CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, ISLAMABAD

Environmental Disclosure and Idiosyncratic Risk; Exploring the Role of Governance

by

Muhammad Mahboob Khan

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To Allah Almighty (SWT)

Who has been there right from the beginning to this very point.

To My Parents My Father and My Mother

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CERTIFICATE OF APPROVAL

This is to certify that the research work presented in the dissertation, entitled "**Environmental Disclosure and Idiosyncratic Risk; Exploring the Role of Governance**" was conducted under the supervision of **Dr. Imran Riaz Malik**. No part of this dissertation has been submitted anywhere else for any other degree. This dissertation is submitted to the **Department of Management Sciences, Capital University of Science and Technology** in partial fulfillment of the requirements for the degree of Doctor in Philosophy in the field of **Management Sciences.** The open defence of the dissertation was conducted on **February 06, 2025**.

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List of Publications

It is certified that following publication(s) has been accepted out of the research work that has been carried out for this dissertation:-

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Abstract

Significant shifts in the climate changes characterized the late twentieth and early twenty-first centuries. An increasing number of environmental measures have been launched to bring this situation under control. Due to the continued increase in carbon dioxide produced by businesses, it has grown in monstrous proportions. Firms are being pushed by social and regulatory forces to embrace environmentally friendly practices. They must also be equipped with the necessary skills and information regarding climate change's influence on financial performance. Keeping in view the climate change dilemma, this study investigated the impact of Environmental Disclosure (END) on a firm's Idiosyncratic Risk (IR). Moreover, the study also investigated the moderating role of the CG index between and IR. Governance index consists of Board Size (BS), Board Independent (BI), and Board Meeting (BM) and is constructed using principal component analysis (PCA). Besides these main variables, the study used firm-level control variables (i.e. Leverage, firm size, firm age, and Sales Growth and country-level control variables (i.e. Official exchange rate (ER), GDP per capita growth (GDPG) and External Corporate Governance Index that contains Voice & Accountability, Political Stability No Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption) to capture better results. The data was collected from 187 listed companies of multiple sectors of Pakistan, India and UK for the period covering 8 years from 2013 to 2020.

For empirical analysis, the study used the Generalized Methods of Moments (GMM) econometric technique for panel data of selected companies of Pakistan, India & UK. GMM test is recommended to use for regression to address endogeniety issue. The empirical results of the study revealed that END and the CG Index have a significant negative impact on IR in the context of Pakistan and UK as theorized by legitimacy, stakeholder and Signaling theories. In the case of India END has positive significant impact on the IR, as suggested by managerial opportunism theory. The results also revealed that the CG index has negatively influenced the relationship between END and IR for the UK and India. In the scenario of

Pakistan, the CG index has negatively modified the relationship between END and IR. In the case of Combine results of all three economies, there is no moderation but the results improved while measuring idiosyncratic risk by using three and five factor model.

The study has theoretical and empirical implications as it is helpful for investors, managers, and researchers. The results of the study contribute to the body of knowledge, particularly in green finance, environment, and firm risk literature. Results of the study reveal that good corporate governance reduces the asymmetry of information which ultimately reduces the risk and increases financial output. Furthermore, research offers recommendations to investors for selecting the right stock for investment. Besides general implication this study has special implication for the studied economies i.e Pakistan, India and UK those have room to implement environment and social policies. Both emerging countries Pakistan and India have environmental laws, although they are often ignored or applied inappropriately. Research on environmental disclosure is necessary to assess the degree to which companies adhere to these rules and to pinpoint any enforcement weaknesses. The report provides information that can assist lawmakers in passing stronger laws and improving current enforcement procedures. So, in underdeveloped and developed countries as well, a proper CG structure is needed, since it is important to manage business risk-taking between what's appropriate and unrealistic.

Keywords: Environmental disclosure, Idiosyncratic Risk, CAPM, Fama & French Three and Five Factor Model and Corporate Governance Index.

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Abbreviations

BI	Board Independence
BM	Board Meetings
BS	Board Size
BD	Board Duality
BoD	Board of Directors
CAPM	Capital Assets Pricing Model
CC	Control of corruption
CCon	Country level control variables
CG	Corporate Governance
CGI	Corporate Governance Index
CSR	Corporate social responsibility
ESG	Environmental and Social Governance
ER	Exchange Rate
END	Environmental Disclosure
Fage	Firm Age
FCon	Firm level control variables
Fs	Firm Size
GDPG	Gross Domestic Product Growth
GE	Government effectiveness
GMM	Generalized Methods of Moments
IRisk	Idiosyncratic Risk
Lev	Leverage
PCA	Principle Component Analysis
PS	Political stability

ReQ	Regulatory quality
ROA	Return on Assets
ROE	Return on Equity
RuL	Rule of law
SG	Sales Growth
VA	Voice and accountability

Chapter 1

Introduction

The term Green Finance (GF) is prominent in the academic literature in the recent times. This led to the organizations address this concern and now they are paying more attention to sustainability disclosure and reporting practices (Kim and Oh, 2020) as well as consumer concerns over sustainability (Grazzini et al., 2021). All stakeholders, including investors, management, employees, researchers, and shareholders, have significant concerns about environmental responsibility (Zhang, 2017). END is a communication mechanism for stakeholders to share knowledge about activities and investments that affect the environment (Cormier and Magnan, 2015). END is the procedure of conveying to diverse stakeholders the social and environmental consequences of a company's economic actions, which entails expanding corporations' accountability beyond the conventional responsibility of giving financial information to shareholders. END may insinuate signals for all stakeholders, especially investors, toward a new era of climate. Repercussions of this Signaling can be visualized in the organization's returns and the firm risk (Misani and Pogutz, 2015). END influence on investment risk is based on a sophisticated theoretical framework. END, on the one hand, encourages a policy that values environmental concerns (Brooks and Oikonomou, 2018). While disclosing environmental information there may arise issue of asymmetric information. Therefore, as both the legitimacy and the stakeholder theories predict, investors may be drawn to companies that commit to releasing environmentally sensitive Information and are

more likely to gain from lower financial risk (Friedman, 1970; Jensen and Meckling, 1976). Asymmetry of Information may be mitigated by providing transparent Information about good or bad news about a firm's activities (Connelly et al., 2011; Tzouvanas et al., 2020). Since companies are gradually shifting from the current environmental paradigm, environmental disclosure transparency can help to balance market expectations (Benlemlih et al., 2018). In turn, this signaling could have implications for the financial state of the firms. For instance, a rational question is whether disclosing such Information reduces firm risk.

Corporate social responsibility (CSR) programs require organizations to do more than just follow the law and act in the public interest to advance social welfare. In terms of ensuring a healthier environment for future generations, corporate environmental and social responsibility is also regarded as an essential element of business sustainability. CSR is the umbrella word for several business-related projects and actions designed to generate long-term benefits for the economy, environment, and society. Then, two primary theoretical stances were mobilized. The first viewpoint, which is grounded in agency theory, makes the case that growing CSR investments increase risk, mostly as a result of managers' discretionary actions, such as using CSR investments to further their financial interests (Behl et al., 2022). The second viewpoint, which advances an insurance-type argument, presents an alternative interpretation, in which CSR investments serve as a safeguard against reputational hazards or significant business risks (Godfrey et al., 2009). Recent empirical findings, though partially inconclusive, appear to support the insurance perspective, with CSR spending lowering organizations' financial risk.

It's also promising that management pushes CSR for their advantage rather than for the benefit of investors. Because of agents' self-interest, opportunistic actions, and risk-deferring strategy. The division of ownership and control was the basis for the introduction of the agency theory. One potential solution to address this severe issue is through corporate governance, which aims to reduce the conflict of interest between principal and agent. The interests of shareholders, employees, customers, and society, management may choose to promote corporate environmental responsibility initiatives while applying corporate governance practices such as board

independence, CEO duality, and board size. These possibilities create conflicting answers to our research objectives, which are whether there is a relationship between END and firm risk and whether corporate governance practices may mitigate it. It is feasible that corporate governance practices can help to moderate the relationship between END and risk in light of these arguments and contradictions (Waldman et al., 2004). In order to reduce agency problems and asymmetric information, the moderating role of corporate governance is investigated. Agency problems can be decreased by monitoring managers' behavior through an efficient corporate governance mechanism (Shahwan and Habib, 2020). The board regulates and supervises management actions, therefore in addition to providing support for managerial choices, it also ensures that these decisions protect the interests of shareholders (García-Sánchez and García-Sánchez, 2020). The composition board of the directors affects the decision making behavior of managers that can help to reduce firm risks.

Several studies have discussed the impact of END on different variables in different economies like firm risk (Benlemlih et al., 2018; Qiu et al., 2016; Tzouvanas et al., 2020), firm performance (Busch and Lewandowski, 2016; Baboukardos, 2018). Several past studies discussed systematic and downside risk also, whereas this study focused on IR because it is determined by business policies and influenced by firm-specific features. IR ought to minimize by comprehensive corporate decision making and minimizing information asymmetric. Organizations can reduce information asymmetric and agency issue by enhancing corporate governance therefore, the study also investigated moderating role CG Index. This study makes several contributions to the field of corporate governance and sustainability. First, as far as we are aware, no studies have been done on the moderating role of CG Index in the relationship between END and IR. Although numerous research studies have looked at the direct impact of END on IR (like (Cai et al., 2016; Benlemlih et al., 2018), It has not been discussed how corporate governance practices might moderate the relationship between END and IR. According to agency theory, managers may seek environmental disclosure for their interests (such as reputation, profit, and compensation) because they have stewardship responsibilities alone and are not involved in the ownership of the company. Corporate governance

practices, however, are designed to assure shareholders that the current risks are effectively assessed, managed, and decreased. Therefore, assessing how corporate governance practices affect the relationship between environmental disclosure and risk can offer fresh information for investors, regulators, and policymakers about how businesses can increase their returns from environmental disclosure. Second, this study demonstrates the significance of agency, stakeholder, and stewardship theories in illuminating the relationship between END and firm IR in emerging markets. The final results reveal policy and practical implications related to how enterprises employ environmental disclosure to decrease risk and the impact of corporate governance practices on this process. The findings also highlight the need for regulatory changes in light of the rising number of insider boards. Previous researchers used corporate governance mechanisms individually, but for better insight, this study used a CG index containing of different internal governance mechanisms such as Board Size (BS), Board Independence (BI), Board Duality (BD), and the Board Meeting (BM). Most of the research is done in developed economies; so far as the best knowledge of the researcher, emerging and underdeveloped economies remain unexplored. Due to the high volatility in emerging markets, some scholars recommended further research in this domain (Wang et al., 2015; Hussain and Amir Shah, 2017). The study provides new evidence from the emerging and developed economies of Pakistan, India, and the UK only.

For empirical analysis, data has been collected from 187 listed firms from non-financial sectors of Pakistan, India, and the UK from 2013 to 2020. The study revealed that, in the case of the UK and Pakistan, END has a significant negative impact on IR as theorized by Signaling and stakeholder theories and previous literature (Utz, 2017; Tzouvanas et al., 2020). In the scenario of India, environmental disclosure significantly positively impacts idiosyncratic risk, which is in line with the managerial opportunism theory and past literature (Cormier and Magnan, 2015; Lee et al., 2015). The CG index has negatively modified the relationship between END and IR for the UK and India, whereas in the case of Pakistan CG index positively moderates the relationship between END and IR. Combined results of all economies show that positive significant impact of END on IR and found negative significant impact of CG index on idiosyncratic risk. Moderation of corporate

governance did not exist in the case of combined results. For robustness, the study measured idiosyncratic risk through Fama & French's three and five factor model to examine the said relationship. Similar results are found except for combined results of all economies which improved and proved the moderating impact of the CG index between the relationship of END and IR. In conclusion, as per the study of Benlemlih et al. (2018), this study also show that END has a more vital association with IR than other risk types.

The study has theoretical as well as empirical implications as it is helpful for investors, managers, and researchers. With the negative correlation between environmental transparency and firm risk, CEOs of companies may get signals to implement more visible environmental measures in order to maximize shareholder value while minimizing idiosyncratic risk on investment. Policymakers can designate "environmentally sensitive firms" and impose controls on them in order to maintain financial stability. It provides informative data on a relationship between climate change and financial markets that has not yet been thoroughly investigated. Environmental disclosure is a tool that business leaders can use to manage risk, build their brand, increase operational capacity, and comply with regulations. It lowers the possibility of unforeseen expenses arising from environmental challenges and harmonizes corporate plans with long-term sustainability goals. A sound corporate governance mechanism is essential in emerging economies, since it's important to balance businesses' needless and appropriate risk-taking.

1.1 Background

Green finance has been an emerging area in the literature of finance for the last few years. All stakeholders including investors, management, employees, researchers, and shareholders have great concerns about environmental responsibility (Zhang, 2017). The disclosure of environmental information has a significant impact on how investors and policymakers will behave in the future. Transparency in environmental reporting reduces knowledge gaps and fosters the development of an informed social

network, both of which are essential for addressing climate change. END is used as a communication mechanism for various stakeholders to share knowledge about activities and investments that affect the environment (Cormier and Magnan, 2015; Matsumura et al., 2014). END may insinuate signals for all stakeholders, especially investors, towards a new era of climate. Repercussions of this signaling can be visualized in the output of the organization and also in the firm risk (Misani and Pogutz, 2015; Endrikat et al., 2014; Benlemlih et al., 2018). Hence, we can say that sustainability disclosure warrants the way forward to achieve organizational goals for all stakeholders.

Firm financial risk comprises total risk, idiosyncratic or unsystematic risk, and systematic risk. IR also called unsystematic risk, specific risk, diversifiable or residual risk, is firm-specific or micro in nature. Megginson et al. (2007) define idiosyncratic risk as "It is kind of uncertainty which exists with the industry or company when anybody invests in. The basic goal of any firm is to make the best use of resources to increase a firm's value by minimizing financial risk. It can be minimized through diversification." Different studies used different methods of estimation to measure idiosyncratic risk. The basic and mostly used method to get error terms for idiosyncratic risk is the Capital Assets Pricing Model (CAPM), with a single descriptive variable of Mkt (Market) (Fu, 2009; Cai et al., 2016), besides this three-factor model of Fama and French (1993) that added SMB (size factor) and HML (value factor) other than mkt factor, Carhart (1997) presented a four-factor model which added momentum factor, Fama and French (2015) five-factor model that includes Investment and profitability factors and the most latest is the six-factor model of (Fama and French, 2018) which include momentum factor (Bouslah et al., 2013; Tzouvanas et al., 2020). This study used Fama & French's three and five factor models to get error terms for measuring idiosyncratic risk. Systematic risk is macro level or country-specific risk, it is also called volatility risk, market risk, or un-diversifiable risk. It can neither be predictable nor completely avoidable as it refers to the whole market Megginson et al. (2007).

Improvement in social and environmental performance of organizations to gain sustainability is a global issue. The importance of integrating sustainability into

the primary business strategy has been highlighted by a number of studies [1], including the ones that is carried out. Nonfinancial reporting has developed over the past 20 years as a means for firms to report to stakeholders on their nonfinancial performance pertaining to social and environmental issues. In underdeveloped and emerging economies the financial performance of their companies is typically the sole thing that interests stakeholders. Increasing the financial returns of companies is the primary objective of investors and shareholders. Environmental reporting and practices are not given enough thought by the management of these companies (Awang et al., 2020). Moreover, some organizations think that such type of social and environmental strategies and related practices negatively impact their financial performance therefore, they are reluctant to implement these practices. This might be because there are conflicting opinions about how environmental and social standards affect a company's financial performance, especially in developing and emerging nations. Besides this, some organizations have not demonstrated any real initiative, motivation, and no commitment to integrate corporate plans and tasks to assure environmental and social practices along with their transparency (Awang et al., 2020).

As far as concern of study selected countries, they have the mechanism and regulation regarding environmental sustainability but implementations are still practicable. Environmental laws are existed in both countries Pakistan and India, but they are frequently disregarded or improperly implemented. For example, In Pakistan, environmental legislation like the Pakistan Environmental Protection Act (1997) have often lacked effective implementation. The Securities and Exchange Commission of Pakistan (SECP) released the CG2002 code in March 2002 which was later amended in 2012, 2017 and most recently in 2019. The code's main goal is to safeguard all stakeholders' rights by promoting sustainable business practices, transparent financial disclosure, and efficient corporate governance (Akbar et al., 2019). Research on END is essential for evaluating how well businesses follow these regulations and identifying any enforcement gaps. India has stringent laws enforced by the National Green Tribunal (2010) and the Environment Protection

[1] Connelly et al. (2011); Benlemlih et al. (2018); Tzouvanas et al. (2020)

Act (1986), but enforcement varies. The Companies Act of 2013 of India mandates the companies that meet certain thresholds allocate a minimum of 2% of their earning towards CSR activities, including environment related projects. This encourages the reporting of such events. Although in the UK, END has developed to the point that businesses are being forced by both consumer demands and regulatory requirements to include environmental risks in their reporting systems.

There are still issues, though, namely with data coverage and uniformity amongst smaller businesses. The predicted evolution of the regulatory framework, particularly with the mandated implementation of Task Force on Climate Related Financial Disclosures (TCFD), further integrate environmental reporting into company governance and become mandatory for companies to implement it with true letter and spirit by 2025. The study offers data that can help legislators enact more robust legislation and enhance existing enforcement protocols of these economies.

There is a need to study the influence of END on idiosyncratic risk, and whether firm risk can be mitigated by disclosing environmental information. Idiosyncratic risk is influenced by corporate policy and it can be reduced by making good quality corporate decisions. The principal-agent dilemma could be eased with careful monitoring and oversight, and managers should face the responsibility of investors. As a result, a company's financial efficiency can be enhanced. Therefore, the study also checked the CG Index moderation between END and IR.

The internal and external elements of corporate governance might affect the firm's risk exposure. Good corporate governance (CG) can increase the returns of an organization by minimizing risk (Wang et al., 2015; Mathew et al., 2018). Internal governance methods such as Board Duality, Board Meeting, Board Size, and Board Independence are aimed to diminish agency issues between boards and shareholders.

Many studies used these internal governance mechanisms separately to inspect corporate governance influence on firm risk and environmental disclosure (Mathew et al., 2018; Chakraborty et al., 2019; Saravanan et al., 2017; Hatane et al., 2019; Gerged, 2021).

The study used the CG Index which includes internal and external corporate governance mechanisms for better insight. The study has theoretical as well as empirical consequences as it will be helpful for all stakeholder like investors, managers, and researchers. Environmental transparency and organization risk are negatively correlated because businesses may perceive signals to take more transparent environmental actions in order to maximize shareholder value and reduce investment idiosyncrasy risk. An appropriate CG mechanism is needed in emerging economies, as it is essential to strike a balance between acceptable and unnecessary risk-taking in businesses.

1.2 Gap Analysis

The study contributed to the body of knowledge on END and firm risk. The study examined how the relationship between END and IR can be strengthened or weaker, for this purpose study evaluated the moderating role of corporate governance. Moreover, the study used the corporate governance index (which include BI, BD, BS and BM) rather than taking individual components of corporate governance. Besides this study used to measure the idiosyncratic risk through Fama and French three-factor model and five factor model. Furthermore, the study took samples for empirical analysis from developed and emerging countries as well. The detail of the study contribution is as follow:-

1.2.1 Moderating Role of Corporate Governance

According to agency theory, managers may pursue environmental disclosure for their interests (such as reputation, profit, and compensation) because they have stewardship responsibilities alone and are not involved in the ownership of the company. Corporate governance practices are designed to guarantee shareholders that the prevailing risks are appropriately analyzed, managed, and decreased. Therefore, assessing how the CG index strengthens or weakens the relationship

between END and IR depicts the latest information for investors, regulators, and policymakers about how businesses can gain from disclosing environmental information. Corporate governance mechanism tends to improve transparency and reduce asymmetry of information. Board presence perks up the company's reputation, minimizes the cost of capital and agency cost, enhances resource allocation, and develops environmental strategies (Jizi, 2017) and (Fernandes et al., 2018). In theory, a good corporate governance structure proved to be more effective in decreasing agency issues by resolving the asymmetric information gap and encouraging the disclosure of environmental data (Gerged, 2021). The internal and external elements of corporate governance might affect the firm's risk exposure. Characteristics of corporate governance like board duality, board independence, board size and board Meeting has a negative relationship with firm risk. Firm risk can be minimized by increasing the corporate governance quality and structure. Researchers and practitioners looked into many techniques to reduce conflict between managers and shareholders, with one of the most popular strategies being to use the finest corporate governance principles (Shahwan and Habib, 2020). Several studies observe the influence of corporate governance mechanisms on the firm's risk or organizational risk-taking behavior (Kiel and Nicholson, 2003; Jiraporn et al., 2015; Akbar et al., 2017; Mathew et al., 2018; Naveed and Zain Ul Abdin, 2020).

This study makes several contributions to the field of corporate governance and sustainability.

- First, no study has been done on how CG practices affect the relationship between END and IR. The moderating effects of the CG index on this relationship have not been discussed, even though various research has looked at the direct impact of END on IR. So, the examination of CG as a moderating role has contributed positively to the literature on END and firm risk. As good corporate governance practice may reduce the agency issue and information asymmetric. Many studies discussed the corporate governance impact on END in a couple of decades (Jizi, 2017; Bueno, 2016; Akbas, 2016; Trireksani and Djajadikerta, 2016; Tamimi and Sebastianelli, 2017; Alazzani et al., 2017; Lewis et al., 2014; Said et al., 2013; Eng and Mak, 2003).

- Moreover, earlier studies used characteristics of corporate governance structure individually but for better insight this study used a CG index which consists of different characteristics of internal governance structure such as BS, BI, BM, and BD. A globally practiced corporate governance scheme is intended to reduce the agency issue and coordinate the actions of all stakeholders in the greatest interests of the principal and agent (shareholders).

1.2.2 Measurement of IR through Fama and French Three and Five Factor Model

Although several studies discussed the influence of END on firm risk Oikonomou et al. (2012); (Diemont et al., 2016); (Utz, 2017); (Cai et al., 2016); (Linciano et al., 2018) and (Tzouvanas et al., 2020), most of the studies analyzed the influence of END on total risk, idiosyncratic risk, downside risk and systematic risk. This study focused on IR as it is associated with firm level. Furthermore, the study estimated idiosyncratic risk by using the three and five factor models of Fama and French for robustness. IR is described as the standard deviation of the residuals of the pricing models. The traditional method for measuring idiosyncratic risk is by using Capital Assets Pricing Model of Sharp, 1952 and several studies used this estimation method Campbell et al. (2001) many researchers used three and five factor models of Fama & French or the four-factor model of Carhart (Bouslah et al., 2013); (Liu et al., 2014); (Mishra and Modi, 2013) and (Tzouvanas et al., 2020). As factors added in the equation, value of error term become decreases, which means by adding more factors idiosyncratic risk can be minimized. Similarly, literature show analysis of model performance shows that while the Five-factor model is better at explaining and forecasting average returns, the Three-factor model yields somewhat more meaningful results. When it comes to describing the returns of portfolios sorted on momentum, the Six-factor model performs as well as or better than the Five-factor model and significantly beats both the Three-factor and Five-factor models (Foye and Valentinčič, 2020). So, the study extended the literature by estimating of idiosyncratic risk through Fama & French's (1993) three factors and Fama and French (2015) five factors models.

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 \; SMB_{i,t} + \beta_3 \; HML_{i,t} + \mu_{i,t}$$

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 \; SMB_{i,t} + \beta_3 \; HML_{i,t} + \beta_4 \; RMW_{i,t} + \beta_5 \; CMA_{i,t} + \mu_{i,t}$$

CAPM uses only the explanatory variable of the market whereas, as per the above-mentioned equations Fama & French's three factors model includes size factor (SMB) and value factor (HML) whereas, the five-factor model further adds profitability factor (RMW) and investment factor (CMA). The recent asset pricing literature has made multi-factor extensions of CAPM a regular, with Fama and French (1993) three-factor model proving to be especially popular. The most current work on average returns was done by Fama and French (2015), who demonstrate that a five-factor model that supplements three factor model with factors related to profitability and investment offers a better explanation (Foye and Valentinčič, 2020). So to my knowledge, this area is still untouched, particularly investigation of END and IR with estimation through three and five factor models.

1.2.3 Empirical Analysis of Emerging and Developed Economies

Previous researchers separately examined the impact of END on firm risk for different countries (Diemont et al., 2016); (Utz, 2017); (Linciano et al., 2018) and (Tzouvanas et al., 2020). Most of the research is done in developed economies, but emerging and underdeveloped economies remain very little explored. Emerging and underdeveloped markets are more volatile than developed countries. As there is less END practices and such research is not common in emerging & underdeveloped economies. Therefore, this study conducted to examine the results of existing disclosure practices which will pave the way to encourage the END in emerging economies. In past studies, due to the high volatility many researchers are recommended further research in this domain (Wang et al., 2015) and (Hussain and Amir Shah, 2017). This study took data for empirical analysis from emerging and developed economies of Pakistan, India, and the UK as they are almost

similar governance structure. Since of British colonial influence, the CG systems of Pakistan, India, and the UK are comparable as they are built around the same legal and regulatory frameworks. The study evaluated data individually and collectively and proposed new evidence for researchers. By analyzing the relationship between END and IR in emerging and developed economies, this study highlights the significance of agency, stakeholder, and stewardship theories.

1.3 Problem Statement

In recent years, not only corporations' stakeholders, such as investors, operators, suppliers, and employees, but also scholars, have paid close attention to the economic implications of corporate environmental and social sustainability (Zhang, 2017). Notably, information regarding environmental disclosure is crucial for determining the plans of management and supervisory bodies (Qiu et al., 2016). In this regard, the administrations of many countries and companies have emphasized the significance of corporate environmental transparency for recognizing firm risks and assisting to improve investors' confidence to track rising temperatures.

Financial risks are one of the most significant issues confronting many organizations, especially those that are listed on the stock exchange and whose value is determined by market conditions. Higher idiosyncratic risk can cause several implications like increased portfolio volatility, investor risk tolerance, market liquidity and reduced effectiveness of diversification etc. Environmental disclosure is a factor that can reduce this problem. While disclosing environmental information, there may arise problems of information asymmetry and agency issue due to selective disclosure, information complexity, time of disclosure and inadequate reporting principle. A good corporate governance structure proved to be more effective in decreasing agency issues by resolving the asymmetric information gap and encouraging the disclosure of environmental data. The agency problem can also be reduced with a robust and efficient corporate governance structure. According to Shahwan and Habib (2020), having an independent board of directors and its subcommittees

prevents managers from acting in their own best interests, which enhances the performance of the firm. The main goal of CG is to safeguard the interests of owners and other stakeholders, which helps to reduce agency risk. Habib et al. (2020) explained in their study that a firm's collapse and financial distress are caused by a weak corporate internal control system and asymmetry of information, whereas corporate governance aids outside investors in safeguarding their rights.

The corporate finance theory states that companies maximize firm value and minimize risk by optimizing transparency policies, corporate governance, and managerial incentives (Rezaee, 2016). An increase in the quantity and quality of disclosures can result from a reduction in the information asymmetry component of the cost of capital caused by an improvement in disclosure quality. A company's non-financial disclosures that include environmental information lessen information asymmetry, which lowers the cost of acquiring information and raises the value of the organization. Environmentalists, legislatures, and culture as a whole are all grappling with the same problems. Companies have been viewed as a major source of pollution in this background, therefore, they have been under - pressure to decrease the impact of their actions on the natural environment.

As a result, the way businesses communicate with the environment, as well as the degree to which they participate in environmental protection and pollution reduction, has become increasingly important to their stakeholders. As far as study concern the main problem of the selected countries i.e Pakistan, India and UK, they have the mechanism and regulation regarding environmental sustainability but implementations are still practicable. Environmental laws are existed in both countries Pakistan and India, but they are frequently disregarded or improperly implemented. For example, In Pakistan, environmental legislation like the Pakistan Environmental Protection Act (1997) and the SECP released the CG2002 code in March 2002 which was later amended in 2012, 2017 and most recently in 2019 but often have lacked of effective implementation. India has stringent laws enforced by the National Green Tribunal (2010) and the Environment Protection Act (1986), but enforcement varies. Although in the UK, END has developed to the point that

businesses are being forced by both consumer demands and regulatory requirements to include environmental risks in their reporting systems.

There are still issues, though, namely with data coverage and uniformity amongst smaller businesses. Research on END is essential for evaluating how well businesses follow these regulations and identifying any enforcement gaps. Although social and environmental transparency has been a mainly discussed area of research for the past few decades, researchers mainstream have dedicated their research to developed countries like Europe, America, and Australia while ignoring developing countries.

Therefore, numerous studies have suggested that developing countries need more advanced research in the area of environmental and social disclosure (like (Tzouvanas et al., 2020); (Babiak and Trendafilova, 2011) and (Gugler and Shi, 2009). By intertwining environmental disclosure and idiosyncratic risk with corporate governance companies may build a more responsible and sustainable business model and lower risks. This strategy improves the bottom line of the companies while simultaneously enhancing the general well-being of the environments and communities in which it operates.

1.4 Research Questions

The following are the research questions that have been addressed in this study.

1. Does Environmental Disclosure impact Idiosyncratic Risk?
2. Does Corporate Governance Index moderate the relationship between Environmental Disclosure and Idiosyncratic Risk?
3. Does measures of idiosyncratic risk obtained from the CAPM, Fama & French three-and five-factor models affect the results?

1.5 Research Objectives

The study's research objectives are as follows.

1. Investigate how Environmental Disclosure information influences firms' Idiosyncratic Risk.
2. Examine whether the Corporate Governance Index strengthens or weakens the relationship between Environmental Disclosure and Idiosyncratic Risk.

1.6 Significance of the study

The study has profound consequences practically as well as theoretically for all stakeholders. Given that investors are naturally persuaded to seek out ways to reduce risk in order to maximize return, they should exercise greater caution when making future investment decisions in the light of environmental disclosure (Cormier and Magnan, 2015). CEOs of companies can perceive signals to implement more visible environmental policies to boost shareholder wealth by reducing the IR of investment, as there is a negative relationship between END and business risk. The findings of the study support the body of knowledge and benefit policymakers and business professionals. First, it expands on prior studies to resolve the ambiguity and contradiction in the current discussion. The environmental disclosure and idiosyncratic risk value debates have been the subject of contrasting explanations in the literature, with some researchers contending that a company's superior environmental information has a beneficial impact on its financial and market performance.

As idiosyncratic risk is diversifiable, investors and portfolio managers can trace the stocks that offer the highest benefits of diversification. For researchers this study could be a handbook, green Finance is a burning topic in financial literature. It opens new doors for researchers to examine not only theoretically but also

the managerial proposition of climate changes on firm risk to increase financial performance.

