CEO Incentives, Information Gaps, and Efficient Investment: When Does Governance Make a Difference

The Journal of Educational Paradigms
2025, Vol. 07(02) 395-407

ISSN (Print): 2709-202X
ISSN (Online): 2709-2038
DOI:10.47609/0702072025

Khalid Mahmood Ahmad[1], Dr. Rizwan Ali[1], Dr. Ramiz ur Rehman[1], Isma Arif[2]

ABSTRACT

The current study examines the relationships between CEO job characteristics, ownership, and performance-based compensation, and firm-level investment efficiency, comparing the mediating role of information asymmetry and the moderating role of board governance. Set within an Agency/Stewardship framework, a moderated mediation is modelled utilizing panel data from 293 non-financial firms sourced from the Pakistan Stock Exchange (2014-2023). Investment efficiency is measured by external indicators of firm-specific crash risk (NCSKEW). We find that CEO incentives have a significant influence on investment efficiency, both directly and indirectly through information asymmetry. In addition, the quality of board governance moderates both the CEO-asymmetry relationship as well as the asymmetry-efficiency relationship. Overall, these findings show that CEO incentives can serve both stewardship governance roles and act as amplifying sources of risk in situations of weak governance. This study contributes to the extant literature by conceptualizing and integrating various internal executive attributes, governance attributes, and informational environments to explain firm investment behavior, particularly in the context of emerging markets, such as Pakistan.

Keywords: CEO Job Attributes, CEO Incentives, Ownership, Remuneration, Information Asymmetry, Board of Governance, Investment Efficiency.

INTRODUCTION

In an increasingly interconnected and volatile global economy, investment efficiency has emerged as a cornerstone of sustainable corporate performance. Amid intensifying competitive pressures, accelerated capital mobility, and mounting stakeholder demand for value-centric governance, firms are now evaluated not merely on profitability but on the strategic prudence with which they allocate capital. The ability to direct financial resources toward value-generating opportunities, while avoiding both underinvestment in high-return ventures and overinvestment in speculative or low-yield projects, has become a key indicator of long-term resilience and strategic agility (Biddle et al., 2009).

While traditional corporate finance theories have primarily attributed investment inefficiencies to external market imperfections, such as information asymmetries, transaction costs, and financing constraints (Myers & Majluf, 1984), an expanding body of scholarship has shifted the analytical focus inward, toward firm-level determinants. In this evolving discourse, investment efficiency is increasingly viewed not merely as a financial optimization outcome but as a reflection of executive judgment, incentive structures, disclosure quality, and governance integrity (Biddle, Hilary, & Verdi, 2009).

This theoretical reorientation underscores the critical importance of internal leadership, particularly the role of the Chief Executive Officer (CEO), in shaping strategic investment outcomes. As the apex decision-makers in modern corporations, CEOs are uniquely positioned to influence how investment opportunities are perceived, evaluated, and acted upon. Their strategic choices are not made in a vacuum; rather, they are shaped by both external conditions and internal incentive structure, specifically, their equity ownership and remuneration packages.

The design of these CEO incentives plays a pivotal role in aligning managerial behavior with shareholder interests. Substantial ownership stakes can reduce agency conflicts, promote long-term value creation, and enhance investment efficiency (Fahlenbrach, 2009). Likewise, performance-contingent compensation, especially equity-based pay, has been associated with more judicious capital allocation (Edmans & Gabaix, 2016). However, these relationships are not without complexity. Some possibilities owning too much may establish management power and weaken the motivation for supervision, which could lead to investment inefficiency (Chen et al., 2021). Also, a misallocation of compensation, either in the form of wrong incentives (Holmstrom, 1983) or short-term incentives (Chancellor, 2007), can promote risk aversion or agency-related opportunistic behaviors, contradicting strategic investment aims (Dittmann et al., 2013). Therefore, CEO incentives are a two-edged sword that, depending on how they are structured and, on the governance setting in which they are used, may improve or worsen investment efficiency.

Another significant channel by which CEO incentives influence investment effectiveness is information asymmetry, the unbalanced distribution of relevant information between corporate insiders and outsiders. High-discretion CEOs with weak monitoring can use informational opacity to conceal inefficiencies or justify speculative investments (Healy & Palepu, 2001; Bushman, Piotroski, & Smith, 2004). In contrast, if incentives are aligned and transparency is present in an institution's practices,

[1] Lahore Business School, The University of Lahore. Corresponding Author Email: kmabajwa@yahoo.com.
[2] Associate Financial Analyst, PACRA

information asymmetry will be diminished, ultimately leading to investor confidence, market discipline, and responsible resource allocation (Myers & Majluf, 1984). Similarly, information asymmetry is assumed to be the primary mediating process between CEO incentives and investment performance.

Yet, these dynamics unfold within a broader governance ecosystem that significantly shapes their manifestation. The effectiveness of corporate governance, particularly the monitoring role of the board of directors, acts as a decisive moderating force. Drawing on Agency Theory (Jensen & Meckling, 1976) and Stewardship Theory (Davis et al., 1997), governance structures, such as board independence, audit committee strength, and the diversity of board expertise, serve as institutional safeguards that ensure executive actions remain aligned with shareholder objectives (Menshawy, Ameen, & Isaac, 2023). Strong boards can mitigate the adverse effects of poorly designed incentives and unchecked information asymmetry, thereby enhancing the integrity of investment decisions. In contrast, weak governance may allow informational distortions and opportunistic behaviors to proliferate, heightening the risk of capital misallocation and long-term value erosion.

Despite increasing scholarly attention to CEO behavior and corporate governance, two critical gaps remain. First, much of the extant literature fails to adopt an integrated analytical framework that simultaneously examines the direct, mediated, and moderates pathways through which CEO incentives affect investment efficiency. Second, the bulk of empirical investigations are situated in developed economies, where robust institutional frameworks and mature governance mechanisms naturally constrain opportunistic behavior and information asymmetry. In contrast, emerging markets present a distinct institutional context characterized by regulatory ambiguities, concentrated ownership, information opacity, and governance fragility, conditions under which internal mechanisms assume a disproportionately vital role in safeguarding investment discipline.

