.0135467	.0231203	0.59	0.558	-.0317683	.0588616
fsize	-.3167344	1.233081	-0.26	0.797	-2.733529	2.100061
egr	-.0052291	.0191252	-0.27	0.785	-.0427139	.0322556
_cons	25.4021	13.16202	1.93	0.054	-.3949806	51.19917
sigma_u	18.257084					
sigma_e	29.869308					
rho	.2719886	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
sp	-.5452049	-.0880494	-.4571555	.2099224
wacc	-1.337031	-.6448462	-.6921849	.7322781
c.sp#c.wacc	.0235608	.0135467	.0100142	.0197139
fsize	3.575786	-.3167344	3.892521	4.938274
egr	-.0143897	-.0052291	-.0091606	.0046333

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =       11.79
              Prob>chi2 =      0.0378

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                     evm |    1225.951       35.01359
                       e |    892.1756       29.86931
                       u |    333.3211       18.25708

        Test:   Var(u) = 0
                                 chibar2(01) =   110.88
                              Prob > chibar2 =   0.0000
```

Model 4: EVM$_{GP*FR}$

```
. xtreg evm gp wacc c.gp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0067                                         min =         5
     between = 0.0048                                         avg =       5.0
     overall = 0.0001                                         max =         5

                                                F(5,639)           =      0.87
corr(u_i, Xb)  = -0.2148                        Prob > F           =    0.5034

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |  -.1867516   .2321649    -0.80   0.421    -.6426501    .2691468
        wacc |  -.4584245   1.193129    -0.38   0.701    -2.801353    1.884504
 c.gp#c.wacc |  -.0007096   .0256527    -0.03   0.978    -.0510833    .0496642
       fsize |    1.50732   4.963584     0.30   0.761    -8.239587    11.25423
         egr |   -.013798   .0196918    -0.70   0.484    -.0524665    .0248704
       _cons |   16.38877    48.8656     0.34   0.737    -79.56779    112.3453
-------------+----------------------------------------------------------------
     sigma_u |  23.264033
     sigma_e |  29.934123
         rho |   .3765586   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.84                     Prob > F = 0.0000

. estimate store fe

. xtreg evm gp wacc c.gp#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0019                                         min =         5
     between = 0.0048                                         avg =       5.0
     overall = 0.0031                                         max =         5

                                                Wald chi2(5)       =      2.02
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.8457

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |  -.2311522   .1766665    -1.31   0.191    -.5774121    .1151077
        wacc |   -1.13557    .973286    -1.17   0.243    -3.043175     .772036
 c.gp#c.wacc |   .0230677   .0210217     1.10   0.272     -.018134    .0642694
       fsize |  -.1725894   1.100773    -0.16   0.875    -2.330065    1.984886
         egr |  -.0051802   .0191194    -0.27   0.786    -.0426536    .0322931
       _cons |   31.16083   13.69334     2.28   0.023     4.322376    57.99929
-------------+----------------------------------------------------------------
     sigma_u |  17.882678
     sigma_e |  29.934123
         rho |  .26301954   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. estimate store re

. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
gp	-.1867516	-.2311522	.0444005	.1506304
wacc	-.4584245	-1.13557	.6771451	.6901246
c.gp#c.wacc	-.0007096	.0230677	-.0237773	.0147021
fsize	1.50732	-.1725894	1.679909	4.839986
egr	-.013798	-.0051802	-.0086178	.0047133

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       12.00
                Prob>chi2 =      0.0348

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                             |       Var     sd = sqrt(Var)
                -------------+------------------------------
                         evm |    1225.951        35.01359
                           e |    896.0517        29.93412
                           u |    319.7902        17.88268

        Test:   Var(u) = 0
                                  chibar2(01) =    107.88
                               Prob > chibar2 =    0.0000
```

Model 4: MVA_{EP*FR}

```
. xtreg mva ep wacc c.ep#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0193                                         min =         5
     between = 0.0206                                         avg =       5.0
     overall = 0.0201                                         max =         5

                                                F(5,639)           =      2.52
corr(u_i, Xb)  = -0.0381                        Prob > F           =    0.0287
```

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ep	.0011687	.0054298	0.22	0.830	-.0094936	.0118311
wacc	.0157678	.014221	1.11	0.268	-.0121577	.0436933
c.ep#c.wacc	-.0011044	.0005673	-1.95	0.052	-.0022185	9.64e-06
fsize	-.0196425	.0968432	-0.20	0.839	-.2098119	.1705269
egr	.0004137	.0003634	1.14	0.255	-.0002999	.0011273
_cons	.2894512	.9094111	0.32	0.750	-1.496344	2.075247
sigma_u	.8624616					
sigma_e	.55180746					
rho	.70954657	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 639) = 10.22                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg mva ep wacc c.ep#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs     =       805
Group variable: id                              Number of groups  =       161

R-sq:                                           Obs per group:
     within  = 0.0106                                         min =         5
     between = 0.1501                                         avg =       5.0
     overall = 0.1151                                         max =         5

                                                Wald chi2(5)      =     34.48
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

mva	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ep	.0083015	.0044795	1.85	0.064	-.0004781	.0170812
wacc	.0094471	.0132348	0.71	0.475	-.0164927	.0353869
c.ep#c.wacc	-.0012108	.0005137	-2.36	0.018	-.0022176	-.000204
fsize	-.1868763	.0409227	-4.57	0.000	-.2670832	-.1066693
egr	.0004746	.0003622	1.31	0.190	-.0002352	.0011845
_cons	1.771336	.3856705	4.59	0.000	1.015435	2.527236
sigma_u	.7491555					
sigma_e	.55180746					
rho	.6482817	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ep	.0011687	.0083015	-.0071328	.0030687
wacc	.0157678	.0094471	.0063207	.0052034
c.ep#c.wacc	-.0011044	-.0012108	.0001063	.0002408
fsize	-.0196425	-.1868763	.1672338	.0877721
egr	.0004137	.0004746	-.0000609	.0000297

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =       19.26
              Prob>chi2 =      0.0017

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     mva |    1.001168        1.000584
                       e |    .3044915        .5518075
                       u |     .561234        .7491555

        Test:   Var(u) = 0
                                 chibar2(01) =   635.77
                              Prob > chibar2 =   0.0000
```

Model 4: MVA_{SP*FR}

```
. xtreg mva sp wacc c.sp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0068                                         min =         5
     between = 0.0607                                         avg =       5.0
     overall = 0.0469                                         max =         5

                                                F(5,639)           =      0.88
corr(u_i, Xb)  = 0.0914                         Prob > F           =    0.4951

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |   .0004895    .005247     0.09   0.926    -.0098139     .010793
        wacc |    .012677   .0219606     0.58   0.564    -.0304466    .0558007
 c.sp#c.wacc |   -.000494   .0005649    -0.87   0.382    -.0016033    .0006152
       fsize |  -.0577022   .0946274    -0.61   0.542    -.2435203     .128116
         egr |   .0004325   .0003658     1.18   0.238    -.0002859    .0011509
       _cons |   .6110414   .8971914     0.68   0.496    -1.150758    2.372841
-------------+----------------------------------------------------------------
     sigma_u |  .84776626
     sigma_e |  .55530672
         rho |  .69976282   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 9.51                     Prob > F = 0.0000

. estimate store fe


. xtreg mva sp wacc c.sp#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0017                                         min =         5
     between = 0.2019                                         avg =       5.0
     overall = 0.1490                                         max =         5

                                                Wald chi2(5)       =     35.43
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |   .0089655   .0044329     2.02   0.043     .0002772    .0176537
        wacc |   .0098361   .0202264     0.49   0.627    -.0298069    .0494791
 c.sp#c.wacc |  -.0006528   .0005142    -1.27   0.204    -.0016607     .000355
       fsize |  -.2137204   .0384741    -5.55   0.000    -.2891282   -.1383127
         egr |   .0004893    .000365     1.34   0.180     -.000226    .0012046
       _cons |   1.830656   .3831743     4.78   0.000     1.079649    2.581664
-------------+----------------------------------------------------------------
     sigma_u |  .72382507
     sigma_e |  .55530672
         rho |   .6294967   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re          Difference          S.E.
-------------+------------------------------------------------------------
          sp |    .0004895     .0089655       -.008476        .0028073
        wacc |     .012677     .0098361       .0028409        .0085534
c.sp#c.wacc |    -.000494    -.0006528       .0001588        .0002338
       fsize |   -.0577022    -.2137204       .1560183        .0864528
         egr |    .0004325     .0004893      -.0000568        .0000253
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       21.34
                Prob>chi2 =      0.0007
                (V_b-V_B is not positive definite)

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+-----------------------------
                 mva |    1.001168       1.000584
                   e |    .3083656       .5553067
                   u |    .5239227       .7238251

        Test:   Var(u) = 0
                                chibar2(01) =   594.36
                              Prob > chibar2 =   0.0000
```

Model 4: MVA_{GP*FR}

```
. xtreg mva gp wacc c.gp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0052                                         min =         5
     between = 0.1685                                         avg =       5.0
     overall = 0.1255                                         max =         5

                                                F(5,639)           =      0.67
corr(u_i, Xb)  = 0.2528                         Prob > F           =    0.6495

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |    .0020461   .0043104     0.47   0.635    -.0064182    .0105105
        wacc |   -.0037029    .022152    -0.17   0.867    -.0472024    .0397967
 c.gp#c.wacc |   -7.86e-06   .0004763    -0.02   0.987    -.0009431    .0009274
       fsize |   -.0912316   .0921554    -0.99   0.323    -.2721956    .0897325
         egr |    .0004525   .0003656     1.24   0.216    -.0002655    .0011704
       _cons |    .8232916   .9072535     0.91   0.365    -.9582671     2.60485
-------------+----------------------------------------------------------------
     sigma_u |  .82242313
     sigma_e |  .55576601
         rho |  .68650182   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 10.00                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg mva gp wacc c.gp#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0046                                         min =         5
     between = 0.1719                                         avg =       5.0
     overall = 0.1289                                         max =         5

                                                Wald chi2(5)       =     33.02
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

mva	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gp	.0040956	.0039185	1.05	0.296	-.0035846	.0117758
wacc	-.0101318	.0207733	-0.49	0.626	-.0508468	.0305831
c.gp#c.wacc	-.0000721	.0004472	-0.16	0.872	-.0009486	.0008045
fsize	-.1919042	.0363763	-5.28	0.000	-.2632004	-.1206079
egr	.0005041	.0003626	1.39	0.164	-.0002066	.0012148
_cons	1.776612	.4005566	4.44	0.000	.9915352	2.561688
sigma_u	.74886699					
sigma_e	.55576601					
rho	.64483868	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	——— Coefficients ———			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
gp	.0020461	.0040956	-.0020495	.0017958
wacc	-.0037029	-.0101318	.006429	.0076929
c.gp#c.wacc	-7.86e-06	-.0000721	.0000642	.0001638
fsize	-.0912316	-.1919042	.1006726	.0846722
egr	.0004525	.0005041	-.0000517	.0000467

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       10.51
                Prob>chi2 =      0.0621


. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     mva |    1.001168        1.000584
                       e |    .3088759         .555766
                       u |    .5608018         .748867

        Test:   Var(u) = 0
                                 chibar2(01) =   639.28
                              Prob > chibar2 =   0.0000
```