The topic of corporate governance has become more and more significant in the corporate world, particularly in the light of the modern era. In emerging markets, corporate governance has gained significant importance following the 2008 financial crisis. In previous chapters, as the study already discussed many international papers have explained the relationship between CG Index, IR, and END, very little work has been done on the moderation of the corporate governance index in Pakistan, India & UK till the date to clarify this issue. The question that needs to be addressed is whether or not corporate governance practices reduce idiosyncratic risk, and if so, how and to what degree. Therefore, it is critical to close this gap and identify the governance practices that result in changes to mitigate idiosyncratic risk. This research is beneficial for all stakeholders in several ways. First, it helps to identify how corporate governance practices are most appropriate for Pakistani, Indian, and UK companies' conditions to address firm-specific risk and achieve environmental and sustainability betterment. The other one is to determine the elements that contribute to idiosyncratic volatility in these economies. Third, the study hopes to offer some helpful insights for implementing, policing, and overseeing corporate governance practices to take control of the firm's risks.

This study intends to add new evidence to an ongoing discussion and clear up the uncertainty brought on by conflicting explanations of the subject. The examination of the research questions of the study reveals whether providing superior environmental information still affects a company's financial performance, and market valuation and helps out to reduce risk. This is achieved by analyzing recent data from 187 non-financial companies listed on the stock exchanges of Pakistan, India, and the UK for the period from 2013 to 2020. The appropriate corporate governance mechanism must be acknowledged in developing economies since it is critical to strike a balance between acceptable and excessive risk-taking by the organization. For managers, according to instrumental stakeholder theory, environment-related policies and management decrease asymmetric information. Therefore, investors may segregate their long-term and short-term investment

horizons according to the firm's objectives. To achieve competitive advantage managers and the board of directors must consider investments regarding pollution prevention and environmental technologies. Also carefully evaluate the climate change sources that influence their company seek for means of hedging.

1.7 Plan of Study

The remaining thesis is organized and planned in the following ways. The next chapter number 2 'literature review' explains the past literature about environmental disclosure, idiosyncratic risk, and corporate governance index along with a theoretical foundation. Chapter number 3 'Methodology' gives insight into population, sample size, and empirical techniques used to analyze data to prove the hypotheses of the study. Chapter number 4 'Results and Discussion' explains the results drawn by using different empirical techniques on collected data, and also discusses the similar results obtained by previous studies. The final chapter of the thesis 'Conclusion and Implication' concluded with all outcomes of the study, the implication of the results for stakeholders, limitations, and future directions for researchers.

Chapter 2

Literature Review

This chapter explores the past literature on the impact of END and IR and analyzes the relationship among CG index, END, and IR. Furthermore, besides theoretical evaluation, this chapter evaluates empirical evidence of different variables including environmental disclosure, CG index, and other firm-level and country-level control variables on idiosyncratic risk from past literature. In recent years, companies and academic scholars have focused more on sustainability disclosure and reporting behaviors as consumer concerns about sustainability have grown (Ademi and Klungseth, 2022). At the end of this chapter, the study proposed a hypothesis based on previous literature and relevant theories.

2.1 Environmental Disclosure and Idiosyncratic Risk

Discussion of reporting and sustainability, there are many different words employed. Corporate social responsibility (CSR), environmental and social governance (ESG), and other phrases with similar meanings that are frequently used interchangeably encompass the subject of sustainability. ESG was a word used in earlier studies. Social sustainability (equitable pay, secure working conditions, etc.) and environmental sustainability (which includes emissions, waste, materials, etc.) are the

two main topic areas under the umbrella term "sustainability." Unless otherwise stated, "sustainability" refers to both social and environmental practices in the subjects mentioned below. However, the focus of this study is only on environmental sustainability disclosures. Although it is a known truth that climate change is occurring, we are unsure of what the financial costs will be. In the same vein, it is challenging to predict what the financial advantages of taking action might be. It would be challenging to estimate the net present value of initiatives aimed at climate change adaptation and mitigation, as well as those focused on more general environmental goals include the maintenance of healthy environmental systems, the prevention and recycling of waste, the control and prevention of pollution, the sustainable use of water and marine resources, and the shift to a circular economy. In addition, there is a great deal of uncertainty regarding the effects of moving towards or away from a low-carbon, resource-efficient, and circular economy. Therefore, it is necessary to address these problems as components of long-term risk. An organization's environmental burden and activities, including its objectives, policies, practices, and results, are described in an environmental disclosure document. It is frequently made available to the public and reported on. The concept of corporate environmental disclosure has become an important dimension in today's business world as commercial enterprises are expected to be both profitable and environmentally conscious (Ong et al., 2016). According to Chang and Zhang (2015), to create exceptional long-term strategies and be competitive in the market, businesses should give environmental information disclosure a lot of thought. They went on to say that corporate entities must disclose more environmental information if they are to effectively convey to stakeholders their level of environmental responsibility. In order to deal with pressure as a primary source of pollution, organizations need to increase the intensity of disclosure of environment related information. The term "END information" describes how financial statement users can learn about a company's environmental-related data actions. (Trumpp et al., 2015; Shi et al., 2017). The inefficiency of environmental information disclosure enforcement can be attributed to two factors. One rationale is that the constitutional framework, the implementation capacities, and the regulatory environment are all ineffective. Another factor is that companies are worried

about the cost-benefit analysis of environmental data sharing's (Zeng et al., 2012). It's possible that the cost of collecting, managing, and sharing environmental data outweighs its benefits. Inaccurate information or errors in reports can significantly raise costs, and revealing information about environmental measures and inefficient processes to competitors may harm a company's ability to compete with rivals and financially performance (Matsumura et al., 2014). Therefore, it makes sense to assume that organization will choose to increase their environmental disclosures when they are certain that the benefits will equal or even exceed the expenses. Higher CO2 emission intensity companies' equities produce better profits (Bolton and Kacperczyk, 2021). Green equities are, on average, underperforming the market, according to other evaluations based on publicly traded environmental portfolios. This conclusion would suggest that because investors are hedging a long-term environmental risk, they are ready to earn relatively less on these assets. The expanding volume of research has discovered a relationship between a number of corporate social performance metrics, including environmental performance, equity market performance, and corporate financial performance metrics (Brammer et al., 2006); (Qiu et al., 2016; Benlemlih et al., 2018). According to earlier studies, voluntary ESG disclosure decisions are influenced by corporate governance Dalla Via and Perego (2018), firm size (Li et al., 2021), and manager characteristics (Davidson et al., 2019). Researchers are still investigating how these disclosures influence investment choices. According to recent studies Burzillo et al. (2022), investors and analysts have difficulty evaluating sustainability performance using companies' disclosures. Kim (2022) discovered less evidence of an average reaction to these estimates for net zero emissions. However, his study showed that ESG-focused investors had a positive response, which is consistent with the fact that at least some investors rely on long-term environmental data.

More importantly, there are various ways in which environmental information deviates from financial disclosures. First, under the existing regulatory framework, both past and prospective environmental information is voluntarily shared. It is anticipated that many sustainable investment projects will have long-term effects. While businesses are increasingly using assurance services for their historical ESG disclosures Gipper et al. (2023), many potentially important environmental

disclosures are less easily verifiable due to the long horizons associated with forward-looking information. Given the long-term nature of the investments, investors may still rely on unverifiable environmental data (such as Kim (2022) if they request information about how businesses intend to continue operating over the decades. Keeping in view the findings of these studies, researchers have also been fascinated by examining the driver of the relationship. They devote considerable attention to the change in expected cash flows and output brought on by corporate social responsibility and environmental performance (Sharfman and Fernando, 2008; Oikonomou et al., 2012; Broadstock et al., 2018).

Previous Research, ESG Disclosure an increasing amount of research examines the causes and effects. According to earlier research, the factors that affect ESG disclosure are comparable to those that affect voluntary financial disclosure (Christensen et al., 2021). Past literature on ESG disclosure has discussed several factors or determinants of ESG like firm size, manager characteristics, sustainability performance, corporate governance etc. A considerable positive correlation between firm size and the volume or caliber of CSR disclosures is one of the most prevalent findings. This positive association can be explained by increased public scrutiny of large companies, which might encourage them to participate in CSR initiatives and report on those efforts (Li et al., 2021). Another element that is commonly linked to CSR disclosures is ownership structure. For example, a study discovers a favorable correlation between the choice to disclose standalone CSR reports and dispersed private-sector ownership (Höllerer, 2013). His study examined firm characteristics and voluntary environmental disclosures among oil and gas and industrial goods companies listed on the Nigerian Exchange Group (NGX).

According to signaling theory, asymmetry of information between various stakeholders and firms can be reduced if organizations provide transparent information about their actions to all stakeholders equally (Connelly et al., 2011). Disclosing information for personal gain and fame can be a cause of agency issue. Mangers should keep in mind the benefits of shareholder and disclose information in a way that increase the shareholder's wealth. Good corporate practices may help to resolve agency issues by providing equal and transparent information to all

stakeholders. Organization insinuate signal to investors especially signals of goods news like environmental disclosure, it can minimize the firm risk and increase return by reducing information asymmetric. Furthermore, according to legitimacy theory, firms may be less vulnerable to both internal and external distress as a result of environmental transparency, which enhances the relationship between the firm and its stakeholders. According to stakeholder theory, a positive relationship between the company and its stakeholders serves as a safeguard that helps it maintain a competitive edge, which ultimately helps it achieve its financial objectives. Organization take actions in the light of best interest of stakeholders. Society is the main stakeholder of any organization therefore action regarding betterment of environment wellbeing is ultimately legitimize the society.

The relationship between END and firm risk have been discussed in both positive and negative ways in the past researches. In the past many studies checked the relationship between END and IR (Longoni et al., 2015; Endrikat et al., 2014; Benlemlih et al., 2018; Qiu et al., 2016; Tzouvanas et al., 2020). IR also called unsystematic risk, specific risk, diversifiable or residual risk, is firm-specific or micro in nature. IR is defined as the standard deviation of error term or residuals of three years of the specified pricing models (Tzouvanas et al., 2020). Error term or residual be calculated from market and equity returns of every firm for each year, and then the calculated standard deviation of the error term or residual determines the IR through Capital Asset Pricing Model (CAPM) or other market factors.

Asset pricing models have been used for years by financial economists and investors to try to understand and forecast stock market returns. The CAPM was created in the middle of the 1960s. The CAPM, which initially worked well, models an asset's return as a function of market risk. With more investigation, it became evident that the CAPM could not account for some return trends, particularly those associated with non-market risk. Later on, Fama and French introduced other factors besides market factor like three and five factors which includes size factor, value factor, profitability factor, and investment factors. We can calculate an expected return using several models, from mean-adjusted, market-adjusted, and market models to more complex models that incorporate other variables to provide estimates of

risk adjustments (Brown and Warner, 1985; Dyckman et al., 1984). Armitage (1995) examines the various expected return models and methods for determining significance. The core concept of multifactor models is that the projected return on an asset depends on its systematic risk, which is quantified by several betas connected to the variables that explain it. Fama and French (1993) introduced a three-factor model as described in equation no 1 which includes Market risk, size, and value are the three factors that together determine predicted returns. Market risk is augmented by microeconomic variables such as the company's size and relative worth in relation to its book value, which are already accounted for in the Capital Asset Pricing Model and other asset pricing models. The size effect concept states that stocks with smaller market capitalizations yield higher returns than those with larger market capitalizations. According to the concept of value impact, equities with low book values perform better than those with high book values. Based on Fama and French's three three-factor model Charhart introduced a factors model in addition to the momentum factor in 1997. The equal-weighted average of the best-performing enterprises is subtracted from the worst-performing firms with a thirty-day lag to obtain the momentum component. The factor gauges a stock's propensity to move in the same direction as it did during the prior time frame.

$$R_{i,t} - R_{f,t} = a_i = \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 SMB_{i,t} + \beta_3 HML_{i,t} + \mu_{i,t} \tag{2.1}$$

After the three and four-factor model, Fama and French (2015) introduced the five-factor model (Equation # 2), which adds two microeconomic risk components to its multivariate expected return analysis. To estimate projected returns, the model also incorporates stocks with high operating profitability to perform better (profitability) and stocks of companies with significant total asset growth have returns that are below average (investment characteristics). Despite its flaws, the latter model provides a more accurate explanation of the anticipated returns on stock investments than the others.

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 \ SMB_{i,t} + \beta_3 \ HML_{i,t} \tag{2.2}$$
$$+\beta_4 \ RMW_{i,t} + \beta_5 \ CMA_{i,t} + \mu_{i,t}$$

Later on in 2018 Fama and French introduced a six-factor model (below as Eq # 3) by adding momentum factors besides market, value, profitability, and investment factors, as per the equation below:-

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 \ SMB_{i,t} + \beta_3 \ HML_{i,t} \tag{2.3}$$
$$+\beta_4 \ RMW_{i,t} + \beta_5 \ CMA_{i,t} + \ \beta_6 \ UMD_{i,t} + \ \mu_{i,t}$$

This study used a three and five-factor model to evaluate idiosyncratic risk. The long-term viability of a business is reflected in information regarding the firm's concern for the environment, society, and governance mechanisms. Investors are still primarily concerned with their return on investment, but they are also cautious of how their decisions may affect society as a whole (Amel-Zadeh and Serafeim, 2018). Environmental, social, and governance (ESG) factors offer more details about how businesses operate and assist investors in making wise choices. Information plays a crucial part in making informed decisions since it reduces the element of risk (Grewal et al., 2019). Because it raises the cost of running a business, both financial and non-financial information also exhibits certain costs to businesses and shareholders. As a result, the method needed to provide the information costs the agency money and adds to shareholder costs. Any economic choice includes risk in some form, and conventional finance is predicated on the idea of risk. The traditional financial approach is predicated on making the best choices. Future outcomes are still unknown, therefore estimating probability and making predictions remain difficult (Bell, 1982). As a result, in a risky setting, future outcome probabilities are known. However, probability does not apply to uncertainty. Although the world is best described as uncertain, risk is assumed in mainstream finance theories instead of uncertainty. The conventional perspective on investor decision-making supposes that investor behavior demonstrates the element of rationality. This idea that traditional financial assumptions are rarely suggested in a genuine corporate setting is supported by previous investigations.

Therefore, behavioral finance is a different paradigm that studies observable human behavior and creates models that describe how investors make wise economic decisions (Acquisti and Grossklags, 2005).

Investments made on the stock market are exposed to uncertainty rather than just risk. The behavioral finance theories consider uncertainty while the classical theories of finance presume risk. The companies that are listed on stock exchanges send out several cues to influence the risk tolerance and individual behavior of investors. Investors who are receivers should use these signals to reduce uncertainty and information asymmetry. The firms' disclosure procedures control the quality of their signals, which in turn control their standing and perception in the eyes of investors. Investors heavily rely on company disclosure to help them make wise decisions. Investor financial and investment decisions continue to be heavily influenced by the quality of information disclosure. However, there is currently little proof that the signaling theory is valid in the context of stock market investing.

Previous studies have discussed idiosyncratic risk with different variables in their cause-and-effect relationship especially in the context of risk and returns. Because investors diversify this risk, asset pricing theories predict a relationship between systematic risk and return but none between idiosyncratic risk and return. The traditional asset pricing assumptions, which show a relationship between idiosyncratic risk and asset prices, conflict with empirical investigations on idiosyncratic risk or volatility. Earlier few studies has discussed positive relationship between END and firm risk (Lin et al., 2014; Wu et al., 2016). Whereas, on the other hand, the various past studies suggest that there is a negative relationship between END or CSR and firm risk (Cai et al., 2016); (Utz, 2017). We start our discussion with the fact that company risk and corporate environmental disclosure are positively correlated. The primary cause of this relationship is the enormous cost bear by organization when they take environmental support initiatives. Moreover, firms are faced with criticisms by shareholders for increasing costs and reducing returns (Brown and Deegan, 1998). Furthermore, An additional justification offered by the theory of managerial opportunism regarding the positive correlation between social and environmental performance and IR (Bouslah et al., 2013). Previous studies

discussed and proved the both positive and negative relationship between END and IR, which is briefly explained as follow:-

2.1.1 Negative Association between END and IR

Past studies discussed positive and negative relationships between END and IR. Few studies show a positive relationship between environmental disclosure and firm risk, several studies, on the other hand, suggest that there is an inverse association between END and firm risk. In terms of negative theoretical justification, environmental disclosure reduces information asymmetry and sends investors in the direction of environmental sustainability. Likewise, when a company discloses its social responsibility, the government eases the burden on it to comply with environmental regulations (Bouslah et al., 2013). The negative framework between risk and environmental disclosure can be expressed through stakeholder theory. The theory backs up the idea that environmentally friendly companies have stronger ties to suppliers, customers, shareholders, workers, and the government. Additionally, it minimizes operating costs and improves the financial and managerial performance of the company (Jones, 1995). Social and environmental policies significantly minimize both systematic and idiosyncratic risk within the framework of stakeholder theory Salama et al. (2011); Oikonomou et al. (2012). Reducing risk ultimately increases the return of the organization which is the ultimate objective of organizations and their stakeholders. The negative relationship between END and firm risk suggests that businesses ought to contribute to the community and educate people about their environmentally friendly practices. This ethical approach in firms is endorsed by legitimacy theory. By disclosing environment friendly actions and information, businesses can fulfill societal expectations and justify their corporate responsibility. So legitimacy and stakeholder theories support the negative association between END and IR.

In past studies inverse association between END and firm risk has been discussed by many researchers (Bouslah et al., 2013; Cai et al., 2016; Petitjean, 2019). They argue that higher disclosure lowers risk, which boosts the company's financial success.

Previous researches have made public the effects of social and environmental initiatives as well as how managerial choices might change the investing behavior of investors. Current study is closely related to Tzouvanas et al. (2020), they use multiple regressions to investigate the relationship between idiosyncratic risk and END in balanced data from 288 enterprises across seventeen European nations between 2005 and 2016. They found that transparent environmental measures, as assessed by CEOs, had a negative correlation with idiosyncratic risk. This correlation decreased idiosyncratic risk of investment due to the benefits of diversity. In the same way, Benlemlih et al. (2018) observed the connotation among corporate social and environmental disclosures and systematic risk, idiosyncratic risk, and total risk. They collected data from 1,620 firms of British companies for the period 2005 to 2013. Even while the study found no correlation between a firm's Environmental and Social disclosures and its systematic risk, the results showed a negative and substantial connection between these disclosures and a firm's idiosyncratic risk and total risk. This new research confirms predictions made by the resource-based view of the firm and the stakeholder theory, which holds that companies that disclose environmental and social issues in a comprehensive and objective manner encourage corporate transparency, which can help build stakeholder trust and a positive reputation. This in turn can reduce the operational and idiosyncratic risk for the companies. According to the stakeholder hypothesis, investors find it more challenging to accurately determine a firm's worth the higher a firm's volatility or risk. In this regard, businesses might lower their risk by making more voluntary disclosures (such as disclosing environment related information) to meet the information needs of the stakeholders. Additionally, managers are supposed to operate the company with the highest moral standards and social responsibility. By increasing the quality of disclosures, a decrease in the information asymmetry component of the cost of capital can increase the volume of disclosures (Cormier et al., 2005).

Benlemlih et al. (2018) examined the relationship between risk measures such as total, systematic, and idiosyncratic risk and a company's environmental and social disclosures. For this purpose they collected data of non-financial companies from different sectors of UK, sample size was contained 1755 firm observations and time

frame was 2005 to 2015. Data was collected from DataStream and Bloomberg databases. Idiosyncratic risk was measure as standard deviation of the error term of calculating through CAPM and environment and social disclosure was taken from score developed by Bloomberg. Current study measure IR in similar method. Empirical analysis of the study discovered a negative and significant association between a firm's environmental and social disclosures and its total and idiosyncratic risk, despite the fact that there is no correlation between a firm's disclosures and its systematic risk. Study results are in linve with the resource based view and stakeholder theories. The resource-based view of the firm and the stakeholder theory, which holds that companies that provide comprehensive and objective environmental and social disclosures encourage corporate transparency, which may assist in the development of a favorable image and stakeholder trust, both predict these new findings.

Rezaee et al. (2021) discussed how risk and environmental disclosure quality relate to one another as well as if corporate governance practices affect this relationship. The study examined a sample of 127 companies that were listed on the Tehran Stock Exchange (TSE) between 2011 and 2016. They built environmental disclosure quality using the Global Reporting Initiative, which is widely accepted and utilized by numerous businesses worldwide. When evaluating hypotheses, OLS regression analysis is used after various business, industry, and year effects have been taken into account. Additionally, several analyses are carried out to determine how reliable the results are. Accounting-based risk is used to evaluate company risk. After taking into account endogeneity issues, the findings demonstrated that environmental disclosure quality significantly lowers company risk. Giving empirical support for the research on environmental disclosure quality and firm risk in other rich and developing economies can have a favorable impact on the global applicability of environmental sustainability disclosure. Additionally, the results of this study give investors significant information about the environmental performance of Iranian enterprises, enabling them to assess firm risk.

Mefteh-Wali et al. (2022) expanded their understanding of the impact of CSR on firm risk by examining the relationship between CSR and IR and how CSR

might be incorporated as insurance in a global risk management plan. The causal relationship between CSR and risk was examined first. Furthermore, Copulas were estimated to reinforce the current findings on the structure of the dependence between the various CSR activity aspects and IR levels. For empirical analysis, the sample included all publicly traded European companies from 2018 to 2020 that are included in the Bloomberg ESG database and for which full ESG scores are available. Then, 254 companies from fifteen different European countries. The date of weekly equity returns was collected from the Bloomberg database. The study employed established specific risk measures, realized the volatility of idiosyncratic, and predicted volatility of idiosyncratic generated by using EGARCH model, to quantify specific risks. After determining the series' stationarity, we use the Granger test to determine the relationship between CSR and the anticipated idiosyncratic volatility. In the second section, we use six Copula functions to determine the function captures the relationship between risk and CSR better. The primary findings revealed a direction of causality between CSR and IR, and the relationships between CSR and recognized IR were modeled. This finding shows that CSR cannot be simply employed as an insurance mechanism to reduce standard risk, even if the relationship is largely negative. Our findings, however, imply that CSR can serve as a defense mechanism against extreme business occurrences.

Cai et al. (2016) studied theoretical and empirical analysis of the relationship between firm risk and corporate environmental responsibility. They created and put to the test the cross-industry variance, resource constraints, and risk reduction hypotheses. After accounting for several business variables, they revealed that corporate environmental responsibility participation has an inverse relationship with firm risk for all United States companies throughout the period 1991–2012 using a large U.S. sample. They utilize firm fixed effect, a different corporate environmental responsibility metric based on PCA, or downside risk assessments, the conclusion is still valid. To address the problem of endogeneity bias, they used a system generalized methods of moment regressions approach, and discovered that risk is lower for enterprises that care about the environment. These results are in line with the hypothesis that END may reduce the firm risk, as well as the idea that senior management in American businesses is often risk averse and that

their corporate environmental responsibility engagement helps them manage risk. This cross-industry study also found that, in contrast to the service sector, where corporate environmental responsibility tends to raise company risk, the inverse corporate environmental responsibility risk association is primarily driven by the manufacturing sector. Results of the study revealed that firm risk is negatively and significantly associated with corporate environmental responsibility engagement for all companies after controlling for firm characteristics using a variety of econometric techniques, including OLS, fixed effect regressions, and PCA and to measure the idiosyncratic risk used CAPM beta and Fama and French market beta. Additionally, the study employed the simultaneous equation methodology and dynamic system GMM to account for the endogeneity problem. The fundamental finding that there is a link between corporate environmental responsibility engagement and firm risk is still valid. Overall, the results did not support the resource-constraint explanation but did support the risk-reduction concept. In the manufacturing sector the study support risk minimization, particularly in large manufacturing industries, in the cross-industry analysis. So, the number of the studies supports the negative association between corporate END and firm risk. After a detailed discussion of the negative relationship between END and IR, the study discussed the positive relationship between END and IR in the next session:

2.1.2 Positive Relationship between END and IR

The incorporation of sustainability or environmental disclosure into operational and management strategy has positive impacts in a competitive market: It strengthens the ties with stakeholders, lowers the ex-ante cost of capital, improves operational efficiency, and enables analysts to make more precise future projections for the company. Therefore, in general, it minimizes idiosyncratic risk and operational uncertainties. However, organizations should pay the bill for putting sustainability investment rules into place. Resources, financing, operations, and principal-agent conflicts are among the many expenses. As a result, there must be a sweet spot where the benefits of CSR outweigh the drawbacks. The advantages of CSR outweigh the disadvantages only below this threshold. As a result, a non-linear link

between CSR and IR is predicted. The majority of research on the CSR-risk nexus has emphasized a linear link. Few researches discussed the positive relationship with sustainability or CSR. The relationship between CSR and risk is not always linear; rather, it is curvilinear, according to (Farah et al., 2021). Since CSR has dual effects on a firm's costs and benefits, its impact on operating leverage and, by extension, its systematic risk, is nonlinear. In other words, because of the additional operating costs associated with CSR fulfillment, the firm's beta should increase. When it reaches a reasonably high level, it will then begin to lower beta. Second, (Li et al., 2021) demonstrate that CSR can have a negative impact on idiosyncratic risk, although the link is U-shaped. Besides the positive, negative, and curvilinear association between END and firm risk, there is also evidence of mixed effects. Benlemlih et al. (2018) presented conflicting and mixed results and revealed that there is no relationship between sustainability and systematic risk.

Companies that have implemented ESG measures have an incentive to proactively reveal their efforts and results, for example through ESG reporting, to signal their conformity with social norms, in addition to preventing bad incidents that could jeopardize their license to operate. One may think that by reducing information asymmetry between businesses and outside stakeholders, the idiosyncratic risk for these businesses should go down. (Reber et al., 2022) started by thinking about the positive correlation between risk and environmental disclosure that is favorable. Due to the additional costs that businesses must bear while also subjecting them to unwarranted criticism, the supportive theoretical framework can be justified (Brown and Deegan, 1998). The managerial opportunism theory offers another reason for the positive relationship between social performance and risk (Bouslah et al., 2013). The principal-agent dilemma, when the latter acts independently of the principals and disregards their goals, is being discussed ((Jensen and Meckling, 1976). Specifically, managers who want to be seen as environmentally conscious managers may over-disclose environmental actions for symbolic reasons. These disclosures will raise investors' anxiety, which leads to uncertainty. For companies to agree to share this kind of information, disclosure must be supported with "good" environmental performance (Lee et al., 2015). High environmental costs would be associated with operating "green" for manufacturing companies. Because the

benefits and costs are directly correlated, manufacturing firms will eventually be at a competitive disadvantage (Wagner, 2005).

Farah et al. (2021) examined the relationship between CSR and firm risk. They had stance that relationship between CSR and firm risk is not necessarily linear, it can be non-linear or curvilinear. As per their study the level of operating leverage exhibited by organizations as a means by which CSR can impact on systematic risk in a nonlinear way. They selected worldwide 43 countries for empirical analysis, 4004 companies' choosed on the basis of availability of ESG data for the time period 2005-2017. 26621 firm year observation were finally retained for analysis. Similar to current study the data of main variables collected from Thomas Reuter's database and data of country level control variables collected World Bank database. For empirical testing they used quadratic model in panel dataset and revealed that CSR and firm risk has curvilinear or U-shaped relationship. More precisely, These findings demonstrate that initially CSR and risk linear relationship as increases CSR increases the risk whereas, firms see a decrease in risk as CSR increases after pointing a certain threshold. A few macro-economic factors, such as the legislative framework and national level of CSR sustainability, modify the relationship between CSR and risk. It is believed that CSR initiatives entail implicit operating cost increases in exchange for obligations to non-investing stakeholders.

Lin et al. (2014) examined the influence of information transparency on idiosyncratic risk, for this purpose, they gathered data from Taiwanese bond markets for the period from 2004 to 2010. According to the study's findings, Information transparency has a positive correlation with IR and a company's credit rating, but it has no relationship with convertible bond returns. A company's idiosyncratic risk increases as it reveals a substantial quantity of information, whereas it decreases when there is less disclosure. Large companies, such as those in the S&P 500, whose environmental consequences are known to be enormous, receive questionnaires from the Carbon Disclosure Project (CDP). Investors will therefore probably recognize the companies being asked to take part in the CDP as major polluters who will soon need to invest in reducing their Greenhouse Gas (GHG) emissions and addressing global warming. Carbon emissions have generally been proven to have a negative

impact on business value. Due to the high anticipated cost of adhering to the growing regulatory requirements and other stakeholder needs related to carbon emissions (Matsumura et al., 2014).

Li et al. (2021) examined how the development of AI and operational effectiveness affect the relationship between CSR and idiosyncratic risk. For empirical analysis data was collected from 1,614 companies from 2010 to 2017, 10 industries, and 31 provinces, 12,912 observations altogether. In our sample, 58.86% of the companies have their headquarters in China's eastern coastline region, and 68.9% of them are in the manufacturing sector. They primarily gathered the information from four sources: the CSMAR and RESSET databases, Hexun for company CSR ratings, and Patentics for patent data about artificial intelligence. The empirical findings indicate that CSR can have a negative impact on idiosyncratic risk, but that, once it reaches a certain point, it turns on idiosyncratic risk and exhibits a U-shaped connection. Operational efficiency, for example, moves the U-shaped curve's turning point to the right, suggesting that companies with strong operational efficiencies can increase their CSR and reap greater benefits.

Lee et al. (2015) studied the relationship between disclosure and the stock market and shareholder value, it's still not clear how a company's stock value and disclosure of carbon emissions are related. Due to the following reasons, voluntary carbon disclosure by organizations may have a negative impact on the equity market: First, participation in the Carbon Disclosure Project or the disclosure of carbon information can be seen as a type of quasi-regulation that compels companies to willingly cut and control their greenhouse gases discharges in order to preserve their status and avoid being subjected to the government's strict oversight. Investors cannot effectively analyze firms' potential risks and possibilities related climate change due to the complexity and incompatibility of CDP information, it is not thought that disclosed carbon information is advantageous to investors. Costs play a key role in all strategies and actions aimed at achieving reduction objectives. For instance, if the corporation chooses to do nothing, any investment in green technologies that reduce greenhouse gases emissions constitutes an unnecessary additional expense. Such cost and risk related news is likely to attract more

consideration from investors than positive information about the advantages of climate change in a market where investors are unable to distinguish strong performance from bad ones using CDP information. Third, investors typically have a negative view of environmental protection. Negotiations over a global climate treaty have stalled due to the claim that a company's proactive action to decrease greenhouse gases emissions incurs more expenses for the company and reduces competitive edge of the industry.

Above mentioned studies, investigate the impact of END on IR, systematic risk, and total risk by using a sample of different sectors of economies by using different econometric techniques. Their results provided more evidence and sources that END minimize IR and systematic risk. As it advances an insurance-type argument, presents an alternative interpretation, in which disclosure investments serve as a safeguard against reputational hazards or significant business risks. The discussion proved both positive and negative relationship between END and IR but the majority of empirical research supports the negative correlation between risk and END. Most of the studies conducted on developed countries on environmental subject, have reported negative relationship frequently. Studies conducted by collecting data from UK have suggested that companies with strong environmental and social policies may have lower idiosyncratic risk ((Cotter et al., 2014; Sciarelli et al., 2023). This aspect can be linked to elements such as enhanced operational effectiveness and superior risk management resulting from an emphasis on long-term viability. As a result, there are less firm-specific shocks, like fines from the law or environmental obligations, and performance becomes more stable as time goes on. In underdeveloped and emerging economies like India and Pakistan companies do not follow the regulations regarding fully END, there are chances of more positive relationship. Despite this, by improving transparency and decision-making processes, corporate governance and board structure might lessen the detrimental effects of END on IR. Nonetheless, the results indicate that in order to fully utilize the risk-reduction potential of environmental and social disclosures, governance reforms in Pakistan are required. In case of India, the relationship between IR and END, and Governance (ESG) issues is the subject of significant research, especially when it comes to corporate performance (Roy and Saurabh, 2022). Adopting

environment and social practices has been linked to a lower the IR for firms, although as per many studies the relationship is not similar. On the basis of above mentioned theoretical and empirical literature particularly regarding Pakistan, India and UK, following hypothesis is proposed by the study.