To address these gaps, this study develops and empirically tests a comprehensive moderated mediation model in which CEO incentives, comprising ownership and remuneration, affect investment efficiency through the mediating role of information asymmetry. Furthermore, the model introduces board governance as a moderator of both the CEO incentive–asymmetry relationship and the asymmetry-investment efficiency link. The empirical context consists of a panel of non-financial firms listed on the Pakistan Stock Exchange (PSX) from 2014 to 2023 - a time of considerable transitioning in policy, including Pakistan being reclassified by MSCI as an emerging market and the implementation of transformational infrastructure initiatives like the China–Pakistan Economic Corridor (CPEC). This context exposes opportunities to understand the role of internal executive dynamics and how the quality of governance influences firm-level investment in the face of institutional uncertainty.

This investigation makes four contributions overall. First, it contributes to corporate governance literature by considering CEO incentives as a focal point for investment efficiency. Second, it interprets the mediating role of information asymmetry, offering a nuanced understanding of how incentive structures shape disclosure behavior and resource allocation. Third, it introduces board governance as a contextual moderator, demonstrating its capacity to enhance or dilute the effects of executive incentives and information gaps. Fourth, by situating the analysis within an emerging market, the study offers novel insights into how internal leadership and governance interact under institutional fragility, a context underrepresented in the existing literature.

The remainder of the paper is structured as follows: Section 2 reviews the relevant theoretical and empirical literature. Section 3 outlines the research methodology, including data sources, variable definitions, and analytical strategies. Section 4 presents empirical findings. Section 5 discusses the theoretical and practical implications. Section 6 concludes with a summary, limitations, and directions for future research.

LITERATURE REVIEW

Theoretical Underpinnings

Agency Theory (Jensen & Meckling, 1976) serves as a foundational framework for understanding the relationship between corporate governance mechanisms and managerial behavior. It posits that managers, as agents, may pursue personal objectives that diverge from the interests of principals (shareholders), particularly in the presence of information asymmetries. These asymmetries grant executives superior access to firm-specific knowledge, creating opportunities for self-interested behavior that may result in suboptimal investment decisions. In relation to agency conflicts of interest, corporate governance relies on incentive alignment rather than direct oversight. Chief Executive Officer (CEO) ownership of equity in the firm and performance-based compensation are perceived as mechanisms that can reduce agency costs. This structural alignment of managerial wealth and firm performance can promote the type of investment decisions consistent with an appropriate economic rationale to create long-term shareholder value. Furthermore, these mechanisms are motivational devices and are for implicit monitoring purposes in environments with limited direct oversight.

Conversely, Stewardship Theory (Davis et al., 1997) describes managerial behavior in a different way. It argues, when there are certain types of organizational structures and psychological conditions are present, people will not act in their self-interest; they will act as stewards of the corporate objectives. For example, if the CEO has displayed both ethical commitment to the organization, identifies strongly with the organization, and has a long-term approach, the CEO is generally driven by an intrinsic motivation to put corporate organizational considerations ahead of personal considerations. Under such conditions, you would expect, given low turnover, significant trust by employees, and a defined sense of mission, that external controls can be viewed as somewhat unnecessary, as individuals have internalized the values of the organization against which they make decisions. Taken together, these two theoretical approaches offer a robust lens for observing how the incentives placed on the CEO influence investment efficiency. Agency Theory emphasizes formal controls that are designed to constrain opportunistic behaviors, while Stewardship Theory illustrates governance forms based on trust that enable decision-making for the long-term future responsibly. Based on

these theoretical foundations, the current study contributes to the literature on how CEO job features, such as ownership and compensation structure, relate to investment efficiency through governance forms and information asymmetry. The study provides a balanced perspective, drawing on both Agency and Stewardship theories, highlighting the coexistence of control-based incentives and relational governance in fostering efficient investment behavior.

CEO Ownership and Investment Efficiency

Ownership of the CEO influences firm investment behavior significantly as an important mechanism for aligning managerial incentives with shareholder interest. It is grounded in the key principles of agency theory (Jensen & Meckling, 1976), that more equity ownership reduces agency conflict because it makes executives internalize part of the gains and losses from the choices they make. Therefore, ownership reduces opportunistic behavior and motivates executives to pursue economically rational and stakeholder-acceptable investment opportunities that will drive capital appreciation in the long run (Morck, Shleifer, & Vishny, 1988). Empirical literature is growing on this subject, and research shows that CEO equity ownership is positively related to strategic management and, hence, quality of investment (Coles et al., 2006). CEO ownership is also negatively related to short-termism and projects that deliver personal utility, not firm value; ownership leads to long-termism with an emphasis on improving sustainable performance through the effective allocation of capital and innovation-oriented projects (Fahlenbrach, 2009).

Ownership also creates a psychological sense of commitment and risk bearing, enhancing strategic planning and resource commitment among CEO's. However, this relationship is not strictly linear. While moderate levels of CEO ownership tend to enhance investment efficiency by improving internal controls and decision-making quality, excessively high ownership may lead to managerial entrenchment and weakened accountability (Chen, Lin, & Yi, 2008). Thus, the hypothesis posits that a moderate degree of CEO ownership enhances investment efficiency by managerial and shareholder interests. This equilibrium reduces agency costs and incentivizes prudent, performance-oriented investment behavior. The theoretical background, with robust empirical support, illustrates that CEO ownership, as long as it is not excessive, forms a robust governance mechanism that contributes to efficient capital allocation and the creation of long-term value for the firm. Developing from this theoretical and empirical background, we put forth the following hypothesis:

H1: CEO ownership is positively associated with the likelihood of Investment Efficiency

CEO Remuneration and Investment Efficiency

CEO compensation design is a central element of corporate governance that significantly influences managerial risk-taking and investment decisions. According to agency theory, performance-based compensation, such as stock options, bonuses tied to key performance indicators, and long-term incentive plans, is a vital mechanism for aligning executive incentives with those of shareholders (Jensen & Murphy, 1990). When compensation is tied closely to firm performance, CEOs have a greater incentive to engage in value-enhancing investments and a lesser incentive to undertake projects that would decrease firm value (Core, Holthausen, & Larcker, 1999). Empirical evidence indicates that performance-based pay becomes a determinant of resource allocation efficiency by incentivizing managers to pursue positive net present value (NPV) projects, while also reducing opportunism (Gopalan et al, 2014).