Model 5: EVM$_{ESGP*AR}$

```
. xtreg evm esgp ec c.esgp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0120                                         min =         5
     between = 0.0136                                         avg =       5.0
     overall = 0.0014                                         max =         5

                                                F(5,639)           =      1.56
corr(u_i, Xb)  = -0.3675                        Prob > F           =    0.1706

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.5514764   .2077447    -2.65   0.008    -.9594212   -.1435316
          ec |  -.5179446   .6728636    -0.77   0.442    -1.839236    .8033464
             |
 c.esgp#c.ec |   .0121103   .0141459     0.86   0.392    -.0156677    .0398883
             |
       fsize |   4.273935   5.144765     0.83   0.406    -5.828755    14.37663
         egr |  -.0157121   .0201087    -0.78   0.435    -.0551993    .0237751
       _cons |  -.4836379   48.42956    -0.01   0.992    -95.58395    94.61668
-------------+----------------------------------------------------------------
     sigma_u |  24.483341
     sigma_e |  29.854226
         rho |  .40211341   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.85                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg evm esgp ec c.esgp#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0015                                         min =         5
     between = 0.0121                                         avg =       5.0
     overall = 0.0059                                         max =         5

                                                Wald chi2(5)       =      2.94
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.7094

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.0825998   .1265156    -0.65   0.514    -.3305657    .1653662
          ec |  -.5735571   .3858389    -1.49   0.137    -1.329787    .1826732
             |
 c.esgp#c.ec |   .0093618   .0087804     1.07   0.286    -.0078475    .0265711
             |
       fsize |  -.2413438   1.243263    -0.19   0.846    -2.678094    2.195406
         egr |  -.0049243   .0194091    -0.25   0.800    -.0429653    .0331167
       _cons |   25.37829   11.34239     2.24   0.025     3.147616    47.60897
-------------+----------------------------------------------------------------
     sigma_u |  17.969742
     sigma_e |  29.854226
         rho |  .26594897   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
esgp	-.5514764	-.0825998	-.4688767	.1647776
ec	-.5179446	-.5735571	.0556126	.5512474
c.esgp#c.ec	.0121103	.0093618	.0027485	.011091
fsize	4.273935	-.2413438	4.515279	4.992285
egr	-.0157121	-.0049243	-.0107878	.0052584

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       13.89
                Prob>chi2 =      0.0163

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |         Var     sd = sqrt(Var)
             ---------+-----------------------------
                 evm |    1225.951        35.01359
                   e |    891.2748        29.85423
                   u |    322.9116        17.96974

        Test:   Var(u) = 0
                                chibar2(01) =    106.67
                            Prob > chibar2 =    0.0000
```

Model 5: $MVA_{ESGP*AR}$

```
. xtreg mva esgp ec c.esgp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0063                                         min =         5
     between = 0.0496                                         avg =       5.0
     overall = 0.0385                                         max =         5

                                                F(5,639)           =      0.81
corr(u_i, Xb)  = 0.0804                         Prob > F           =    0.5442
```

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
esgp	-.0047314	.0038652	-1.22	0.221	-.0123215	.0028587
ec	-.0106026	.0125191	-0.85	0.397	-.0351862	.0139809
c.esgp#c.ec	.0001653	.0002632	0.63	0.530	-.0003516	.0006821
fsize	-.0469213	.095722	-0.49	0.624	-.234889	.1410464
egr	.0004838	.0003741	1.29	0.196	-.0002508	.0012185
_cons	.6921507	.9010661	0.77	0.443	-1.077258	2.461559
sigma_u	.85188845					
sigma_e	.55545895					
rho	.70168231	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 639) = 9.55                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg mva esgp ec c.esgp#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0010                                         min =         5
     between = 0.1933                                         avg =       5.0
     overall = 0.1429                                         max =         5

                                                Wald chi2(5)       =     33.89
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |   .0049577   .0031525     1.57   0.116    -.001221    .0111364
          ec |  -.0041583   .0098593    -0.42   0.673    -.0234821    .0151655
             |
 c.esgp#c.ec |  -.0000629   .0002174    -0.29   0.772    -.0004889    .0003632
             |
       fsize |  -.2138047   .0389535    -5.49   0.000    -.2901522   -.1374571
         egr |   .0006196   .0003714     1.67   0.095    -.0001083    .0013475
       _cons |    1.94161   .3630143     5.35   0.000     1.230115    2.653105
-------------+----------------------------------------------------------------
     sigma_u |   .72382088
     sigma_e |   .55545895
         rho |   .62936614   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re

. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re          Difference          S.E.
-------------+----------------------------------------------------------------
        esgp |  -.0047314     .0049577       -.0096891        .0022365
          ec |  -.0106026    -.0041583       -.0064443        .0077151
 c.esgp#c.ec |   .0001653    -.0000629        .0002282        .0001484
       fsize |  -.0469213    -.2138047        .1668833        .0874375
         egr |   .0004838     .0006196       -.0001357        .0000453
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       18.41
                Prob>chi2 =      0.0025
                (V_b-V_B is not positive definite)

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |         Var      sd = sqrt(Var)
             ---------+-----------------------------
                 mva |    1.001168        1.000584
                   e |    .3085346        .5554589
                   u |    .5239167        .7238209

        Test:   Var(u) = 0
                                 chibar2(01) =   594.03
                              Prob > chibar2 =   0.0000
```

Model 6: EVM$_{EP*AR}$

```
. xtreg evm ep ec c.ep#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0102                                         min =         5
     between = 0.0130                                         avg =       5.0
     overall = 0.0016                                         max =         5

                                                F(5,639)           =      1.32
corr(u_i, Xb)  = -0.3592                        Prob > F           =    0.2534

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.4600511   .1870315    -2.46   0.014    -.8273218   -.0927805
          ec |  -.4740908   .4847005    -0.98   0.328    -1.425889    .4777076
             |
   c.ep#c.ec |   .0149471   .0120903     1.24   0.217    -.0087945    .0386887
             |
       fsize |   4.176465   5.207879     0.80   0.423    -6.050162    14.40309
         egr |  -.0189697   .0203911    -0.93   0.353    -.0590114    .0210719
       _cons |  -8.169753   49.31908    -0.17   0.868    -105.0168     88.6773
-------------+----------------------------------------------------------------
     sigma_u |  24.361747
     sigma_e |  29.881394
         rho |  .39928536   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.84                     Prob > F = 0.0000

. estimate store fe

. xtreg evm ep ec c.ep#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0005                                         min =         5
     between = 0.0147                                         avg =       5.0
     overall = 0.0062                                         max =         5

                                                Wald chi2(5)       =      2.56
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.7679

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.0239848   .1060817    -0.23   0.821     -.231901    .1839315
          ec |  -.3520058   .2444766    -1.44   0.150    -.8311711    .1271594
             |
   c.ep#c.ec |   .0051021   .0062868     0.81   0.417    -.0072199    .0174241
             |
       fsize |  -.4769228   1.282832    -0.37   0.710    -2.991227    2.037381
         egr |  -.0053472   .0195766    -0.27   0.785    -.0437167    .0330223
       _cons |   25.00025   11.69725     2.14   0.033     2.074069    47.92644
-------------+----------------------------------------------------------------
     sigma_u |  17.917423
     sigma_e |  29.881394
         rho |  .26445807   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re          Difference          S.E.
-------------+------------------------------------------------------------
          ep |   -.4600511    -.0239848       -.4360663        .1540372
          ec |   -.4740908    -.3520058        -.122085        .4185282
   c.ep#c.ec |    .0149471     .0051021         .009845        .0103272
       fsize |    4.176465    -.4769228        4.653387         5.04741
         egr |   -.0189697    -.0053472       -.0136226        .0057055
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       13.75
                Prob>chi2 =      0.0173

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+------------------------------
                 evm |    1225.951        35.01359
                   e |    892.8977        29.88139
                   u |     321.034        17.91742

        Test:   Var(u) = 0
                              chibar2(01) =   106.27
                           Prob > chibar2 =   0.0000
```

Model 6: EVM$_{SP*AR}$

```
. xtreg evm sp ec c.sp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0088                                         min =         5
     between = 0.0190                                         avg =       5.0
     overall = 0.0032                                         max =         5

                                                F(5,639)           =      1.13
corr(u_i, Xb)  = -0.3632                        Prob > F           =    0.3430

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.3859828   .1842868    -2.09   0.037    -.7478638   -.0241018
          ec |  -.1596407    .678137    -0.24   0.814    -1.491287    1.172006
   c.sp#c.ec |   .0037554   .0127708     0.29   0.769    -.0213223    .0288332
       fsize |   2.936253   5.072578     0.58   0.563    -7.024683    12.89719
         egr |  -.0148571   .0200646    -0.74   0.459    -.0542577    .0245436
       _cons |   6.556542   48.25413     0.14   0.892    -88.19928    101.3124
-------------+----------------------------------------------------------------
     sigma_u |  24.330538
     sigma_e |  29.903476
         rho |  .39831642   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.83                     Prob > F = 0.0000