H_1: Environmental Disclosure reduce the Idiosyncratic Risk.

2.2 Moderating Role of Corporate Governance Index

Another objective of the study is to investigated the relationship between CG Index and IR and evaluate the moderating role of the CG index between END and IR. In the context of strengthening the relationship of END and IR and to eliminate the asymmetry information study discussed the corporate governance index collectively. The agency theory takes into account a number of corporate governance and regulatory procedures, including as the board of directors, structure of ownership, and independent monitoring, that limit managers' self-interested and opportunistic actions (Dalton et al., 2003). This theory holds that corporate directors and executives, who are usually risk averse, manage the corporation to satisfy the interests of its many stakeholders. CSR disclosure tends to lessen business risk, according to prior research agency theory, which also shows that good corporate governance mechanism can prevent conflicts of interest between shareholders and managers (Jo and Harjoto, 2011).

Effective corporate governance lowers capital and agency costs, boosts the firm's reputation, and tends to make the organization more transparent. Management can minimize the asymmetry of information and increase transparency by enhancing governance system. Good CG also enhances cash flows, and share prices and removes asymmetric information Fernandes et al. (2018). Therefore, this study discussed the direct relationship between the corporate governance index and environmental disclosure as well as the moderating impact of the CG index with supporting evidence from past literature.

2.2.1 Corporate Governance and Environmental Disclosure

The goal of an internationally recognized corporate governance system is to reduce the agency problem and coordinate the actions of all stakeholder involved in the best interests of the principal and shareholders. This mechanism of CG system is more beneficial in minimizing agency issue and protecting shareholders' interests, particularly in economies where principal and agent disputes are prevalent (Wang et al., 2015). The primary focus of CG mechanism is on the interaction between a company's board of directors, management, and shareholders (Shleifer and Vishny, 1997). As discussed in precious sections that in response of environmental disclosure there may be chance of asymmetric information. Asymmetric information may result in a number of problems, such as unfair advantage for one side and inefficiencies in the market. Addressing or escalating information asymmetry depends in large part on information disclosure. Corporate governance can mitigate this issue as corporate regulations and procedures frequently encourage fair disclosure and transparency in order to reduce asymmetric information. This includes laws against insider trading, mandates that businesses give timely and correct information to all parties involved, and initiatives to improve financial market reliability and consumer safety. The goal of addressing asymmetric information is to provide balance helpful information to stakeholders and participant, promoting healthy competition, market efficiency, and trust. Good governance should increase accountability, responsibility, promote transparency, and eventually lead to greater disclosure both obligatory and voluntary. Thus, study evaluated how well governance structures affect voluntary disclosure, especially environmental disclosure.

Jizi (2017) studied how board membership relates to a firm's social and environmental disclosure as well as the execution of social policies, Study provided empirical support for escalating CSR literature. The findings demonstrate that more board independence improves the transmission of firms' good citizenship image by boosting societal conscience using a sample of FTSE 350 corporations over the years 2007 to 2012. The findings of the paper also demonstrate that the establishment of ethical principles and CSR engagement and reporting are

positively impacted by the presence of women on boards. As a result, the research implies that boards with greater independence and female representation increase the credibility of CSR reporting. Independent and diverse boards help the company focus some of its limited resources on social projects that maximize value and then report on those projects.

Jizi et al. (2014) examined the different component of corporate governance on CSR disclosure, for this purpose they used national commercial banks listed in of US stock exchange. In this regard they focused on the board of directors about corporate governance of the firms after the financial crisis of 2007–2008. Examine the CSR disclosures in the annual reports of US national commercial banks from 2009 to 2011. They removed non-financial or semi financial institutes like national saving institutions, and credit unions etc from our considerations to concentrate on financial institutions that offer comparable services and transparency requirements. The 193 banks that make up the study sample now have total assets ranging from $0.048.00 billion to $2,223.00 billion. The study further refined our sample by removing any banks with less than $1000.000 million in total assets to guarantee that banks are subject to comparable levels of regulatory scrutiny and public awareness. 107 commercial banks listed in US equity markets were included in the initial sample that was chosen using the predetermined criteria each year. The CSR data came from the 2009 to 2011 annual reports of the banks. Additionally, information on onboard activities and membership was collected through linked proxy statements and annual reports for the institutions. Financial information was obtained from the 10-K forms and websites of the banks as well as the Thomson One Banker database when appropriate. The study provided evidence that the two board characteristics (i.e. BI and BS) are positively correlated with CSR disclosure and typically connected to the protection of shareholders' interests. This indicates that independent and large number of board of directors in internal corporate governance arrangements promote the shareholders' interest and other stakeholders regarding CSR disclosure. This study also suggested that CEO duality has positively affects the CSR disclosure. These findings are supported with agency theory, as strong CEOs may increase disclosure of CSR initiatives for their gain. Whereas, this might suggest that prominent CEOs are under extra pressure to

allay stakeholders' worries that they might misuse their position by disclosing a lot of CSR information, it could also represent managerial risk aversion or managers' reputational worries. When the labor market, goods markets and capital market are not completely competitive, agency theory argues that managers may be capable and prepared to misuse their power to exploit the company's stakeholders as well as shareholders. When external corporate governance fails, it is expected that internal corporate governance processes, especially boards of directors will be vital in monitoring and disciplining management (Hermalin and Weisbach, 2001; Guest, 2008). Financial laws regarding services setups extends the legal responsibilities of bank directors to depositors and regulators, whereas boards of other organization (non-financial) corporations are typically required to regulate managers primarily in the shareholders' interest.

Arayssi et al. (2016) studied in their research how more women on a company's board of directors may affect corporate performance and environmental, social, and governance (ESG) disclosure. Between 2007 and 2012, all of the companies under investigation were included 350 index. Panel data are applied through a regression model, and Bloomberg social disclosure score is employed. The findings showed that the board duality has a positive influence on a firm's risk and performance by encouraging investment in worthwhile social endeavors and reporting on them. Increased risk-adjusted and buy-and-hold abnormal returns as well as decreased company risks, as determined by both return volatility and systematic risk, are the results of women on board's desirable effect on the ESG performance relationship. Studies contend that having more women on corporate boards improves firms' ESG disclosure and has a positive effect on the relationship between ESG and organization output. The 2014 UK corporate governance code recognizes the value of communication for efficient board operation and promotes board diversity to foster fruitful discussion. The guideline emphasizes how important a variety of viewpoints are for effective stakeholder involvement and plan delivery. A wider variety of perspectives, qualities, and talents are brought to board discussions as a result of changing gender dynamics on corporate boards, which enhances board performance. The possibility to hire talent from a bigger pool of workers who are

probably more client and market focused arises from increasing the representation of women.

Even though CSR activities are expensive for shareholders, managers may pursue them to boost their social standing. Therefore, CSR programs that shareholders see as reducing their wealth might raise business risk (Barnea and Rubin, 2010). The viewpoints on CG practices and CSR offered by agency and stakeholder theories are diverse. According to stewardship theory, management is responsible for actively and sustainably caring for all stakeholders and for managing financial, operational, human, social, and environmental capital in addition to strategic and operational capital (Rezaee, 2016). Stewardship theory brief that, stewardship procedures of management and CSR are highly correlated since paying attention to CSR domains enhances relationships with important stakeholder groups, which leads to improved overall performance. The fundamental premise of this idea is that CSR is a tool that an organization uses to utilize its resources more effectively.

Besides the connection between CG mechanism and firm risk, several studies investigated the relationship between CG mechanism and environmental disclosure. Fernandes et al. (2018) investigated the impact of the board of directors on the level of environmental disclosure, as board of directors is one of the major component of corporate governance. For empirical analysis they took 152 Brazilian companies listed in Paulo stock exchange, Brazil. They excluded financial and services sectors, only those companies taken into account having environmental disclosure for the period Oct to Dec 2016. For regression technique generalized linear model and generalized additive models (negative binomial distribution) used for analysis and revealed that The number of independent board members was statistically significant, indicating that more END and better administrative control can result from board independence. According to the age variables, END went up until the average age of sixty, at which point it started to decline. The synergy of experiences, knowledge, ages, genders, and other aspects that diversity on the board brings to the discussion can boost a company's ability to innovate, promote transparency, oversee administrators, and strengthen its END policy. These factors make the study's findings useful for the selection of board members. It is acknowledged

that individuals with the ability to lessen information asymmetry and encourage the voluntary END disclosure ought to be selected as members. Therefore it is necessary to discussed board size as part of CG index to examined the moderation between EDN and IR.

Giannarakis et al. (2020) examined CG elements that might influence the optimal of sustainability reporting. This research specifically aims to examine the environmentally sensitive aspects of different corporate governance elements, with regard to sustainable issues that influence the decision to create END. The study concentrated on CG as an explanatory variable since it establishes the guidelines and procedures for managing a business. They used five individual characteristics of corporate governance in their study including Audit committee frequency, Independent director's presence on the board, sustainable committee presence in board, independent directors and youngest director age. For empirical analysis, they used environmental, social, and governance scores calculated by Bloomberg to measure the environmental aspect. The 500 largest companies, as measured by market capitalization that are also listed on the NYSE or NASDAQ are included in the S&P 500 index. Data were obtained from the online Bloomberg database. The final study sample consisted of 278 enterprises due to the lack of company data regarding END and CG variables. Empirical results revealed that independent directors and the existence of lead independent directors keep strengthening the decision to enhance the environmental, social, and governance disclosure whereas, the youngest director has negative a significant impact on END.

Kathy Rao et al. (2012) examined the CG impact on the disclosure of environmental information by firms. For this purpose an environmental disclosure index developed based on information drawn by firms annual reports, as total number of words devoted to the environmental items was taken from annual reports of firms with an emphasis on the Australian corporate context. The size of the firm and the Board of Directors, board independence, and institutional investors were found to be important variables for the level of END information using a sample of 98 companies of Australia. These results indicate that, given the numerous environmental issues that confront society worldwide, boards comprising both independent and female

directors are likely to have a positive effect on companies' environmental reporting. This is significant for broader stakeholders as well as the general public. However, analysis revealed a positive association rather than a negative one between the level of END, institutional investors, and size of the board. This study revealed mix results regarding corporate governance, as some components have positive relationship and some have negative relationship with environmental information.

Gerged (2021) studied how environmental disclosure is influenced by internal corporate governance in Jordan companies. For this purpose study collected data from 100 non-financial enterprises of ASE from 2010 to 2014 with 500 firm year observations. Data were analyzed using dynamic system GMM regression models and linear panel quantile regression to determine the sample size, as to address and resolve the endogeneity issue in the this technique more suitable. He exclude financial sector from final sample, as per him financial sector have financial and corporate governance rules and regulation more than other sectors and second this sector has not directly influence on environment. Therefore, study selected industrial and service sector for analysis and got 50 companies from each sector for balance representation. He collected most of the data manually from annual reports of the firms publish in their websites along with some other sources like a Trade Mubasher and Perfect Information. According to the study, certain internal corporate governance elements like board independence, board size, board duality, and foreign ownership of board members have a positive impact on a company's END, while ownership concentration, managerial influence, and institutional ownership have a negative impact on END. Theoretically, by addressing the information asymmetry and encouraging the END information, board arrangements seemed to be more effective than ownership structures in decreasing agency issues. Particularly this study revealed that owners appeared more worried about possible share losses when it came to expended more budget on environmental disclosure, which may make them less willing to reveal environmental information about their organization.

Ezhilarasi and Kabra (2017) examined the impact of internal Corporate Governance on END information. They used components of corporate governance i.e. CEO

duality, board size, domestic institutional ownership and foreign institutional ownership for analysis. They selected 171 companies as final sample out of population 431 companies for the period 2009 to 2015 through stratified random sampling method on the basis of industry discharge most pollution. They measured EDN information by making index of END index, score used for index based on Global Reporting Initiative (GRI). Study applied panel regression empirical techniques for analysis and revealed that Corporate Governance mechanisms such as board size, board duality, foreign institutional, and overseas institutional have impact on END. The Securities and Exchange Board of India should require all companies to provide comprehensive financial and non-financial information on environmental matters in their periodic reports. Additionally, greater focus should be placed on enhancing the CG qualities of all companies in order to improve END. Similarly, there are number of studies in as well as in developing economies have looked at the relationship among various CG mechanisms and firm END (Giannarakis et al., 2020; Jizi, 2017; Kathy Rao et al., 2012; Ezhilarasi and Kabra, 2017; Akbas, 2016).

Board composition is an important aspect of CG; in this context, Independent directors appear to be essential in improving company image and ensuring that businesses are run effectively by executives. In that regard, past research on the impact of CG on sustainability reports looked into the function of independent directors as a stand-in for board independence. Independent directors don't take part in day-to-day business activities. Liao et al. (2015) explored the association between corporate governance and greenhouse gases discharge as a stand-in for END in the United Kingdom. A dummy variable was used to reflect involvement in the Carbon Disclosure Project as a stand-in for the choice to disclose GHG emissions during development. Higher proportions of presence of independent director on boards are associated with a greater ability to balance financial versus environmental responsibilities, according to a review of the 329 largest firms based on market capitalization in the United Kingdom. Some of the key findings concern the importance of the Board of Directors' independence, the variety of the Board of Directors' membership in terms of gender, and the existence of an environmental committee. A similar study conducted by Haniffa and Cooke (2005); Michelon and Parbonetti (2012) revealed that to ensure that organizational actions are in line

with social values or organizational legitimacy, it has been stated that independent directors forced corporations to share sustainability disclosure. They also revealed that having more independent directors on the board had a beneficial impact on the quality of CSR and environmental information.

Another aspect of the board's composition is the existence of the Lead Independent Directors. A range of tasks, including reviewing the agendas for board meetings and serving as the independent directors' point of contact with the CEO, are under the preview of this independent director. The Independent Director is chosen to serve as the representative of the independent directors and is given essential duties that are detailed in the corporate charter and bylaws. According to the agency theory, CEOs who also chair the Board of Directors are expected to behave in their self-interest, driving up agency costs. Consequently, the inclusion of a Lead Independent Director could result in a reduction in agency costs since its primary function is to uphold the reputation of corporate control. Although independent directors have been extensively studied in connection to the level of sustainable disclosure, no prior works have looked at the effect of having a Independent Director on firms' END (Giannarakis et al., 2020). Few theoretical and empirical researches have addressed the impact of independent directors on CSR initiatives in the French setting. According to various experts, a board's efficacy in handling non-financial disclosure must be assessed by its independence because it is directly correlated with the board's capacity for strength. Independent directors ensure corporate existence by using their skills, connections, and contracts to satisfy the stakeholders (Martínez-Ferrero and García-Sánchez, 2017). Independent directors help businesses achieve their strategic objectives and offer viewpoints that may influence a firm's readiness to publish transparent environmental information accessible to many stakeholders.

2.2.2 Corporate Governance and Idiosyncratic Risk

As per agency theory the relationship between corporate governance components and business financial risk is shown by the conflict of interest between principle

and agent. Jensen and Meckling (1976) Agency theory proposes that conflicts of interest between shareholders and management are the source of monitoring or agency costs and offers a framework for connecting disclosure behavior to corporate governance. For firms to operate efficiently in the financial markets, corporate governance is essential. Firms have developed a variety of governance structures to address agency issues brought on by ownership and control separation. According to the agency theory, there are two main reasons why managers don't take the best possible risks. First, managers are risk-averse and stay away from high-risk ventures that will increase in value. Second, managers lack adequate diversification compared to fully diversified shareholders because the majority of their financial and human resources are tied to their companies. Risk-averse and undiversified directors take on less risk than fully diversified shareholders would like them to in order to pass on good net present value investments. The consequent unfavorable risk-taking has a detrimental effect on shareholder wealth. Firms implement a variety of governance measures to encourage managers to accept the right amount of risk to reduce this issue. Controlling the likelihood of risk can be achieved by improving various aspects of corporate governance. The risk-taking behavior of a corporation is positively influenced by board independence and CEO duality, large board size having more approach on environmental resources, so it also minimize the risk as well (Akbar et al., 2017). Haider and Fang (2016); Pathan (2009) examined how board independence affected risk and discovered that having an independent board reduced a company's financial risk.

Hussain and Amir Shah (2017) studied the relationship between CG mechanism and firm downside risk along with the moderating role of socio political factors between CG and firm downside risk. Corporate governance contained important components, two components pertaining to audit quality, five pertaining to ownership structure, and three pertaining to board composition. To develop the socio-political index, the study used two proxies, terrorism and assassination, whereas CAPM is used as a measure of systemic risk and downside risk. In Asian marketplaces, ownership is concentrated in 2/3 of the companies. The issue of wealth extraction for minority shareholders is brought about by this circumstance. Therefore, the updated code of corporate governance mandates that listed businesses have an independent audit

committee and at least 1/3 of its directors be independent in order to protect the interests of non-controlling shareholders. Consequently, the effectiveness of board and audit committee features in controlling downside risk is studied. They also construct two indices for corporate governance index and socio political index by using PCA. Current study also construct CG index by using PCA, which is better than other methods. This study has investigated the link using the Arellano-Bond Dynamic Data-Estimation (System GMM) regression methodology using a sample of 201 non-financial enterprises from 2003 to 2014. The empirical results found that the Corporate Governance mechanism decreases the firm downside risk and the relationship between CG and firm downside risk moderates by Socio-political factors. Analysis of individual components of corporate governance revealed that board size and managerial ownership have positive significant impact on downside risk whereas, remaining components of pertaining to ownership structure and board composition structure have significant negative impact on firm risk.

Mathew et al. (2018) examined the relationship between business risk and the board of governance structure. Study created a CG index based on the board's composition, leadership structure, member characteristics, and processes, and it then investigates the relationship between the overall index and firm risk. For empirical evaluation, this study used a sample of 268 UK companies from the FTSE 350 index. Data on these companies were collected from different sources from 2005 to 2010. To represent the firm's total governance structure, an index is created. The index's regressions on three risk metrics are looked at. This study revealed a strong and adverse relationship between firm risk and the CG index, which combines the four sets of board qualities. The same results are also confirmed and supported by robustness tests.

Chakraborty et al. (2019) determined whether CG procedures differ in their impact on firm risk between companies listed in Canadian equity market and cross-listed Canadian companies which are listed on US markets. This study used empirical analysis technique was OLS and fixed effect model to investigate the impact of CG procedures on business risk. For empirical analysis, the study collected data of Canadian companies included in the S&P Combined Index for the time

period 2009 to 2014. The empirical results showed that some distinct variations between companies listed in Canadian equity market and Canadian companies that listed US equity market in terms of how these factors affect firm risk. In particular, we discover that CEO duality and insider ownership significantly affect risk-taking in those companies which are not only listed in Canadian but also listed in US stock market. Whereas, institutional shareholdings, ESG disclosure scores, and family ownership, on the other hand, have no discernible impact on cross-listed corporations' firm risk but do in Canadian-only companies. Canadian listed companies only and companies listed in US also both organizations are significantly impacted by board attributes like size, independence, and the board duality. According to the findings, cross-listing status dramatically alters how various governance tools affect business risk. CEO duality and insider ownership have little effect on managerial risk-taking in Canadian-only enterprises since corporate insiders have more power over Canadian firms due to more concentrated ownership and a pyramidal ownership structure. Family ownership, on the other hand, is only important for Canadian businesses because cross-listed corporations must operate in several capital market conditions. It offers additional proof of the viability of governance structures for companies those listed in Canadian equity market and US exchanges as well.

Jiraporn et al. (2015) conducted a similar research as one of objective of current study, they investigated the effect of Corporate Governance quality on risk handling behavior of firm. Studies offer evidence of how corporate governance affects the level of business risk-taking. Study governance indicators, which are offered by Institutional Shareholder Services (ISS), are among the most thorough in the body of literature. They used 62 governance components those consist of 8 dimension of corporate governance like board composition, director and executive education and payment, audit structure, ownership structure, progressive practices etc. they studied governance comparison with risk due to executives reward and freedom of managers regarding articulating corporate strategies. As per them Managerial compensation is often based on the performance of the company. Because of the structure of these contracts, managers are probably encouraged to take on greater risk in the hopes of earning higher reward. In this regard by the study refer most

recent financial crisis, in which executives were pressured to take much higher risks. It is anticipated that strong, efficient governance will shield stockholders from needless risk-taking. On the other hand, inadequate governance is unlikely to prevent managers from excessive commitment. To justify their argument they took sample of organization reported by ISS with 7015 firm year observation for the time period 2001 to 2004. Data of CG is collected from CRSP and COMPUSTAT database and for risk calculated standard deviation of daily returns. Empirical results proved that less risk-taking is a result of improved governance. All things considered, our findings show that good governance not only encourages but also substantially reduces risk-taking. They went on to say that companies with effective and well-designed governance structures avoid taking unjustified risks because they employ fewer hazardous strategies than companies with inadequate corporate governance mechanisms. Furthermore, study results revealed that the impact of governance dimensions on firm risk varies. Board ownership and compensation are some of the dimension with greater effects than others. The study also confirmed these results by robustness analysis based on a two-stage least squares (2SLS).

Nguyen (2011) examined how Japanese companies' risk-taking is influenced by corporate governance. He used family control, bank control, and ownership concentration characteristics of corporate governance empirically and theoretically. For empirical analysis, He took a sample of 1,252 companies across 27 industry sectors of Japanese companies listed on the TSE. Final data excluded financial institutions like banks, insurance companies' securities, etc. Because of this, as well as economic structure of Japan, the industrial and manufacturing zones are frequently overrepresented. Negative equity firms are also disqualified for their potential for taking excessive risks. The findings of the study revealed that bank-controlled businesses have considerably lower IR, which suggests that they have lesser competitive advantages and consequently are more dependent on favorable economic conditions to maintain their company's financial health, as was the case in Japan during the country's extraordinary post-World War II expansion. Firms with concentrated ownership and those under family control, on the other hand, show greater return volatility. These results imply that risk-taking is influenced by both increased interest alignment for family businesses and enhanced surveillance

intensity for concentrated ownership. Firms with concentrated ownership outperform other types of businesses when comparing their CG structures to firm risk taking strategies.

Wu et al. (2016) studied the corporate governance practices of publicly traded Chinese companies, their success on stock markets, investigated from 2001 to 2006. Data for this study comes from two of China's top publishers of financial market data, GuoTaiAn (GTA) and SINOFIN. 8742 observations make up the sample that was used to address the research topics. Study reported highlights the significant challenges that CG will confront and tackles current worldwide issues regarding transparent information and oversight, the lack of which is one of the main causes of the current financial crisis. They investigated if establishing a distinct supervisory body that isn't a part of the board of directors can enhance information sharing. Findings, which are corroborated by data from equity markets of China, demonstrate that having a distinct and functional monitoring organ raises the level of IR, provided that the legal framework is sufficiently robust and the monitoring organ's functionality is well-defined.

Rezaee et al. (2021) discussed how corporate governance practices strengthen or weaker the relationship between END quality and risk. To establish the relationship they used a sample of 127 companies of Iran from 2011 to 2016. Empirical findings of the study revealed that the inverse association between END quality and business risk is weakened by board independence. For the other board variables, such as CEO duality and board size, however, no meaningful result was discovered. The findings contradict the claim that enhanced board independence enhances management monitoring and permits more efficient risk management in the context of Iranian governance due to two reasons. In Iran, the demand for board independence and the appointment of more independent directors are essentially formalities that have no influence on enhancing END by businesses and, consequently, risk minimization. This is because it is difficult to define exactly what constitutes an independent director. Second, these findings support the managerial-incentive theory, which contends that managers are not motivated to be affected by independent directors. Due to the direct involvement of directors and executives in corporate decisions,

Corporate Governance practices may moderate the association between EDN Quality and business risk. The influence of CG practices on the link between END Quality and risk is ambiguous, and it is yet unknown if corporate environmental reporting and Corporate Governance practices together affect firm risk. The CG index was employed in this study because of the large number of Corporate Governance attributes and their multidimensional correlation with one another. Another reason to use the corporate governance index is that the study wants to guarantee that our variables are independent of each other. PCA is used to construct the CG index. A tool called PCA is used for feature extraction or to shrink the size of your feature space. When there are several variables and it is challenging to understand how each one is related to the others, this technique is employed. Additionally, it is employed when there are a lot of variables and there's a chance that the model may be over fitted. The index for this study comprises BI, BS, BD, and BM, which are explained in detail as follows.

2.2.2.1 Board Independence

From the perspective of agency theory, boards with a high proportion of independent directors are believed to be more adept in supervising and controlling management. Therefore, it is anticipated that they will be more effective in guiding organization toward long term initiatives that enhance firm worth and a high level of transparency. Since they are not directly involved in the creation of the company's strategies and business policies. It is anticipated that independent directors will assess the performance of management more accurately than CEOs. Furthermore, compared to associated non-executive directors and executive directors with economic ties to the company, independent directors rely less on the goodwill of the CEO. Consequently, it is anticipated that having a larger percentage of independent directors on the board will improve management oversight and control (John and Senbet, 1998; Cheng and Courtenay, 2006). Furthermore, the income of independent non-executive directors is irrelevant to the company's growth and financial wellness, in contrast to that of CEO and affiliated non-executive directors'

business prospects. Therefore, independent directors are supposed to be less concerned with achieving short-term financial objectives and more drawn to actions that improve a company's long-term viability, like participating in and disclosing CSR (Ibrahim et al., 2003). Therefore, it is envisaged that banks with independent boards will engage in CSR and report on CSR activities more frequently (Arora and Dharwadkar, 2011). Independent directors appear to be more in favor of companies investing in CSR initiatives, according to empirical study (Johnson and Greening, 1999).

Many studies discussed board independence and firm risk with different scenarios such as Vallascas et al. (2017) established how increased board independence encouraged banks to take on less risk after the global financial crisis. Similar conclusions are drawn from the Enterprise Risk Management (ERM) literature, which shows that one factor influencing ERM implementation is having an independent board of directors (Desender, 2011). Similarly Dah and Jizi (2018) examined the board independence influence on social disclosure and firm risk. Results indicate that social disclosures are increased by greater board independence. We also demonstrate that the existence of independent directors on corporate boards positively impacts, the effect of social disclosure on the risk and performance of the company. Thus, we show that board independence affects the CSR-firm performance association positively in addition to making it easier for enterprises to report on their corporate social responsibility. Board independence increases the credibility of the information revealed and strengthens its signaling power about the company's prospects for the future, which improves the effectiveness of CSR reporting. The primary concepts of the UK corporate governance law, which promotes enhanced board independence for the efficient fulfillment of duties, are supported by our empirical data.

2.2.2.2 Board Size

Board size is one of the most crucial factors that may affect the board's actions and, ultimately, the results for the company. Smaller boards size are frequently

seen to be more adept at overseeing and managing management than bigger boards due to group dynamics. Owing to their smaller size, they should gain from improved individual board member dedication and accountability, as well as more effective communication and coordination (Dey, 2008). The disadvantage of board size with small members is that workload of individual members are typically heavy, which may restrict the board's capacity for oversight (John and Senbet, 1998). Furthermore, compared to larger boards, smaller boards may be able to access a less diverse pool of experts, which may have an effect on the caliber of the monitoring and recommendations provided (Guest, 2008). According to empirical study, several criteria, such as the industry, firm size, and the intricacy of the organization's operations, influence the size of the board (Pathan, 2009). Upadhyay (2015) Investigated how board size affects corporate risk. Based on empirical findings, the average and medium firm's idiosyncratic risk is reduced by about 1.576% when one more board member is added, and in the context of total risk, it is reduced by 2.189%. Next, the study examined at the relationship between stock value and board size in companies with higher levels of long-term debt. In companies with higher long term debt-to-asset ratios, study found that board size has negative association with Tobin's q. Above mentioned literature regarding board size depict that enhancement in corporate governance through board size reduces the firm risk, as increase in board members could play a role for transparency, environmental disclosure and better governance.

2.2.2.3 Board Duality

Board duality is the CEO of the firm serving as both the chairman of the board and the CEO. According to agency theory, a CEO who also serves as board chair may have negative influence on the success of the company. Because he/she has the power to choose directors for the board who are easy to control through influence and who have the freedom to make their own decisions. Taking steward theory into account, chairman duality may work better due to uniform and concentrated command on the board, which improves decision-making (Finkelstein and D'aveni,

1994). Their research creates a dummy variable to measure CEO dualism, with a value of 1 for CEOs who also serve as company board chairs and 0 otherwise.

According to agency theory, managers' interests are probably going to affect how much CSR they do and disclose. Board duality in this context might be interpreted as a symbol of management power as well as a tool. CEOs with a strong track record or significant ownership of the company's shares are expected to be employed as chairmen of the BoDs (Hermalin and Weisbach, 2001). Additionally, CEOs who simultaneously serve as board chairs have the power to conceal important information from other directors, especially non-executive ones, because they may establish the agenda and control the information shared with other board members (Krishnan and Visvanathan, 2009). CEOs may be able to effect board appointments in their favor by serving as chair. In light of this, non-executive directors may be more interested in accepting decision-making against their better judgment to keep their positions on the board by avoiding conflicts with strong CEOs (Dey, 2008). Alabdullah et al. (2019) examined the association amon board size, board duality, and CSR disclosure in Malaysian companies. Empirical results exposed that board size has a positive relationship with CSR disclosure whereas board duality has negative relationship with CSR disclosure.