In contexts with a high level of information asymmetry, the performance metrics organizations choose to use tend to become even more important, as governance structures will then have a substantial portion of the burden to face to determine whether the required information indicators and governance processes lead to reasonable assessments of managers' performance. Evidence shows that CEO compensation that ties to long-term performance indicators, such as the sum of the shareholders' total shareholder returns, and often return on invested capital, was decisions that dampen earnings' manipulation and encourage value creation (Dechow & Sloan, 1991). However, highly regarded but poorly structured, excessive, or otherwise poorly considered compensation, particularly if it does not relate to performance, can create inefficiencies, such as over-investment or excessively risk-averse decisions, since it may be much more in CEOs' interests to maximize their rewards than their firms' value. Thus, we propose that a well-designed, performance-based compensation model promotes investment efficiency, allowing the CEO to take accountable responsibility for the measurement of investment risk and performance metrics to achieve long-term value for the firm when capital is required. In summary, we have proposed the following research hypothesis based upon the conceptual and empirical models above.

H2: CEO Compensation relates positively to Investment Efficiency

CEO Incentives and Information Asymmetry:

Information asymmetry is a key issue in corporate governance since CEOs hold exclusive information not available to outside stakeholders, which modifies investment signals and affects overall market discipline, and raises agency costs (Healy & Palepu, 2001). Within this context, CEO incentives, particularly equity ownership and compensation structures, play a pivotal role in shaping disclosure quality and transparency. Anchored in Agency Theory (Jensen & Meckling, 1976), equity-based ownership aligns managerial and shareholder interests by internalizing the outcomes of executive decisions. Moderate ownership tends to enhance transparency, as CEOs seek to safeguard firm value and personal wealth (Morck et al., 1988). However, excessive ownership may lead to entrenchment, weakening external oversight, and incentivizing the concealment of material information (Chen, Lin, & Yi, 2021). Thus, the relationship between ownership and information asymmetry is non-linear and context-dependent.

Similarly, the design of CEO compensation significantly influences disclosure behavior. Performance-tied incentives, such as stock options and long-term bonus schemes, encourage transparent reporting aligned with value maximization (Edmans & Gabaix, 2016). In contrast, fixed or weakly performance-linked pay can reduce accountability, enabling opportunistic behavior, including earnings manipulation and delayed disclosure (Dittmann et al., 2013). To summarize, well-structured compensation

packages act as internal governance mechanisms for disciplining managers' behavior and adding transparency. The connection between CEO incentives and information asymmetry manifests in emerging economies like Pakistan, especially as a result of institutional voids and a lack of regulatory oversight, which makes disclosures risky. Therefore, in these environments, ownership and compensation mechanisms serve as substitutes for ineffective external governance mechanisms, and these are important in developing managerial incentives and transparency at the firm level. Overall, CEO incentives eliminate agency conflicts and encourage transparency; however, the effectiveness of CEO incentives in reducing information asymmetry relies on how these incentives are structured, the extent of CEO incentives, and the overall governance context.

Based on that, the next hypotheses are suggested:

H3a: CEO ownership is positively associated with information asymmetry.

H3b: CEO compensation is positively associated with information asymmetry.

Information Asymmetry and Investment Efficiency:

Investment efficiency refers to the firm's ability to invest capital into value-enhancing projects without over-investing in projects with low returns and under-investing in profitable projects (Biddle et al., 2009). Information asymmetry is probably the most significant barrier to investment efficiency because corporate managers possess private information that is not readily available to the firm's external stakeholders (e.g., investors, analysts, and regulators) (Myers & Majluf, 1984). This asymmetry impedes proper assessment of firm value and investment quality, resulting in suboptimal allocation of financial resources. From an Agency Theory perspective (Jensen & Meckling, 1976), information asymmetry magnifies agency conflicts by creating conditions under which managers can act opportunistically. In the absence of full transparency, executives may overinvest in empire-building projects to expand their power or prestige, even if such projects lack positive net present value (NPV). Alternatively, in high-asymmetry environments, firms may experience underinvestment due to investor skepticism and capital rationing, as external fund providers are unable to accurately assess risk and return potential (Bushman & Smith, 2003). In both cases, asymmetry weakens firm-level investment discipline.

Empirical research provides strong support for the adverse role of information asymmetry in investment decisions. For example, Hope and Thomas (2008) find that firms with greater disclosure quality tend to exhibit higher investment efficiency. Similarly, Francis, LaFond, Olsson, and Schipper (2005) show that enhanced transparency reduces the cost of capital, enabling firms to fund more profitable projects. Conversely, studies by Chen et al. (2011) and Gul et al. (2009) find that high levels of opacity and selective disclosure are associated with investment distortions, such as delayed or misaligned capital deployment. The mechanisms through which information asymmetry influences investment efficiency can be both financial and behavioral. On the financial side, asymmetric information leads to mispricing of firm securities, limiting access to external finance and reducing the firm's ability to invest, especially in innovation-intensive or long-term projects (Verrecchia, 2001). On the behavioral side, managers operating in opaque settings may exploit informational advantages to pursue personal gains, undertake earnings management, or engage in inefficient mergers and acquisitions, decisions that may not align with shareholder value maximization. Based on these insights, the following hypotheses are proposed:

H4: Information Asymmetry is negatively related to the likelihood of Investment Efficiency

Mediating Role of Information Asymmetry:

Information asymmetry, a fundamental challenge in corporate governance, arises when CEOs possess superior private knowledge regarding a firm's financial standing, strategic direction, and risk profile, information that is not equally accessible to external stakeholders such as investors, regulators, and shareholders (Myers & Majluf, 1984; Healy & Palepu, 2001). This imbalance compromises market discipline facilitates managerial discretion, and can lead to inefficient investment decisions. Firms may suffer from overinvestment in speculative ventures or underinvestment due to investor skepticism and capital rationing (Akerlof, 1970; Bushman & Smith, 2003). Within this framework, CEO incentives, notably equity ownership and performance-linked remuneration, play a critical role in shaping corporate transparency. From the lens of Agency Theory (Jensen & Meckling, 1976), moderate CEO ownership helps align managerial and shareholder interests by internalizing the consequences of executive actions, thereby incentivizing truthful disclosure (Morck, Shleifer & Vishny, 1988). However, excessive ownership may weaken accountability, increase management power, and increase opacity (Chen, Lin & Yi, 2021). Similarly, performance compensation – stock options or long-term compensation- encourages transparency through linking executive payouts in varied scenarios to shareholder outcomes (Edmans & Gabaix, 2016). Meanwhile, fixed or excessive pay arrangements may be linked to withholding information or opportunism (Dittmann, Maug & Schneider, 2013).