. estimate store fe
```

```
. xtreg evm sp ec c.sp#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs     =       805
Group variable: id                              Number of groups  =       161

R-sq:                                           Obs per group:
     within  = 0.0001                                         min =         5
     between = 0.0183                                         avg =       5.0
     overall = 0.0063                                         max =         5

                                                Wald chi2(5)      =      1.85
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.8695
```

evm	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
sp	.0201956	.1052492	0.19	0.848	-.186089	.2264802
ec	-.1502183	.3595537	-0.42	0.676	-.8549305	.554494
c.sp#c.ec	-.0010131	.0074712	-0.14	0.892	-.0156565	.0136302
fsize	-.4421082	1.22155	-0.36	0.717	-2.836302	1.952086
egr	-.002257	.0193018	-0.12	0.907	-.0400878	.0355738
_cons	22.95732	11.32919	2.03	0.043	.7525166	45.16212
sigma_u	17.874089					
sigma_e	29.903476					
rho	.26323047	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
sp	-.3859828	.0201956	-.4061785	.1512754
ec	-.1596407	-.1502183	-.0094224	.5749704
c.sp#c.ec	.0037554	-.0010131	.0047686	.0103573
fsize	2.936253	-.4421082	3.378361	4.923298
egr	-.0148571	-.002257	-.0126001	.0054801

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

 Test:  Ho:  difference in coefficients not systematic

           chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =       13.95
         Prob>chi2 =      0.0159

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                 --------+------------------------------
                     evm |    1225.951        35.01359
                       e |    894.2179        29.90348
                       u |    319.4831        17.87409

        Test:   Var(u) = 0
                                chibar2(01) =   105.62
                            Prob > chibar2 =   0.0000
```

Model 6: EVM$_{GP*AR}$

```
. xtreg evm gp ec c.gp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0069                                         min =         5
     between = 0.0001                                         avg =       5.0
     overall = 0.0007                                         max =         5

                                                F(5,639)           =      0.88
corr(u_i, Xb)  = -0.1608                        Prob > F           =    0.4923

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |  -.2629703   .1343194    -1.96   0.051    -.526731    .0007904
          ec |  -.4029284   .5522538    -0.73   0.466    -1.48738    .6815232
             |
   c.gp#c.ec |   .0090993   .0095632     0.95   0.342    -.0096798    .0278784
             |
       fsize |    1.65143   4.974725     0.33   0.740    -8.117355    11.42021
         egr |  -.0152344   .0201243    -0.76   0.449    -.0547521    .0242833
       _cons |   14.64522   48.02082     0.30   0.760    -79.65247    108.9429
-------------+----------------------------------------------------------------
     sigma_u |  23.006229
     sigma_e |  29.932226
         rho |   .3713706   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.77                     Prob > F = 0.0000

. estimate store fe

. xtreg evm gp ec c.gp#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0028                                         min =         5
     between = 0.0315                                         avg =       5.0
     overall = 0.0143                                         max =         5

                                                Wald chi2(5)       =      6.71
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.2435

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |  -.1718505   .0937593    -1.83   0.067    -.3556153    .0119143
          ec |  -.9074884   .3727347    -2.43   0.015    -1.638035   -.1769417
             |
   c.gp#c.ec |   .0145692   .0069919     2.08   0.037     .0008654    .0282731
             |
       fsize |   .0350176    1.10094     0.03   0.975    -2.122785     2.19282
         egr |  -.0037545   .0192475    -0.20   0.845    -.0414788    .0339699
       _cons |   27.69543   11.25195     2.46   0.014     5.642011    49.74886
-------------+----------------------------------------------------------------
     sigma_u |  17.701211
     sigma_e |  29.932226
         rho |   .2591089   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
gp	-.2629703	-.1718505	-.0911198	.0961815
ec	-.4029284	-.9074884	.50456	.4074961
c.gp#c.ec	.0090993	.0145692	-.0054699	.0065244
fsize	1.65143	.0350176	1.616412	4.851373
egr	-.0152344	-.0037545	-.0114799	.0058755

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 9.24
Prob>chi2 = 0.0998

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+------------------------------
                 evm |   1225.951       35.01359
                   e |   895.9382       29.93223
                   u |   313.3329       17.70121

        Test:   Var(u) = 0
                            chibar2(01) =   104.45
                          Prob > chibar2 =   0.0000
```

Model 6: MVA$_{EP*AR}$

```
Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0143                                         min =         5
     between = 0.0095                                         avg =       5.0
     overall = 0.0099                                         max =         5

                                                F(5,639)           =      1.85
corr(u_i, Xb)  = -0.0967                        Prob > F           =    0.1009
```

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ep	-.0075278	.0034627	-2.17	0.030	-.0143273	-.0007282
ec	-.0031866	.0089737	-0.36	0.723	-.020808	.0144348
c.ep#c.ec	-.0000446	.0002238	-0.20	0.842	-.0004841	.000395
fsize	-.0007293	.0964177	-0.01	0.994	-.1900631	.1886046
egr	.0005244	.0003775	1.39	0.165	-.0002169	.0012658
_cons	.2847526	.9130844	0.31	0.755	-1.508256	2.077761
sigma_u	.87114266					
sigma_e	.55321866					
rho	.7126122	(fraction of variance due to u_i)				

F test that all u_i=0: F(160, 639) = 10.10 Prob > F = 0.0000

```
. estimate store fe
```

```
. xtreg mva ep ec c.ep#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0042                                         min =         5
     between = 0.1537                                         avg =       5.0
     overall = 0.1161                                         max =         5

                                                Wald chi2(5)       =     30.67
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

mva	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ep	.0007724	.0027515	0.28	0.779	-.0046204	.0061652
ec	-.001642	.0066847	-0.25	0.806	-.0147438	.0114598
c.ep#c.ec	-.0001711	.0001691	-1.01	0.312	-.0005025	.0001603
fsize	-.1821863	.0407782	-4.47	0.000	-.2621101	-.1022624
egr	.0006839	.0003731	1.83	0.067	-.0000473	.0014152
_cons	1.816166	.3804974	4.77	0.000	1.070404	2.561927
sigma_u	.74600175					
sigma_e	.55321866					
rho	.64518699	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ep	-.0075278	.0007724	-.0083001	.0021022
ec	-.0031866	-.001642	-.0015446	.0059867
c.ep#c.ec	-.0000446	-.0001711	.0001265	.0001467
fsize	-.0007293	-.1821863	.181457	.08737
egr	.0005244	.0006839	-.0001595	.0000576

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       14.03
                Prob>chi2 =      0.0154
                (V_b-V_B is not positive definite)

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     mva |   1.001168       1.000584
                       e |   .3060509       .5532187
                       u |   .5565186       .7460018

        Test:   Var(u) = 0
                                chibar2(01) =   631.19
                              Prob > chibar2 =   0.0000
```

Model 6: MVA$_{SP*AR}$

```
. xtreg mva sp ec c.sp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0059                                         min =         5
     between = 0.0538                                         avg =       5.0
     overall = 0.0417                                         max =         5

                                                F(5,639)           =      0.76
corr(u_i, Xb)  = 0.0755                         Prob > F           =    0.5788

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.0033837   .0034238    -0.99   0.323     -.010107    .0033395
          ec |  -.0036942   .0125988    -0.29   0.769    -.0284342    .0210458
             |
   c.sp#c.ec |   4.58e-06   .0002373     0.02   0.985    -.0004613    .0004705
             |
       fsize |    -.05526    .094241    -0.59   0.558    -.2403194    .1297994
         egr |   .0004981   .0003728     1.34   0.182    -.0002339    .0012301
       _cons |    .723629     .89649     0.81   0.420    -1.036793    2.484052
-------------+----------------------------------------------------------------
     sigma_u |   .8495812
     sigma_e |  .55556218
         rho |   .7004677   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 9.41                     Prob > F = 0.0000

. estimate store fe

. xtreg mva sp ec c.sp#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0009                                         min =         5
     between = 0.2087                                         avg =       5.0
     overall = 0.1536                                         max =         5

                                                Wald chi2(5)       =     35.73
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |   .0056406   .0027024     2.09   0.037      .000344    .0109372
          ec |   .0017514   .0094844     0.18   0.853    -.0168377    .0203405
             |
   c.sp#c.ec |  -.0001883   .0001896    -0.99   0.320    -.0005598    .0001832
             |
       fsize |  -.2156551   .0383857    -5.62   0.000    -.2908897   -.1404206
         egr |    .000617   .0003693     1.67   0.095    -.0001068    .0013407
       _cons |   1.911454    .362243     5.28   0.000      1.20147    2.621437
-------------+----------------------------------------------------------------
     sigma_u |  .71973122
     sigma_e |  .55556218
         rho |  .62663193   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re
```

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
sp	-.0033837	.0056406	-.0090243	.0021022
ec	-.0036942	.0017514	-.0054455	.0082931
c.sp#c.ec	4.58e-06	-.0001883	.0001929	.0001427
fsize	-.05526	-.2156551	.1603951	.0860692
egr	.0004981	.000617	-.0001188	.000051

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 19.59
Prob>chi2 = 0.0015
(V_b-V_B is not positive definite)

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

mva[id,t] = Xb + u[id] + e[id,t]

Estimated results:

	Var	sd = sqrt(Var)
mva	1.001168	1.000584
e	.3086493	.5555622
u	.518013	.7197312

Test: Var(u) = 0
chibar2(01) = 588.69
Prob > chibar2 = 0.0000

Model 6: MVA$_{GP*AR}$

```
. xtreg mva gp ec c.gp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0111                                         min =         5
     between = 0.1524                                         avg =       5.0
     overall = 0.1131                                         max =         5

                                                F(5,639)           =      1.43
corr(u_i, Xb)  = 0.2237                         Prob > F           =    0.2100
```

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gp	-.0007547	.0024866	-0.30	0.762	-.0056375	.0041281
ec	-.0193715	.0102235	-1.89	0.059	-.0394471	.0007041
c.gp#c.ec	.0003415	.000177	1.93	0.054	-6.16e-06	.0006891
fsize	-.0763899	.0920933	-0.83	0.407	-.257232	.1044521
egr	.0004433	.0003725	1.19	0.235	-.0002883	.0011749
_cons	.8071233	.8889728	0.91	0.364	-.9385378	2.552784
sigma_u	.8253649					
sigma_e	.55411242					
rho	.6893144	(fraction of variance due to u_i)				