2.2.2.4 Board Meeting

The annual meeting attendance of a corporation's BoDs is known as the number of board meetings. Typically, a company holds four meetings a year, separated by a minimum of twelve months. More than the stated numbers exist in certain instances. The primary corporate functions such as firm performance, risk, auditing, human resource development, and short- and long-term company goals are discussed during the board meeting, which is chaired by the chairman of the board. Board Meeting is another significant aspect of the board values. While some studies claim that board meetings help in decision-making, others have claimed that because of a shortage of time or associated costs, these sessions are not always helpful. The connection between the board meetings and idiosyncratic risk is yet to be considered. Therefore,

when building a corporate governance index, we also take board meetings into account. Eluyela et al. (2018) demonstrated that increasing the number of board meetings enhanced business performance. They recommended that the company hold at least four more board meetings a year. Counting the number of board members present at meetings is one of the simplest ways to assess the performance of the board. They perform their responsibility of monitoring and advising the firm more intensely the more meetings they have. Furthermore, Chou et al. (2013) revealed in earlier research that board meetings improve the success of the company. It is emphasized, therefore, that the board members ought to attend the meeting on their own and not through a representative. They utilized two proxies, to investigate the board meeting variable. The first proxy is the proportion of board meetings that a director personally attends, and the second is the proportion of board meetings that a director's designated representatives attend. The annual reports of the organization and financial institutions have three board meeting details. The first is the quantity of board of director internal meetings. The number of meetings between a board of directors and an executive board is the second. The attendance rate for both of the previously described types of meetings is the last. It is mentioned that the annual number of board of director meetings has an inverse impact on company value when discussing the effect of board meetings on firm output. The unusual board monitoring points to the company's underwhelming performance from the prior year, which will be improved in the following year (Brick and Chidambaran, 2010). However, other studies discovered that the board meeting had a favorable effect on the performance of the company (Gafoor et al., 2018; Eluyela et al., 2018). Numerous CG factors, including BS, BI, number of meetings, and board duality are taken into consideration when developing the CG index in the current study. An empirical investigation of the association between the CG index and the firm's idiosyncratic risk along with the moderating role of the CG index is our main contribution to the field. To create CG Index, we take into account four fundamental corporate governance characteristics rather than simply one. Past studies mostly discussed corporate governance characteristics individually to examine the cause-and-effect relationship of corporate governance. Different

CG structure such as size of board, Insider shareholdings, board independence, Board Meetings, board gender, CEO duality and Institutional ownership etc. There are different methods to construct the index for corporate governance. The survey method is one of them, several studies used this method to construct a CG index (like (Ertugrul and Hegde, 2009; Black et al., 2006), for data collection they conducted a survey and constructed a corporate governance index based on a survey response. Moreover, governance scores created by different rating agencies can be used as a corporate governance index. The Corporate Library (TCL), Institutional Shareholder Services (ISS), Governance Metrics International (GMI), and Standard & Poor's (S&P) are the leading rating agencies in the US. These organizations evaluate the integrity of public companies' governance procedures using a proprietary score system. These governance rating companies typically serve large investor groups as their clientele. Furthermore, these governance scores have gained popularity and influence among regulators, client firms, and retail investors since the recent corporate crises. Surprisingly, though, not much systematic research has been done on the usefulness of these third-party governance ratings in evaluating the success of businesses. A questionnaire built on the Standards & Poor's Governance, Management, Accountability Metrics and Analysis (GAMMA) approach was used to get the score. Besides the survey method, Javed et al. (2006) created the CG Index by utilizing an average of three years' worth of corporate data and accounting for key factors including the board, ownership, and shareholding, as well as transparency, disclosure, and auditing. Moreover, these considerations were broken down into several subheads, and the CG Index was created using a subjective scoring system that ranked the firms on a continuum of adherence to the norms from 0 to 100. The most common method to construct a CG index is Principal

Component Analysis (PCA), which is also used in this study. Tarchouna et al. (2017) applied the PCA approach to determine a CG index. PCA offers a lot of benefits. First, this research enables us to create a special corporate governance index by combining the data already present in each organization's corporate governance features. Secondly, when many corporate governance variables are individually included in the same model, PCA can account for issues with multicollinearity.

Given that various corporate governance measures may function as stand-ins to reduce agency concerns, it is crucial to account for any potential interrelationships between corporate governance variables (Weir et al., 2002; Lasfer, 2006). The PCA also has the benefit of automatically generating the weights for each corporate governance variable. As a result, the corporate governance index can account for a greater proportion perceived of the deviation in the collection of CG factors. Therefore, it is not necessary to predetermine the weights. This study constructed a CG index by using PCA to assess the entire corporate governance framework of non-financial companies of Pakistan, India & UK. By providing additional resources, good corporate governance strengthens environmental campaigns and motivates management to implement social and environmental policies that minimizing business risk. Through monitoring, corporate governance is a process that directly impacts managers' actions and the performance of the company. The relationship between END and IR is therefore improved by the best practices of CG. Thus, the association between management behavior and business returns are found to be moderated by the corporate governance index, which is made up of the BS, BD, BM, and BI. Discussion in above mentioned paragraphs, we proved that better corporate governance structure can reduce firm risk (total risk, systematic risk an idiosyncratic risk) by improving and enhancing the environmental information. One of the objective that 'CG index has significant negative impact on IR' has been proved by several above mentioned studies. As per above mentioned discussion study justified that CG index has significantly influence on END, therefore, we can proposed the hypothesis that CG index can moderates the relationship between END and IR. Study proposed following hypothesis on the basis of above theoretical and empirical past literature.

H_2: CG Index has a negative impact on IR.

H_3: CG Index moderates the relationship between END and the IR of the firm.

2.3 Control Variables

By observing past studies on similar topic, the current study also controlled the influence of some other firm-level and country-level variables. A firm's performance

may be threatened by these circumstances (i.e., macro) favorably or negatively. Although management has some control over micro factors, it does not influence macro factors.

2.3.1 Firm Level Control Variables

Besides the main independent variable i.e. Environmental Disclosure and corporate governance index several other variables can influence on dependent variable i.e. idiosyncratic risk. Based on the past literature, the study took up some other determinants of idiosyncratic risk as control variables. As leverage, firm size, firm age, and sales growth are taken as firm level control variables (Dioha et al., 2018). Current study objective is to examine the direct relationship between END and IR and between the CG index and IR besides the moderating role of the CG index. Based on past literature some microeconomic variables like firm size, firm age, leverage, and sales growth is controlled by current study.

The firm's volatility may be influenced by firm size. It has been noted that large businesses face less adverse selection than small businesses because there is more information available about them. The financial portfolios of the larger companies are more varied. Large companies therefore experienced consistent and less unpredictable cash flows. Ahmad (2011) provided evidence that a key factor influencing a company's performance is its size. He has demonstrated how positively firm performance is impacted by firm size. Benlemlih et al. (2018) control firm size which is determined by taking log (ln) of total assets, into account. They anticipate a negative correlation between firm risk and size. Previous research suggests that because large organizations are better able to manage risk, particularly during periods of high volatility, they are less vulnerable to risk.

The proportion of short term and long term debt to total assets is used to calculate leverage. Higher leverage may be linked to higher firm risk, according to prior research. Debt holders believe that companies that use a lot of leverage financing are subject to greater scrutiny. Accordingly, this monitoring practice lessens the

firm's asymmetric information Harris et al. (1991). However, several researchers countered that high levered firms tend to emerge more widely throughout cross-sections. The explanation for this is that the company's lenders have the right to demand funding from them at any time. Thus, a correlation between a firm's leverage and risk is anticipated to be positive; return on assets serves as a proxy for profitability. More profitable companies, according to prior studies, are less dangerous (e.g. (Jo and Na, 2012). Wiyono and Mardijuwono (2020) studied the impact of different firm-level variables on firm risk. The study used data from 2016 to 2018 for this purpose and revealed that leverage had a considerably negative relationship with risk, whereas profitability and firm size had a significantly positive relationship with risk.

Benlemlih et al. (2018) revealed that, our results showed that firm size has a positively correlate with systematic risk and a negative correlation with total and idiosyncratic risks. Second, riskier companies tend to have larger levels of leverage, presumably as a result of greater probability of default. Third, the coefficients on firm return on assets load all three measures of firm risk are negatively and statistically significant.

Leverage is determined by dividing the total liabilities which include market value of short term and long term liabilities. As a measure of financial risk, leverage is anticipated to be positive as riskier businesses typically carry huge debt financing (Mallin and Ow-Yong, 2012). Increase the value of leverage suggests that investors take on a lot of cash flow risk, which raises the volatility of equity return.

Another control variable of the study is firm age, which is determined by counting the years that the business has been in operation. According to some experts, firm age begins at registration. The current study has employed the method that Gul et al. (2011) previously used to count the firm's age from its listing on the stock exchange. Fink et al. (2004) demonstrated that the age characteristics of the enterprises that make up the market affect the variability of idiosyncratic risk. Notably, the increased tendency of companies to issue public equity at an earlier stage of their life cycle accounts for the rise in idiosyncratic risk during the last forty

years. Over this period, the idiosyncratic risk of the ordinary public corporation has increased, which is not surprising, as the equity of young enterprises implies a claim on cash flows that are further into the future. Their findings also contribute to our understanding of the associated losses in survival rates, return on equity, and earnings quality within the same period. Rujiin and Sukirman (2020) investigated in their study how business risk management disclosure is impacted by firm age, leverage, profitability, local individual ownership structure, international ownership structure, and domestic institutional ownership structure. An IDX-registered manufacturing firm from 2013 to 2017 made up the study's sample for statistical analysis. Study concludes that the only factors that significantly positively affect enterprise risk management disclosure are firm age and size, which depict that the more years a firm has been in business and the larger its size, the higher the disclosure. Larger companies have more diverse business operations, which

reduces individual risk. Study used log of the overall assets as a size proxy (Cai et al., 2016). Risk and profitability are connected. Return on assets, a proxy for financial profitability, assesses the firm's capacity to make money from its assets. High profitability could serve as a warning to buyers about the financial strength of the firm (Mishra and Modi, 2013). The yearly growth rate of total sales is another indicator of profitability because growth shows the company's cash flows, which is anticipated to lower risk (Ang et al., 2006). All other control variable coefficients usually have the expected signs. Higher investment in R&D is favorably correlated with firm risk, larger firms are less risky, and negative relationship between market-to-book and risk found. Leverage (Chakraborty et al., 2019). As we discussed above, the past researcher studied several firm-level control variables that influence idiosyncratic risk. Studies proved these control variables theoretically and empirically. As aforementioned in view this study controlled the impact of firm age, firm size, sales growth, and leverage while examining the relationship between END and IR. Similarly study controlled the impact of these firm-level control variables during empirical evaluation of the corporate governance index and idiosyncratic risk.

2.3.2 Country Level Control Variables

Micro and Macroeconomic control variables both affected the firm expected cash flows, however microeconomic control variable can be manage with good governance whereas macroeconomic control variables are unavoidable and cannot be managed or controlled. There are several country-level control variables along with firm-level variables that might be affected by main variables. As recommended by previous literature, the study used some macroeconomic control variables in addition to microeconomic control variables. Earlier research has established the effect of macroeconomic variables on fluctuations in the value of financial assets, including the GDP, inflation rate, interest rates, money supply, unemployment rate, currency rate, and so forth (Bondzie et al., 2014). The study used the following particular macroeconomic variables as country-level control variables Official exchange rate (ER), GDP per capita growth (GDPG), and External Corporate Governance Index that contains Government effectiveness (GE), Regulatory quality (ReQ), Voice and accountability (VA), Political stability (PS), Rule of law (RuL), and Control of corruption (CC).

2.3.2.1 Exchange Rate (ER)

The cost at which one country's money can be exchanged for another is known as the exchange rate (ER), according to the Business Dictionary. The ER, according to Harvey (2012), is the value of two currencies about one another. It is the ER that is used to indicate how much one currency is worth in relation to another. It is the cost associated with converting one currency into another at a given rate (Egbunike and Okerekeoti, 2018). Either exchange rates remain constant for a specific period or they are floating. The central banks of each country set fixed exchange rates, while market forces like supply and demand drive floating exchange rates (The Economic Times, 2017). ER are influenced by a number of variables, including rate of interest, inflation, balance of trade, political condition, the state of the economy overall, and the degree of governance. Comprehending the impacts of foreign exchange risk is crucial for the purposes of risk handling and corporate

pricing, as demonstrated by (Martin and Mauer, 2003). Wiyono and Mardijuwono (2020) examined the effect of firm size, leverage, profitability and exchange rate on risk. The study analyzed by using data from 2016 to 2018, 369 listed firms on the Indonesia Stock Exchange (IDX) provided secondary data for analysis. To evaluate the hypotheses, they used multiple linear regression analysis. The findings of the study showed that the exchange rate did not show any significant association with risk, while profitability and firm size influence significantly. Martin and Mauer (2003) shown that knowledge of foreign exchange risk's consequences is crucial for risk management and business value. The equity market returns of Ghana's listed firms are considerably boosted by the ER of country (Barnor, 2014). In contrast to interest rate and currency rate, which had no significant impact on ROA. Egbunike and Okerekeoti (2018) discovered that inflation rate and GDP growth rate had a substantial impact. Second, the firm characteristics demonstrated the importance of firm size, leverage, and liquidity.

2.3.2.2 Gross Domestic Product Growth (GDP)

GDP measures the total market value of goods and services of a nation's economy generated over a given period. All finished goods and services, or those produced by economic agents based in that country, are covered by it, independently of their owner and free from any kind of resale (Egbunike and Okerekeoti, 2018). (Mwangi, 2013) asserts that the most often used macroeconomic metric to measure the overall level of economic activity inside an economy is the gross domestic product (GDP), whose pace of expansion reveals the state of the business cycle. It is the primary output and economic activity metric used worldwide. Past literature proved both positive and negative impact of GDP Growth on firm's returns. Tan and Floros (2012) studied relationship between GDP Growth and bank profitability by taking sample of Chinese banks. They observed a negative association between GDP growth and bank profitability. While Trujillo-Ponce (2013) found a positive impact of GDP growth on return on asset and return on equity, they took sample of Spanish banks for empirical analysis. Another study conducted by Sinha and Sharma (2016) by taking sample of Indian companies, they also documented a

favorable association and positive impact of GDP growth on RoA and RoE in India. Wen et al. (2021) took gross domestic product as a control variable while investigative the impact of economic policy uncertainty on corporate risk. Their study revealed that GDP has a negative significant effect on enterprise risk taking. Most of the previous literature has pointed out that increase in GDP growth increase the return of companies, that proves there may increase the risk factor as to gain higher return invest face high risk. Above mentioned studies proved that GDP growth has significant impact on firm risk, therefore current study made part of the research to control the effect of DGP on idiosyncratic risk. Current study also revealed mix results, both positive and negative impact of GDP growth on idiosyncratic risk found.

2.3.2.3 External Governance Index

A large sample of companies, citizen, and respondents of expert survey from both developed and underdeveloped economies provide their perspectives on the governance effectiveness in a summary form that is provided by the Worldwide Governance Indicators (WGI), which is a research investigation database. Many survey organizations, international organizations, think tanks, NGOs, and private sector businesses have provided the data for this study.

The World Bank or the economies they represent do not necessarily endorse the Worldwide Governance Indicators. The World Bank Group does not allocate resources using the WGI. The project WGI develops composite indicators for six major facets of governance.

The six aggregate indicators of the WGI are built on a nation's customs and institutions Kaufmann et al. (2011). They consider the methods used in the selection, monitoring, and replacement of governments, the capacity of a government to develop and carry out solid policies, public opinion, and the organizations that shape monetary and social collaborations. GE, ReQ, VA, PS, RuL, and CC are the six indicators included in the database. Explanation of these as per "The Worldwide Governance Indicators" is as under:-

Voice and Accountability represent views on the right to free speech, freedom of association, and the freedom of the press, as well as views on the extent to which people of a country has the right to select their political administration.

Political Stability and Absence Terrorism Measures of the perceived possibility of unstable politics and/or politically driven violence. People of the country should right to select political party and allow them to complete their regime. Stabilization in politics in a way to complete short term and mega projects for better future of nation.

Government Effectiveness It expresses attitudes about the excellence of public facilities, the impartiality of the civil service from political intervention, the development and implementation of policies, and the reliability of the government's commitment to implementing these policies.

Regulatory Quality It expresses views regarding the capacity of the government and administration to enforce acceptable laws and rules that encourage and facilitate the expansion of the private sector especially in quality control sector.

Rule of Law reflects opinions about the degree to that individuals respect and trust social norms; this includes opinions about the probability of misconducts and violence as well as the efficiency of the justice system, police, rights of ownership, and compliance with contracts.

Control of Corruption reveals opinions of the extent to which public authority is used for personal and private benefit, encompassing both lower and higher level corruption and kickbacks, elites' "capture" of the government, and personal gain.

Furthermore, businesses may function to their fullest capacity and have more opportunities to use economies of scale and scope in an open financial system with robust regulatory and legal frameworks. It makes sense that financial institutions would reduce their activities in economies with lax regulations and unreliable property rights. Thus, banks can diversify their revenue streams and reduce risk as long as the legal system is competent (Bui and Bui, 2019).

However, depending on institutional development, the governance mechanism might operate differently. Prior researches has demonstrated that strong political forces can divert the available funds in the banking sector to their objectives in the presence of a lax regulatory environment (Bui, 2018). In previous paragraphs of the current study, we elaborate on how corporate governance mechanism strengthen or weaken the relationship between END and IR, and how better CG help to reduce the firm risk.

The six governance indicators calculated by Kaufmann et al. (2011) are used to measure external governance infrastructure. These indices include information on a wide range of country governance-related topics, such as GE, ReQ, VA, PS, RuL, and CC. Although there is already available external governance index in world bank website but this study following AlShiab et al. (2020) and Emara et al. (2016) constructed own external governance index by using PCA as as they suggested it proposes a powerful gauge for assessing the efficacy and managerial skill of the administration. One drawback of existing index is the amount of measurement error can be assessed, making it easier to determine how useful every indicator is about the governance concept as a whole (Kaufmann et al., 2011). Furthermore, there is a strong significant correlation among the indices, making it challenging to incorporate them all into a single equation (Globerman and Shapiro, 2002) and because multi-colinearity is avoided. Therefore, study has created external governance index through PCA instead of using readily available index in the World Bank's Worldwide Governance Indicators.

2.4 Theoretical Foundation

The association between END and IR as well as the moderating impact of the CG index can be explained by several theories (such as signaling theory, agency theory, stakeholder theory, legitimacy theory corporate finance theory, and stewardship theory). Past studies proved that there are three streams of research in this debate. Every stream makes a distinct case for the existence of a positive, negative, or

U-shaped relationship between END and IR (Qiu et al., 2016; Tzouvanas et al., 2020; Lin et al., 2014; Wu et al., 2016; Li et al., 2021). Some of these theories are brief in detail in the following section.

2.4.1 Signaling Theory

The basic concept of conventional finance theories is that knowledge is equally dispersed among all economic participants. In reality, however, management has more access to information about a company's going concern than shareholders. When one side has more important information than the other, there is an information asymmetry. Perfect information is in contrast to information asymmetry. While neo-classical theories of finance assume information asymmetry, classical theories of finance assume perfect information. Transparent communication of positive or negative news on the company's operations might help to reduce information asymmetry (Connelly et al., 2011; Tzouvanas et al., 2020). Signaling theory explains how management disseminates information to shareholders, investors, and other stakeholders to reduce the effect of information asymmetry (Bhattacharya, 1979); (Miller and Rock, 1985). The main concern of the signaling theory is minimizing information asymmetry between two main stakeholders i.e. individuals and organizations, where one party (sender) decides how and when to disseminate evidence or news and the other party (receiver) decides how to decode that information (Connelly et al., 2011). To make wise and informed economic decisions, stakeholders require pertinent information. These signals are still expensive and still have the power to influence the stakeholder's behavioral intentions. According to fundamental communication channels, signalers (firms) and receivers (outsiders) are the main actors, and signals reflect either positive or negative information to reduce ambiguity and information asymmetry. Signals that drive the firm's dedication and activities that affect its reputation and relationship with stakeholders have been found to indicate the worth of the organization and its long-term prospects (Hahn et al., 2021). The theory is still important to investigate how people behave

when shareholders and management have conflicting information. The information asymmetry produces a significant amount of uncertainty, which hurts how an economic decision turns out. As a result, signaling theory is best suited to address the problem of information asymmetry. The firm's objectives to inform the stakeholders of information disclosure through various signals can still be examined using theory. Management literature also has applied signaling theory to examine asymmetry of information, recently in corporate governance, entrepreneurship and human resource management. Similarly organizations disseminate the signal of END to mitigate the information asymmetry for investors and other stakeholders. Thus, risk can be minimized by reducing the asymmetry of information. The asymmetric information misleads the investor and results in suboptimal economic choices. The signaling theory is best positioned to deal with the issue of information asymmetry and explains the firm's intention to disclose information and signals to attract prospective stakeholders. The information asymmetry results in agency problems and increases uncertainty. Therefore, firms through information disclosure send signals to assist stakeholders to make informed and sound financial choices. Besides mitigating the uncertainty quality signals result in trust which is the intriguing element of economic contracts.

Dhaliwal et al. (2011) articulated in their study that company's reputation is improved by END, especially with long-term and socially concerned investors. Investors those privileged sustainability, are more inclined to retain shares for longer periods of time, and are less sensitive to short-term swings are drawn to companies with strong environmental reporting. As a result, there is less volatility in stock prices and IR. According to signaling theory, messages can only lessen information asymmetry if two requirements are met: costliness and observability (Spence, 1973). Costliness: In order to convey information about the sender's quality, signals must be expensive to implement. Otherwise, signals may be readily forged or mimicked. The second prerequisite is observability which means targeted audience must be able to observe the signal. This indicates that in order for the recipient to appropriately judge the sender's quality or intentions, the signal must be visible and clear to them. In the event that the signal cannot be observed,

information asymmetry will continue and the recipient may grow doubtful. In turn, these steps lessen company-specific uncertainty, hence reducing IR.

2.4.2 Stakeholder Theory

Stakeholder theory explains the linkage, association, and preferences among all stakeholders. Internal stakeholders and external stakeholders are two main types of stakeholders in a firm (Freeman, 2010). All stakeholders' interests should be taken into account by businesses when making decisions and taking action. All of those individuals and groups who are influenced by the firm's decisions and actions are considered stakeholders. The stakeholders who are concerned with management and governance activities are called internal stakeholders like a board of directors, management, and all other employees similarly the stakeholders who have concerns with the working environment or indirect link with the organization are external stakeholders like customers, suppliers, creditors, government regulatory bodies etc. Clarkson (1995) separates stakeholders into two categories: primary and secondary. The company's primary stakeholders are its formal, official, or contractually obligated personnel, clients, investors, and suppliers. The societal groups that are impacted by the company's operations but do not have a contractual connection to it are considered secondary stakeholders. Addressing stakeholders who are concerned about the company's social and environmental duty is crucial for businesses. The firm's systemic and idiosyncratic risk is drastically reduced by actions related to social and environmental development (Oikonomou et al., 2012; Salama et al., 2011). Stakeholder theory reveals investors consider riskier firms to be those that are not environmentally friendly as it increases the chances of becoming explicit of many corporate stakeholders. Firms disclosing environmental actions enhance efficiency, increase return, decrease cost and risk, and tighten the relationship with different stakeholders (Donaldson and Preston, 1995; Jones, 1995). According to a stakeholder perspective, organization those provide significant END enhance corporate visibility that can assist them to develop a healthy loyalty and image with their participants. As a result, the firm's IR can be reduced (Benlemlih et al., 2018). By engaging in corporate environmental responsibility and being

accountable to all the stakeholders, directors can increase business worth, decrease conflicts of interest, and reduce risk (Cai et al., 2016). Therefore, through disclosing or enhancing environmental information a firm may protect the interest and rights of concerned stakeholders, which may enhance the returns of the firm and minimize the firm risk, especially the firm's idiosyncratic risk as it is a firm-specific risk.

There are several factors those help to reduce IR by increasing END through the lens of stakeholder theory. An organization can gain more stakeholders' confidence and reputation by disclosing environmental information. Key stakeholders, including customers, employees, regulators, and investors, are more inclined to trust businesses that are open about their sustainability and environmental effect. IR is reduced by trust, which lowers the anticipated likelihood that the company embroiled in scandals or environmental infractions (Jensen, 2002). Similarly, sustainability is a top priority for institutional and socially conscious investors, and END is becoming progressively more significant. Investors with a long-term emphasis on sustainability are more likely to be drawn to companies that are open about their environmental impact. These investors can assist lower stock price volatility and IR since they often have longer investment horizons and are less likely to panic during short-term changes (Eccles et al., 2014). Businesses that omit environmental information or participate in hazardous environmental activities are more likely to come under fire from NGOs, activist organizations, and the media. This can undermine their brand and raise IR. Companies that are open can better manage these risks. Stakeholders, such as customers and advocacy groups, hold companies accountable for their environmental impact. Moreover, customers that care about the environment are becoming more selective about what companies do when it comes to their environmental policies, and companies that provide comprehensive information about their sustainability initiatives stand to gain from this. In addition to fostering consumer loyalty, this lowers the possibility of losing market share to rivals with stronger environmental credentials. Resolving customer complaints also contributes to revenue stream stabilization and lowers IR for the company (Porter and Kramer, 2014).

A broad spectrum of stakeholders' expectations and concerns are addressed by END, which has an impact on IR. Companies may increase trust, draw in long-term

investors, lower regulatory risks, and boost consumer and staff loyalty by using a stakeholder principles. Together, these steps lower firm-specific risks and stabilize the bottom line. Stakeholder theory highlights that companies can decrease specific risks associated with environmental and social activities and reduce uncertainty by attending to the demands of all stakeholders through transparent environmental disclosure.

2.4.3 Legitimacy Theory

The phenomenon of environmental and social disclosure is extensively conferred by Legitimacy theory as it portrays the social bond among all stakeholders (Mousa et al., 2015). The growth and sustainability of organizations are based on two things. One is that the social financial output of the organization can be given to stakeholders and the community. The other one is that the organization obtains political, societal, and economic bonds, according to existing supremacy (Shocker and Sethi, 1973). Legitimacy theory is the broad assumption or views that an entity's actions are preferred, acceptable, or legitimate within a socially constructed framework of norms, rules, and standards (Suchman, 1995). This is demonstrated by how much thought, worry, and expectation businesses have for stakeholders' perspectives as well as their commitment to conducting business in a socially and environmentally conscious manner (Aghdam, 2015).

The social contracts that should exist between corporate entities and society are the basis of the idea of legitimacy theory. These contracts state that the values of business entities and those of society should be interlinked. Businesses are deemed to have breached this agreement if they fail to address social and environmental issues that could hurt their operations and returns (Patten, 1992). For instance, disclosures in annual reports can be used to communicate environmental disclosure practices. Another basis for the study is the legitimacy theory, which maintains that businesses disseminate environmental information primarily to uphold the implicit social contract, grow their presence in the environment, and prevent legitimacy crises. This implies that certain disclosure practices are optional and may be

influenced by several variables, including business-specific characteristics (firm size, earnings, leverage, and firm age).

According to the aforementioned assumptions, interested parties show a range of interests. Companies are under pressure from these stakeholders to be environmentally friendly in the production process and final products to remain strategic and competitive for improved outcomes, from the creditor, who is interested in the firm's leverage and earnings, to the government, who is interested in the profit for tax purposes, and down to existing and potential employees, who are interested in the firm's size, earnings, and age for job security assurance. Legitimacy theory explains very well the ethical approach of the relationship. The negative relation reveals that organizations have to contribute by disclosing to the public their environmental actions. This shows that social contracts are the cause of organizations' sustainability and existence, which can create legitimacy in society (Solikhah et al., 2020). Transparent information about environmental actions indicates that they operate ecologically friendly to minimize risk by reducing the asymmetry of information and also reduce external pressure for environmental change. Organizations that work for societal betterment, for instance, increase and disclose environmental and social practices may increase their return as these social contracts increase public trust in such organizations, which ultimately reduces firm risks.

Companies that disclose environmental information are better able to match their behavior to social norms, particularly when it comes to environmental stewardship. Legitimacy theory states that businesses lower their risk of negative press, stakeholder reaction, or a decline in customer trust when they are seen as operating properly. Through the proactive disclosure of environmental information, companies legitimate their activities and reduce the dangers particular to their business of being perceived as careless or unethical (Deegan, 2002). According to Cho and Patten (2007) businesses with poor environmental performance are shown to raise their END in an effort to restore their legitimacy. By doing this, these companies aim to control stakeholder perceptions and lessen the effect of unfavorable incidents on their reputation and stock price, hence minimizing IR. As per legitimacy theory

a crucial strategy used by businesses to preserve their social license to operate is END. Enterprises can effectively handle public views, address crises of legitimacy, and exhibit adherence to legal and societal obligations by proactively revealing their environmental performance. Since it lessens the possibility of financial, legal, and reputational consequences, this legitimacy also aids in lowering IR. By conforming to social norms and exhibiting reliable conduct, businesses can draw in long-term capital, lessen equity market volatility, and achieve operational stability.

2.4.4 Agency Theory

Jensen and Meckling first presented the idea of agency theory in 1976, which describes the agency's connection between principals (shareholders) and agents (management). Shareholders delegate the powers to agents or directors who control and manage the firm. In return, directors or agents earn compensation, bonuses, and remuneration, whereas shareholders or principals are the proprietors and their main duty is to supply the funds to the company (Jensen and Meckling, 1976), make it clear that all parties such as managers, investors, and others act in their self-interest. In enterprises, the owners select the managers who use the company's resources to their greatest financial advantage and for which they compensated. There may be a disagreement between shareholders and management since managers speak for their interests and have access to more information than shareholders. The agency issue arises when the objectives of the two parties are mismatched. Investors (the principals) invest in a business with the expectation that the management (the agents) allocate it to the most important projects, maximizing their wealth and protecting their interests. As a result, a disagreement between the two parties is known as an agency issue. Managers and directors are the responsible parties to perform operations of the company and have the perceptive to mislead the resources of the firm at every opportunity, in the name of shareholders or agency costs. Then, under agency theory, a manager's action to invest or spend on environment and social welfare reduce profits directly from the firm (Rajablu, 2016).

As per agency theory, managers of highly profitable firms should prioritize the profit distribution for funding environment-friendly projects to shareholders. Even if managers invest in environmental performance, we can conclude that better environmental performance improves financial performance, if managers invest in the environment, as organizations have free reserves for investment in environmental projects. Some managers invest in environmental projects just for the sake of improving their status as environmentally sensitive managers or just have symbolic motives, as these investments are usually costly and unproductive (Trumpp and Guenther, 2017). Moreover, agency issues raise asymmetry of information between principals and agents (Agyei-Mensah, 2017). Directors have more information about the organization than shareholders because they are directly handling the routine operations of the organization. Therefore, shareholders are not in a position to make productive decisions based on managers' performance and cost asymmetric news by the shareholders.

Furthermore, efficient corporate governance is necessary to reduce agency problems. CG is a tool used to lessen the agency problem between a principal and an agent, according to the shareholder model, which is based on agency theory (Maxfield et al., 2018). The agency theory, which emphasizes the importance of both CG and END in mitigating the agency issue, improving firm performance through better governance, and reducing uncertainty and firm risk, serves as the study's guiding theoretical framework. The theory explains how the agency problem arises as a result of managers' conflicts of interest and attempts to disclose environmental information. As a result, a mechanism is needed to watch over managers carefully to protect shareholders' rights, and corporate governance plays a moderate this relationship between END and IR.

Understanding the impact of corporate governance on the connection between IR and END is made easier with the help of agency theory. The fundamental components of this framework center on the struggle between shareholders, who act as principals, and managers, who act as agents, with corporate governance systems intended to balance their interests. According to agency theory, managers might not always behave in the best interests of the company's shareholders.

To increase their own pay or position, they could be more concerned with profit making or steer clear of expensive environmental projects. CG practices, which guarantee that managers behave in the best interests of shareholders, are meant to reduce agency concerns. Examples of these practices include executive compensation, ownership structure, and board independence. Numerous research demonstrate that healthy corporate governance frameworks enhance the caliber of END in multiple ways.

Effective governance frameworks increase a company's ability to offer high-quality environmental information and facilitate the alignment of managerial behavior with the organization's long-term objectives. Furthermore, companies with more independent boards typically release more environmental data (Benlemlih et al., 2018; Clarkson et al., 2008; Jizi et al., 2014). All of these factors enhance the quality of END and reduce the IR that are more accurate and trustworthy. Agency theory shows that CG has a major impact on the link between IR and END.