Thus, information asymmetry is a mediating mechanism for how CEO incentives shape investment efficiency. Good incentives foster transparent information environments that allow stakeholders to make informed decisions about firm value and risk, which leads to better capital allocation and investment discipline. Bad incentive systems exacerbate opacity, mislead resource allocation, and subsequently firm outcomes (Francis et al., 2005; Hope & Thomas, 2008), with the mediating relationship reflecting the ethical orientation and informational behavior of CEOs. Transparent leaders will reduce the information gap, create pathways to efficient investment decisions, and constrain agency costs. In contrast to these explanations, self-interested executives may use their informational advantages to seek private benefits that we have shown may diminish shareholder value and create inefficiencies (Francis et al., 2016). The role of CEO incentives is mainly to motivate managers and act as informal governance structures that influence disclosures and investments, especially in developing economies such as Pakistan, where there are multiple institutional voids and weak monitoring structures in the environment. In this context, this study considered that information asymmetry could mediate the relationship and that it

would represent the underlying mechanism that translates characteristics of executives to value-enhancing investment actions.

H5a: Information asymmetry mediates the relationship between CEO Ownership and investment efficiency.

H5b: Information asymmetry mediates the relationship between CEO compensation and investment efficiency.

The moderating effect of Effective Board Governance:

CEO incentives, especially equity ownership and performance-related compensation, are to ensure alignment of the interests of the manager or executive with the owners and shareholders. CEO incentives, when implemented correctly, can be effective at enhancing transparency and promoting quality decisions. For instance, moderate equity ownership ties the CEO's wealth to firm performance, encouraging full and accurate disclosure to protect both firm value and personal financial interests (Morck et al., 1988). Similarly, performance-based compensation mechanisms such as bonuses and stock options motivate executives to enhance long-term firm value and maintain investor trust through transparent reporting (Edmans & Gabaix, 2016). However, these mechanisms can also yield unintended consequences. Excessive ownership may insulate CEOs from external discipline, fostering managerial entrenchment and enabling them to obscure unfavorable information (Chen, Lin, & Yi, 2021). Likewise, non-performance-linked or overly generous pay structures may weaken managerial accountability, increasing the risk of earnings manipulation, delayed disclosures, or opportunistic behavior (Dittmann, Maug, & Schneider, 2013). In such cases, CEO incentives may inadvertently amplify information asymmetry, undermining the very transparency they were designed to foster.

This is where board governance emerges as a vital moderating force. From an Agency Theory perspective (Fama & Jensen, 1983), the board of directors serves as an essential mechanism for monitoring executive behavior. Boards that are independent, diverse, financially knowledgeable, and proactively engaged are better positioned to scrutinize CEO actions, enforce disclosure norms, and uphold investor interests (Hermalin & Weisbach, 2001; Adams et al., 2010). When CEOs possess high strategic influence through ownership or incentive-rich contracts, the presence of a strong board becomes critical to ensure that informational advantages are not misused. Moreover, in the presence of information asymmetry, where insiders hold superior private knowledge relative to external stakeholders, investment efficiency becomes vulnerable. Managers may overinvest in speculative projects for personal gain (moral hazard) or underinvest due to capital market skepticism (adverse selection) (Myers & Majluf, 1984; Bushman & Smith, 2003). Here too, effective governance plays a moderating role, demanding credible justifications for strategic decisions, enforcing robust oversight over capital allocation, and reducing the distortionary effects of hidden information (Armstrong, Guay, & Weber, 2010; Brown & Caylor, 2006).

Independent audit committees, financial experts, and vigilant directors serve as institutional counterbalances to CEO authority, mitigating the negative implications of incentive misalignment and enhancing firm-level transparency (Klein, 2002; Core, Guay, & Larcker, 1999). Thus, board effectiveness moderates two critical relationships: (1) between CEO incentives and information asymmetry, and (2) between information asymmetry and investment efficiency. Through rigorous oversight, boards can neutralize opportunism and ensure that CEO incentives translate into value-aligned behavior and more efficient investment decisions.

H6a: Corporate board effectiveness significantly moderates the relationship between CEO Ownership and Information Asymmetry.

H6b: Corporate board effectiveness significantly moderates the relationship between CEO compensation and Information Asymmetry.

H6c: Corporate board effectiveness significantly moderates the relationship between Information Asymmetry and Investment Efficiency.

What has been done? And what can be done?

Prior literature has extensively examined how CEO characteristics contribute to firm performance over multiple dimensions, specifically within the context of investment efficiency. Research covering traits like tenure, education, sex, or overconfidence has yielded measurable effects on managerial decisions and firm performance. Bringing these two ideas together, both behavioral finance and agency theory have recently started to integrate personality traits of CEOs into the explanation of either increased or decreased levels of asymmetric information. However, the majority of existing literature is atomized, focusing on selected attributes in isolation without a complete view of how those characteristics interact with governance mechanisms such as board oversight. In addition, empirical studies seldom compare countries or make considerations for industry dynamics instead compromising the validity of general conclusions.

It's time that the next studies take a multidimensional perspective on the issue from an ecological perspective (not treating individual characteristics of CEOs as isolated phenomena, but as part of a broader, vaunted governance system), to take the field forward from here. Stronger insights can be drawn through such integration of psychological assessments and financial data, along with deploying sound econometric techniques over heterogeneous institutions. In addition, research should investigate how effective boards can counterbalance the anticipatory negative effects of overconfident CEOs, or indeed entrenchment, and improve investment efficiency. Studying these dynamics in emerging economies — where governance structures tend to be less developed — can help to close an important gap and offer unique insights into the global conversation. Not only does this pathway provide a deeper academic lens of corporate performance, but it also serves to furnish evidence-based paradigms for policymakers and practitioners to leverage when looking to advance corporate performance by aligning leadership with strategy.