F test that all u_i=0: F(160, 639) = 10.21 Prob > F = 0.0000

```
. estimate store fe
```

```
. xtreg mva gp ec c.gp#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0094                                         min =         5
     between = 0.1684                                         avg =       5.0
     overall = 0.1282                                         max =         5

                                                Wald chi2(5)       =     36.16
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

mva	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gp	.0011931	.0021875	0.55	0.585	-.0030944	.0054806
ec	-.0206799	.0087849	-2.35	0.019	-.0378981	-.0034618
c.gp#c.ec	.0002877	.0001593	1.81	0.071	-.0000246	.0006
fsize	-.1868182	.0369367	-5.06	0.000	-.2592128	-.1144236
egr	.0005658	.0003658	1.55	0.122	-.0001511	.0012828
_cons	1.821654	.3701403	4.92	0.000	1.096193	2.547116
sigma_u	.76007072					
sigma_e	.55411242					
rho	.65296271	(fraction of variance due to u_i)				

```
. estimate store re

. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
gp	-.0007547	.0011931	-.0019478	.0011822
ec	-.0193715	-.0206799	.0013084	.0052291
c.gp#c.ec	.0003415	.0002877	.0000538	.0000772
fsize	-.0763899	-.1868182	.1104282	.0843614
egr	.0004433	.0005658	-.0001225	.0000706

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

  Test:  Ho:  difference in coefficients not systematic

              chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =        5.85
            Prob>chi2 =      0.3212

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                     mva |    1.001168       1.000584
                       e |    .3070406       .5541124
                       u |    .5777075       .7600707

        Test:   Var(u) = 0
                                 chibar2(01) =   665.24
                              Prob > chibar2 =   0.0000
```

APPENDIX 3

Breusch-Pagan LM Test and Groupwise Wald Test: Heteroskedasticity

Model 1: EVM_{ESGP}

```
. xtreg evm esgp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0109                                         min =         5
     between = 0.0186                                         avg =       5.0
     overall = 0.0027                                         max =         5

                                                F(3,641)           =      2.35
corr(u_i, Xb)  = -0.3800                        Prob > F           =    0.0711

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.4685401   .1831277    -2.56   0.011    -.8281427   -.1089374
       fsize |   3.905785   5.121675     0.76   0.446    -6.151503    13.96307
         egr |   -.014144   .0196128    -0.72   0.471    -.0526571    .0243692
       _cons |  -.5915873   48.27416    -0.01   0.990    -95.38619    94.20302
-------------+----------------------------------------------------------------
     sigma_u |  24.559348
     sigma_e |  29.824708
         rho |  .40408104   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 2.90                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    5.7e+07
Prob>chi2 =      0.0000
```

Model 1: MVA_{ESGP}

```
. xtreg mva esgp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0050                                         min =         5
     between = 0.0540                                         avg =       5.0
     overall = 0.0415                                         max =         5

                                                F(3,641)           =      1.08
corr(u_i, Xb)  = 0.0904                         Prob > F           =    0.3558

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |    -.00343   .0034074    -1.01   0.314     -.010121     .003261
       fsize |  -.0518461   .0952972    -0.54   0.587    -.2389785    .1352863
         egr |   .0004596   .0003649     1.26   0.208     -.000257    .0011762
       _cons |   .6531107   .8982202     0.73   0.467    -1.110699     2.41692
-------------+----------------------------------------------------------------
     sigma_u |  .85065838
     sigma_e |  .55493779
         rho |  .70147031   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 9.92                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    4.9e+09
Prob>chi2 =      0.0000
```

Model 2: EVM_{EP}

```
. xtreg evm ep fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0079                                         min =         5
     between = 0.0177                                         avg =       5.0
     overall = 0.0032                                         max =         5

                                                F(3,641)           =      1.69
corr(u_i, Xb)  = -0.3622                        Prob > F           =    0.1673

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |   -.349425   .1635266    -2.14   0.033    -.6705375   -.0283125
       fsize |   3.628244   5.186954     0.70   0.484    -6.557231    13.81372
         egr |  -.0143944   .0196438    -0.73   0.464    -.0529683    .0241795
       _cons |  -6.453129   49.20925    -0.13   0.896    -103.0839    90.17768
-------------+----------------------------------------------------------------
     sigma_u |  24.304736
     sigma_e |  29.870415
         rho |  .39833809   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 2.88                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    4.9e+08
Prob>chi2 =      0.0000
```

Model 2: EVM_{SP}

```
. xtreg evm sp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0086                                         min =         5
     between = 0.0175                                         avg =       5.0
     overall = 0.0029                                         max =         5

                                                F(3,641)           =      1.86
corr(u_i, Xb)  = -0.3612                        Prob > F           =    0.1353

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.3598718   .1599183    -2.25   0.025    -.6738989   -.0458447
       fsize |   2.829523    5.05256     0.56   0.576    -7.092046    12.75109
         egr |   -.014826   .0196389    -0.75   0.451    -.0533903    .0237383
       _cons |   6.442061   48.04088     0.13   0.893    -87.89446    100.7786
-------------+----------------------------------------------------------------
     sigma_u |  24.316863
     sigma_e |  29.858897
         rho |  .39876213   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 2.88                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    8.1e+07
Prob>chi2 =      0.0000
```

Model 2: EVM_{GP}

```
. xtreg evm gp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0054                                         min =         5
     between = 0.0037                                         avg =       5.0
     overall = 0.0000                                         max =         5

                                                F(3,641)           =      1.17
corr(u_i, Xb)  = -0.1867                        Prob > F           =    0.3218
```

evm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gp	-.1915047	.1107861	-1.73	0.084	-.4090522	.0260429
fsize	1.134998	4.941173	0.23	0.818	-8.567843	10.83784
egr	-.0134417	.0196691	-0.68	0.495	-.0520654	.0251821
_cons	16.53968	47.80746	0.35	0.729	-77.33848	110.4178
sigma_u	23.107773					
sigma_e	29.906986					
rho	.37382406	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 641) = 2.88                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   6.7e+07
Prob>chi2 =      0.0000
```

Model 2: MVA_{EP}

```
. xtreg mva ep fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0132                                         min =         5
     between = 0.0044                                         avg =       5.0
     overall = 0.0054                                         max =         5

                                                F(3,641)           =      2.86
corr(u_i, Xb)  = -0.1097                        Prob > F           =    0.0363
```

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ep	-.0076077	.0030255	-2.51	0.012	-.0135489	-.0016666
fsize	.000251	.0959681	0.00	0.998	-.1881989	.1887009
egr	.0004516	.0003634	1.24	0.214	-.0002621	.0011653
_cons	.2397513	.9104611	0.26	0.792	-1.548095	2.027598
sigma_u	.87475914					
sigma_e	.55265727					
rho	.71472027	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 641) = 10.54                    Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   5.6e+08
Prob>chi2 =      0.0000
```

Model 2: MVA$_{SP}$

```
. xtreg mva sp fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0053                                         min =         5
     between = 0.0447                                         avg =       5.0
     overall = 0.0348                                         max =         5

                                                F(3,641)           =      1.14
corr(u_i, Xb)  = 0.0586                         Prob > F           =    0.3310

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.0032465   .0029717    -1.09   0.275     -.009082     .002589
       fsize |  -.0547132   .0938904    -0.58   0.560    -.2390831    .1296566
         egr |   .0004531   .0003649     1.24   0.215    -.0002635    .0011698
       _cons |   .6829358   .8927309     0.76   0.445    -1.070095    2.435966
-------------+----------------------------------------------------------------
     sigma_u |  .85261317
     sigma_e |  .55485994
         rho |   .7024894   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 641) = 9.84                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   2.6e+09
Prob>chi2 =      0.0000
```

Model 2: MVA$_{GP}$

```
. xtreg mva gp fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0046                                         min =         5
     between = 0.1530                                         avg =       5.0
     overall = 0.1156                                         max =         5

                                                Wald chi2(3)       =     29.92
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |   .0035246   .0017861     1.97   0.048      .000024    .0070252
       fsize |  -.1892735   .0368506    -5.14   0.000    -.2614994   -.1170476
         egr |    .000509   .0003612     1.41   0.159    -.0001989    .0012168
       _cons |   1.676126    .366131     4.58   0.000     .9585223    2.393729
-------------+----------------------------------------------------------------
     sigma_u |  .76569146
     sigma_e |  .55497039
         rho |  .65559594   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |       Var      sd = sqrt(Var)
             ---------+------------------------------
                 mva |   1.001168        1.000584
                   e |   .3079921        .5549704
                   u |   .5862834        .7656915

        Test:   Var(u) = 0
                                 chibar2(01) =    677.84
                              Prob > chibar2 =    0.0000
```

Model 3: EVM$_{ESGP*FR}$

```
. xtreg evm esgp wacc c.esgp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =         805
Group variable: id                              Number of groups   =         161

R-sq:                                           Obs per group:
     within  = 0.0129                                         min =           5
     between = 0.0162                                         avg =         5.0
     overall = 0.0019                                         max =           5

                                                F(5,639)           =        1.67
corr(u_i, Xb)  = -0.3951                        Prob > F           =      0.1407
```

evm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
esgp	-.6384193	.3319132	-1.92	0.055	-1.290192	.0133531
wacc	-1.170078	1.222506	-0.96	0.339	-3.570693	1.230537
c.esgp#c.wacc	.0211769	.0352791	0.60	0.549	-.0481001	.0904538
fsize	4.512395	5.152799	0.88	0.382	-5.60607	14.63086
egr	-.0140236	.0196447	-0.71	0.476	-.0525995	.0245523
_cons	2.92567	48.65907	0.06	0.952	-92.62534	98.47668
sigma_u	24.785005					
sigma_e	29.841519					
rho	.40822121	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 639) = 2.89                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    4.5e+07
Prob>chi2 =      0.0000
```