Efficient governance protocols mitigate information asymmetry, dissuade managerial opportunism, and synchronize managerial actions with the interests of shareholders. Addressing the principal-agent dilemma through effective CG mechanism firms may guarantee that environmental transparency translates into decreased IR, which benefits both shareholders and larger societal interests.

2.4.5 Stewardship Theory

The viewpoints on corporate governance practices and CSR offered by agency and stakeholder theories are diverse. According to the stewardship hypothesis, Management acts as each stakeholder's proactive, long-term custodian as well as the custodian of strategic, operational, monetary, human, societal, and environmental capital (Rezaee, 2016). Stewardship theory is proposed by Donaldson and Davis (1989) that is an alternative to the agency theory, which states that a manager is a steward and wants to perform to the best of his ability with his inner impulses to do his best to protect the interests of the shareholders. An alternative normative

framework to agency theory is the stewardship idea, which is a component of corporate governance. According to the stewardship theory, which explains the high correlation between employee satisfaction and business performance, managers would allocate resources wisely if left to their discretion.

The relationship between corporate social responsibility and risk disclosure is better explained by stewardship theory According to stewardship theory management stewardship practices and corporate social responsibility performance are highly correlated since paying attention to corporate social responsibility domains enhances relationships with important stakeholder groups which leads to improved overall performance The fundamental premise of this idea is that CSR is a practice that companies may use to utilize their resources more effectively (Orlitzky et al., 2003) Investors may view companies with bad management and inadequate CSR performance as high risk and refuse to invest in them Stewardship theory which addresses management stewardship of both financial and nonfinancial allows the management to concentration on achieving long term developments in financial and nonfinancial CSR activities that generate worth for all participants As per stewardship theory management should allocate resources for CSR like environmental and social responsibility to achieve the objective of higher return and to minimize firm risk especially risk associated with firms.

Stewardship Theory, in contrast to Agency Theory, proposes that managers announce environmental information to signal effective CG, sustainability, and durable stability because they are driven by a feeling of responsibility and compatibility with shareholder interests. According to the Stewardship theory END is a strategic technique used by managers to show their dedication to the long-term sustainability of the company. Managers can improve the reputation of the company, foster trust with stakeholders, and lessen ambiguity about environmental concerns by proactively releasing environmental information. As investors are more informed about the company's environmental practices and long-term outlook, these factors help to reduce IR.

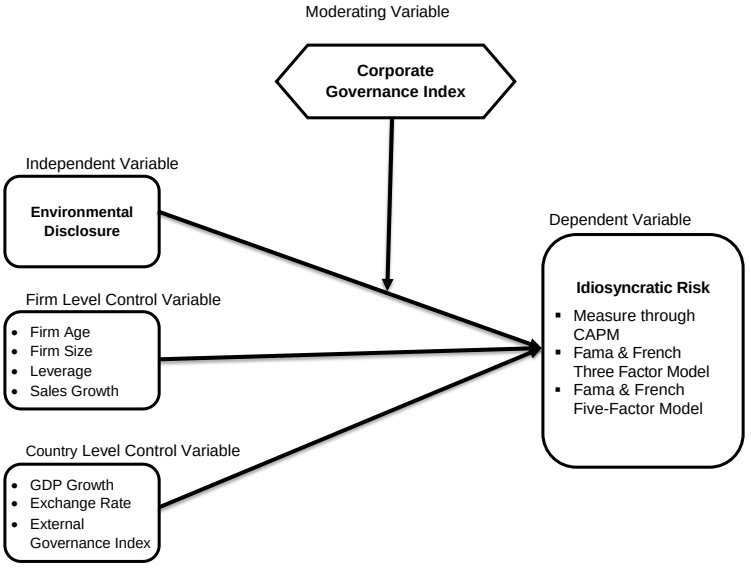

FIGURE 2.1: Research Model

Chapter 3

Research Methodology

3.1 Introduction

This study analyzed the effect of END and CG index along with firm-specific variables and country-specific variables as control variables, on IR for 187 non-financial firms from Pakistan, India, and the UK for the period from 2013 to 2020. The study also evaluated how the CG index moderates the relationship between END and IR. This part of study offers justification of data collection and methodology, which later on used for empirical analysis and testing hypotheses formulated in Chapter 2. Section 3.2 explains total population and countries along with source of data collection used in the current study. Section 3.3 states the rationalization of final sample size of the study and time period for which data is collected. Section 3.4 shows detail and construction variables hypothesized in current study. Section 3.5 explains panel data and valuation techniques connected with panel data. Section 3.6 creates a methodology and provides model specifications that are utilized to test hypotheses. Section 3.7 provides Empirical Model and Data Type about different analytical tests used in the study.

3.2 Data for Study

The study sample covers non-financial listed firms contained eight years period from 2013 to 2020. For empirical analysis Pakistan, India and UK are selected as governance mechanism of these economies have almost similar. Because they are based on similar legal and regulatory frameworks, the CG mechanism in Pakistan, India, and the UK are comparable as a result of British colonial influence. Shared standards including shareholder rights, board structures and regulatory oversight have served as the foundation for the governance frameworks of these economies. The UK Companies Act of 1866 and subsequent British legislation laid the groundwork for companies' laws in both economies. These economies retained and altered many aspects of the British legal, regulatory, and corporate governance systems after their independence. On the basis of market capitalization top-ranked companies listed on equity market of these countries were selected for data collection. Data collection time period started after the global financial crisis since, numerous corporate governance-related policies and regulations have changed thereafter. For analysis, data of independent variable (END) and data of stock prices to measure the dependent variable (IR) is collected from S&P Global. Similarly data of BS, BI, and BM to construct to moderating variable (CGI) and firm level control variables (total debt, total equity, total assets, sales and firm age) collected from S&P Global. Data of macroeconomic control variables (GDP, exchange rate and six indicators of external governance) was collected from Worldwide Governance Indicators website.

3.3 Sample Size

Table #3.1 presents the companies' representation from each country for empirical analysis. Companies and their market capitalization were collected from 'globaleconomy.com' website and then selected top-ranked companies on the basis of market capitalization. Following that, companies are further scrutinized based

on the availability of data of END. 570 companies were left, and those disclosed environmental data. Further scrutinized data based on the non-financial sector that 491 companies left behind. There was missing data or some companies did not disclose environmental information every year. The study further scrutinized and retained only those companies that have environmental disclosure data in all years from 2013 to 2020, so only 187 companies were selected as a final sample for analysis purpose. Number of companies selected from each country are as follow:-

TABLE 3.1: Composition of Companies from Each Country

Sr	Country	Stock Exchanges	Total Listed Companies	Frequency for sample size	Percent
1	UK	FTSE 350	350	85	24%
2	Pakistan	KSE 100	100	13	13%
3	India	NIFTY 500	500	89	18%
Total			**600**	**187**	31%

3.4 Measurement of Study Variables

IR is the dependent variable of the current study and Environmental Disclosure is the independent variable whereas CG Index, is the moderating variable described by four classifications which are the BS, BI, BD, and BM. Control variables may essentially change the empirical results of the relationship between corresponding and dependent variables (Atinc et al., 2012). Descriptive and correlation tables should include the Impact of the control variable (Becker, 2005). Therefore, certain micro-economic and macro-economic control variables are made part of the analysis. After the selection of sample size and data collection for the study now study discussed the construction of all dependent, independent, moderating, and control variables. A detailed explanation of construction of variables along with past relevant literature also discussed in this

chapter. Table 3.2 provides an overview and explanation of independent, dependent, moderating, mediating, and control variables.

3.4.1 Idiosyncratic Risk

Firm financial risk contains total risk, IR or unsystematic risk, and systematic risk. Idiosyncratic risk also called unsystematic risk, specific risk, diversifiable or residual risk, is firm-specific or micro in nature. To answer the hypotheses of the study, these types of risks need to be constructed. Construction of total risk many studies adopt the simple way to annualize the standard deviation of stock return (Bouslah et al., 2013; Benlemlih et al., 2018; Tzouvanas et al., 2020). In general, there is no consensus on the proxy to employ when calculating corporate risk. Acharya et al. (2011) employ a range of accounting-risk metrics, including operating cash flow standard deviation, maximum minimum Return on Assets, and Return on Assets standard deviation. By earlier research, the principal indicator of company risk is the accounting based measure of risk which can be RoA volatility, or the five years standard deviation of ROA (Boubakri et al., 2013). This variable is computed using a five-year moving frame. The key concern of the study is to investigate the influence of END on IR.

The Idiosyncratic risk can be explained as the standard deviation average of three year error term by getting through pricing models (Fu, 2009; Tzouvanas et al., 2020). First, we calculated the error term for every firm for each year and then calculated the standard deviation of the error term, which determined the IR. Stock prices of selected companies in Pakistan, India, and the UK are collected from S&P Global. Data for returns of companies are collected on a daily basis. The most popular models used for this estimation are CAPM (capital asset pricing model) with the single descriptive variable of Mkt (Market), Fama and French (1993) three-factor model that added SMB, and HML other than market factor, later on Carhart (1997) added momentum factor besides size, value and market factor and introduced a four-factor model, Fama and French (2015) five-factor model that included Investment and profitability factors and excluded momentum

factor, and the most latest is six factor model of (Fama and French, 2018) which included momentum factor (Cai et al., 2016; Tzouvanas et al., 2020). Current study used the CAPM model to measure IR and for robustness, Fama & French three and five-factor models are also used to compute IR, as it is the latest method to measure IR. Estimation of CAPM and Fama & French three and five-factor models are as follows:-

$$R_{i,t} = R_f + \beta\,(R_m - R_f) + \mu_{i,t} \tag{3.1}$$

Where:
$R_{c,i,t}$ = Expected rate of return of Security
$R_{c,f}$ = Riskfree rate of return of Security
$R_{c,m}$ = Market return.
β_i = Beta of Security.
$R_{c,m-Rf}$ = Market premium

The measurement of three-factor model of (Fama and French, 1993):-

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_1\,(R_{m,t} - R_{f,t}) + \beta_2\ SMB_{i,t} + \beta_3\ HML_{i,t} + \mu_{i,t} \tag{3.2}$$

Where:
$R_{(i,t)}$ = Security i expected return in the month of t
$R_{(f,t)}$ = Risk-free rate (T-Bill rate) in the month of t
(R_m - R_f)= Excess return on the market portfolio in the month t
SMB = Size factor
HML = Value factor

The measurement of five-factor model of (Fama and French, 2015):-

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_1\,(R_{m,t} - R_{f,t}) + \beta_2\ SMB_{i,t} + \beta_3\ HML_{i,t} + \beta_4\ RMW_{i,t} + \beta_5\ CMA_{i,t} + \mu_{i,t} \tag{3.3}$$

Where:

$R_{(i,t)}$ = Security i expected return in the month of t

$R_{(f,t)}$ = Risk-free rate (T-Bill rate) in the month of t

(R_m - R_f)= Excess return on the market portfolio in the month t

SMB = Size factor

HML = Value factor

RMW = Profitability factor

CMA = Investment factor

Above mentioned equation indicates $R_{(i,t)}$ is the expected return of the security, this study took the daily returns of each company from S&P Global, (R_m - R_f) is the market factor in which Rm shows the market return of the security or portfolio whereas Rf is the risk free rate of the specific security i for the period t. The difference of returns between a diversified portfolio of a small equity and a big equity is known as the size factor or SMB. The value factor, also referred to as HML, is the difference in the returns of diversified portfolios of high and low Book to Market companies. The profitability factor, or RMW, is the variation in returns on diversified portfolios of stocks with strong and weak profitability. The variation between the returns on diversified portfolios of stocks of low and high investment equities is known as the investment factor or CMA. Which we refer to as conservative and aggressive. $\mu_{(i,t)}$ is the zero-mean residual. By following Martinez-Blasco et al. (2023) Study used a method or procedure to calculate Idiosyncratic Risk through the Fama & French three and five-factor model using MS Excel, Eviews, and STATA:-

The companies were included in FTSE 350, KSE 100, and NIFTY 500 index (from 2013 to 2020) for the analysis. The smaller number of companies makes it possible to execute step-by-step computations in MS Excel. It was also necessary to construct a market portfolio with a manageable amount of companies for manual computation. It should be highlighted that due to the restrictions of human data processing in MS Excel, where each company must be handled manually. It was ensured that all the information required to complete the calculations was available. Therefore, to build portfolios, Obtaining accounting data for every organization

in the sample is essential. Additionally, market data is required, including the daily return of the organizations in our sample, market indices, and the federal discount rate. There are several free data sources accessible right now, however, for this exercise S&P Global database was used to obtain data for analysis. In the first step, companies were sorted into Small, Big, High, Low, Robust, Weak, Conservative, and Aggressive categories by the requirement of the model. It is simple to categorize companies as small (S) or big (B). With market capitalization, there is only one variable that needs to be ordered from lowest to highest. Using the Excel SORT tool, sorting was simple. The top 50% of companies were taken as small and the rest of the 50% were categorized as large companies. Negative returns companies were not taken into account while constructing portfolios as per Fama and French (1993) or the following variables (High, Medium, or Low categorization), for small and large groups. High, Medium, and Low: The B/M ratio was used to group the companies into one of the three categories and was arranged from highest to lowest (Eq. 3.4). Out of total sorted values, 30% of the firms from the lowermost assigned as low (L), 30% from the top companies on the list assigned as high (H) and remaining 40% of the companies on the list were assigned as medium (M).

$$B/Mratio = \frac{Equity\,(t-1)}{MarketCapitalization\,(t-1)} \tag{3.4}$$

The operational profitability ratio (Eq. 3.5) was used to group the companies into three categories i.e. Robust, Medium, and Weak. The operating profitability ratio was ranked from maximum to lowermost. Out of total RWM data, 40% of the middle-ranked companies were classified as Medium (M), 30% of the bottom-ranked companies were classified as Weak (W), and 30% of the list's top-ranked companies were classified as Robust (R).

$$Operatingprofitabilityratio = \frac{OperatingProfit}{Equity\,(t-1)} \tag{3.5}$$

Whereas, Operating profit = Net Revenue – (COGS + Administrative and office expenses + Selling and distribution expenditures).

Companies were characterized into one of three clusters on the basis of their investment ratios (Eq. 3.6), which were ranked from lowest to highest. These groups were conservative, medium, and aggressive. Out of the total data, Conservative (C) firms made up 30% of the top-ranked companies on the list, Aggressive (A) companies made up 30% of the bottom-ranked companies, and Medium (M) companies made up the remaining 40% of the intermediate companies.

$$Investment\ ratio = \frac{TotalAssets\,(t-1)\ - TotalAssets\,(t-2)}{TotalAssets\,(t-2)} \tag{3.6}$$

After calculating SMB, HML, RWM, and CMA values, by using Eviews we calculated the error term for every company from respective year and then calculated the standard deviation of the error term to calculate the IR (Lalwani and Chakraborty, 2020; Martin and Mauer, 2003).

3.4.2 Environmental disclosure (END)

Academic scholars and institutional authorities are becoming interested in the creation of sustainable disclosure indexes. Several initiatives that serve as proxies for environmental disclosure have been described about the environmental component. For instance, the CDP-recommended methodology was used by (Luo and Tang, 2014; Liao et al., 2015) identified 43 disclosure items and categorized them into eight classes while keeping in mind China's Ministry of Environment's guidelines. Whereas, Clarkson et al. (2008) constructed an environment information index on the basis of sustainability reporting guidelines provide by GRI. D'Amico et al. (2016) were suggested 31 disclosure items based on an investigation into the factors impacting environmental disclosure in Italy and the adoption of GRI and ESG recommendations by the Financial Analysts Societies of European Federation, while 10 elements were suggested by Zeng et al. (2012) to gauge the disclosure of environmental information. Al Tuwaijri et al., (2004) developed an END primarily on the basis of US Securities and Exchange Commission Forms 10-K.

Finally, Thomson Reuters Datastream and Thomson Reuters Eikon are alternate online databases to access information on corporate governance and environmental disclosure. Thomson Reuters offers explicit online database systems for creating configurable yardsticks across various industries and economies. It provides an END score to establish the organization's environmental effect on the environmental element of sustainability (Biswas et al., 2018). The Bloomberg ESG disclosure index was accepted as a reliable indicator of ESG data source. The ESG disclosure dimensions make up the three components of the Bloomberg ESG disclosure score. Every disclosure item assesses its sustainability using a set of prearranged items. The disclosure score is calculated using 100 of the 219 raw data values that collected by Bloomberg, mostly followed by GRI recommendations. The ESG disclosure score ranges from 0-100, for businesses disclosing the bare minimum of social and environmental information to 100 for those disclosing all available information. Each piece of information is given a weight based on its significance, and the final score is adjusted to meet various industry standards. A lot of attention was paid to the ESG disclosure score on Bloomberg Online among other sustainable information sources (Eccles et al., 2011). To test such hypotheses, some studies created a collection of related D-Score measurements. These measurements, which are based on a line-by-line study of voluntary environmental disclosures, capture variance in VEDQ between enterprises. Some studies utilized the index which is used to categorize and collect these data (Clarkson et al., 2013). The index was developed with the assistance of a sector expert and was based on the Global Reporting Initiative methodology. Environmental performance can be evaluated using several third-party sustainability ratings, such as CSR Hub, Refinitiv (Khandelwal et al., 2022), S&P Global, and Dow Jones Sustainability (DJSI) Yearbook membership (Cho et al., 2012). Each of these sources rates firms in a somewhat different way, and they all take into account the volume of reporting and disclosures to some extent. The sub-scores offered by Refinitiv and S&P Global, which offer specialized environmental, governance, and social scores, are an exception to this rule. The environmental, governance, and overall scores were applied to these sources.

A company's environmental, social, and governance (ESG) performance is evaluated by S&P Global's ESG Score. It assesses a company's ESG risk and opportunity

management skills using both proprietary data and public disclosures. The three categories are: Social, Governance, and Environmental. Public filings, corporate reports, and S&P Global's in-house research are the data sources. It assists stakeholders and investors in evaluating the potential and risks associated with sustainability in enterprises. S&P Global offers distinct scores for every category in addition to an overall ESG score (0–100). The aggregate ESG score is calculated by adding the scores from the individual evaluations in each category according to predetermined criteria. Each category has a different weight based on the business and sector. For the estimation of environmental disclosure variable, the study used END scores provided by the S&P Global database. This database assigns a score between 0 and 100 to the information revealed by the organization, measuring it both in terms of its reliability and magnitude. Higher scores depict higher environmental disclosure. The aggregate criteria-level rankings indicating the environmental aspects of particular sectors and economic materials are reflected in the score for each element. Even though several past researches used a binary or low range score to measure END (Hsu and Wang, 2013) and (Matsumura et al., 2014), According to certain research, Bloomberg and Datastream scores are a better source for measurement of END (Broadstock et al., 2018) and (Tzouvanas et al., 2020). These databases collect information from a variety of sources, including organization's financial reports, sustainability reports available on websites, and scores assigned to corporations based on their environmental disclosure.

3.4.3 Corporate Governance Index

Good corporate governance is important to develop the concern and understanding between shareholders and management. There are two developing economies i.e. Indai and Pakistan and one developed economy i.e. UK for which the current study builds its corporate governance indices. In this study, principal components analysis (PCA) is used to create a Corporate Governance Index. PCA is a tool for feature extraction or for shrinking the size of your feature space. It is applied in situations when a large number of variables are present and it is challenging to identify the relationships between all of them. It is also employed in situations when there are a

lot of variables and there is a chance that the model will be over fit. Because there are numerous corporate governance features in this study and they are all connected across a variety of dimensions, therefore, the corporate governance index is used for testing the hypothesis. The current study aims to ensure that our variables are independent of each other, which is the second justification for employing CG INDEX. There are several CG mechanisms, such as BM, BS, BD, BI, board gender, board ownership and board diversity that are assumed to help the minimize agency issue (Mathew et al., 2018). Since of British colonial influence, the CG systems of Pakistan, India, and the UK are comparable as they are built around the same legal and regulatory frameworks. These economies' governance structures have been built on shared values such as shareholder rights, board responsibility, transparency and regulatory supervision. Since 1947, the independence of India and Pakistan (previously been British colonies), inherited British laws, including business laws. The foundation of corporation laws in both countries was established by the UK' Companies Act of 1866 and later British legislation. Many features of British legal, regulatory and corporate governance frameworks were kept and modified by these countries even after their independence (Chakrabarti and Megginson, 2009).

Keeping in view the availability of data on corporate governance dimensions, this study selected BM, BS and BI for further analysis. By following Ellul and Yerramilli (2013) and Tarchouna et al. (2017) study constructed the first factor in the PCA, since it accounts for the greatest percentage of variation in the original dataset. Current study established a CG index by using PCA to assess the entire CG framework of non-financial companies of Pakistan, India & UK.

Each successive principal component reflects less variance than the one before it, with the first principal component explaining the greatest amount of variability in the initial data. This is the sequence in which these principal components are arranged (Jolliffe, 2002). The three above-mentioned variables of corporate governance, are reduced by the PCA into a single measure called the corporate governance index (CG INDEX). These variables are combined in a linear fashion.

Andreica et al. (2010) addressed how Principal Component Analysis (PCA) eliminates unnecessary dimensions and only wraps those that contribute more without losing essential information. The index is created using principal component analysis (PCA) using the following equation.

$$PrincipalComponentAnalysisIndex = (FeatureVector)^T X\,(SDofdata)$$

The feature vector (Components) is constructed using the covariance between the dimensions used to construct the index and Eigenvectors. The PCA index is the product of the transposition of the standardized data set values and the feature vector. The standardized value is obtained using the following formula.

$$Z = \frac{OriginalValue - Mean}{SD\,(Standarddeviation)}$$

3.4.3.1 Board Size

The number of members on board of the company at the close of the financial period is known as the board size (BS). Many studies used board size as a proxy for CG. It is the total number of directors present in the boardroom of the company during a specific year (Golam Hassan, 2017). There is a contention that a big board size can lessen adverse selection, promote transparency, and diminish asymmetric information. This can increase trust in a company's ability to make decisions.

3.4.3.2 Board Independence

The percentage of independent directors on the board of total number of director on board is known as board independence (BI). The number of outside directors divided by the total number of directors in a company for a particular year is the formula used to calculate board independence. Numerous researchers have used

this proxy for corporate governance. Large numbers of non-executive directors on the board reduce adverse selection, which in turn reduces the variability of the company, as demonstrated by empirical evidence. Some studies link risk and outside directors as well. According to their interpretation, the risk to the company falls as independent directors gain more control over the board and improve corporate governance.

3.4.3.3 Board Duality

When a CEO of the company and chairman of the board are the same individual in a company, this is known as board duality (BD). According to agency theory, a CEO who also serves as board chairman may have a negative effect on the success of the company. As Westphal and Zajac (1995) stated he or she may choose directors for the board who are readily controlled by their influence and who make decisions based only on their own volition. In light of steward theory, chairman duality may function better due to uniform, concentrated authority over the board, which improves decision-making. To quantify CEO duality, our research creates a dummy variable wit 1 if the CEO also serves as the chairman, and 0 otherwise. It is pertinent to mention that initially board duality variable was taken as it is the part of board structure whereas, later on it was omitting while making corporate governance index as PCA can only be applied on continuous data instead of categorical data.

3.4.3.4 Board Meeting

A Board Meeting (BM) is referred to as the number of meetings conducted by board members during a specific year. In general, a firm holds at least four meetings with a gap of 120 days annually. There may be more than the stated amounts in certain circumstances. The board meeting, chaired by the board chairs, is where the main functions of the company are discussed. These functions include risk, human resource development, audits, firm performance, and short- and long-term business goals.

3.4.4 Moderation of Corporate Governance Index

To examine the moderating role of CG Index, after the measurement of the CG index through PCA, the study formed interaction terms by multiplying the independent variable (END) and moderating variable (CG index). This interaction term (new variable) becomes part of the regression equation for investigating the moderating role of moderator (Muller et al., 2005). After that, this interaction term (new variable) include in the equation, and then used methodology technique called system GMM for empirical analysis of the moderation effect. Using the previously mentioned regression technique, the equation was regressed, and it was discovered that there is moderation because the interaction term has a positive significant result when considering each economy independently. In the case of combining results of all economies through CAPM, the results of the interaction term are insignificant and depict there is no moderation.

3.4.5 Firm-level Control Variables

The study has also selected some control variables that can affect the main variables as recommended by previous studies. The study has taken Leverage, firm size, firm age, and sales growth as firm-level control variables, a description of these is in Table #3.2.

3.4.6 Country-level controls

As recommended by previous literature, the study used some macro-economic control variables besides micro-economic control variables. These control variables included Consumer Exchange Rate (ER), GDP Growth (GDPG), External Governance Index (GI) which includes GE, ReQ, VA, PS, RuL, and CC. Table # 3.2 contains a description of these variables.

3.5 Research Model

We discussed about the equation that forms the research objective of current study in this part of thesis. Each variable of the equation represents i,t as company i time t, whereas c country c and time t. Furthermore, in equation micro-economic and macro-economic control variables are referred by Fcon and CCon, where firm level denote by FCon and country level denote by CCon. The description and measurement of each variable is presented in Table # 3.2 of the study.

Consideration should be given to the persistently reported issue of endogeneity (Çoban and Topcu, 2013; Endrikat et al., 2014; Busch and Lewandowski, 2016). A Sys-GMM (system of generalized method of moments) statistical technique is recommended by Blundell and Bond (1998) to control endogeneity. A study by Tzouvanas et al. (2020), which illustrates the possibility of an endogenous relationship between risk and environmental actions, served as the impetus for the implementation of this model:

3.5.1 Moderating Role of CG Index between of END and IR.

$$I.Risk_{i,t} = \beta_0 + \beta_1 I.Risk_{i,t-1} + \beta_2 END_{i,t} + \beta_3 CGI_{i,t} + \beta_4 END_{i,t} * CGI_{i,t} + \sum_{i=1}^{j} \lambda_i FCon_{i,t} + \sum_{l=1}^{m} \alpha_l CCon_{c,t} + \mathrm{e_{i,t}}$$

Where, I Risk = Idiosyncratic Risk (Dependent Variable)
CGI = Corporate Governance Index (Moderating Variable)
FCon = micro level (Firm specific) control variables i.e firm size, age, leverage and sales growth
CCon = Country specific macro level control variables i.e GDP growth, exchange rate and external governance index.

Furthermore, the lagged values of IR is incorporated in the model. To effectively handle the endogeneity, System GMM combines the first-difference estimator and

the estimator in levels because lagged values are generally weak instruments. Do not include micro / industry and macro / country dummies to prevent the over-identified constraints and autocorrelation. The model is suitable to examine the hypothesis.

3.6 Statistical Techniques, Empirical Model and Data Type

3.6.1 Descriptive Statistics

Descriptive indicators for each variable have been supplied before the hypothesis is tested. In descriptive statistic study examined Mean, Standard Deviation, Minimum, and Maximum values. The mean, which measures average value, and standard deviation, which displays variation in the data for all variables, are both used. In descriptive statistics, the minimum and maximum values are also displayed. All factors in the situation of all three economies i.e. Pakistan, India & UK have descriptive statistics reported in the study. The average value (mean value) is obtained by apportioning the total number of observations by the sum of all values.

$$Mean\,(x) = \frac{\sum x}{n}$$

$\sum$ x = shows the sum of all variable values

n = Total number of observations.

The data's fluctuation has been estimated by using the standard deviation. By dividing the total square of the deviation from the mean by the overall observations, the SD is determined. The square root is then calculated using the outcomes.

$$\textbf{Standar Deviation} = \sqrt{\frac{\sum (\mathrm{X} - \ \mathrm{mean})^2}{\mathrm{n}}}$$

Furthermore, it has been demonstrated in descriptive statistics that knowing the lowest and highest values of each variable is also necessary for determining the range of the series.

3.6.2 Correlation Analysis

The study used correlation analysis to demonstrate the association among study variables. The coefficient of correlation shows how much the variables are related to one another. The value of the correlation coefficient is between -1 and 1. A weaker relationship between the variables is specified by a coefficient of correlation value that is nearer to 0. A strong association is specified by a correlation coefficient value that is nearer to 1 or -1. The issue of multi-colinearity and high correlation is also indicated by the correlation between the independent variables; specially, if the correlation between the independent variables is higher than 0.90, then the problem of multi-co-linearity is present (Hair et al., 2010).

3.6.3 Panel Unit Root Test

There are various methods to test a unit root for panel data. Research in this field was started by Quah (1994), who also suggested asymptotically normal tests for a unit root. However, these tests rely on unidentified characteristics that are challenging to predict. Adjusted t-test for multiple panel data models to examine unit root, established by (Levin et al., 2002) (LL). This test has been very popular in applications and is commonly used in macroeconomics and global finance. Whereas, it is uncommon in time series data to assume the same autoregressive (AR) coefficient under the null and alternative hypotheses as in LL for all groups (economies, businesses, or individuals), even if this is a typical practice in panel data analysis. Augmented Dickey-Fuller tests and likelihood ratio averages were both taken into consideration by Im et al. (1995) (IPS). As per the simulation findings in IPS, such checks appear to execute better in limited data samples than LL's test despite being based on generic hypotheses.

Panel tests for stationarity under models with different levels of heterogeneity have been added to the Augmented Dickey-Fuller test (ADF), e.g. by Levin and Lin (1992) and (Im et al., 2003) (IPS). To investigate the stationarity in data current study used the Levin-Lin-Chu unit root test. A P-value of the Levin-Lin Chu

unit root test determines whether the data is stationary or not. If the results are significant, it means the data is stationary and can be used for further regression analysis.

3.6.4 Test for Endogeneity

Endogeneity in regression models states the situation in which two error terms or an explanatory variable correlate with the residual while conferring with structural equation modeling. Due to endogeneity bias, estimates may be inconsistent, which could result in false inferences, confusing conclusions, and inaccurate theoretical explanations. Even Ketokivi and McIntosh (2017) acknowledged that endogeneity bias could cause researchers to misinterpret the sign of coefficients. There are three main causes of the endogeneity issue. One of the most serious issues in many empirical studies, especially those that use panel data, is an omitted variable, which is the first possibility. Variables that should be specified in the model but are not referred to as omitted variables. Second, simultaneity bias appears when explanatory factors and the dependent variable are simultaneously determined, thus it is possible to assert that either X causes Y or Y causes X. Measuring inaccuracy is the last element causing endogeneity problems. The majority of empirical investigations employ proxies to gauge variables or unobservable entities. Measurement mistakes result from any differences between proxies and real variables (Park et al., 2021).

The Durbin-Wu-Hausman test is normally employed to determine if a given regressor is endogenous. This test examines if the error term is associated with the explanatory variable, which theoretically should be uncorrelated with the independent variable on the right hand side. The OLS regression is therefore tested for endogeneity using the Durbin-Wu-Hausman test. When the explanatory variable passes the Durbin-Wu-Hausman test with a significant test statistic, it is assumed that the explanatory variable is endogenous since it correlates with the residual error term Researchers must use a more precise estimation method than OLS if there is even one endogenous variable in the econometric formulation. The

current study assumed that I. Risk t-1 is an endogenous variable and employed the Durbin–Wu–Hausman test to examine the existence of endogeneity. Confirming the exogenous nature of our variable as the null hypothesis verifies the lack of endogeneity affects.