Research Framework

The basis for this study is Agency Theory (Jensen & Meckling, 1976) supplemented by Stewardship Theory (Davis et al., 1997) to create a theoretical framework that examines CEO job characteristics and how these characteristics relate to firm-level capital allocation efficiency. Agency theory suggests that

managers represent both their interests and those of the shareholders when ownership and control are not congruent, especially when information asymmetries exist. Stewardship theory suggests that, given the right psychological state and organizational design, executives do act as stewards of the long-term interest of the organization. These theories form the basis for this study's focus on the processes by which executive compensation, transparency of corporate governance, and monitoring of the board impact capital allocation efficiency. To date, the majority of prior research focuses on CEO psychological traits or stock price crash risk as an outcome variable, whereas this study focuses on investment efficiency, as one characteristic that plays a significant role in determining long-term corporate performance. The study specifically examines the effects of CEO Ownership and CEO Remuneration on investment efficiency through the mediating role of information asymmetry and the moderating role of Board Effectiveness.

The conceptual framework addresses two important gaps in literature. First, it studies the indirect effects of CEO incentives on investment efficiency through the information asymmetry hypothesized in this model, which is under-researched in emerging market contexts. Second, the conceptual framework considers board governance as a moderating role to lessen or heighten the direct effects of CEO incentives and information opacity on investment efficiency. As a conceptual framework incorporating moderated mediation, the framework offers a richer sense of how the internal governance dynamics interact to influence strategic investment decisions in institutional contexts with weak enforcement and transparency gaps, such as emerging economies like Pakistan. Figure 3.1 outlines the study's theoretical framework, which empirically assesses the direct, indirect, and moderate relationships between the variables.

Measurement of variables

Based on our hypothesis, we use four proxies to measure our dependent variable, Investment Efficiency (INVEFF): Negative coefficient of skewness (NCSKEW), Down up volatility (DUVOL), Extra Sigma (Esigma), and Crash. Consistent with (Liu & Liu, 2023) *NCSKEW* is calculated for firm *i* in a year *T* by taking the negative of the third moment of firm-specific weekly returns and dividing it by the standard deviation of firm-specific weekly returns raised to the third power. Whereas according to (Jung & Song, 2023) DUVOL is the Log the ratio of the standard deviation of the down weeks to that of the standard deviation of the up weeks. On the other hand, (Choi et al., 2023) stated that the extreme sigma (Esigma). is the negative of the worst deviation of firm-specific weekly returns from the average firm-specific weekly return divided by the standard deviation of firm-specific weekly returns? In the same way Consistent with (Bae et al., 2019; Xu et al., 2023; Zhang et al., 2023) *CRASH*, an indicator variable, equals 1 if there is at least one extremely low $W_{i,w}$ in year *t* and 0 otherwise. We considered a $W_{i,w}$ to be extremely low if it was smaller than [Mean ($W_{i,w}$) − 3.09 × standard deviation ($W_{i,w}$)]

Regarding our independent variable, the CEO's Incentives (CEO Ownership, & CEO Remuneration), are based on firms' characteristics indicative of overconfidence, such as investment above the industry median (Campbell et al., 2011; Ahmed & Duellman, 2013; Ben-David et al., 2013) or an industry-adjusted debt-to-equity ratio above the median for a given year (Schrand & Zechman, 2012). Following the aforementioned literature, we construct the proxy for measuring overconfidence as posited by Schrand and Zechman (2012), and (Chiu et al., 2022) based on the firm's long-term debt-to-equity ratio, equal to non-current debt divided by the market value of the firm. If the firm's long-term debt to equity ratio is greater than the industry median for the year, it implies that the firm presumably has an overconfident manager. The approach presented by (Ranasinghe et al., 2023) is used to measure the role of mediating variable, investment efficiency, and consistent with (Menshawy et al., 2021), a cross-sectional regression model is used to substitute the efficiency of investment by measuring a firm's investment as a function of sales growth, which serves as an indicator of growth-related opportunities. This model is implemented for each year and industry. Inefficient investment (INVEFF) can be determined by utilizing the residuals from equation II to assess the ranking of companies based on the probability of either underinvestment or overinvestment. Based on the residuals, two groupings are proposed. Positive observations are classified as overinvestment, whereas negative observations are labeled as under-investment. Equation 1 provides the measurement of investment efficiency. (Eq1 as follows: $INVEST_{i,t} = \beta_0 + \beta_1 Growth_{i,t} + \beta_2 Slack_{i,t} + \beta_3 Lev_{i,t} + \beta_4 CFO - OPRE_{i,t} + \beta_5 Size_{i,t} + \beta_6 Age_{i,t} + \varepsilon Year_{i,t} + \varepsilon_{i,t}$…… Eq 1.

The importance of the effectiveness of a board is widely recognized in previous literature, which confirms that a board that operates effectively greatly reduces or eliminates conflicts of interest between the agency and the board (Farooque et al., 2020). The effectiveness of the board is typically assessed based on its size, structure, and whether or not the CEO also serves as the board's chairperson (Mubeen et al., 2021). The present study aims to assess the efficacy of the board by utilizing the composite index of corporate governance. The current evaluation will assess the board's efficacy using the corporate governance index (Wang et al., 2020). So to measure our moderating variable board effectiveness (BDEFF), consistent with (Fernando et al., 2020; Naz et al. 2021) Listed Companies (Code of Corporate Governance), Rules 2019 a composite measure of CG attributes, Board size (if board size is more than 7 then 1 otherwise 0); CEO Duality (1 if CEO and Chairman are different, 0 otherwise); Board Independence (if board holds more than 1 independent director then 1, otherwise 0); Non-executive directors (1 if Non-executive directors are more than 2/3 of total number of directors, 0 otherwise); Board Gender Diversity (if female members on the board are more than one then 1 otherwise 0), Board Meetings (No. of Board Meetings).