Model 3: MVA$_{ESGP*FR}$

```
. xtreg mva esgp wacc c.esgp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =         805
Group variable: id                              Number of groups   =         161

R-sq:                                           Obs per group:
     within  = 0.0081                                         min =           5
     between = 0.0759                                         avg =         5.0
     overall = 0.0576                                         max =           5

                                                F(5,639)           =        1.04
corr(u_i, Xb)  = 0.1296                         Prob > F           =      0.3921
```

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
esgp	.0033817	.0061725	0.55	0.584	-.0087391	.0155026
wacc	.0228965	.0227346	1.01	0.314	-.0217471	.0675401
c.esgp#c.wacc	-.0008725	.0006561	-1.33	0.184	-.0021608	.0004158
fsize	-.0563949	.0958253	-0.59	0.556	-.2445654	.1317756
egr	.0004362	.0003653	1.19	0.233	-.0002811	.0011536
_cons	.5073133	.9049001	0.56	0.575	-1.269624	2.284251
sigma_u	.8451095					
sigma_e	.55495498					
rho	.69870914	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 639) = 9.63                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    4.4e+09
Prob>chi2 =      0.0000
```

Model 4: EVM_{EP*FR}

```
. xtreg evm ep wacc c.ep#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0099                                         min =         5
     between = 0.0145                                         avg =       5.0
     overall = 0.0021                                         max =         5

                                                F(5,639)           =      1.28
corr(u_i, Xb)  = -0.3800                        Prob > F           =    0.2690

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.5253803   .2940749    -1.79   0.074    -1.10285    .0520897
        wacc |  -.8848067   .7702019    -1.15   0.251    -2.397239   .6276259
 c.ep#c.wacc |   .0220289    .030727     0.72   0.474    -.0383092   .0823671
       fsize |     4.4591   5.244985     0.85   0.396     -5.84039   14.75859
         egr |  -.0140524   .0196814    -0.71   0.475    -.0527005   .0245957
       _cons |  -7.352451    49.2533    -0.15   0.881    -104.0703   89.36544
-------------+----------------------------------------------------------------
     sigma_u |  24.559217
     sigma_e |  29.885649
         rho |  .40309581   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.86                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    4.9e+08
Prob>chi2 =      0.0000
```

Model 4: EVM_{SP*FR}

```
. xtreg evm sp wacc c.sp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0110                                         min =         5
     between = 0.0176                                         avg =       5.0
     overall = 0.0025                                         max =         5

                                                F(5,639)           =      1.43
corr(u_i, Xb)  = -0.3815                        Prob > F           =    0.2131

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.5452049   .2822306    -1.93   0.054    -1.099416   .0090067
        wacc |  -1.337031   1.181235    -1.13   0.258    -3.656603   .9825408
 c.sp#c.wacc |   .0235608    .030384     0.78   0.438    -.0361037   .0832254
       fsize |   3.575786   5.089896     0.70   0.483    -6.419158   13.57073
         egr |  -.0143897   .0196785    -0.73   0.465     -.053032   .0242526
       _cons |   9.820272   48.25889     0.20   0.839    -84.94491   104.5855
-------------+----------------------------------------------------------------
     sigma_u |  24.583931
     sigma_e |  29.869308
         rho |  .40384324   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.89                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    2.0e+08
Prob>chi2 =      0.0000
```

Model 4: EVM_{GP*FR}

```
. xtreg evm gp wacc c.gp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0067                                         min =         5
     between = 0.0048                                         avg =       5.0
     overall = 0.0001                                         max =         5

                                                F(5,639)           =      0.87
corr(u_i, Xb)  = -0.2148                        Prob > F           =    0.5034

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |  -.1867516   .2321649    -0.80   0.421    -.6426501    .2691468
        wacc |  -.4584245   1.193129    -0.38   0.701    -2.801353    1.884504
 c.gp#c.wacc |  -.0007096   .0256527    -0.03   0.978    -.0510833    .0496642
       fsize |    1.50732   4.963584     0.30   0.761    -8.239587    11.25423
         egr |  -.013798   .0196918    -0.70   0.484    -.0524665    .0248704
       _cons |   16.38877    48.8656     0.34   0.737    -79.56779    112.3453
-------------+----------------------------------------------------------------
     sigma_u |  23.264033
     sigma_e |  29.934123
         rho |   .3765586   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.84                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   7.3e+07
Prob>chi2 =      0.0000
```

Model 4: MVA_{EP*FR}

```
. xtreg mva ep wacc c.ep#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0193                                         min =         5
     between = 0.0206                                         avg =       5.0
     overall = 0.0201                                         max =         5

                                                F(5,639)           =      2.52
corr(u_i, Xb)  = -0.0381                        Prob > F           =    0.0287

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |   .0011687   .0054298     0.22   0.830    -.0094936    .0118311
        wacc |   .0157678    .014221     1.11   0.268    -.0121577    .0436933
 c.ep#c.wacc |  -.0011044   .0005673    -1.95   0.052    -.0022185    9.64e-06
       fsize |  -.0196425   .0968432    -0.20   0.839    -.2098119    .1705269
         egr |   .0004137   .0003634     1.14   0.255    -.0002999    .0011273
       _cons |   .2894512   .9094111     0.32   0.750    -1.496344    2.075247
-------------+----------------------------------------------------------------
     sigma_u |   .8624616
     sigma_e |  .55180746
         rho |  .70954657   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 10.22                    Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   8.7e+08
Prob>chi2 =      0.0000
```

Model 4: MVA$_{SP*FR}$

```
. xtreg mva sp wacc c.sp#c.wacc fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0068                                         min =         5
     between = 0.0607                                         avg =       5.0
     overall = 0.0469                                         max =         5

                                                F(5,639)           =      0.88
corr(u_i, Xb)  = 0.0914                         Prob > F           =    0.4951

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |   .0004895    .005247     0.09   0.926    -.0098139    .010793
        wacc |    .012677   .0219606     0.58   0.564    -.0304466   .0558007
 c.sp#c.wacc |    -.000494   .0005649    -0.87   0.382    -.0016033   .0006152
       fsize |  -.0577022   .0946274    -0.61   0.542    -.2435203    .128116
         egr |   .0004325   .0003658     1.18   0.238    -.0002859   .0011509
       _cons |   .6110414   .8971914     0.68   0.496    -1.150758   2.372841
-------------+----------------------------------------------------------------
     sigma_u |  .84776626
     sigma_e |  .55530672
         rho |  .69976282   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 9.51                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   4.7e+09
Prob>chi2 =      0.0000
```

Model 4: MVA$_{GP*FR}$

```
. xtreg mva gp wacc c.gp#c.wacc fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0046                                         min =         5
     between = 0.1719                                         avg =       5.0
     overall = 0.1289                                         max =         5

                                                Wald chi2(5)       =     33.02
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |   .0040956   .0039185     1.05   0.296    -.0035846    .0117758
        wacc |  -.0101318   .0207733    -0.49   0.626    -.0508468    .0305831
 c.gp#c.wacc |  -.0000721   .0004472    -0.16   0.872    -.0009486    .0008045
       fsize |  -.1919042   .0363763    -5.28   0.000    -.2632004   -.1206079
         egr |   .0005041   .0003626     1.39   0.164    -.0002066    .0012148
       _cons |   1.776612   .4005566     4.44   0.000     .9915352    2.561688
-------------+----------------------------------------------------------------
     sigma_u |  .74886699
     sigma_e |  .55576601
         rho |  .64483868   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |       Var      sd = sqrt(Var)
             ---------+------------------------------
                 mva |   1.001168        1.000584
                   e |   .3088759         .555766
                   u |   .5608018         .748867

        Test:   Var(u) = 0
                                chibar2(01) =    639.28
                            Prob > chibar2 =    0.0000
```

Model 5: EVM$_{ESGP*AR}$

```
. xtreg evm esgp ec c.esgp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0120                                         min =         5
     between = 0.0136                                         avg =       5.0
     overall = 0.0014                                         max =         5

                                                F(5,639)           =      1.56
corr(u_i, Xb)  = -0.3675                        Prob > F           =    0.1706

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.5514764   .2077447    -2.65   0.008    -.9594212   -.1435316
          ec |  -.5179446   .6728636    -0.77   0.442    -1.839236    .8033464
 c.esgp#c.ec |   .0121103   .0141459     0.86   0.392    -.0156677    .0398883
       fsize |   4.273935   5.144765     0.83   0.406    -5.828755    14.37663
         egr |  -.0157121   .0201087    -0.78   0.435    -.0551993    .0237751
       _cons |  -.4836379   48.42956    -0.01   0.992    -95.58395    94.61668
-------------+----------------------------------------------------------------
     sigma_u |  24.483341
     sigma_e |  29.854226
         rho |  .40211341   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.85                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   1.1e+08
Prob>chi2 =      0.0000
```

Model 5: MVA$_{ESGP*AR}$

```
. xtreg mva esgp ec c.esgp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0063                                         min =         5
     between = 0.0496                                         avg =       5.0
     overall = 0.0385                                         max =         5

                                                F(5,639)           =      0.81
corr(u_i, Xb)  = 0.0804                         Prob > F           =    0.5442

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.0047314   .0038652    -1.22   0.221    -.0123215    .0028587
          ec |  -.0106026   .0125191    -0.85   0.397    -.0351862    .0139809
 c.esgp#c.ec |   .0001653   .0002632     0.63   0.530    -.0003516    .0006821
       fsize |  -.0469213    .095722    -0.49   0.624     -.234889    .1410464
         egr |   .0004838   .0003741     1.29   0.196    -.0002508    .0012185
       _cons |   .6921507   .9010661     0.77   0.443    -1.077258    2.461559
-------------+----------------------------------------------------------------
     sigma_u |  .85188845
     sigma_e |  .55545895
         rho |  .70168231   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 9.55                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   6.2e+09
Prob>chi2 =      0.0000
```

Model 6: EVM$_{EP*AR}$

```
. xtreg evm ep ec c.ep#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0102                                         min =         5
     between = 0.0130                                         avg =       5.0
     overall = 0.0016                                         max =         5

                                                F(5,639)           =      1.32
corr(u_i, Xb)  = -0.3592                        Prob > F           =    0.2534