3.6.5 Empirical Technique and Regression Analysis

For panel data, the study used panel regression econometric approach called System GMM. The econometric technique aims to capture the relationship between END and corporate risk from several angles, despite the lack of well-researched papers in this area.

Since the data is panel and includes both time series and cross-sections data, the study used a panel data model to analyze the END influence on firm IR. The first study used the likelihood ratio to determine the Fixed Effect and Random Effect models based on hausman and redundant tests after verifying that the data were normal. This study builds on earlier studies by highlighting disclosure in panel data analysis risk regressions (Delmas et al., 2015). Endogeneity issue is normally controlled with the GMM or with 2SLS in panel data. The key benefit of GMM is that it does not require the identification of external instruments and can handle any control variables as endogenous as finding exogenous factors to instrument the endogenous variable can be challenging, and they may never be exogenous at all (Broadstock et al., 2018). For this reason, GMM relies on internal instruments (lagged values or internal transformation). For instance, the environmental disclosure from the prior year can be having a bigger impact on idiosyncratic risk than the current disclosure (Diemont et al., 2016; Tzouvanas et al., 2020). Next, in accordance with previous research's recommendations, the study employed the generalized method of moments model (GMM) to address the endogeneity issue (Endrikat et al., 2014; Busch and Lewandowski, 2018). One issue that arises from simultaneity or omitted variable bias is endogeneity. There is a greater likelihood of endogenity between risk and disclosure in companies with higher levels of risk since they usually begin or invest more on END (Busch

and Lewandowski, 2018). Even though GMM is an effective estimating method, there are a number of issues with it, especially when there are little samples, inferior instruments, and over fitting. By employing system GMM, lowering the instrument count, adopting robust standard errors, and carrying out diagnostic testing, researchers can get around these biases (Blundell and Bond, 1998; Genaro and Astorino, 2022). It is essential to comprehend the particular context and features of the dataset in order to choose the right adjustments that would reduce bias in GMM estimation.

TABLE 3.2: Descriptions and Source of Variables

Variables	**Description**	**Source**
END	Score of environmental disclosure produced by S&P Global. (Broadstock et al., 2018; Tzouvanas et al., 2020)	S&P Global / Datastream
I.Risk	CAPM for Idiosyncratic risk	S&P Global (Stock Prices / Return)
	Annualized standard deviation of Fama and French three and five-factor model's residuals for measurement of IR. Stock and market price / return data retrieved from S&P Global is used in the CAPM, Fama & French three and five factors models to estimate the idiosyncratic risks. (Benlemlih et al., 2018; Tzouvanas et al., 2020; Fama and French, 1993, 2015; Martin and Mauer, 2003)	S&P Global
CGI	The Corporate Governance Index (CGI) will be constructed based on principle component analysis (PCA). It will comprise by following components:-	S&P Global / Annual Reports

CGI	BS (Board size), is the organization's total number of individuals on board. (Minton et al., 2014; Tarchouna et al., 2017; Lalwani and Chakraborty, 2020) BI (Board independence), total non-executive independent members divided by the total number of individuals on board members (Vallascas et al., 2017; Tarchouna et al., 2017; Lalwani and Chakraborty, 2020) BM (Board Meeting) Log is taken after adding 1 to the count of meetings. (Eluyela et al., 2018; Tarchouna et al., 2017)	S&P Global / Annual Reports
Firm-level Control Variable		
Lev	Leverage = Total debt / total equity (Mallin and Ow-Yong, 2012; Wiyono and Mardijuwono, 2020)	S&P Global
Log TA	Firm Size = Log of TA (Total Assets) (Jo and Na, 2012; Benlemlih et al., 2018)	S&P Global
Sales Growth (SG)	Subtract the previous year's sales from the current year's sales, divide the result by the previous year's sales, and then multiply the result by 100 to get sales growth. (Ang et al., 2006)	S&P Global
Firm age	The log of the number of years a corporation has been in existence was used to calculate the firm's age. Gul et al. (2011); Rujiin and Sukirman (2020)	S&P Global
Country level Control Variable		
GDP Growth	GDP yearly growth rate for each nation in year t. Economic Growth = (GDP 2 - GDP 1) /	

	GDP 1. Data collected from the World Bank Database. (Vallascas et al., 2017)	World Bank Website
Exchange Rate (Er)	For year t and each country, the average yearly exchange rate is US dollars. Regression analysis has chosen to use the natural log of exchange rates. Data collected from the World Bank Database. (Harvey, 2012; Egbunike and Okerekeoti, 2018)	World Bank Website
External Governance Index (GI)	The external Governance index (GI) constructed through PCA. It comprise the following world governance indicators:- Government Effectiveness, Regulatory Quality indicators, Rule of Law, Voice & Accountability, Political Stability No Violence and Control of Corruption (Kaufmann et al., 2011; Bui and Bui, 2019)	World bank website.

Chapter 4

Results and Discussion

4.1 Introduction

This chapter shows the empirical findings of Combined and country-wise analysis of study variables for Pakistan, India, and UK. This section of the study shows the outcomes of descriptive, correlation, and regression.

First, it presents country-wise and combined descriptive statistics, correlation results, and regression results with market factor i.e. CAPM in the subsection, followed by Fama & French's three and five-factor model in this section for Pakistan, India, and the UK.

4.2 Descriptive Statistics

This sub-section presents the results obtained for country-wise analysis for Pakistan, India, and UK. It is the overall mean, standard deviation, minimum and maximum values of study variables discussed in the study.

The final sample out of total population of the study enumerates 680, 104, and 712 observations for UK, Pakistan, and India respectively. We will now examine some descriptive statistics of study variables for the UK, Pakistan, and India that were employed in the regression analyses.

4.2.1 Descriptive Analysis in the Context of Pakistan

Table# 4.1 depicts the descriptive state of Pakistan. The study extracts 104 annual values, the table shows an average of 25% for idiosyncratic risk calculating through CAPM that can deviate 7% up or downside from 25%.

The lowest and highest values for the said variable are 15% and 43% respectively as per the sample dataset. Similarly, the table shows a 1.6% average with a 0.4% probability of deviation from the average for idiosyncratic risk calculating through the three-factor model and a 1.5% average with a 0.3% deviation of said variable for idiosyncratic risk measuring through the factor mode.

The minimum and maximum range is 0.9% to 3% and 0.8% to 2% for idiosyncratic risk calculating through three and five-factor models correspondingly. Study took natural logarithm of the END score data as shown in tables whereas, in description of END results study shown exponential of these values for comparison with the END score range of 1 to 100 provided by the S&P global database.

The average value of natural logarithm of END score is 1.7898 while the exponential of 1.7898 is 6. It means, in case of Pakistan average score of environmental disclosure is 6, from the environmental disclosure score range of 1 to 100. In the variables definition paragraphs, an explanation of environmental disclosure and its score has already been provided. The standard deviation value for Environmental disclosure.

The minimum and maximum score of environmental disclosure in the case of Pakistan is 2 and 17 respectively. The average score of the corporate governance index is 1.00 which can deviation from the 4.60 score lower or upper side. This index is constructed through Principle Component Analysis (PCA) by using four components (Board Independence, Board Size, Board Duality, and Board Gender). The minimum and maximum scores of the CG index are 0.03 and 4.60 respectively.

Furthermore, table 4.1 shows the average age of Pakistani firms used in the study is 36 years (minimum 16 and maximum 69) with a standard deviation of 2 years.

The normal sales growth and leverage are 61% and 28% with standard deviations of 20% and 14% respectively.

For country-level control variables average GDP growth is 1.74 with a standard deviation is 2.21. Similarly exchange rate of Pakistan for the sample period is 116.81 USD and the standard deviation is 1.19. The table also shows the maximum and minimum values of firm-specific and country-specific control variables for Pakistan.

TABLE 4.1: Descriptive Results - Pakistan

Variables	**Obs**	**Mean**	**SD**	**Min**	**Max**
END	104	1.78985	0.58565	0.69315	2.83321
I.Risk	104	0.25099	0.06876	0.14790	0.43440
Age	104	3.58035	0.44697	2.77300	4.23400
Sg	104	0.61048	0.19864	-0.54300	0.75800
Lev	104	0.28283	0.14133	0.01930	0.55150
Fs	104	18.76264	1.08291	15.51600	20.60600
Gdpg	104	1.74375	2.21197	-2.88000	3.68000
Er	104	4.76062	0.17745	4.61512	5.08759
GI	104	0.00001	2.20455	-5.32096	2.86481
CGI	104	0.00195	1.45870	-3.55865	1.52680
I Risk3	104	0.01646	0.00416	0.00929	0.02718
I Risk5	104	0.01524	0.00388	0.00882	0.02300

Source: The authors note: This Table describes descriptive results of Pakistan, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = IR measure through Fama & French three-factor model, I.Risk5 = IR measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, VA, PS, ReQ, RuL and CC).

4.2.2 Descriptive Statistics in the Context of India

Descriptive statistics of India describes in table# 4.2. Study extract 712 annual values, table shows an average of 29% from 0% to 87% minimum and maximum

range for idiosyncratic risk calculating through CAPM. This average value can deviate from 8% up or down from 29%. Whereas, the average of idiosyncratic risk calculated through the three-factor model and the five-factor model is 1.7% and 1.8% respectively. The minimum and maximum are 0.89% to 4.5% for the three-factor model and 1% to 4.7% for the factor model. Average figures can deviate 0.5% in the case of the three-factor model and 0.6% of the factor model from their average. Study took natural logarithm of the END score data as shown in tables whereas, in description of END results study shown exponential of these values for comparison with the END score range of 1 to 100 provided by the S&P global database. The average value of natural logarithm of END score is 2.95192 while the exponential of 2.95192 is 19.14. It means, in case of India average score of environmental disclosure is 19.14, from the environmental disclosure score range of 1 to 100. Whereas, the minimum and maximum score of environmental disclosure is 2 and 93 respectively for India. Similarly, the average score of the corporate governance index is 1.00 which can deviate from a 3.08 score lower or upper side with minimum and maximum values of 0.049 and 14.60. The construction of the corporate index is the same as in the case of Pakistan's data. As concern for descriptive states for control variables, table 4.2 shows the average age of Indian firms used in the study is 40 years with a standard deviation of 1.64 years. The minimum and maximum age of firms is 8 years to 96 years. The mean value of sales growth and leverage is 9% and 20% with a standard deviation of 15% for sales growth and 17% for leverage. For country-level control variables average GDP growth is 3.89 with a standard deviation is 4.70. The exchange rate of India for the sample period is 65.96 USD which is lower than Pakistan as the Indian currency is stronger. The standard deviation of the exchange rate is 1.07. The average score of the external corporate governance index is 1.00 and the standard deviation is 8.04 score. The external corporate governance index is constructed through Principle Component Analysis (PCA) by using six components of external governance mechanism that contains GE, ReQ, VA, PS, RuL, and CC. The minimum and maximum scores of the external corporate governance index are 0.006 and 13.226 respectively. The table also shows the maximum and minimum values of firm-specific and country-specific control variables for India.

TABLE 4.2: Descriptive Results - India

Variables	Obs	Mean	SD	Min	Max
END	712	2.95192	0.93027	0.69310	4.53260
I.Risk	712	0.29449	0.08374	0.00000	0.87450
Age	712	3.69992	0.49465	2.07940	4.56430
Sg	712	0.09234	0.14925	-0.80230	0.89200
Lev	712	0.19999	0.17094	0.00000	0.63220
Fs	712	19.03420	1.43659	15.17160	23.17940
Gdpg	712	3.89094	4.70869	-8.16490	7.08220
Er	712	4.18905	0.07115	4.07070	4.30540
GI	712	0.00001	2.08422	-5.06730	2.58220
CGI	712	0.00001	1.12555	-3.00670	2.68100
I.Risk3	712	0.01783	0.00564	0.00891	0.04515
I.Risk5	712	0.01899	0.00601	0.01027	0.04753

Source: The authors note: This Table describes descriptive results of India, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = IR through Fama & French three-factor model, I.Risk5 = IR measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC).

Concluded

4.2.3 Descriptive Statistics in the Context of UK

The results of the descriptive analysis for the UK shows in table # 4.3. The study extracted 680 annual values. In the case of the UK average value for idiosyncratic risk (calculating through only market factors) is 24% which can deviate 9% up or downside from the mean value. The lowest and highest are 0 and 112% respectively. Similarly, the normal value is 2% which can deviate 0.8% from the mean value for idiosyncratic risk (calculating through the three-factor model) whereas for the five-factor model mean value is 2% with a probability of deviation is 0.9%. The minimum and maximum range is 0.9% to 9% for idiosyncratic risk calculating through a three-factor model and 0.9% to 13% minimum to maximum range

for idiosyncratic risk calculating through five factor model. Study took natural logarithm of the END score data as shown in tables whereas, in description of END results study shown exponential of these values for comparison with the END score range of 1 to 100 provided by the S&P global database. The average value of natural logarithm of END score is 3.85000 while the exponential of 3.85000 is 47. It means, in case of India average score of environmental disclosure is 47, from the environmental disclosure score range of 1 to 100. The standard deviation value for Environmental disclosure is 1.78. The minimum and maximum score of environmental disclosure is 2 and 100 respectively, which depicts that firms from the UK disclose and work on environmental disclosure more, as compared to Pakistan and India. The average score of the corporate governance index is 0.99 with a standard deviation of 2.81. The minimum and maximum scores of the corporate governance index are -0.002 and 32.89 respectively. Moreover, table 4.3 shows average age of UK firms used in the study is 39 years (minimum age 2 and maximum age 275) with a standard deviation of 2 years. The average sales growth and leverage are -7% and 28% with a standard deviation of 29% and 21% respectively. As a concern of country-level control variables, the economic dynamics of the UK are different than Pakistan and India. UK currency (pond) has a closer worth with the US Dollar, therefore, the average exchange rate is 1.41 which is different from Pakistan and India. The minimum and maximum exchange rate of the UK is 1.28 and 1.65 and the standard deviation is 0.15. Average GDP growth is 0.08 with a standard deviation is 3.75. The results of the study are almost consistent with Benlemlih et al. (2018) empirical results. In individual results of descriptive analysis, Pakistan and India results are almost similar whereas in the case of the UK, there is a change in some variables.

4.2.4 Combined Descriptive Statistics Results (Pakistan, India & UK)

Previously we discussed individual descriptive results of the UK, India, and Pakistan separately. Now we analyze combine descriptive statistics of the UK, Pakistan, and

TABLE 4.3: Descriptive Results - UK

Variables	Obs	Mean	SD	Min	Max
END	680	3.85000	0.57600	0.00001	4.60517
I.Risk	680	0.23651	0.09485	0.00007	1.11912
Age	680	3.66735	0.88599	0.69315	5.62040
Sg	680	-0.06806	0.28786	-0.99922	0.82481
Lev	680	0.27848	0.21155	0.00001	2.66811
Fs	680	15.66018	1.60510	10.55956	23.73202
Gdpg	680	0.08420	3.74667	-9.90699	2.23546
Er	680	1.40990	0.14780	1.27600	1.65000
GI	680	-0.00001	2.03759	-5.29931	1.88401
CGI	680	-0.00001	1.03481	-15.34661	3.49339
I.Risk3	680	0.01934	0.00810	0.00937	0.09978
I.Risk5	680	0.01846	0.00859	0.00924	0.13273

Source: The authors note: This Table describes descriptive results of the UK, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = IR measure through Fama & French three-factor model, I.Risk5 = IR measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC).

India. Table# 4.4 depicts the descriptive statistics of the combined results. Study extract 1,496 annual values, the table shows an average of 27% for idiosyncratic risk and the standard deviation is 9%. The minimum and maximum values for said variable are 0 and 112% respectively for the combined sample dataset. Similarly average is 1.7% for idiosyncratic risk which can deviate 0.6% from the mean value for idiosyncratic risk measuring through the factory model, whereas 1.9% average value with a standard deviation of 0.7% for idiosyncratic risk measuring through the factor model. The minimum and maximum range is 9% to 13% for idiosyncratic risk measuring through a three-factor model and 9% to 13% for idiosyncratic risk measuring through the five-factor model. The environmental disclosure score range is 1 to 100 provided by S&P global database, the average score of environmental disclosure is 27. The standard deviation value for Environmental disclosure is 2.66. The minimum and maximum score of environmental disclosure in the case of Pakistan is 1 and 100 respectively. The average score of the corporate governance

index is 1.00 which can deviation from the 3.04 score lower or upper side. CGI is constructed through Principle Component Analysis by using four mechanisms i.e. BI, BS, BD, and BG. The minimum and maximum scores of the corporate governance index are 0.03 and 29.80 respectively. Furthermore, table 4.4 shows the average age of firms in combined data is 40 years with a standard deviation of 2 years. The minimum and maximum age is 2 years to 276 years. The mean (standard deviation) values of sales growth and leverage are -5% (28%) and 24% (19%) respectively. For country-level control variables average GDP growth is 2.01 with a standard deviation is 4.54. Similarly exchange rate of combined sample data is 8.768 USD and the standard deviation is 9.947. Besides these, the table also shows the maximum and minimum values of firm-specific and country-specific control variables for combined data.

TABLE 4.4: Descriptive Results - Combine

Variables	**Obs**	**Mean**	**SD**	**Min**	**Max**
END	1,496	3.28153	0.97766	.00001	4.60517
I.Risk	1,496	0.26511	0.09244	.00001	1.11912
Age	1,496	3.67680	0.69828	0.69315	5.62040
Sg	1,496	-0.05476	0.28476	-0.99922	0.8919
Lev	1,496	0.24143	0.19277	0.00001	2.66811
Fs	1,496	17.48168	2.23688	10.55956	23.73202
Gdpg	1,496	2.01065	4.54266	-9.90699	7.0822
Er	1,496	2.17114	2.29729	-0.49802	5.08760
GI	1,496	0.0010	2.07037	-5.32096	2.86481
CGI	1,496	0.00014	1.11149	-15.3466	3.39439
I.Risk3	1496	0.01712	0.00668	0.0087	0.12477
I.Risk5	1496	0.01859	0.00717	0.00924	0.13273

Source: The authors note: This Table describes descriptive results of Combined data, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = IR measure through Fama & French three-factor model, I.Risk5 = IR measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC).

4.3 Correlation Analysis

This section presents the correlation findings. First, correlations between various variables related to idiosyncratic risk with market factor are explored, and then correlation statistics for idiosyncratic risk with three and five factors models are presented. The association among variables for the entire sample as well as for all study Pakistan, India, and the UK is examined for idiosyncratic risk in this subsection. About the whole sample and the other three economies of the world, the association among the study variables for IR is shown in Tables 4.3.1 to 4.3.4.

4.3.1 Correlation Analysis of UK

Results of Table # 4.5 give preliminary insights and pairwise correlations of the impact of independent variables on IR. The findings illustrates the weak and inverse relationship between independent variables and IR for the UK. Results revealed that the correlation between idiosyncratic risk and independent variables including Firm Age, Sales Growth, Leverage, Firm Size, GDP Growth, Exchange Rate, environmental Disclosure, corporate governance index, and External governance index are -0.153, -0.095, -0.129, -0.138, -0.395, 0.268, -0.202, 0.056 and -0.399 respectively. Similar results regarding firm size and leverage have been revealed in different studies by Wiyono and Mardijuwono (2020); Benlemlih et al. (2018). As per their results leverage, firm size, and idiosyncratic risk have a negative association with -0.005 and -0.0202 respectively. They also found a negative correlation between END and IR with -0.213 values. Overall study found a weak and mostly negative correlation between idiosyncratic risk and other independent variables. Similarly correlation between END and other variables including IR, Firm Age, Sales Growth, Leverage, Firm Size, GDP Growth, Exchange Rate, corporate governance index, and External governance index are -0.202, 0.154, -0.058, -0.016, 0.452, 0.023, -0.058, -0.058 and 0.015 respectively. The lowest and weakest correlation found between environmental disclosure and external governance index is 0.015 and the higher correlation is found between firm size and environmental disclosure which is 0.452.

The corporate governance index also shows weak relationships although some are negative and some are positive with END, idiosyncratic risk, and other control variables. For robustness study also examined the association of idiosyncratic risk measures through the three and five-factor models. Results show a negative and weak relationship of idiosyncratic risk (measured through a three-factor model) with environmental disclosure that is -0.114, similarly weak and negative (-0.023) relationship with the CG index. In the case of the five-factor model the relationship between IR and END is found positive and weak association which is 0.058 but there is a negative weak association (-0.095) found between five-factor and environmental disclosure. Almost similar results were shown by (Li et al., 2021) in their study. The correlation results of their study show a negative weak association of firm size, firm age, leverage, and CSR against idiosyncratic risk.

Furthermore, since there is no correlation between the independent variable and the control variables, there is no multicollinearity problem in the data as the correlation coefficient is lower than 0.70 for all study variables except the correlation between GDPG and external governance index which is 0.963. Multicolinearity issue arises when there is a high association likely more than 0.9 found among explanatory and control variables (Hair et al., 2010).

TABLE 4.5: Correlation Matrix – UK

Variables	**I.Risk**	**Age**	**Sg**	**Lev**	**Fs**	**Gdpg**	**Er**
I.Risk	1.000						
Age	-0.153***	1.000					
Sg	-0.095**	-0.053	1.000				
Lev	-0.129***	-0.123***	-0.049	1.000			
Fs	-0.138***	0.194***	-0.176***	0.063	1.000		
Gdpg	-0.395***	-0.019	0.236***	0.015	-0.057	1.000	
Er	0.264***	0.044	-0.234***	-0.053**	0.114***	-0.411	1.000
END	-0.202***	0.154***	-0.058	-0.016	0.452***	0.023	-0.058
CGI	0.056	-0.019	0.027	-0.044	0.022	0.034	-0.089

Continued on next page

Variables	**I.Risk**	**Age**	**Sg**	**Lev**	**Fs**	**Gdpg**	**Er**
GI	-0.399***	-0.020	0.196***	0.038	-0.064	0.963***	-0.459***
I.Risk3	-0.041	-0.019	0.003	0.154***	0.016	0.016	0.008
I.Risk5	-0.061	-0.121***	-0.008	0.055	0.135***	0.005	0.039
Variables	**ENE**	**CGI**	**GI**	**I.Risk3**	**I.Risk5**		
END	1.000						
CGI	-0.058	1.000					
GI	0.015	0.038	1.000				
I.Risk3	-0.114***	-0.023	0.017	1.000			
I.Risk5	0.058	-0.095	0.007	0.572***	1.000		

*Source: The authors note: This Table describes the Correlation results of the UK, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = IR measure through Fama & French three-factor model, I.Risk5 = IR measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC). *** P < .01, ** p < 0.05, * p < .1*

Concluded

4.3.2 Correlation Analysis of India

Table # 4.6 provides a pairwise correlation analysis between independent variables, idiosyncratic risk, and other micro-economic and macro-economic control variables for India. The overall results show a weak and negative association between independent variables and IR for India. Results of table # 4.6 depict that the correlation between idiosyncratic risk and independent variables including Firm Age, Sales Growth, Leverage, Firm Size, GDP Growth, Exchange Rate, environmental Disclosure, corporate governance index, and External governance index are -0.053, -0.057, 0.273, 0.117, -0.275, 0.181, -0.089, -0.092, -0.280 respectively. Correlation

analysis found a weak and mostly negative correlation between idiosyncratic risk and other independent variables. The weakest correlation exists between environmental disclosure and firm age whereas, the highest correlation is found between environmental disclosure and external governance index but still no issue of multicollinearity. Similarly, the correlation between END and other variables including IR, Firm Age, Sales Growth, Leverage, Firm Size, GDP Growth, Exchange Rate, corporate governance index, and External governance index are -0.089, -0.077, -0.075, 0.031, 0.260, -0.017, -0.018 respectively. A comparatively higher correlation is shown between firm size and environmental disclosure which is 0.260 and a lower correlation is found between GDP growth and environmental disclosure. The corporate governance index also shows a weak relationship with other variables including environmental disclosure, idiosyncratic risk, and control variables. For robustness relationships with three and five-factor models were also examined. The findings of correlation analysis shows there is a weak and positive association between END and IR for both three and five factors i.e. 0.001 and 0.011 respectively. Whereas there is a negative and weak relationship found with the corporate governance index for Fama & French three and five factors (-0.097 and -0.021 respectively).

Moreover, in study variables, only GDP Growth and external governance index may problem of multicollinearity as their value of the correlation coefficient is 0.905, whereas the weakest association was found between the corporate governance index and environmental disclosure. Overall there is no multicollinearity issue is seen in the data as independent variables and control variables show weak correlation as the correlation coefficient is lower than the threshold value of multicollinearity. Therefore, it is envisaged that multicollinearity will not be an issue during regression analysis.

TABLE 4.6: Correlation Matrix – India

Variables	**I.Risk**	**Age**	**Sg**	**Lev**	**Fs**	**gdpg**	**Er**
I.Risk	1.000						

Continued on next page

Variables	**I.Risk**	**Age**	**Sg**	**Lev**	**Fs**	**gdpg**	**Er**
Age	-0.053	1.000					
Sg	-0.057	-0.184***	1.000				
Lev	0.273***	-0.148***	0.052*	1.000			
Fs	0.117***	0.111***	-0.048	0.398***	1.000		
Gdpg	-0.275***	-0.012	-0.005	0.004	-0.102***	1.000	
Er	0.181***	0.076**	-0.081**	-0.057	0.155***	-0.663***	1.000
END	-0.089**	-0.077*	-0.075*	0.031	0.260***	-0.017	-0.018
CGI	-0.092**	-0.034	0.092**	-0.129**	-0.061	-0.008	0.026
GI	-0.280***	-0.036	0.044	0.026	-0.128	0.905***	-0.859***
I.Risk3	0.432***	-0.021	-0.011	0.206***	0.187***	-0.631***	o.450***
I.Risk5	0.432	-0.022	-0.111	0.207***	0.633***	0.452***	0.188***

Variables	**END**	**CGI**	**GI**	**I.Risk3**	**I.Risk5**
END	1.000				
CGI	-0.002	1.000			
GI	-0.009	-0.012	1.000		
I.Risk3	0.001	-0.097	-0.448***	1.000	
I.Risk5	0.011	-0.021	-0.401	0.644***	1.000

*Source: The authors note: This Table describes the Correlation results of India, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = IR measure through Fama & French three-factor model, I.Risk5 = IR measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC). *** P < .01, ** p < 0.05, * p < .1*

Concluded

4.3.3 Correlation Analysis of Pakistan

Results of Table # 4.7 provide pilot views and pairwise correlations of the influence of independent variables on idiosyncratic risk for Pakistan. Results shown in table # 4.7 revealed that the correlation between idiosyncratic risk and independent variables including Firm Age, Sales Growth, Leverage, Firm Size, GDP Growth, Exchange Rate, environmental Disclosure, corporate governance index, and External governance index are 0.055, 0.316, -0.370, -0.279, -0.144, 0.055, -0.027, 0.313 and -0.104 respectively. There is a weak and mostly negative correlation found between idiosyncratic risk and other independent variables. Similarly correlation between END and other variables including IR, Firm Age, Sales Growth, Leverage, Firm Size, GDP Growth, Exchange Rate, corporate governance index, and External governance index are -0.027, -0.110, -0.114, 0.113, -0.083, 0.247, -0.303, -0.226 and 0.203 respectively. The weakest association was found between idiosyncratic risk and environmental disclosure i.e. -0.027 and the higher correlation is found between GDP Growth and environmental disclosure which is 0.247, but within the threshold level. The corporate governance index also shows weak relationships although some are negative and some are positive with END, idiosyncratic risk, and other control variables. The weakest association was found between the CG index and GDP growth which is 0.026 and the maximum value of the correlation coefficient is 0.313 between the CG index and idiosyncratic risk that has not problematic for multicolinearity.

Moreover, in the data of Pakistan independent variable and control variables indicates weak correlation and no problem of multicollinearity present as the correlation coefficient is lower than the threshold value of multicollinearity for all study variables. The highest correlation found between GDPG and the external governance index is 0.794.

Table 4.7: Correlation Matrix – Pakistan

Variables	**I.Risk**	**Age**	**Sg**	**Lev**	**Fs**	**gdpg**	**Er**
I.Risk	1.000						
Age	0.055	1.000					

Continued on next page

Variables	**I.Risk**	**Age**	**Sg**	**Lev**	**Fs**	**gdpg**	**Er**
Sg	0.316***	0.005	1.000				
Lev	-0.370**	0.248	-0.212***	1.000			
Fs	-0.279***	-0.136	-0.125	0.015	1.000		
Gdpg	-0.144	-0.019	0.042	-0.069	-0.193**	1.000	
Er	0.055	0.068	0.033	0.070	0.277***	-0.871***	1.000
END	-0.027	-0.110	-0.114**	0.113*	-0.083	0.247***	-0.303***
CGI	0.313***	-0.294***	0.368***	-0.238**	-0.102	-0.028	0.026***
GI	-0.104	-0.037	0.006	-0.047	-0.239**	0.794***	-0.814***
I.Risk3	0.961***	0.047	0.288***	-0.189**	-0.230**	-0.189*	0.102
I.Risk5	0.960	0.046	0.289**	-0.198	-0.231**	0.177*	0.101
Variables	**END**	**CGI**	**GI**	**I.Risk3**	**I.Risk5**		
END	1.000						
CGI	-0.226	1.000					
GI	0.203***	-0.016	1.000				
I.Risk3	0.001	-0.097***	-0.448	1.000			
I.Risk5	0.011	-0.021***	-0.401	0.644	1.000		

*Source: The authors note: This Table describes the Correlation results of Pakistan, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = IR measure through Fama & French three-factor model, I.Risk5 = IR measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC). *** P < .01, ** p < 0.05, * p < .1*

Concluded

4.4 Results of Panel Unit Root Test (P-value of Levin Lin-Chu)

To investigate the stationarity of the data study used a panel unit root test. Table 4.9 displays the significance level of the Levin-Lin-Chu unit root test which is derived from the unit root test. The Ho is the panel containing the unit root and the alternative hypothesis is H1: The panel is stationary.

The results of the Panel Unit Root - Levin Lin-Chu test indicate that P-values are less than 0.05 for independent, dependent, and control variables. These significant results depict that all alternative hypothesis is accepted. So, the p-value study variables is less than 0.05 mean stationary at level I. Therefore, these can be used for regression analysis.

TABLE 4.8: Results of Panel Unit Root Test

Ser	**Variables**	**Results**	**Status**
1	END	P-value < 0.05	Data is Stationary at a level I
2	I.Risk	P-value < 0.05	Data is Stationary at a level I
3	Age	P-value < 0.05	Data is Stationary at a level I
4	Sg	P-value < 0.05	Data is Stationary at a level I
5	Lev	P-value < 0.05	Data is Stationary at a level I
6	Fs	P-value < 0.05	Data is Stationary at a level I
7	Gdpg	P-value < 0.05	Data is Stationary at a level I
8	Er	P-value < 0.05	Data is Stationary at a level I
9	GI	P-value < 0.05	Data is Stationary at a level I
10	CGI	P-value < 0.05	Data is Stationary at a level I

Source: The authors note: This Table describes the results of the Panel Unit Root Test, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC).