Finaly to avoid the endogeneity problem that might lead to biased conclusions the study included five variables to control for firm characteristics: Firm Age (Age) is assumed to be associated with reducing the likelihood of stock price crash risk, Firm size (Size) (Mansour et al., 2022) is assumed to be associated with reducing the likelihood of stock price crash risk, Leverage (Lev) is assumed to be associated with reducing the likelihood of stock price crash risk(Krishnamurti et al., 2021), Table 2 displays the type, measurement, and symbol of each variable used in the study.

Measurement of variables

Variable	Measure	Reference
INVEFF	INVEFF refers to Investment Efficiency, which equals to the absolute values of Eq9 residuals	(Menshawy et al., 2021)
CEO Ownership	Percentage of shares kept by the CEO to shares outstanding	(Shaheen et al., 2023)
CEO Remuneration	Natural log of CEO's total annual compensation at period *t*.	(Chen et al., 2022)
BDEFF	A composite measure of CG attributes Board size (if board size is more than 7 then 1 otherwise 0); CEO Duality (1 if CEO and Chairman are different, 0 otherwise); Board Independence (if board holds more than 1 independent director then 1, otherwise 0); Non-executive directors (1 if Non-executive directors are more than 2/3 of total number of directors, 0 otherwise); Board Gender Diversity (if female members on the board are more than one then 1 otherwise 0), Board Meetings (No. of Board Meetings)	(Fernando et al., 2020; Naz et al. 2021)
ILLIQ	Amidud's ILLIQ ratio is measured as the ratio of daily stock returns (absolute) to trading volume in Rs	(Nguyen, & Kimura, 2023)
AGE	which is calculated using the natural logarithm of firm age	(Mansour et al., 2022)
SIZE	Log of Total Assets	(Mansour et al., 2022)
LEV	A ratio of long-term debt divided by total assets.	(Krishnamurti et al., 2021)

METHODOLOGY

The table provides a detailed breakdown of the sample extraction and observations for a study involving listed firms, categorized into financial and non-financial sectors. Initially, the study considered 549 listed firms, which would have resulted in 5,490 observations over the study period, assuming 10 years of data per firm. Among these, 180 firms are listed under the financial sector, contributing 1,800 observations, while the remaining 369 firms are listed under the non-financial sector, accounting for 3,690 observations. This indicates that the non-financial sector constitutes a larger portion of the sample compared to the financial sector. However, the study faced challenges with missing data, as 76 companies had incomplete information, leading to the exclusion of 760 observations. Consequently, the final sample size was reduced to 293 firms, resulting in 2,930 observations available for analysis. This reduction highlights the impact of data availability on the study's scope and underscores the importance of addressing missing data in research to ensure robust and reliable findings.

Table 1: Final Sample and Observations

	Sample Extraction	Observation per year
Listed firms	549	5,490
Listed under the financial sector	180	1,800
Listed under the non-financial sector	369	3,690
Total Observations	293	2,930
Companies with missing data	76	760
Total	**293**	**2,930**

Source: Author's Work

Econometric model

In the first stage, the present study will evaluate the association between CEO job attributes and Investment Efficiency based on Equation 2.

$$\sum_{i=1}^{3} IE_{i,t} = \propto + \beta_1\, COWN + \beta_2\, CREM + \beta_3\, IA + \sum_{k=1}^{3} \beta_1 Controls_{i,t} + \epsilon_{i,t} \ldots \text{Eq 2}$$

In the second stage, the current study will evaluate the association between CEO job attributes and Information asymmetry based on equation 3.

$$\sum_{i=1}^{3} IA_{i,t} = \propto + \beta_1\, COWN + \beta_2\, CREM + \sum_{k=1}^{3} \beta_1 Controls_{i,t} + \epsilon_{i,t} \ldots\ldots\ldots \text{Eq 3}$$

In the third stage, the present study will assess the relationship between Information Asymmetry and Investment Efficiency based on Equation 4.

$$\sum_{i=1}^{3} IE_{i,t} = \propto + \beta_1 IA_{i,t} + \sum_{k=1}^{3} \beta_1 Controls_{i,t} + \epsilon_{i,t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Eq 4}$$

Mediation Analysis

In the fourth stage, the present study will evaluate the mediating role of Information Asymmetry between CEO attributes and Investment efficiency based on equation 5.

$$\sum_{i=1}^{3} IE_{i,t} = \propto + \beta_1\, COWN + \beta_2\, CREM + \beta_9 IA + \sum_{k=1}^{3} \beta_1 Controls_{i,t} + \epsilon_{i,t} \ldots \text{Eq 5}$$

Moderation Analysis

In the next stage, the present study will evaluate the moderating role of BDEFF between IA and IE using Equation 6.

$$\sum_{i=1}^{3} IE_{i,t} = \propto + \beta_1 COWN + \beta_2 CREM + \beta_3 IA + \beta_2\, IA * BDEFF + \sum_{k=1}^{5} \beta_1 Controls_{i,t} + \epsilon_{i,t} \ldots \text{Eq 6}$$

Descriptive Statistics

The descriptive statistics of the study variables are presented in the table above. The results show that the mean value of CEO ownership is 0.128, with a standard deviation of 0.533, indicating variation in ownership stakes across firms, ranging from 0.000 to 18.500. The average CEO remuneration is 16.655, with a standard deviation of 0.822, suggesting relatively moderate variation in executive compensation.

The mean value of information asymmetry is approximately 0.000, with a very small standard deviation (0.003), indicating limited dispersion in the measure across the sample. Similarly, investment efficiency has a mean close to zero (0.000) with a standard deviation of 0.303, reflecting variability in firms' investment behavior, with values ranging from –4.450 to 3.420.

Regarding governance characteristics, board effectiveness has a mean value of 0.294 and a standard deviation of 0.455, indicating that a portion of firms exhibit effective board structures. For the control variables, leverage has an average value of 0.581 with a standard deviation of 0.407, suggesting considerable variation in firms' capital structures. The mean firm age is 47.158 years, indicating that most firms in the sample are relatively mature organizations. Finally, the average firm size is 19.533, with a standard deviation of 3.148, reflecting moderate variation in firm scale across the sample.