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.4600511   .1870315    -2.46   0.014    -.8273218   -.0927805
          ec |  -.4740908   .4847005    -0.98   0.328    -1.425889    .4777076
             |
   c.ep#c.ec |   .0149471   .0120903     1.24   0.217    -.0087945    .0386887
             |
       fsize |   4.176465   5.207879     0.80   0.423    -6.050162    14.40309
         egr |  -.0189697   .0203911    -0.93   0.353    -.0590114    .0210719
       _cons |  -8.169753   49.31908    -0.17   0.868    -105.0168    88.6773
-------------+----------------------------------------------------------------
     sigma_u |  24.361747
     sigma_e |  29.881394
         rho |  .39928536   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.84                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    4.4e+08
Prob>chi2 =      0.0000
```

Model 6: EVM$_{SP*AR}$

```
. xtreg evm sp ec c.sp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0088                                         min =         5
     between = 0.0190                                         avg =       5.0
     overall = 0.0032                                         max =         5

                                                F(5,639)           =      1.13
corr(u_i, Xb)  = -0.3632                        Prob > F           =    0.3430

------------------------------------------------------------------------------
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.3859828   .1842868    -2.09   0.037    -.7478638   -.0241018
          ec |  -.1596407    .678137    -0.24   0.814    -1.491287    1.172006
             |
   c.sp#c.ec |   .0037554   .0127708     0.29   0.769    -.0213223    .0288332
             |
       fsize |   2.936253   5.072578     0.58   0.563    -7.024683    12.89719
         egr |  -.0148571   .0200646    -0.74   0.459    -.0542577    .0245436
       _cons |   6.556542   48.25413     0.14   0.892    -88.19928    101.3124
-------------+----------------------------------------------------------------
     sigma_u |  24.330538
     sigma_e |  29.903476
         rho |  .39831642   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 2.83                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    1.1e+08
Prob>chi2 =      0.0000
```

Model 6: EVM$_{GP*AR}$

```
. xtreg evm gp ec c.gp#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0028                                         min =         5
     between = 0.0315                                         avg =       5.0
     overall = 0.0143                                         max =         5

                                                Wald chi2(5)       =      6.71
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.2435
```

evm	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gp	-.1718505	.0937593	-1.83	0.067	-.3556153	.0119143
ec	-.9074884	.3727347	-2.43	0.015	-1.638035	-.1769417
c.gp#c.ec	.0145692	.0069919	2.08	0.037	.0008654	.0282731
fsize	.0350176	1.10094	0.03	0.975	-2.122785	2.19282
egr	-.0037545	.0192475	-0.20	0.845	-.0414788	.0339699
_cons	27.69543	11.25195	2.46	0.014	5.642011	49.74886
sigma_u	17.701211					
sigma_e	29.932226					
rho	.2591089	(fraction of variance due to u_i)				

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        evm[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |         Var     sd = sqrt(Var)
             ---------+-----------------------------
                 evm |    1225.951        35.01359
                   e |    895.9382        29.93223
                   u |    313.3329        17.70121

        Test:   Var(u) = 0
                             chibar2(01) =   104.45
                          Prob > chibar2 =   0.0000
```

Model 6: MVA$_{EP*AR}$

```
. xtreg mva ep ec c.ep#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0143                                         min =         5
     between = 0.0095                                         avg =       5.0
     overall = 0.0099                                         max =         5

                                                F(5,639)           =      1.85
corr(u_i, Xb)  = -0.0967                        Prob > F           =    0.1009
```

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ep	-.0075278	.0034627	-2.17	0.030	-.0143273	-.0007282
ec	-.0031866	.0089737	-0.36	0.723	-.020808	.0144348
c.ep#c.ec	-.0000446	.0002238	-0.20	0.842	-.0004841	.000395
fsize	-.0007293	.0964177	-0.01	0.994	-.1900631	.1886046
egr	.0005244	.0003775	1.39	0.165	-.0002169	.0012658
_cons	.2847526	.9130844	0.31	0.755	-1.508256	2.077761
sigma_u	.87114266					
sigma_e	.55321866					
rho	.7126122	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(160, 639) = 10.10                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =    8.3e+08
Prob>chi2 =      0.0000
```

Model 6: MVA_{SP*AR}

```
. xtreg mva sp ec c.sp#c.ec fsize egr, fe

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0059                                         min =         5
     between = 0.0538                                         avg =       5.0
     overall = 0.0417                                         max =         5

                                                F(5,639)           =      0.76
corr(u_i, Xb)  = 0.0755                         Prob > F           =    0.5788

------------------------------------------------------------------------------
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.0033837   .0034238    -0.99   0.323     -.010107    .0033395
          ec |  -.0036942   .0125988    -0.29   0.769    -.0284342    .0210458
             |
   c.sp#c.ec |   4.58e-06   .0002373     0.02   0.985    -.0004613    .0004705
             |
       fsize |    -.05526    .094241    -0.59   0.558    -.2403194    .1297994
         egr |   .0004981   .0003728     1.34   0.182    -.0002339    .0012301
       _cons |    .723629     .89649     0.81   0.420    -1.036793    2.484052
-------------+----------------------------------------------------------------
     sigma_u |   .8495812
     sigma_e |  .55556218
         rho |   .7004677   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(160, 639) = 9.41                     Prob > F = 0.0000

. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (161)  =   2.2e+09
Prob>chi2 =      0.0000
```

Model 6: MVA_{GP*AR}

```
. xtreg mva gp ec c.gp#c.ec fsize egr, re

Random-effects GLS regression                   Number of obs     =       805
Group variable: id                              Number of groups  =       161

R-sq:                                           Obs per group:
     within  = 0.0094                                         min =         5
     between = 0.1684                                         avg =       5.0
     overall = 0.1282                                         max =         5

                                                Wald chi2(5)      =     36.16
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

mva	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gp	.0011931	.0021875	0.55	0.585	-.0030944	.0054806
ec	-.0206799	.0087849	-2.35	0.019	-.0378981	-.0034618
c.gp#c.ec	.0002877	.0001593	1.81	0.071	-.0000246	.0006
fsize	-.1868182	.0369367	-5.06	0.000	-.2592128	-.1144236
egr	.0005658	.0003658	1.55	0.122	-.0001511	.0012828
_cons	1.821654	.3701403	4.92	0.000	1.096193	2.547116
sigma_u	.76007072					
sigma_e	.55411242					
rho	.65296271	(fraction of variance due to u_i)				

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        mva[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                 --------+------------------------------
                     mva |    1.001168       1.000584
                       e |    .3070406       .5541124
                       u |    .5777075       .7600707

        Test:   Var(u) = 0
                                 chibar2(01) =   665.24
                              Prob > chibar2 =   0.0000
```

APPENDIX 4

Robust Regression Models

Model 1: EVM$_{ESGP}$

```
. xtreg evm esgp  fsize egr, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0109                                         min =         5
     between = 0.0186                                         avg =       5.0
     overall = 0.0027                                         max =         5

                                                F(3,160)           =      3.34
corr(u_i, Xb)  = -0.3800                        Prob > F           =    0.0207

                                    (Std. Err. adjusted for 161 clusters in id)
```

evm	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
esgp	-.4685401	.1504876	-3.11	0.002	-.7657383	-.1713418
fsize	3.905785	5.610586	0.70	0.487	-7.174571	14.98614
egr	-.014144	.0217663	-0.65	0.517	-.0571303	.0288424
_cons	-.5915873	53.93299	-0.01	0.991	-107.1039	105.9208
sigma_u	24.559348					
sigma_e	29.824708					
rho	.40408104	(fraction of variance due to u_i)				

Model 1: MVA$_{ESGP}$

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress mva esgp fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                               Number of obs     =        805
                                                F(167, 637)       =     636.91
                                                Prob > F          =     0.0000
                                                R-squared         =     0.7601
                                                Root MSE          =     .55064
```

mva	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
esgp	.0039879	.0036095	1.10	0.270	-.0031002	.0110759
fsize	.0796561	.1354225	0.59	0.557	-.1862725	.3455846
egr	.0005219	.0004053	1.29	0.198	-.000274	.0013178
_cons	-1.77526	1.281398	-1.39	0.166	-4.291535	.7410158

Model 2: EVM_{EP}

```
. xtreg evm ep fsize, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0070                                         min =         5
     between = 0.0166                                         avg =       5.0
     overall = 0.0031                                         max =         5

                                                F(2,160)           =      5.15
corr(u_i, Xb)  = -0.3536                        Prob > F           =    0.0068

                                    (Std. Err. adjusted for 161 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.3482067   .1128116    -3.09   0.002    -.5709985   -.1254149
       fsize |   3.334559   5.954081     0.56   0.576    -8.424166    15.09328
       _cons |  -3.798563   56.75148    -0.07   0.947    -115.8771      108.28
-------------+----------------------------------------------------------------
     sigma_u |  24.206914
     sigma_e |  29.859641
         rho |  .39657923   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Model 2: EVM_{SP}

```
. xtreg evm sp fsize egr, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0086                                         min =         5
     between = 0.0175                                         avg =       5.0
     overall = 0.0029                                         max =         5

                                                F(3,160)           =      2.30
corr(u_i, Xb)  = -0.3612                        Prob > F           =    0.0792

                                    (Std. Err. adjusted for 161 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.3598718   .1403169    -2.56   0.011    -.6369838   -.0827598
       fsize |   2.829523   5.466446     0.52   0.605    -7.966171    13.62522
         egr |   -.014826   .0213307    -0.70   0.488     -.056952       .0273
       _cons |   6.442061    52.9807     0.12   0.903    -98.18961    111.0737
-------------+----------------------------------------------------------------
     sigma_u |  24.316863
     sigma_e |  29.858897
         rho |  .39876213   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Model 2: EVM_{GP}

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress evm gp fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                               Number of obs     =        805
                                                F(167, 637)       =      13.75
                                                Prob > F          =     0.0000
                                                R-squared         =     0.4223
                                                Root MSE          =     29.897
```

evm	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
gp	-.1671617	.0941858	-1.77	0.076	-.352114	.0177906
fsize	3.446913	6.156346	0.56	0.576	-8.642273	15.5361
egr	-.0116469	.0196674	-0.59	0.554	-.0502677	.0269739
_cons	26.26726	13.05618	2.01	0.045	.6289872	51.90554

Model 2: MVA_{EP}