Concluded

4.5 Test for Endogeneity in the Context of Combined Economies (Pakistan, India and UK)

Table No. 4.10 shows the results for endogeneity in the context of all three countries (Pakistan, India & UK) and the pooling of these three countries.

TABLE 4.9: Results of Panel Unit Root Test

Relationship between independent variable i.e. Environmental disclosure with error term obtained by applying research models, in which idiosyncratic risk measured by CAPM, Three Factor, and Five Factor.

Dependent Variables	**With CAPM**	**With Three Factor Model**	**With Five Factor Model**
I.Risk	0.004***	0.002***	0.001***
	0.000	0.000	0.002

*Source: The authors note: This Table describes results for endogeneity in the context of combined economies (Pakistan, India & UK), dependent variable I.Risk = Idiosyncratic Risk, ***P‡ 0.01, **P‡ 0.05, *P‡ 0.1 Parenthesis= (P-value, significance)*

To check the endogeneity issue in the data study used Durbin-Wu-Test supposes the Idiosyncratic Risk t-1 is an endogenous variable and significant results of the test confirm the presence of the endogeneity effect. Usually, to identify endogeneity in a particular regressor the test used is Durbin-Wu-Hausman. This test looks at whether the error term is related to the explanatory variable, which in theory shouldn't be correlated with the one on the right. Thus, the Durbin-Wu-Hausman test is used to check for endogeneity in the OLS regression (Ullah et al., 2018). For this purpose, the independent variable (environmental disclosure) is a dependent variable and has been regressed on all other explanatory variables and control variables (including micro-level and macro-level control variables). The same has been applied in the context of all economies as collectively and residual terms have been obtained. Then, these error terms have been taken as part of general equations as explanatory variables along with all other independent and control variables in the context of all countries collectively. The endogenous variable is present, indicating that the explanatory variable is connected to the residual and that endogeneity was a problem, according to the coefficients of the residual components that were deemed at 1% level of significance. The findings demonstrate that the term residual is regressed on dependent variables (idiosyncratic risk) in

the situations of all three countries and the pooling of these economies and that the coefficient is significant in all cases with a p-value less than 0.05. As a result, the findings verify that an endogeneity problem exists in every model and every country. The current study applied this technique to examine the endogeneity effect only on combined economies i.e. Pakistan, India, and UK. Results revealed that in combined data endogeneity problem is found, it is understood that it will exist in separate economies data. Once an endogeniety issue is found in the data, then the GMM test is recommended to use for regression to address this issue, to avoid spurious results.

4.6 Regression Results of System Generalized Methods of Moments (Measurement of Idiosyncratic Risk Through CAPM)

This subsection presents the system generalized methods of moments for the dynamic panel model. Since there isn't a lot of literature on this particular subject, we're attempting to cover all the various aspects of the association between risk and disclosure along with the moderation of the CG index. In addition to addressing endogenous and non-linear estimates, the methodology seeks to shed light on the overall effect of END on corporate risk. First, interpret the results country-wise for three economies Pakistan, India, and Pakistan separately and then combined. Table # 4.11 shows the empirical results of the study, which is impact of END on IR. Furthermore, by reducing the agency problem and asymmetric information, the CG index (interaction term END*CGI) contributes to the improvement of the association between END and IR. To capture the influence of the END on idiosyncratic risk, research also employed certain macro-level factors (exchange rate, GDPG, external governance index), as well as some micro-level control variables (firm age, sales growth, leverage, and firm size). Instrument variables are lagged explanatory variables, dependent variable, moderating, and control variables. following earlier studies such as (Nollet et al., 2016; Tzouvanas et al.,

2020), the current study used a panel data approach and emphasized disclosure in risk regressions and moderating impact of corporate governance as indicated below:-

$$I.Risk_{i,t} = \beta_0 + \beta_1 I.Risk_{i,t-1} + \beta_2 END_{i,t} + \beta_3 CGI_{i,t} + \beta_4 END_{i,t} * CGI_{i,t}$$
$$+ \sum_{i=1}^{j} \lambda_i FCon_{i,t} + \sum_{l=1}^{m} \alpha_l CCon_{c,t} + \mathrm{e_{i,t}}$$

Whereas,

Subscript 'i' = Firm, i = 1, 2, ..., n

Subscript 't' = time / year, t = 1, 2, ..., t

$e_(i,t)$,t = residual

I.Risk = Idiosyncratic Risk

CGI = CG Index

FCon = Micro-level control variables

CCon = Macro-level control variables

Two-stage system generalized methods of moments approach was applied to examine the study hypothesis as per the above-mentioned equation # 1. Sargan test of over-identifying restriction demonstrates insignificant results for all economies of Pakistan, India, and UK as their p-values are less than 5%, proving the reliability of the instruments utilized in the two-step approach GMM method (Shin et al., 2020). The finding also consist of first, second, and third-order autocorrelation.

4.6.1 Regression Results of System GMM and Hypothesis Testing for Pakistan, India & UK (Measurement of Idiosyncratic Risk through CAPM)

Column 7, 8 & 9 of Table # 4.11 shows the regression results of Pakistan. The table depicts that END influences significantly IR (END = -9.422, P-Value = 0.016).

The coefficient of END is negative with a possibility less than 5%, which depicts that END has a negative significant impact on IR for Pakistan. The findings support hypothesis 1 of the study, and as a result, transparent communication about climate change and more disclosure regarding the environment reduces the idiosyncratic risk for Pakistani non-financial firms. This study lends more credence to the legitimacy and stakeholder theories. Due to the requirement that businesses give back to the community and educate the public about their environmentally friendly practices, stakeholder and legitimacy theories strengthen the idea that social and environmental initiatives significantly lower firm risk. The findings are in line with the previous research that recognizes the advantages of social business activity (Mishra and Modi, 2013; Cai et al., 2016; Tzouvanas et al., 2020). The CG Index comprised of BI, BS, BD, and BM has negative significant effect on IR as the coefficient of CG Index is -17.391 with P-Value less than 0.05. These results also support hypothesis 2, which hypothesized that increase in corporate governance mechanisms decrease the IR of the firm. Similar results have also been presented in by earlier researchers (like (Hatane et al., 2019), (Chakraborty et al., 2019). The Beta value of moderator or interaction term (END*CGI) is -0.917 with a p-value less than 5% indicating that CG Index negatively moderates the relationship between END and IR. As the association between END and IR is negatively significant, so negative coefficient of interaction term (moderating variable) depicts that CG Index enhance and strengthen the association between END and IR. It means good CG mechanism strengthen the existing relationship of independent and dependent variables. Results suggests that organization should focus on betterment of corporate governance structure to increase the environmental disclosure which ultimately decrease idiosyncratic risk of the equity. Besides these main variables, the study also discussed some control variables, which have a significant influence on IR. An increase in firm age, leverage, GDP Growth rate, and exchange rate decreases the idiosyncratic risk as their co-efficient are -9.287, -79.851, -2.404 and -37.311 respectively. Whereas, an increase in sales growth, firm size, and external governance index increases the idiosyncratic risk as their co-efficient are 17.934, 10.187, and 0.955 respectively. In the case of Pakistan number of observations is 91 and the number of instruments is 122. The results of the 'test of over-identifying

restrictions' are insignificant that depicts instrumental over-identified is valid. In the model, AR (1) and AR (2) have been added to examine and resolve the serial correlation, In the case of Pakistan it has been found that a p-value higher than 0.05 which denotes AR (1) is insignificant.

Regression results for India shows in column 4, 5 and 6 of Table # 4.11. The table shows that the coefficient of environmental disclosure is 0.013 with a p-value 0.000 which indicates END has a positive significant effect on IR. This result does not support hypothesis 1 as the study hypothesized that END has a negative impact on IR. Although the results are not endorse the study hypothesis but are supported by managerial opportunism theory. This study supports the managerial opportunism hypothesis, or the principal agent issues concept, which contends that agents act in a way that best backings the interests of the principals. The findings are in line with the several past researches those support positive relationship between END and IR like (Bouslah et al., 2013; Wu et al., 2016). Results indicates that coefficient of CG Index is -0.037 with a p-value less than 5%, which indicates that CG Index has negatively influenced IR and supports study hypothesis 2. This outcome is in line with the past researches of (Hussain and Amir Shah, 2017; Mathew et al., 2018). They argued that companies with effective and well-designed governance structures avoid taking unnecessary risks because they employ less hazardous tactics than companies with weak corporate governance mechanisms. The coefficient of interaction term (END*CGI) is reported as -0.003 with a p-value less than 0.05, which shows CG index negatively moderates the association between END and IR. Results of hypothesis 1, presented that there is positive relationship between END and IR, so negative coefficient of moderating variable (interaction term) depicts that CG Index weaker the relationship between END and IR. It means, in case of India, good corporate does not strengthen the existing relationship of END and IR. Results suggests that organization should focus on betterment of corporate governance structure to decrease idiosyncratic risk of the equity. Besides environmental disclosure, some micro-level and macro-level control variables have significantly influenced the idiosyncratic risk. As per Table # 4.11 firm age, sales growth, firm size, and external governance index have a negative significant effect on IR as their co-efficient are -0.178, -0.120, -0.157, and -0.017

respectively. Whereas, leverage, GDP growth, and exchange rate have a positive influence on idiosyncratic risk as their co-efficient are 0.416, 0.003, and 0.703 respectively. The unexpected positive effect of leverage on IR was also reported in past studies. As a measure of financial risk, leverage is anticipated to be positive because riskier businesses often hold heavier debt (Ang et al., 2006; Psillaki et al., 2010). The number of observations for India is 623 and the number of instruments is 79. The same Pakistan results of the 'test of over-identifying restrictions' are insignificant and depict instrumental over-identified is valid. In the model, AR (1) and AR (2) have been included, and in the case of India, it has been found that AR (3) is insignificant with a p-value 0.411 higher than the threshold level, which means in the model at lag-3 no serial correlation exists and it has been addressed. It is important to underline the validity of the model. AR(1) and AR(2) related to the first differenced equation denote that there are first-order auto-correlated disturbances and no second-order autocorrelation. Windmeijer (2005) confirms that unbiased results are obtained using the two-step estimator with the finite sample adjustment for standard errors. Underscoring the importance of the unique risk, the autoregressive term for Risk is positive and highly statistically significant, as predicted by (Ang et al., 2006). Regression results of the UK shows in Column 1, 2 and 3 of Table # 4.10. The coefficient of environmental disclosure -0.010 with less than 0.05 p-value depicts that an increase in disclosure decreases IR as both have a negative significant relationship. The finding is supported by hypothesis 1 of the study and in line with the theorization of legitimacy and stakeholder theories. As a result, in the UK transparent communication about climate change and more disclosure regarding the environment reduces idiosyncratic risk. Earlier studies like Salama et al. (2011); Oikonomou et al. (2012); Benlemlih et al. (2018) also found a negative relationship between END and IR. The corporate governance index comprises BD, BS, BM, and BI has negatively influences the idiosyncratic risk as the coefficient of CG INDEX is -0.006 with P-Value less than 0.05. Results support the hypothesis 2 of the study, which is increase in corporate governance mechanisms decreases the IR of firms. The results have already been discussed in earlier studies like (Hatane et al., 2019), (Chakraborty et al., 2019). The coefficient of moderator or interaction term (END*CGI) is -0.001 with a p-value less than 0.05

indicating that CG Index negatively moderates the relationship between END and IR. As the findings of the hypothesis revealed that association between END and IR is negatively significant, so negative coefficient of interaction term depicts that CG Index enhance and strengthen the relationship between END and IR. It shows good corporate governance strengthen the existing relationship of END and IR. Results suggests that organization should focus on improvement of CG structure to increase the END which ultimately decrease IR of the stock. The study also discussed some control variables that have a significant impact on idiosyncratic risk other than environmental disclosure. The increase in firm age, firm size, GDP Growth rate, and exchange rate increase the idiosyncratic risk as their co-efficient are 0.071, 0.034, 0.008, and 0.001 respectively. Although the majority of empirical research shows a negative correlation between Firm size and age with idiosyncratic risk, but in some cases there might be positive relationship. As companies of UK are more mature and larger in size and age, therefore to sustain their status company's needs to bear higher risk. Wiyono, E. R. and Mardijuwono, A. W. (2020) studied the impact of different firm-level variables on firm risk. They revealed that leverage had a considerably negative relationship with risk, whereas profitability and firm size had a significantly positive relationship with risk.

Whereas, an increase in leverage and external governance index decreases the idiosyncratic risk as their co-efficient are -0.021 and -0.028 respectively. Unusual from Pakistan and India results, sales growth has an insignificant relationship with idiosyncratic risk. In the case of the UK number of observations is 595 and the number of instruments is 112. The results of the 'test of over-identifying restrictions' are insignificant that depicts instrumental over-identified is valid. In the model, AR (1) and AR (2) have been added, and in the case of the UK, it has been found that AR (2) is insignificant with a p-value 0.117 higher than the threshold level, which means in the model at lag-2 no serial correlation exists and it has been addressed.

Moreover, it is debatable whether portfolio managers and investors ought to indiscriminately favor companies that disclose more information. Investing in assets that disclose their ownership suggests a lower level of idiosyncratic risk, and as such, lesser risk should result in lower returns. Compared to high-risk portfolios,

low-risk portfolios have higher disclosure and higher returns. Accordingly, decreased idiosyncratic risk may not always imply worse returns, in line with (Ang et al., 2006).

TABLE 4.10

	UK			India			Pakistan		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
	Coef	**z test**	**P-Value**	**Coef**	**z test**	**P-Value**	**Coef**	**z test**	**P-Value**
IRisk (-1)	0.424	21.36	0.000	-0.059	-2.06	0.039	-25.416	-2.37	0.018
END	-0.01	-3.66	0.000	0.013	4.91	0.000	-9.422	-2.42	0.016
CGI	-0.006	-5.26	0.000	-0.037	-6.24	0.000	-17.391	-2.41	0.016
END*CGI	-0.001	-2.62	0.009	-0.003	-2.37	0.002	-0.917	2.39	0.017
Age	0.071	9.57	0.000	-0.178	-4.13	0.000	-9.287	-2.41	0.016
SG	0.001	1.29	0.197	-0.12	-6.27	0.000	17.934	2.41	0.016
Lev	-0.021	-3.08	0.002	0.416	13.17	0.000	-76.851	-2.41	0.016
FS	0.034	8.53	0.000	-0.157	-7.01	0.000	10.187	2.42	0.016
GDPG	0.008	8.42	0.000	0.003	3.57	0.000	-2.404	-2.41	0.016
ER	0.001	3	0.003	0.703	8.85	0.000	-37.311	-2.4	0.016
GI	-0.028	-16.17	0.000	-0.017	-5.87	0.000	0.955	2.4	0.016
Constant	-0.615	-8.82	0.000	0.864	4.25	0.000	68.516	2.43	0.15
AR (1)		-2.506	0.012		-3.297	0.001		-0.796	0.426
AR (2)		-1.569	0.117		-2.561	0.01			
AR (3)					0.822	0.411			

	UK	**India**	**Pakistan**
Number of Obs	595	623	91
Number of Instruments	112	79	122
Test of over-identifying restrictions	Insignificant	Insignificant	Insignificant

Source: The authors note: This Table describes Regression results of the UK, India & and Pakistan, Independent Variable END = Environmental Disclosure, and dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = Idiosyncratic risk measure through Fama & French three-factor model, I.Risk5 = Idiosyncratic risk measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDPG, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC). All firm-specific variables are defined in table 3.2.

4.6.2 Combined (Pakistan, India & UK) Results of System GMM and Hypothesis Testing (Measurement of Idiosyncratic Risk through CAPM)

Previously we discussed regression results country-wise separately. Now discuss the combined results of Pakistan, India, and the UK by applying the regression technique system GMM. Table # 4.11 shows the regression results of combined data. As we seen there were positive and negative relationships between END and IR. Now combined findings show that there is a significant impact of environmental disclosure on idiosyncratic risk as P-Value less than 5.

The coefficient of environmental disclosure is positive i.e. 0.013, which portrays END, has a positive significant effect on IR. Although evidence of a positive relationship was found in past studies these findings do not support hypothesis 1 of the study. As per the combined result, transparent communication about climate change and more disclosure regarding the environment increase IR. This study lends more weight to the managerial opportunism theory, to put it another way, this theory denotes to the principal agent issue, which proposes that agents behave in a way that best serves the interests of the principals.

Previous research revealed a positive impact of END and IR (Bouslah et al., 2013; Wu et al., 2016). The CG Index comprised of Board Independence, Board Size, Board Duality, and Board Meeting has a negative influence on the IR as the coefficient of CGI is -0.009 with P-Value less than 0.055. These results also support hypothesis 2, which hypothesizes increased governance mechanism decrease the IR of the firm. The results have already been discussed in previous studies like (Hatane et al., 2019; Chakraborty et al., 2019). The p-value of the moderator (END*CGI) is 0.760 which indicates that CG Index does not moderate the relationship between END and the CG index.

In contrast to separate results of Pakistan, India, and UK, the combined result shows there is no moderating effect of corporate governance and does not support the study hypothesis 3. Besides these main variables, some micro-economic and

macro-economic variables have been examined. The table shows that age, leverage, firm size, and external governance index have a negative significant influence on IR. An increase in firm age, leverage, firm size, and external governance index decreases the idiosyncratic risk as their co-efficient are -0.012, -0.039, -0.010, and -0.019 respectively. Whereas, an increase in sales growth, GDP Growth, and exchange rate decreases the idiosyncratic risk as their co-efficient are 0.007, 0.002, and 0.014 respectively.

In the case of combined data number of observations is 1,309 and the number of instruments is 230. The results of the 'test of over-identifying restrictions' are insignificant that depicts instrumental over-identified is valid. In model AR (1), AR (2), and AR (3) have been added, and in the case of combined economies, it has been found that AR (3) is insignificant with a p-value 0.275 higher than the threshold level, which means in the model at lag-3 no serial correlation exists and it has been addressed.

4.7 Results of System GMM and Hypothesis Testing for Pakistan, India & UK (Measurement of Idiosyncratic Risk through Fama & French Three Factor Model)

This subsection presents the system generalized methods of moments for the dynamic panel model. In previous sections study measured IR through CAPM to examine several aspects of the association between risk and disclosure along with the moderating effect of the CG index. Now for robustness, the study measures IR by using the Fama & French three-factor model and the five-factor model. In addition to addressing endogenous and non-linear estimates, the methodology seeks to shed light on the overall influence of END on corporate risk same as in the previous section. First explain country-wise results for the three economies Pakistan, India, and UK separately and then explain the combined results of all

TABLE 4.11: Regression results (Idiosyncratic Risk Measure through CAPM)

	Combine (UK, India & Pakistan)		
Variables	**(1)**	**(2)**	**(3)**
	Coef	**z test**	**P-Value**
IRisk (-1)	0.296	31.45	0.000
END	0.013	21.39	0.000
CGI	-0.009	-3.6	0.000
END*CGI	0.001	0.31	0.760
Age	-0.012	-8.16	0.000
SG	0.007	5.42	0.000
Lev	-0.039	-8.63	0.000
FS	-0.01	-14.66	0.000
GDPG	0.002	12.97	0.000
ER	0.014	19.35	0.000
GI	-0.019	-60.58	0.000
Constant	0.343	30.49	0.000
AR (1)		-4.573	0.000
AR (2)		-2.837	0.005
AR (3)		1.092	0.275
No of Obs			1,309
No of Instruments			230
Test of over-identifying restrictions			Insignificant

Source: The authors note: This Table describes Regression results of Combined data (UK, India, and Pakistan), Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = Idiosyncratic risk measure through Fama & French three-factor model, I.Risk5 = Idiosyncratic risk measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC).

three economies. The study used a similar panel data approach as used for CAPM or Market factor to emphasize disclosure in risk regressions and moderating impact of corporate governance as indicated below:-

$$IRisk_{i,t} = \beta_0 + \beta_1 IRisk_{i,t-1} + \beta_2 END_{i,t} + \beta_3 CGI_{i,t} + \beta_4 END_{i,t} * CGI_{i,t}$$

$$+ \sum_{i=1}^{j} \lambda_i FCon_{i,t} + \sum_{l=1}^{m} \alpha_l CCon_{c,t} + \mathrm{e_{i,t}}$$

Whereas,

Subscript 'i' = Firm, i = 1, 2, ..., n

Subscript 't' = time / year, t = 1, 2, ..., T

$e_{(i,t)}$,t = error term

IRisk = Idiosyncratic Risk measuring through three factor model

CGI = CG Index

FCon = Micro level control variables

CCon = Macro level control variables

4.7.1 Regression Results (Idiosyncratic Risk Measured Through Three Factor Model) for UK, India & Pakistan

Regression results of the UK demonstrates column 1, 2 & 3 of Table # 4.12, with the scenario IR measured through three factor model. The table shows that END has significant influence on IR (END = -0.014, P-Value = 0.000). The coefficient of END is negative with a p-value is less than 0.05, which depicts that END has a negative significant impact on IR for the UK. This result proves the theorization of legitimacy and stakeholder theories and supports the study hypothesis 1, the findings are in line with the CAPM model. Results are similar with the results of past studies like (Benlemlih et al., 2018; Mefteh-Wali et al., 2022). As a result, in the UK transparent communication and more disclosure regarding the environment reduces idiosyncratic risk. The corporate governance index comprised of BI, BS, BD, and BM has a negative effect on IR as the coefficient of the corporate governance index is -0.009 with a Probability less than 5%. Moreover, results support the study hypothesis 2. Past studies of (Mathew et al., 2018; Rezaee et al., 2021) also proffered similar results. The Beta of the moderating variable or interaction term (END*CGI) is -0.002 with the probability is less than 5% depicting that the CG index negatively moderates the association between END and the IR. As the relationship between END and IR is negatively significant, so negative beta of interaction term depicts that CG Index enhance and strengthen their relationship. Results suggests that organization should focus on betterment of corporate governance structure to increase the environmental disclosure which

ultimately decrease idiosyncratic risk of the equity. Hypothesis 3 of the study supported these results. Similar to the CAPM model here discussed some control variables, which have a significant effect on IR other than environmental disclosure. An increase in firm size, GDP Growth rate external governance index, and exchange rate shows a significant impact on IR, firm age, exchange rate, and governance index have a positive impact whereas firm size and GDP have a negative influence on IR. These results are similar with past studies which have already been discussed in this chapter. The results of the 'test of over-identifying restrictions' are insignificant that depicts instrumental over-identified is valid. In the model, AR (1) and AR (2) have been added, and in the case of India, it has been found that AR (2) is insignificant with a p-value 0.674 higher than the threshold level, which means in the model at lag-2 no serial correlation exists and it has been addressed. The results of the main variables for the three-factor model are the same in the CAPM model.

Column 4, 5 & 6 of Table # 4.13 shows the regression results for India. For robustness, idiosyncratic risk was measured with a three-factor model to check the impact of END on IR. Statics show there is a significant positive influence of END on idiosyncratic risk as the coefficient of environmental disclosure is 0.001 with a p-value of 0.000. This result does not support hypothesis 1 as the study hypothesized that END has a negative influence on IR and is in line with the managerial opportunism theory. Bouslah et al. (2013); Reber et al. (2022) also revealed a positive relationship between END and IR. For the moderating variable, results report the beta of CG Index is -0.001 with a p-value less than 0.001, which indicates that CG Index has a negative influence on IR and supports study hypothesis 2. Results show that moderation of CG Index exists as a significant negative relationship found with a p-value less than 0.05 and the coefficient of moderating variable or interaction term (END*CGI) is reported as -0.001. As there was positive significant relationship between END and IR, than negative beta of interaction term depicts that CG Index weaker the connection between END and IR. It means good corporate governance mechanism will not increase the risk while increasing the disclosure. So the results of this section shows that organization should improve their corporate governance structure to reduce risk

that ultimately increase return of the stock. Besides environmental disclosure, all other control variables like firm age, size, sales growth, leverage, GDP, exchange rate, and governance index have significantly influenced the idiosyncratic risk. As per Table # 4.8 firm size and DGP Growth have a negative impact on idiosyncratic risk as their co-efficient are -0.011 and -0.003 respectively. Whereas, firm age, sales growth, leverage, exchange rate, and Governance Index have an influence positively to idiosyncratic risk as their co-efficient are 0.178, 0.018, 0.012, 0.049, and 0.004 respectively. Regression results of main variables like dependent, independent, and moderating variables are the same as working of idiosyncratic risk with CAPM.

The results of the 'test of over-identifying restrictions' are insignificant that depicts instrumental over-identified is valid. It is important to underline the validity of the model. AR(1) and AR(2) related to the first differenced equation denote that there are first-order autocorrelated disturbances and no second-order autocorrelation.

Column 7, 8 & 9 shows the regression results of Pakistan, for robustness idiosyncratic risk measured through a factor model. Table # 4.13 depicts that END influences significantly towards IR (END = 0.005, P-Value = 0.043). The coefficient of END is positive with a possibility less than 5%, which illustrates that END has a significant positive effect on IR for Pakistan. The findings are not supported by hypothesis 1 of the study. The results support managerial opportunism theory and earlier studies like (Reber et al., 2022; Lin et al., 2014).

The CG Index comprised of Board Independence, Board Size, Board Duality, and Board Meeting has significant negative impact on IR as the coefficient of CGI is -.007 with a P-Value is 0.040. This eventually supports the study hypothesis 2. There is no moderation of CG Index between END and IR as the result of corporate governance is insignificant.

The coefficient of moderating variable or interaction term (END*CGI) is -0.003 with a p-value is 0.239. This result does not support with the study hypothesis # 3. This result is in contrast with the results derived through CAPM, as in that case there was moderation of the corporate governance index. Besides

these main variables, the study also discussed micro-level and macro-level control variables.

Results show only the external governance index has a significant negative effect on IR, whereas firm size, firm age, leverage, sales growth, GDP growth, and exchange rate were found insignificant impact on firm IR which are contrast with results drawn through CAPM. The results of the 'test of over-identifying restrictions' are insignificant that depicts instrumental over-identified is valid.

4.7.2 Combined Regression Results for All Economies UK, India, and Pakistan (Idiosyncratic Risk Measured Through Three Factor Model)

In the robustness section, previously we discussed regression results country-wise separately. Now analyze regression results combined for all economies by applying the regression technique system GMM. Table # 4.13 indicates the regression results of combined data. Results statistics of the factor model show that there is a negative significant impression of END on IR as a Probability is less than 5%. The coefficient of environmental disclosure is negative as the coefficient of environmental disclosure is -0.001, which supports study hypothesis 1 and is supported by the legitimacy and stakeholder theories. The CG Index comprised of BI, BS, BD, and BM has a negative significant influence on the IR as the coefficient of CG Index is -0.001 with P-Value 0.000. The findings support the study hypothesis 2, which hypothesizes that enhanced governance mechanisms decrease the IR of the firm. The p-value of the interaction term of the moderator is less than 0.005 with a coefficient value is -0.001 which indicates that CG Index moderates the relationship between END and the CG index. In contrast to the results of idiosyncratic risk measures through CAPM, these findings are in line with the study hypothesis 3. Previously moderation results of combined economies (idiosyncratic risk measure through CAPM) were not significant and moderation did not exist, but now with

TABLE 4.12: Regression results (Idiosyncratic Risk Measure Through Fama & French Three Factor Model

	UK			India			Pakistan		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
	Coef	**z test**	**P-Value**	**Coef**	**z test**	**P-Value**	**Coef**	**z test**	**P-Value**
IRisk (-1)	-0.139	-13.29	0.000	-0.901	-44.26	0.000	-0.72	-0.98	0.329
END	-0.014	-12.21	0.000	0.001	10.57	0.000	0.005	2.02	0.043
CGi	-0.009	-13.35	0.000	-0.001	-3.46	0.001	-0.007	-1.48	0.04
END*CGI	-0.002	-14.44	0.000	-0.001	-9.98	0.000	-0.003	-1.18	0.239
Age	0.001	0.03	0.973	0.178	6.08	0.000	0.004	0.62	0.537
SG	-0.004	-2.36	0.197	0.018	3.02	0.003	-0.004	-0.6	0.547
Lev	0.003	6.67	0.000	0.012	10.16	0.000	-0.03	-118	0.239
FS	-0.008	-7.19	0.000	-0.011	-12.86	0.000	-0.002	-0.41	0.684
GDPG	-0.001	-4.03	0.000	-0.003	-71.68	0.000	-0.001	-1.82	0.068
ER	0.001	8.82	0.000	0.049	29.42	0.000	-0.008	-0.71	0.478
GI	0.001	0.001	0.000	0.004	38.93	0.000	-0.001	-2.35	0.019
Constant	0.039	0.003	0.000	-0.029	-5.62	0.000	0.095	-1.31	0.19
AR (1)		-1.473	0.141		-3.872	0.001		-0.284	0.776
AR (2)		-0.42	0.674		-1.793	0.073		-1.081	0.279

UK	**India**	**Pakistan**
No of Obs	595	623	91
No of Instruments	117	127	116

Source: The authors note: This Table describes Regression results of the UK, India, and Pakistan, Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = Idiosyncratic risk measure through Fama & French three-factor model, I.Risk5 = Idiosyncratic risk measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC).

the three factor model moderation exists as the interaction term becomes significant. In case of combined economies, there was negative significant association between END and IR, than the negative significant coefficient of moderating variable depict that corporate governance index has strengthen the relationship between END and IR. It means CG index strengthen the relationship of END and IR. So, results suggest that enhance the corporate governance mechanism for better return and sustainability disclosure. Besides these main variables, some micro-economic and macro-economic variables have been examined. The table shows that sales growth,

leverage, firm size, and external governance index have a significant negative effect on idiosyncratic risk. An increase in firm age, GDP growth, and exchange rate decreases the idiosyncratic risk Results of the 'test of over-identifying restrictions' are insignificant that depict instrumental over-identified is valid. In the model, AR (1) and AR (2) have been added, and in the case of combined economies, it has been found that AR (2) is insignificant with a p-value 0.591 higher than the threshold level, which means in the model at lag-2 no serial correlation exists and it has been addressed.

TABLE 4.13: Regression results for idiosyncratic risk (Working Through Fama & French Three Factor Model

	Combine (UK, India & Pakistan)		
Variables	**(1)**	**(2)**	**(3)**
	Coef	**z test**	**P-Value**
IRisk (-1)	0.336	43.3	0.000
END	-0.001	-20.38	0.000
CGI	-0.001	-5.02	0.000
END*CGI	-0.001	-4.96	0.000
Age	-0.002	-14.36	0.000
SG	0.001	19.57	0.000
Lev	0.001	4.82	0.000
FS	0.001	20.3	0.000
GDPG	0.000	-79.04	0.000
ER	-0.001	-3.9	0.000
GI	0.001	60.71	0.000
Constant	-0.002	-1.77	0.077
AR (1)		-1.763	0.078
AR (2)		0.537	0.591
No of Obs		1,309	
No of Instruments		212	
Test of over-identifying restrictions		Insignificant	

Source: The authors note: This Table describes Regression results of Combined data (UK, India & Pakistan), Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = Idiosyncratic risk measure through Fama & French three-factor model, I.Risk5 = Idiosyncratic risk measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC).