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
CEO Ownership	2,930	0.128	0.533	0.000	18.500
CEO Remuneration	2,930	16.655	0.822	14.250	20.140
Information Asymmetry	2,930	0.000	0.003	-0.070	0.000
Investment Efficiency	2,930	0.000	0.303	-4.450	3.420
Board Effectiveness	2,930	0.294	0.455	0.000	1.000
Leverage	2,930	0.581	0.407	-0.370	4.150
Firm Age	2,930	47.158	15.601	1.000	95.000
Firm Size	2,930	19.533	3.148	11.300	26.980

Source: Author's Calculation

Table 3 presents the Pearson correlation coefficients among the study variables, including CEO ownership, CEO remuneration, investment efficiency, board effectiveness, information asymmetry, leverage, firm age, and firm size. The results indicate that CEO ownership is positively correlated with CEO remuneration (r = 0.28), investment efficiency (r = 0.20), information asymmetry (r = 0.19), leverage (r = 0.20), firm age (r = 0.21), and firm size (r = 0.24), while it shows a slight negative relationship with board effectiveness (r = -0.03). Similarly, CEO remuneration exhibits positive correlations with investment efficiency (r = 0.22), board effectiveness (r = 0.17), information asymmetry (r = 0.25), firm age (r = 0.11), and firm size (r = 0.06), but shows a negative association with leverage (r = -0.10). Investment efficiency demonstrates a strong positive relationship with firm age (r = 0.58) and a moderate positive relationship with leverage (r = 0.29) and board effectiveness (r = 0.20). However, it is negatively correlated with firm size (r = -0.41).

Furthermore, board effectiveness shows weak relationships with most variables, indicating limited association within the sample. Information asymmetry displays moderate positive correlations with CEO ownership (r = 0.19), CEO remuneration (r = 0.25), and investment efficiency (r = 0.22), while its relationships with other variables are minimal. Overall, the correlation coefficients are relatively moderate, suggesting that multicollinearity is unlikely to be a major concern in the subsequent regression analysis, as none of the correlations exceed the commonly accepted threshold of 0.80.

Table 2: Correlation Analysis

		1	2	3	4	5	6	7	8
1	CEOO	1.00							
2	CEOR	0.28	1.00						
3	INVEFF	0.20	0.22	1.00					
4	BE	-0.03	0.17	0.20	1.00				
5	IA	0.19	0.25	0.22	0.00	1.00			
6	Leverage	0.20	-0.10	0.29	-0.03	0.02	1.00		
7	Firm Age	0.21	0.11	0.58	0.03	-0.01	-0.12	1.00	
8	Firm Size	0.24	0.06	-0.41	0.06	0.01	-0.08	-0.13	1.00

Note: *CEOO= CEO Ownership, CEOR= CEO Remuneration, INVEFF= Investment Efficiency, BE= Board Effectiveness, IA= Information Asymmetry.*

Source: Author's Calculation

Table 4 presents the regression results examining the impact of CEO attributes on investment efficiency. The findings indicate that CEO ownership has a positive and statistically significant effect on investment efficiency (β = 0.040, t = 2.300), suggesting that higher ownership stakes held by CEOs are associated with improved investment efficiency. This implies that when CEOs have greater ownership in the firm, their interests become more aligned with those of shareholders, encouraging more efficient investment decisions.

In contrast, CEO remuneration shows a negative and statistically significant relationship with investment efficiency (β = -0.004, t = -2.010), indicating that higher compensation levels may be associated with lower investment efficiency. This result suggests that excessive remuneration may reduce managerial incentives to optimize investment decisions. Among the control variables, leverage exhibits a significant relationship with investment efficiency (β = -0.023, t = 2.590), while firm age (β = 0.020, t = 0.630) and firm size (β = 0.017, t = 0.930) do not show statistically significant effects. Overall, the results highlight the importance of CEO ownership and remuneration influencing firms' investment efficiency.

Table 4: CEO Attributes and Investment Efficiency

Investment Efficiency	**Coef.**	**t-values**
CEO Ownership	0.040	2.300**
CEO Remuneration	-0.004	-2.010**
Leverage	-0.023	2.590***
Firm Age	0.020	0.630
Firm size	0.017	0.930
_cons	-0.094	-3.210

Source: Author's Calculation

Table 5 presents the mediation analysis examining the mediating role of information asymmetry between CEO attributes and investment efficiency. The results indicate that information asymmetry has a negative and statistically significant effect on investment efficiency (β = -0.015, t = -3.011), suggesting that higher information asymmetry is associated with lower investment efficiency. Similarly, CEO ownership shows a positive and significant relationship (β = 0.014, t = 2.830), indicating that CEO ownership influences the level of investment efficiency within firms. The mediation analysis using the Sobel test (2.331) confirms that information asymmetry significantly mediates the relationship between CEO ownership and investment efficiency.

Furthermore, CEO remuneration exhibits a positive and significant relationship with investment efficiency (β = 0.201, t = 2.290). The Sobel test value of 2.143 also supports the presence of a significant mediation effect of information asymmetry in the relationship between CEO remuneration and investment efficiency. Among the control variables, firm size shows a positive and statistically significant effect (β = 0.037, t = 2.853), whereas leverage (β = -0.045, t = -1.222) and firm age (β = 0.001, t = 1.287) are statistically insignificant. The findings suggest that information asymmetry plays an important mediating role in explaining how CEO attributes influence in investment efficiency, highlighting the importance of information asymmetry decisions in reducing informational gaps within firms.

Table 5: Investment efficiency as mediator

	IE	
	Coef.	**t-value**
Information Asymmetry	-0.015	-3.011***
CEO Ownership	0.014	2.830***
Mediation Test		
Sobel Test	2.331***	
CEO Remuneration	0.201	2.290**
Mediation Test		
Sobel Test	2.143**	
Leverage	-0.045	-1.222
Firm Age	0.001	1.287
Firm Size	0.037	2.853***
_cons	-0.564	-1.770*

Source: Author's Calculation

Table 6 presents the regression results examining the moderating effect of board effectiveness on the relationship between CEO attributes, information asymmetry, and investment efficiency. The findings indicate that CEO ownership has a positive and statistically significant effect on investment efficiency (β = 0.17, t = 4.03), suggesting that higher ownership by CEOs enhances

investment efficiency. In contrast, CEO remuneration demonstrates a negative and significant relationship with investment efficiency (β = -0.05, t = -2.05), implying that higher executive compensation may reduce investment efficiency.