```
. xtreg mva ep fsize egr, fe vce(robust)

Fixed-effects (within) regression               Number of obs     =        805
Group variable: id                              Number of groups  =        161

R-sq:                                           Obs per group:
     within  = 0.0132                                         min =          5
     between = 0.0044                                         avg =        5.0
     overall = 0.0054                                         max =          5

                                                F(3,160)          =       2.59
corr(u_i, Xb)  = -0.1097                        Prob > F          =     0.0551

                                    (Std. Err. adjusted for 161 clusters in id)
```

mva	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ep	-.0076077	.0035639	-2.13	0.034	-.0146462	-.0005693
fsize	.000251	.1741026	0.00	0.999	-.3435844	.3440865
egr	.0004516	.0003827	1.18	0.240	-.0003042	.0012074
_cons	.2397513	1.651398	0.15	0.885	-3.021596	3.501099
sigma_u	.87475914					
sigma_e	.55265727					
rho	.71472027	(fraction of variance due to u_i)				

Model 2: MVA$_{SP}$

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress mva sp fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                               Number of obs     =        805
                                                F(167, 637)       =     603.95
                                                Prob > F          =     0.0000
                                                R-squared         =     0.7598
                                                Root MSE          =     .55095
```

mva	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
sp	.001778	.0033155	0.54	0.592	-.0047327	.0082887
fsize	.0832762	.1350339	0.62	0.538	-.1818892	.3484415
egr	.0005213	.0004025	1.30	0.196	-.0002691	.0013116
_cons	-1.753855	1.285336	-1.36	0.173	-4.277863	.7701533

Model 2: MVA$_{GP}$

```
. xtreg mva gp fsize egr, re vce(robust)

Random-effects GLS regression                   Number of obs     =        805
Group variable: id                              Number of groups  =        161

R-sq:                                           Obs per group:
     within  = 0.0046                                         min =          5
     between = 0.1530                                         avg =        5.0
     overall = 0.1156                                         max =          5

                                                Wald chi2(3)      =      26.53
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

                                        (Std. Err. adjusted for 161 clusters in id)
```

mva	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
gp	.0035246	.0018947	1.86	0.063	-.0001889	.0072381
fsize	-.1892735	.0404251	-4.68	0.000	-.2685052	-.1100418
egr	.000509	.0004221	1.21	0.228	-.0003184	.0013363
_cons	1.676126	.3857428	4.35	0.000	.9200838	2.432168
sigma_u	.76569146					
sigma_e	.55497039					
rho	.65559594	(fraction of variance due to u_i)				

Model 3: $EVM_{ESGP*FR}$

```
. xtreg evm esgp wacc c.esgp#c.wacc fsize egr, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0129                                         min =         5
     between = 0.0162                                         avg =       5.0
     overall = 0.0019                                         max =         5

                                                F(5,160)           =      3.13
corr(u_i, Xb)  = -0.3951                        Prob > F           =    0.0101

                                    (Std. Err. adjusted for 161 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.6384193   .2726175    -2.34   0.020    -1.176812   -.1000266
        wacc |  -1.170078   .9713632    -1.20   0.230    -3.088425    .7482687
             |
c.esgp#c.wacc |   .0211769   .0315011     0.67   0.502    -.0410347    .0833884
             |
       fsize |   4.512395   5.607403     0.80   0.422    -6.561673    15.58646
         egr |  -.0140236   .0217706    -0.64   0.520    -.0570185    .0289713
       _cons |    2.92567   54.14395     0.05   0.957    -104.0033    109.8546
-------------+----------------------------------------------------------------
     sigma_u |  24.785005
     sigma_e |  29.841519
         rho |  .40822121   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Model 3: $MVA_{ESGP*FR}$

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress mva esgp wacc c.esgp#c.wacc fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                               Number of obs      =       805
                                                F(169, 635)        =    584.83
                                                Prob > F           =    0.0000
                                                R-squared          =    0.7606
                                                Root MSE           =    .55086

------------------------------------------------------------------------------
             |               Robust
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |   .0095983   .0070813     1.36   0.176    -.0043072    .0235038
        wacc |   .0187618    .032984     0.57   0.570     -.046009    .0835326
             |
c.esgp#c.wacc |  -.0007461    .000805    -0.93   0.354    -.0023269    .0008347
             |
       fsize |    .072705   .1352962     0.54   0.591     -.192977    .3383871
         egr |   .0005002   .0004112     1.22   0.224    -.0003074    .0013077
       _cons |  -1.857453   1.288998    -1.44   0.150    -4.388668    .6737612
------------------------------------------------------------------------------
```

Model 4: EVM$_{EP*FR}$

```
Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0099                                         min =         5
     between = 0.0145                                         avg =       5.0
     overall = 0.0021                                         max =         5

                                                F(5,160)           =      2.63
corr(u_i, Xb)  = -0.3800                        Prob > F           =    0.0258

                                    (Std. Err. adjusted for 161 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.5253803   .2539851    -2.07   0.040    -1.026976   -.0237847
        wacc |  -.8848067   .7009692    -1.26   0.209    -2.269152    .4995384
             |
 c.ep#c.wacc |   .0220289   .0286007     0.77   0.442    -.0344547    .0785126
             |
       fsize |     4.4591   6.036144     0.74   0.461     -7.46169    16.37989
         egr |  -.0140524   .0219878    -0.64   0.524    -.0574761    .0293713
       _cons |  -7.352451   56.29616    -0.13   0.896    -118.5318    103.8269
-------------+----------------------------------------------------------------
     sigma_u |  24.559217
     sigma_e |  29.885649
         rho |  .40309581   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Model 4: EVM$_{SP*FR}$

```
. xtreg evm sp wacc c.sp#c.wacc fsize egr, fe  vce(robust)

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0110                                         min =         5
     between = 0.0176                                         avg =       5.0
     overall = 0.0025                                         max =         5

                                                F(5,160)           =      2.27
corr(u_i, Xb)  = -0.3815                        Prob > F           =    0.0498

                                    (Std. Err. adjusted for 161 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.5452049   .2296669    -2.37   0.019    -.9987744   -.0916354
        wacc |  -1.337031   .9482288    -1.41   0.160     -3.20969    .5356274
             |
 c.sp#c.wacc |   .0235608   .0260033     0.91   0.366    -.0277931    .0749148
             |
       fsize |   3.575786   5.419462     0.66   0.510    -7.127117    14.27869
         egr |  -.0143897   .0212303    -0.68   0.499    -.0563175    .0275381
       _cons |   9.820272   53.53027     0.18   0.855    -95.89674    115.5373
-------------+----------------------------------------------------------------
     sigma_u |  24.583931
     sigma_e |  29.869308
         rho |  .40384324   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Model 4: EVM$_{GP*FR}$

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress evm gp wacc c.gp#c.wacc fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                                 Number of obs     =        805
                                                  F(169, 635)       =      11.03
                                                  Prob > F          =     0.0000
                                                  R-squared         =     0.4246
                                                  Root MSE          =     29.884
```

evm	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
gp	-.1634004	.2623786	-0.62	0.534	-.6786351	.3518343
wacc	-.8448421	1.259402	-0.67	0.503	-3.317939	1.628255
c.gp#c.wacc	-.0014848	.0334654	-0.04	0.965	-.0672011	.0642314
fsize	3.802945	6.170239	0.62	0.538	-8.313595	15.91948
egr	-.0120572	.019445	-0.62	0.535	-.0502415	.026127
_cons	-4.130172	60.83269	-0.07	0.946	-123.5877	115.3274

Model 4: MVA$_{EP*FR}$

```
. xtreg mva ep wacc c.ep#c.wacc fsize, fe vce(robust)

Fixed-effects (within) regression               Number of obs     =        805
Group variable: id                              Number of groups  =        161

R-sq:                                           Obs per group:
     within  = 0.0173                                         min =          5
     between = 0.0136                                         avg =        5.0
     overall = 0.0141                                         max =          5

                                                F(4,160)          =       2.04
corr(u_i, Xb)  = -0.0565                        Prob > F          =     0.0906

                                    (Std. Err. adjusted for 161 clusters in id)
```

mva	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ep	.0013863	.0063136	0.22	0.826	-.0110825	.0138551
wacc	.0161241	.0213938	0.75	0.452	-.0261265	.0583748
c.ep#c.wacc	-.0011362	.0006806	-1.67	0.097	-.0024804	.000208
fsize	-.0117239	.1802427	-0.07	0.948	-.3676856	.3442377
_cons	.2148184	1.669958	0.13	0.898	-3.083184	3.512821
sigma_u	.86643788					
sigma_e	.55193506					
rho	.71134391	(fraction of variance due to u_i)				

Model 4: MVA$_{SP*FR}$

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress mva sp wacc c.sp#c.wacc fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                                 Number of obs     =        805
                                                  F(169, 635)       =     581.69
                                                  Prob > F          =     0.0000
                                                  R-squared         =     0.7601
                                                  Root MSE          =     .55149
```

mva	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
sp	.0047937	.0057476	0.83	0.405	-.0064929	.0160802
wacc	.0095291	.0305734	0.31	0.755	-.0505081	.0695664
c.sp#c.wacc	-.0004141	.0006291	-0.66	0.511	-.0016494	.0008212
fsize	.0790398	.1349905	0.59	0.558	-.1860419	.3441215
egr	.0005033	.000408	1.23	0.218	-.0002978	.0013045
_cons	-1.79057	1.293171	-1.38	0.167	-4.329979	.7488382