4.7.3 Results of System GMM and Hypothesis Testing for Pakistan, India & UK (Measurement of Idiosyncratic Risk through Fama & French Five Factor Model)

In the previous section idiosyncratic risk was measured trough CAPM to check the effect of END on IR, and also check the moderating role of corporate governance index. Later on for robustness study used Fama & French three-factor model to measure IR. Now study used the Fama & French five-factor model to measure IR. Regression results of the UK shows in column 1, 2 & 3 of Table # 4.14, by using a five-factor model. Results show that END has a significant negative influence on IR for the UK (as END = -0.001, P-Value = 0.000) which proves the theorization of legitimacy and stakeholder theories. Results support the study hypothesis 1 and are in line with past studies results like (Benlemlih et al., 2018; Mefteh-Wali et al., 2022; Cai et al., 2016). The results are the same as the results shown through the CAPM model and the three-factor model. As a result, in the UK more disclosure regarding the environment reduces idiosyncratic risk. Moderating variable corporate governance index comprised of BI, BS, BD, and BM has a significant negative influence on IR as the coefficient of corporate governance index is -0.003 with P-Value less than 0.05. This result also supports the study hypothesis 2 and is similar to past studies results (like (Mathew et al., 2018; Rezaee et al., 2021). The table shows CG index negatively moderates the relationship between END and IR as the coefficient of moderator or interaction term is -0.009 with a p-value less than 0.05, which supports hypothesis 3. As the association between END and IR is negatively significant, so negative beta of interaction term depicts that CG Index enhance and strengthen the relationship between END and IR. It means good CG strengthen the existing relationship of independent and dependent variables. Results suggests that organization should focus on betterment of corporate governance structure to increase the environmental disclosure which ultimately decrease idiosyncratic risk of the equity. Besides independent and moderating variables study also discussed some control variables for the factor model. Results show sales growth, firm size, and DGP growth have a negative influence on IR as their coefficients are -0.001,

-0.001, and -0.002 respectively. Whereas exchange rate and external governance index have a positive significant impact on IR and their coefficients are 0.001 for each. Results of firm age, and leverage are insignificant in contrast with previous results. These results are almost the same as CAPM and three-factor model results show, especially results of the main variable i.e. independent and moderating variables are the same. These results are in line with past studies which have already been discussed in this chapter. The results of the 'test of over-identifying restrictions' are insignificant that depict instrumental over-identified is valid same as reported in previous sections of CAPM and three factor model. In the model, AR (1) and AR (2) have been added, and in the case of India, it has been found that AR (1) is insignificant with a p-value 0.154 higher than the threshold level, which means in the model at lag-1 no serial correlation exists and it has been addressed.

Regression results for India indicates in column 4, 5 & 6 of table # 4.15. For robustness idiosyncratic risk was measured with Fama & French five-factor model to check the impact of environmental disclosure on idiosyncratic risk. Similar to CAPM and the three-factor model results of the five-factor model show a significant positive influence of END on IR as the coefficient of environmental disclosure is 0.001 with a p-value less than 0.001. This result does not support hypothesis 1 as the study hypothesized that END has a negative impact on IR. Although results do not support the study hypothesis but these results are supported by managerial opportunism theory and several past researches support a positive relationship between END and IR like (Bouslah et al., 2013; Wu et al., 2016). There is a similarity of moderation results with CAPM and the three-factor model, results report coefficient of CG Index is -0.001 with a p-value less than 0.001, which indicates that CG Index has a significant negative impact on IR and supports study hypothesis 2. There are similar results found in past studies like (Hussain and Amir Shah, 2017; Mathew et al., 2018). Results show that moderation of CG Index exists and strengthens the connection between END and IR measured by the five-factor model, as the coefficient of interaction term (END*CGI) is reported as -0.001, which supports hypothesis 3 . Results of hypothesis 1, indicated that there is positive association between END and IR, so negative beta of interaction

term depicts that CG Index weaker the relationship between END and IR. It means, in case of India, good corporate does not increase the existing relationship of END and IR. Results suggests that organization should focus on betterment of corporate governance structure to decrease idiosyncratic risk of the equity. Besides environmental disclosure, all other control variables like firm age, size, leverage, GDP, exchange rate, and external governance index have almost the same results as CAPM and the three-factor model. As per results shown in table # 4.15 firm size and DGP Growth have a negative impact on idiosyncratic risk as their co-efficient are -0.011 and -0.003 respectively. Whereas, firm age, leverage, exchange rate, and External Governance Index have a positive impact on IR as their co-efficient are 0.128, 0.019, 0.053, and 0.005 respectively. Sales growth has shown no significant result. The results of the 'test of over-identifying restrictions' are insignificant that depicts instrumental over-identified is valid. It is important to underline the validity of the model. AR(1) and AR(2) related to the first differenced equation denote that there are first-order autocorrelated disturbances and no second-order autocorrelation.

Regression results of Pakistan shows in column 7, 8, and 9 of Table # 4.15, for robustness IR measured through the five-factor model. Results depict that END has a significant positive influence on IR in the case of Pakistan as the coefficient of END is 0.004 and the P-Value is 0.040. Hence, results does not support hypothesis 1, but support and in line with the managerial opportunism theory. Several past research also revealed that environmental disclosure and idiosyncratic risk has positive relationship. Reber et al. (2022) revealed in their study that positive correlation between risk and environmental disclosure that is favorable, due to the additional costs that must bear by businesses. The managerial opportunism theory explains a positive relationship between firm risk and CSR (e.g. environmental disclosure) activities. It claims that managers could expend on environmental or social projects in an effort to please stakeholders and enhance their reputations as upstanding citizens, even at the expense of shareholders (Bouslah et al., 2013; Barnea and Rubin, 2010). CG Index comprised of BI, BS, BD, and BM has negatively influenced the IR as the coefficient of CGI is -0.004 with P-Value less than 0.05. Results support hypothesis 2, and several past studies indicates that components of corporate governance has

negative relationship with the idiosyncratic risk (like (Hussain and Amir Shah, 2017; Mathew et al., 2018; Rezaee et al., 2021). They carried on to say that well-designed and effective governance structures prevent businesses from incurring unnecessary risks since they enable strong corporate governance to adopt less hazardous strategies than those of businesses with weak corporate governance mechanisms. The coefficient of moderating variable i.e CG Index (END*CGI) is -0.001 with a p-value is 0.419 indicating that CG Index did not moderate the relationship between END and the CG index in the case of the five-factor model. This result does not support study hypothesis 3 and is contrary to results provided through CAPM and the three-factor model. The study also discussed control variables besides the main variables. All firm-level control variables insignificantly impact on idiosyncratic risk but country-level control variables i.e. DGP growth and external governance index have a negatively significant impact on IR. The results of the 'test of over-identifying restrictions' are insignificant that depicts instrumental over-identified is valid.

4.7.4 Combined Regression Results for All Economies UK, India, and Pakistan (Idiosyncratic Risk Measuring through Five Factor Model)

In the robustness section, after discussing the factor model, the study discussed regression results (idiosyncratic risk measuring through a factor model) country-wise separately. Now analyze regression results working through five factor model for combining all economies by using the system GMM. Table # 4.15 shows the regression results of combined data. Results statistics of the five-factor model show that there is a negative significant influence of END on IR as a P-value less than 0.05. The results are the same as three factor model. The coefficient of environmental disclosure is -0.0006. The findings are supported by hypothesis 1 of the study, and as a result, transparent communication about climate change and more disclosure regarding the environment reduces IR. This study lends more credence to the legitimacy and stakeholder theories, as well as to previous research that recognizes the advantages of social business activity (Mishra and Modi, 2013;

TABLE 4.14: Regression results (Idiosyncratic Risk Measure Through Fama & French Five-Factor Model

	UK			India			Pakistan		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
	Coef	**z test**	**P-Value**	**Coef**	**z test**	**P-Value**	**Coef**	**z test**	**P-Value**
IRisk (-1)	-0.184	-27.16	0.000	-0.893	-58.25	0.000	0.015	0.02	0.98
END	-0.001	-3.23	0.001	0.001	18.89	0.000	0.004	1.97	0.04
CGi	-0.003	5.41	0.000	-0.001	-2.33	0.02	-0.004	-1.2	0.032
END*CGI	-0.009	-6.48	0.000	-0.001	-7.66	0.000	-0.001	-0.81	0.419
Age	0.001	1.15	0.252	0.128	3.64	0.000	0.008	1.81	0.07
SG	-0.001	-5.85	0.000	0.001	1.24	0.215	0.001	0.21	0.837
Lev	0.001	1.07	0.287	0.019	13.2	0.000	-0.015	-0.86	0.392
FS	-0.002	-6.07	0.000	-0.011	-13.99	0.000	-0.002	-0.39	0.696
GDPG	-0.001	-4.46	0.000	-0.003	-79.25	0.000	-0.001	-2.4	0.016
ER	0.001	12.12	0.000	0.053	39	0.000	-0.007	-0.63	0.532
GI	0.001	5.28	0.000	0.005	46	0.000	-0.003	-2.15	0.032
Constant	0.047	10.11	0.000	-0.028	-3.45	0.001	0.058	0.79	0.431
AR (1)		-1.427	0.154		-4.114	0.000		-0.062	0.091
AR (2)		-0.594	0.552		-1.625	0.104		0.951	-1.693

	UK	**India**	**Pakistan**
No of Obs	595	623	91
No of Instruments	117	106	116
Test of over-identifying restrictions	Insignificant	Insignificant	Insignificant

Source: The authors note: This Table describes Regression results of the UK, India, and Pakistan, Independent Variable END = Environmental Disclosure, and dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = Idiosyncratic risk measure through Fama & French three-factor model, I.Risk5 = Idiosyncratic risk measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC).

Cai et al., 2016; Tzouvanas et al., 2020). Whereas, the results of the CG Index show a significant negative effect on the IR as the coefficient of CG Index is -0.001 with a P-Value of 0.000. This result supported the hypothesis 2. As per the results CG Index moderates with strengthens the relationship between END and IR with a five-factor model. The p-value of the interaction term of moderator is less than 0.005 with a coefficient value is -0.0001. In contrast to the results of idiosyncratic risk measure through CAPM, these findings are similar with the study hypothesis 3. As the relationship of END and IR is negatively significant, so the negative coefficient of interaction term indicates that CG governance strengthen the relationship of END and IR. It means better corporate governance mechanism

can enhance the environmental disclosure quality and transparency, which will reduce the firm risk. This result suggest that organization should make effort for better corporate governance structure to protect and enhance the shareholders wealth. Besides these main variables, some micro level and macro level control variables examined their impact on idiosyncratic risk. The result shows that age, GDP Growth, and exchange rate have significant negative impacts on idiosyncratic risk. An increase in sales growth, leverage, firm size, and external governance index increases the idiosyncratic risk which are same as the factor model showed. The results of the 'test of over-identifying restrictions' are insignificant that depicts instrumental over-identified is valid. In the model, AR (1) and AR (2) have been added, and in the case of combined economies, it has been found that AR (2) is insignificant with a p-value 0.593 higher than the threshold level, which means in the model at lag-2 no serial correlation exists and it has been addressed.

Above mentioned results are describe on the basis of data collected from studied economies i.e Pakistan, India and UK. Results depicts that results and relationship of study variables are different as each country has its own rules, regulations, policies and trends. Enhancing social and environmental performance is a global issue that businesses must address if they hope to create sustainable enterprises. In developing and emerging economies, stakeholders usually have only one interest: the financial performance of their enterprises. Investors' and shareholders' main goal is to gain profit from these businesses. Furthermore, some companies are hesitant to put these practices into effect because they believe practices and integrated strategy will have a detrimental effect. This could be due to differing views on how environmental and social norms impact on financial success, particularly in developing countries. It is discovered that the size and investment factors are redundant. Analysis of model performance shows that while the Five-factor model is better at explaining and forecasting average returns, the Three-factor model yields somewhat more meaningful results. When it comes to describing the returns of portfolios sorted on momentum, the Six-factor model performs as well as or better than the Five-factor model and significantly beats both the Three-factor and Five-factor models (Foye and Valentinčič, 2020). Moderation results of combined economies (idiosyncratic risk measure through CAPM) were not significant and

TABLE 4.15: Regression results for idiosyncratic risk (Working Through Fama & French Five Factor Model

	Combine (UK, India & Pakistan)		
Variables	**(1)** **Coef**	**(2)** **z test**	**(3)** **P-Value**
IRisk (-1)	0.3264	70.02	0
END	-0.0006	-28.76	0.000
CGi	-0.0001	-5.7	0.000
END*CGI	-0.0001	-2.97	0.003
Age	-0.0015	-35.08	0.000
SG	0.0014	21.14	0.000
Lev	0.0039	28.65	0.000
FS	0.0014	26.21	0.000
GDPG	-0.0009	-99.65	0.000
ER	-0.0002	-4.22	0.000
GI	0.0015	69.91	0.000
Constant	-0.0002	-4.09	0.000
AR (1)		-1.764	0.078
AR (2)		0.535	0.593
No of Obs		1,309	
No of Instruments		205	
Test of over-identifying restrictions		Insignificant	

Source: The authors note: This Table describes Regression results of Combined data (UK, India & Pakistan), Independent Variable END = Environmental Disclosure, dependent variable I.Risk = Idiosyncratic Risk, I.Risk3 = Idiosyncratic risk measure through Fama & French three-factor model, I.Risk5 = Idiosyncratic risk measure through Fama & French five-factor model, Moderating Variable CGI = corporate governance index (it comprises BI, BS, BD, and BM), Firm-level control variables Age = Firm Age, Sg = Sales Growth, Lev = Leverage, Fs = Firm Size, Country level control variables Er = Exchange Rate, Gdpg = GDP Growth, GI = External governance index (It comprises GE, ReQ, VA, PS, RuL, and CC). All firm-specific variables are defined in the methodology chapter, System GMM is used as an econometric technique.

moderation did not exist. Whereas, in the context of the three-factor model, results improved and moderation existed as the interaction term became significant.

Chapter 5

Conclusion, Implications, and Future Directions of the Research

This final chapter of the study concludes the overall work done in the study, it includes theoretical, empirical, and all aspects completed in previous chapters. This chapter also explains the implications of the study for readers and all stakeholders. Furthermore, this part gives insight into the limitations and future directions of the study for researchers.

5.1 Conclusion

The study investigates how CG Index modifies the relationship between END and IR and also checks the direct relationship between CG index and IR. Another objective of the study is to inspect the effect of END on IR. To test the hypothesis, the study collected data from 187 non-financial companies listed on the equity markets of Pakistan, India, and UK for the period from 2013 to 2020. For empirical analysis, data was collected from S&P Global, MSCI ESG, and WRDS databases. Macro-economic control variables data may be collected from the Worldwide Governance indicators website. The study measured the END variable by score provided from S&P Global, the score range is 1 to 100. A company's ESG data

openness is measured annually by the S&P Global ESG Disclosure Score, which runs from 1 to 100, with 100 representing full disclosure of environmental information. After compiling all publicly accessible data from yearly and sustainability reports, interviews, press release and publications and third party researches), the Score is determined using more than 120 quantitative and qualitative metrics. Every item of information is given a weight based on its significance and modified based on the industry; statistics on greenhouse gas emissions, the workforce, and the board of directors are given more weight than other disclosures. Idiosyncratic risk is calculated by getting the error term of each year for every firm then the calculated standard deviation of the error term is determined as the IR by using the CAPM model. Later for robustness study also calculated IR by using the Fama & French three-factor model and a five-factor model. To compute the CG index study used Board Independence, Board Size and Board Meeting for further analysis. Corporate Governance Index constructed through Principle Component Analysis (PCA). For empirical investigation of testing hypothesis and conceptual frame work study used techniques, System Generalized Methods of Moments beside Descriptive statistics and correlation analysis on data of each economy separately and collectively. The same techniques and procedures are applied for robustness tests with three and five-factor models. The study used company-specific control variables (size, age, leverage, and sales growth) and country-specific control variables (GDP Growth, exchange rate, and external governance index which contain GE, ReQ, VA, PS, RuL, and CC) to test the hypothesis. By adopting these procedures and techniques, the following results are drawn.

5.2 Main Outcomes of the Study

The primary intentions of the study have been outlined previously, and along these same lines, the research questions and hypotheses have been developed.

1. To estimate IR by using CAPM, three and five-factor model of Fama & French..

2. To investigate how END information influences firms' IR.

3. To examine whether the CG Index strengthens or weakens the relationship between END and IR.

Research questions and hypotheses are established based on already discussed study objectives. In the light of economic theories, outcomes of the study reveal that END has significantly influenced the IR in both contexts positively supported by managerial opportunism theory and negatively supported by legitimacy and stakeholder theories. According to agency theory, asymmetric information and agency problems are decreased by sound corporate governance (Maxfield et al., 2018), the results of the study show that CG Index negatively modifies the association between END and IR. The study's objectives directed the development and testing of the hypotheses, which were conducted by using the empirical technique of system GMM. The status of the hypotheses is explained by these key findings, which further explain the accomplishment of the study's objectives. Results of testing hypothesis in the context of Pakistan, India, and the UK are briefly discussed as follows.

5.2.1 Environmental Disclosure Influence on Idiosyncratic Risk

Data were analyzed for Pakistan, India, and the UK individually and combined for all economies to test the study hypothesis. In the context of UK and Pakistan results for hypothesis 1 depict that END influence significantly IR and the coefficient of END is negative. These findings are supported by hypothesis 1 of the study, and as a result, transparent communication about climate change and more disclosure regarding the environment reduces idiosyncratic risk for UK and Pakistani non-financial firms. The results of the study are in line with the legitimacy and stakeholder theories, as well as previous research that recognizes the advantages of social business activity. There several studies show a negative significant association

between END and IR (Mishra and Modi, 2013; Cai et al., 2016; Tzouvanas et al., 2020; Rezaee et al., 2021; Mefteh-Wali et al., 2022).

In the case of India and Combined for all economies results did not support hypothesis 1 as there is a positive significant impact of END on IR. Although results rejected the hypothesis these are followed by managerial opportunism theory. Due to the additional costs that businesses must bear while also subjecting them to unwarranted criticism, the supportive theoretical framework can be justified. Besides this managerial opportunism theory and the principal-agent dilemma, when the agent acts independently on behalf of the principal and disregards their goals are proffered reason for a positive relationship between sustainability disclosure and firm risk. Several past researches support a positive relationship between END and IR such as (Bouslah et al., 2013; Lin et al., 2014; Lee et al., 2015; Wu et al., 2016).

Some researchers also discussed the positive relationship with sustainability disclosure. The relationship between CSR and risk is not always linear; rather, it is curvilinear due to the firm's cost and benefit effects (Farah et al., 2021). Similarly, the results of the UK and collective results with the three-factor model supported hypothesis 1 as there is a significant negative influence of END on IR. However, in the case of India and Pakistan results revealed that END has a positive significant influence on IR with a three-factor model. In the context of the five-factor model, results regarding hypothesis 1 revealed that the UK and combined results of all economies support the hypothesis as there is a significant negative relationship between END and IR. Whereas, in case of Pakistan and India did not support the hypothesis as there is a positive significant impact of END on IR.

As results depict that there is no synchronization of relationship between END and IR in three different scenarios i.e CAPM, three factor and five factor. In emerging economies (Pakistan) relationship is negative and for India relationship is positive in case of measurement of IR through CAPM, whereas in case of measurement of IR through three factor and five factor results show positive relationship. IR is the residual value of model, so as increase the factor (like SMB, HML, RMW and

CMA) leads to lower the residual value that mean it improve the risk measurement. In emerging economies of Pakistan and India results show positive relationship because of the additional costs that organizations have to pay and the unjustified criticism and not practicing the rules and regulation regarding environmental and social disclosure. As study discussed earlier developed countries have the regulatory bodies and laws regarding END and they are following them in true letter and spirit, therefore, they decrease the IR on higher disclosure. Results revealed that UK data depict negative relationship between END and IR in all the scenario, idiosyncratic risk measure through CAPM, three factor and five factor. END disclosure can be better by improving management and governance. There should be environmental and social laws and more important implementation of these laws. Analysis of model performance shows that while the Five-factor model is better at explaining and forecasting average returns, the Three-factor model yields somewhat more meaningful results.

5.2.2 Moderating Role of Corporate Governance Index in the Relationship between Environmental Disclosure and Idiosyncratic Risk

For testing hypothesis 2, the study investigated the impact of the CG index on IR and for testing hypothesis 3, the study examined the moderating role of the CG index between END and IR. For this purpose study constructed a corporate governance index that comprises BI, BD, BM, and BS by using the PCA method.

Before examining the moderation effect, the study checked the direct relationship between the corporate governance index and idiosyncratic risk. Results (with CAPM) show that the case of the UK, India, and Pakistan CG index has a negative influence on IR. Few studies us discussed the moderating role of corporate governance.

The interaction term of the study shows that the CG index which include BI, BS, BD, and BM has negatively modified the relationship between END and IR.

The study's conclusions emphasize the importance of board structures for more effective resource use in both developed and emerging countries like the Pakistan, India and UK and accepted hypotheses 2 and 3. Better resource management in the best interests of the shareholders depends on an efficient governance structure, which also decreases agency problems and asymmetric information, both of which minimize firm risk.

The findings of the moderating effect of CG Index between END and IR are in line with agency theory and resource-based theory. Whereas in the context of combined results of Pakistan, India, and the UK, there are no significant results found which revealed no moderation of corporate governance index exists hence, rejected hypothesis no 3.

Similar to CAPM results, in the context of the three-factor model Pakistan, India and the UK's results revealed that there is a negative significant impact of CG Index on IR and CG Index negatively moderates the relationship between END and IR, hence support the hypothesis 2 & 3 of the study.

Unlike CAPM results combined results of Pakistan, India, and UK also support hypotheses 2 and 3. Now in the context of the five-factor model results of the UK and India regarding hypotheses 2 and 3 are the same as the factor model.

It shows that separate results of the UK and India and combined results of Pakistan India and UK support the hypotheses 2 and 3 of the study as the interaction term of moderating variable is significant.

However, in the context of Pakistan, hypothesis 3 is not supported as the results of the interaction term are found insignificant, although hypothesis 2 is supported with a significant negative impact of CG Index on IR but no moderation of CG Index between END and IR exit.

5.3 Summary of Testing of Hypothesis

This section study presents the summary of the results of hypothesis acceptance or rejection for all economies i.e. Pakistan, India & UK separately and combined in different scenarios of idiosyncratic risk measurement.

TABLE 5.1: Hypothesis Testing – Measurement of idiosyncratic risk Through CAPM

	Hypothesis	**Pakistan**	**India**	**UK**	**Combined**
H 1:	END has a negative significant impact on IR.	Supported	Rejected	Supported	Supported
H 2:	CG Index has a negative significant impact on IR.	Supported	Supported	Supported	Supported
H 3:	CG Index moderates the relationship of END with the IR of the firm.	Supported	Supported	Supported	Rejected

TABLE 5.2: Hypothesis Testing – Measurement of idiosyncratic risk Through Fama & French Three Factor Model

	Hypothesis	**Pakistan**	**India**	**UK**	**Combined**
H 1:	END has a negative significant impact on IR.	Rejected	Rejected	Supported	Supported
H 2:	CG Index has a negative significant impact on IR.	Supported	Supported	Supported	Supported
H 3:	CG Index moderates the relationship of END with the IR of the firm.	Rejected	Supported	Supported	Supported

TABLE 5.3: Hypothesis Testing – Measurement of idiosyncratic risk Through Fama & French Five-Factor Model

	Hypothesis	**Pakistan**	**India**	**UK**	**Combined**
H 1:	END has a negative significant impact on IR.	Rejected	Rejected	Supported	Supported
H 2:	CG Index has a negative significant impact on IR.	Supported	Supported	Supported	Supported
H 3:	CG Index moderates the relationship of END with the IR of the firm.	Rejected	Supported	Supported	Supported

5.4 Implications of the Study

Since investors naturally want to minimize risk in order to maximize gain, they should be more cautious when making future investment decisions in light of environmental disclosure. This study has significant practical as well as theoretical consequences for all stakeholders, including investors, managers, CEOs, portfolio managers, researchers, and academics. These implications are discussed in detail in following paragraphs.

5.4.1 Theoretical Implications

This study's goal is to provide persuasive factual information that will help resolve the disruptive debate about the consequences of environmental disclosure. The term "convincing" is used in this context to describe the use of panel data regression analysis to assess the hypothesis. The goal of this study is to provide new information to an ongoing debate and eliminate any ambiguity resulting from competing theories on the subject. Providing superior environmental information may still have an impact on a company's financial performance, market value, and ability to reduce risk, according to an analysis of the study's research questions. With the help of this study, we aim to better understand how climate change affects firm risk. This study can be used as a handbook by researchers in the field to become familiar with the key concerns and concepts associated with this interdisciplinary subject. To do this, we examine the effects of climate change on firm risk from a theoretical, managerial, and regulatory perspective. The findings that the financial sector is aware of the implications of climate change, which are not just limited to the real economy, should raise some regulatory and managerial concerns (Dell et al., 2014). The study used the principal component analysis (PCA) to create a corporate governance index (CG INDEX) for the three size groups as well as for the entire sample of non-financial companies of Pakistan, India & UK based on three variables BI, BS and BM. The primary benefit of employing PCA is that it generates a solitary corporate governance metric that assesses the overall corporate governance framework of companies without requiring any subjective assessment for the creation of weights about the various corporate governance variables.

5.4.2 Practical and Managerial Implications

The study's findings are crucial for those who create environmental and financial policies. Policymakers can keep an eye on companies that are climate-sensitive and have an impact on the entire financial system. Our research can serve as a guide for micro-prudential policies. The financial sector can benefit from having the necessary resources and knowledge to combat climate change by measuring the systemic climate effect on businesses. A micro-prudential strategy would eventually lead to macro-prudential efficiency in climate change. The most effective way to reduce firm systematic and unsystematic risk and maintain financial stability is through prevention. In other words, to preserve financial stability, policymakers can identify "environmentally sensitive firms" and impose regulations on them. As it offers insightful information on a currently unsearched connection between climate change and financial markets, the chapter may also have further consequences for a wide range of other stakeholders. Because of the inverse relationship between END and firm risk, CEOs of firms can identify signals to implement more visible environmental policies that will increase shareholder wealth by decreasing idiosyncratic investment risk.

The effective corporate governance structure must be acknowledged in emerging economies since it is crucial to strike a balance between acceptable and excessive risk-taking in businesses. According to instrumental stakeholder theory, management and environmental rules reduce asymmetric information for managers. The study's findings included developing an efficient corporate governance system, safeguarding shareholders' interests by keeping an eye on and regulating management so they seek to maximize shareholders' wealth. The study also recommended that to ensure corporate transparency and to reduce ambiguity, which in turn reduces idiosyncratic risk, corporate governance should establish guidelines and require management to disclose quality information on the environment.

Besides general implication this study has special implication for the studied economies i.e Pakistan, India and UK. As study discussed earlier that due to unawareness and less strictness, there is room to implement environment and

social policies. Both emerging countries Pakistan and India have environmental laws, although they are often ignored or applied inappropriately. In Pakistan, state bank of Pakistan, corporate law authority, and finance ministry and SECP are exist to check and balance the matters pertaining to sustainability. Besides this Securities and Exchange Commission of Pakistan (SECP) developed the CG2002 code in 2002. It was later amended in 2012, 2017 and most recently in 2019. Environmental laws such as the Pakistan Environmental Protection Act (1997) have not always been implemented effectively in Pakistan. Similarly the Environment Protection Act (1986) and the National Green Tribunal (2010), for instance, enforce strict restrictions in India, however their application varies. Research on environmental disclosure is necessary to assess the degree to which companies adhere to these rules and to pinpoint any enforcement weaknesses. The report provides information that can assist lawmakers in passing stronger laws and improving current enforcement procedures. In the context of UK END has progressed to the point that companies are being compelled to incorporate climate and environmental risks into their reporting systems by both legal requirements and customer demand. However, there are still problems, particularly with data coverage and consistency for smaller firms. The legal framework is expected to evolve, and the mandatory implementation of Task Force on Climate-related Financial Disclosures will require a deeper integration of environmental reporting into corporate strategy and governance.

5.5 Limitations and Future Directions of the Study

The main hurdle faced during research is the availability of environmental disclosure data. Firms especially from emerging and underdeveloped economies do not disclose or show data on environmental disclosure. Most of the firms that have data on environmental disclosure, is not available for all years of long past. Organizations can conduct more thorough analyses of quality of END and market trends when they have access to large amounts of data. Decisions about risk management,

investment plans, and information disclosure are well-informed as a result of this level of study. Organization can improve offers, create focused strategies, and make well-informed judgments that improve their market position by evaluating large datasets. Furthermore, big data may also pinpoint areas where operations need to be improved, enabling organizations to optimize resource allocation and streamline procedures. The results of the study can be more comprehensive if increase sample size, especially from emerging economies and extended periods.

Another limitation of this argument is the dearth of environmental and other variables related to climate change. This dearth results from the absence of specific reporting rules, particularly in the past, and the mostly voluntary nature of corporate environmental disclosure. Another flaw is the assumption of objectivity in the estimation of END (Nollet et al., 2016) and (Benlemlih et al., 2018). The quality of environmental actions that companies reveal should be the subject of future research. Creating an END index and conducting a similar analysis while controlling for a greater number of economies and businesses would be another interesting direction for future research.

Future research may focus on examining the connection between systematic risk and environmental disclosure. Finally, our analysis encourages additional investigation into the diversification advantages of portfolios incorporating symmetric environmental information. Future research can be conducted with dependent variables like Firm performance, systematic risk downside risk, etc. The results of the study can be more comprehensive if increase sample size, especially from emerging economies and extended periods. Finally, it would be fascinating to investigate how the COVID-19 situation has influenced the relationship between END and IR. Unprecedented financial and economic effects of the COVID-19 pandemic have surely increased interest in businesses' social and environmental commitment. To gain a clear grasp of the sustainability and idiosyncratic risk nexus during difficult times, it would be highly interesting to expand our analysis by adding observations made after January 2020 meaning post-COVID-19. As past studies proved, both negative and positive relationship between END and IR. It means the relationship between END and IR is not linear, there might be

non-linearization which future researcher may consider for analysis. In the context of the CG index, future studies in this field can expand by utilizing a wider range of factors, such as director compensation, directors' shareholding, audit compensation, or other board committees, to create CG Index. It can also be strengthened by utilizing qualitative board characteristics that affect company success, such as the number of female directors, their qualifications, age, and compensation, among other things.

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Appendix

Sr. No	SCFS
1	Reverse Factoring
2	Accounts Receivables Financing
3	Purchase Order Financing
4	Agricultural Supply Chain Finance
5	Factoring
6	Online SCF Platform
7	Inventory Financing
8	Warehousing Financing
9	Buyer Direct Financing
10	Vendor-Managed Inventory
11	Raw Material Financing
12	Third Party Logistics Financing
13	Dynamic Discounting
14	Early Payment Discount Program
15	Buy Back Guarantee
16	Credit Guarantee
17	Bank Guarantee
18	Manufacturer Collateral
19	Supplier's Subsidy
20	Pre-selling
21	Trade Credit