Model 4: MVA$_{GP*FR}$

```
. xtreg mva gp wacc c.gp#c.wacc fsize egr, re vce(robust)

Random-effects GLS regression                     Number of obs     =        805
Group variable: id                                Number of groups  =        161

R-sq:                                             Obs per group:
     within  = 0.0046                                          min =          5
     between = 0.1719                                          avg =        5.0
     overall = 0.1289                                          max =          5

                                                  Wald chi2(5)      =      27.85
corr(u_i, X)   = 0 (assumed)                      Prob > chi2       =     0.0000

                                    (Std. Err. adjusted for 161 clusters in id)
```

mva	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
gp	.0040956	.005098	0.80	0.422	-.0058964	.0140876
wacc	-.0101318	.0322862	-0.31	0.754	-.0734116	.053148
c.gp#c.wacc	-.0000721	.0006055	-0.12	0.905	-.0012587	.0011146
fsize	-.1919042	.0400881	-4.79	0.000	-.2704754	-.1133329
egr	.0005041	.0004294	1.17	0.240	-.0003376	.0013458
_cons	1.776612	.4823501	3.68	0.000	.8312228	2.722001
sigma_u	.74886699					
sigma_e	.55576601					
rho	.64483868	(fraction of variance due to u_i)				

Model 5: $EVM_{ESGP*AR}$

```
. xtreg evm esgp ec c.esgp#c.ec fsize egr, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0120                                         min =         5
     between = 0.0136                                         avg =       5.0
     overall = 0.0014                                         max =         5

                                                F(5,160)           =      2.04
corr(u_i, Xb)  = -0.3675                        Prob > F           =    0.0755

                                    (Std. Err. adjusted for 161 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |  -.5514764   .1885753    -2.92   0.004    -.9238941   -.1790587
          ec |  -.5179446    .381298    -1.36   0.176    -1.270971    .2350815
             |
 c.esgp#c.ec |   .0121103   .0092604     1.31   0.193    -.0061781    .0303987
             |
       fsize |   4.273935   5.690431     0.75   0.454    -6.964106    15.51198
         egr |  -.0157121   .0210254    -0.75   0.456    -.0572351    .0258109
       _cons |  -.4836379   54.27541    -0.01   0.993    -107.6722     106.705
-------------+----------------------------------------------------------------
     sigma_u |  24.483341
     sigma_e |  29.854226
         rho |  .40211341   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Model 5: $MVA_{ESGP*AR}$

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress mva esgp ec c.esgp#c.ec fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                               Number of obs      =       805
                                                F(169, 635)        =    618.96
                                                Prob > F           =    0.0000
                                                R-squared          =    0.7603
                                                Root MSE           =    .55121

------------------------------------------------------------------------------
             |               Robust
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        esgp |    .003363   .0040084     0.84   0.402    -.0045083    .0112344
          ec |  -.0070103   .0108111    -0.65   0.517    -.0282401    .0142195
             |
 c.esgp#c.ec |   .0000611   .0001886     0.32   0.746    -.0003092    .0004314
             |
       fsize |   .0813221   .1342128     0.61   0.545    -.1822325    .3448768
         egr |   .0005713   .0004145     1.38   0.169    -.0002427    .0013852
       _cons |  -1.752094   1.280858    -1.37   0.172    -4.267325     .763136
------------------------------------------------------------------------------
```

Model 6: EVM_{EP*AR}

```
. xtreg evm ep ec c.ep#c.ec fsize egr, fe  vce(robust)

Fixed-effects (within) regression               Number of obs      =       805
Group variable: id                              Number of groups   =       161

R-sq:                                           Obs per group:
     within  = 0.0102                                         min =         5
     between = 0.0130                                         avg =       5.0
     overall = 0.0016                                         max =         5

                                                F(5,160)           =      2.48
corr(u_i, Xb)  = -0.3592                        Prob > F           =    0.0341

                                    (Std. Err. adjusted for 161 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.4600511   .1437626    -3.20   0.002     -.743968   -.1761342
          ec |  -.4740908   .2673145    -1.77   0.078    -1.002011    .053829
             |
   c.ep#c.ec |   .0149471   .0082977     1.80   0.074    -.0014401    .0313343
             |
       fsize |   4.176465    6.02666     0.69   0.489    -7.725595    16.07852
         egr |  -.0189697   .0201534    -0.94   0.348    -.0587707    .0208312
       _cons |  -8.169753   57.29447    -0.14   0.887    -121.3207    104.9812
-------------+----------------------------------------------------------------
     sigma_u |  24.361747
     sigma_e |  29.881394
         rho |  .39928536   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Model 6: EVM_{SP*AR}

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress evm sp ec c.sp#c.ec fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                               Number of obs      =       805
                                                F(169, 635)        =     13.86
                                                Prob > F           =    0.0000
                                                R-squared          =    0.4236
                                                Root MSE           =    29.912

------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          sp |  -.351505    .231032    -1.52   0.129    -.8051842    .1021741
          ec |  -.1380765   .5149533    -0.27   0.789    -1.149294    .8731409
             |
   c.sp#c.ec |   .0030163   .0095423     0.32   0.752     -.015722    .0217546
             |
       fsize |    3.96191   6.028914     0.66   0.511    -7.877109    15.80093
         egr |  -.0129308   .0195081    -0.66   0.508    -.0512389    .0253774
       _cons |  -12.91571   60.10168    -0.21   0.830    -130.9378    105.1064
------------------------------------------------------------------------------
```

Model 6: EVM$_{GP*AR}$

```
. xtreg evm gp ec c.gp#c.ec fsize egr, re vce(robust)

Random-effects GLS regression                   Number of obs     =        805
Group variable: id                              Number of groups  =        161

R-sq:                                           Obs per group:
     within  = 0.0028                                         min =          5
     between = 0.0315                                         avg =        5.0
     overall = 0.0143                                         max =          5

                                                Wald chi2(5)      =      10.17
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0706

                                    (Std. Err. adjusted for 161 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         evm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          gp |  -.1718505   .0940593    -1.83   0.068    -.3562034    .0125024
          ec |  -.9074884   .3653786    -2.48   0.013    -1.623617   -.1913595
             |
   c.gp#c.ec |   .0145692   .0077549     1.88   0.060    -.0006301    .0297686
             |
       fsize |   .0350176   1.093453     0.03   0.974     -2.10811    2.178146
         egr |  -.0037545   .0206488    -0.18   0.856    -.0442253    .0367164
       _cons |   27.69543   12.45705     2.22   0.026     3.280064     52.1108
-------------+----------------------------------------------------------------
     sigma_u |  17.701211
     sigma_e |  29.932226
         rho |   .2591089   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Model 6: MVA$_{EP*AR}$

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress mva ep ec c.ep#c.ec fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                               Number of obs     =        805
                                                F(169, 635)       =     561.18
                                                Prob > F          =     0.0000
                                                R-squared         =     0.7602
                                                Root MSE          =     .55139

------------------------------------------------------------------------------
             |               Robust
         mva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ep |  -.0022365   .0033938    -0.66   0.510    -.0089008    .0044279
          ec |  -.0033922   .0085124    -0.40   0.690    -.0201081    .0133238
             |
   c.ep#c.ec |  -.0000514   .0001793    -0.29   0.774    -.0004036    .0003007
             |
       fsize |   .0916669   .1352895     0.68   0.498     -.174002    .3573359
         egr |   .0005899   .0004015     1.47   0.142    -.0001985    .0013783
       _cons |  -1.779913   1.285673    -1.38   0.167    -4.304598    .7447711
------------------------------------------------------------------------------
```

Model 6: MVA$_{SP*AR}$

Robust Least Square Dummy Variable (LSDVR)

```
. xi: regress mva sp ec c.sp#c.ec fsize egr i.year i.id, vce(robust)
i.year            _Iyear_2019-2023    (naturally coded; _Iyear_2019 omitted)
i.id              _Iid_1-161          (naturally coded; _Iid_1 omitted)

Linear regression                                 Number of obs     =        805
                                                  F(169, 635)       =     586.29
                                                  Prob > F          =     0.0000
                                                  R-squared         =     0.7600
                                                  Root MSE          =     .55151
```

mva	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
sp	.0019843	.0038924	0.51	0.610	-.0056592	.0096277
ec	-.0027678	.0111009	-0.25	0.803	-.0245667	.0190311
c.sp#c.ec	-.0000388	.0001783	-0.22	0.828	-.0003889	.0003112
fsize	.0836529	.1341052	0.62	0.533	-.1796904	.3469961
egr	.0005806	.0004065	1.43	0.154	-.0002176	.0013789
_cons	-1.745811	1.282363	-1.36	0.174	-4.263996	.7723746

Model 6: MVA$_{GP*AR}$

```
. xtreg mva gp ec c.gp#c.ec fsize egr, re vce(robust)

Random-effects GLS regression                   Number of obs     =        805
Group variable: id                              Number of groups  =        161

R-sq:                                           Obs per group:
     within  = 0.0094                                         min =          5
     between = 0.1684                                         avg =        5.0
     overall = 0.1282                                         max =          5

                                                Wald chi2(5)      =      31.11
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

                                  (Std. Err. adjusted for 161 clusters in id)
```

mva	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
gp	.0011931	.0020742	0.58	0.565	-.0028722	.0052585
ec	-.0206799	.0092197	-2.24	0.025	-.0387502	-.0026097
c.gp#c.ec	.0002877	.0001519	1.89	0.058	-9.97e-06	.0005854
fsize	-.1868182	.0398767	-4.68	0.000	-.264975	-.1086613
egr	.0005658	.0004498	1.26	0.208	-.0003158	.0014475
_cons	1.821654	.3924588	4.64	0.000	1.052449	2.590859
sigma_u	.76007072					
sigma_e	.55411242					
rho	.65296271	(fraction of variance due to u_i)				

AUTHOR'S PROFILE



Peter Chinedu Okoye is a distinguished Finance Executive and a Postgraduate Researcher with over 14 years of leadership experience in corporate finance, Business Advisory, audit, and strategic financial management across various sectors in Nigeria. A Fellow of ACCA (UK) and holder of multiple advanced degrees, including an MBA in Finance & Investment (ABU) and an MSc in Accounting & Finance (UK). Currently, he is working full-time on his PhD in Accounting with a research focus on ESG practices, corporate value creation and strategic risk.

LIST OF PUBLICATION:

Okoye, P. C., Fahmi, M. F. & Ali, M. M. (2025). ESG Controversies on Corporate Value and Market Risk: The Moderating Role of Board Independence. *Advanced International Journal of Business, Entrepreneurship and SMEs, 7(23), 212-231.*

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