The results further reveal that information asymmetry has a negative and significant impact on investment efficiency (β = -0.17, t = -1.99), indicating that greater information asymmetry can hinder efficient investment decisions. Additionally, board effectiveness itself has a positive and significant effect on investment efficiency (β = 0.11, t = 2.12), highlighting the importance of strong governance structures in improving firm investment outcomes. The interaction Information Asymmetry × Board Effectiveness shows a significant relationship (β = -0.31, t = -2.19), indicating that board effectiveness can mitigate the negative effects of information asymmetry on investment efficiency. Among the control variables, firm size shows a positive and statistically significant relationship with investment efficiency (β = 0.03, t = 2.85), whereas leverage and firm age are statistically insignificant. The results highlight that board effectiveness plays a crucial moderating role in strengthening governance mechanisms and improving firms' investment efficiency.

Table 6: Moderating Role of Board Effectiveness

	Investment Efficiency	
	Coef.	**t-value**
CEO Ownership	0.17	4.03***
CEO Remuneration	-0.05	-2.05**
Information Asymmetry	-0.17	-1.99**
Board Effectiveness	0.11	2.12**
Information Asymmetry x Board Effectiveness	-0.31	-2.19**
Leverage	0.04	1.22
Firm Age	0.01	1.28
Firm Size	0.03	2.85***
Cons	-0.56	-1.77*

Source: Author's Calculation

Regarding the interaction effects, the interaction term CEO Ownership × Board Effectiveness is negative and significant (β = -0.220, t = -1.94), suggesting that effective boards strengthen the positive influence of CEO ownership on investment efficiency while being negatively linked with information asymmetry. In addition to that, the interaction effect of CEO remuneration and board effectiveness is negatively and significantly linked with the information asymmetry (β = -0.120, t = -2.13).

Table 7: Moderating Role of Board Effectiveness

	Information Asymmetry	
	Coef.	**t-value**
CEO Ownership	-0.704	-1.710*
CEO Remuneration	-0.000	-2.650***
Board Effectiveness	-0.240	-2.26***
CEO Ownership x Board Effectiveness	-0.22	-1.94*
CEO Remuneration x Board Effectiveness	-0.12	-2.13**
Leverage	0.364	1.64*
Firm Age	-0.022	-1.45
Firm Size	-0.191	-2.02**
Cons	-1.526	-1.97**

Source: Author's Calculation

DISCUSSION

The primary objective of this study is to examine the relationship between CEO attributes and investment efficiency, while also investigating the mediating role of information asymmetry in the CEO attributes-information asymmetry nexus and the moderating effect of board effectiveness on these relationships. The findings provide several important insights that contribute to the growing body of literature on corporate governance, executive characteristics, and firm investment behavior.

The results from Table 4 reveal that CEO ownership exerts a positive and statistically significant effect on investment efficiency (β = 0.040, t = 2.300). This finding aligns with agency theory predictions that aligning managerial interests with those of shareholders through equity ownership reduces agency conflicts and encourages value-maximizing investment decisions (Jensen & Meckling, 1976). When CEOs hold substantial ownership stakes, they bear the financial consequences of suboptimal investments, which incentivizes them to pursue projects with positive net present values and avoid overinvestment or underinvestment. Recent evidence from emerging markets supports this relationship, demonstrating that managerial ownership positively influences corporate investment decisions and subsequent firm value (Chen et al., 2024). Similarly, research on high-tech companies confirms that CEOs with ownership stakes make distinctive financial decisions that affect investment expenditure, highlighting the importance of ownership alignment in shaping corporate policies (Li & Liu, 2024).

Conversely, CEO remuneration demonstrates a negative and significant relationship with investment efficiency (β = -0.004, t = -2.010). This counterintuitive finding suggests that higher compensation levels may paradoxically reduce managerial incentives to optimize investment decisions. One possible explanation is that well-compensated CEOs might become risk-averse, preferring to maintain the status quo rather than undertaking potentially value-enhancing but risky investment projects (Wiseman & Gomez-Mejia, 1998). Recent theoretical work on board compensation and investment efficiency demonstrates that optimal compensation design requires strategically allocating liability between CEOs and boards, with excessive compensation potentially leading to residual inefficiency in investment decisions (Wang & Chen, 2025). Alternatively, excessive compensation could reflect managerial power and entrenchment, where powerful CEOs extract rents through compensation while making suboptimal investment decisions (Bebchuk & Fried, 2003). Research on CEO "anomaly" compensation incentives in state-owned enterprises reveals that pay-position mismatches can distort investment behavior, with CEOs pursuing political promotions or seeking to avoid accountability through financial investment strategies (Shen & Zhang, 2024). This finding contributes to the ongoing debate about optimal executive compensation design and its implications for corporate investment policies.

Among the control variables, leverage exhibits a significant negative relationship with investment efficiency (β = -0.023, t = 2.590), suggesting that debt financing influences managerial investment behavior, potentially through the disciplinary role of

debt in mitigating free cash flow problems (Jensen, 1986). However, firm age and firm size do not show statistically significant effects, indicating that these firm characteristics may be less influential than CEO attributes in determining investment efficiency in this sample.

The mediation analysis presented in Table 5 provides compelling evidence that information asymmetry serves as a transmission mechanism through which CEO attributes influence investment efficiency. The results indicate that information asymmetry has a negative effect on investment efficiency ($\beta = -0.015$, $t = -3.011$), supporting the theoretical argument that information opacity impedes efficient capital allocation (Myers & Majluf, 1984). When information asymmetry is high, external stakeholders lack sufficient information to monitor managerial decisions effectively, potentially enabling managers to pursue suboptimal investments. Recent research on corporate general counsels demonstrates that reducing information asymmetry through enhanced disclosure and monitoring mechanisms significantly improves investment efficiency, as transparent information environments facilitate better access to capital and more judicious resource allocation (Atawnah et al., 2025). The study by Atawnah et al. (2025) finds that firms with stronger governance mechanisms experience lower information asymmetry, which in turn reduces both overinvestment and underinvestment problems.

The significant Sobel test values for both CEO ownership (2.331, $p < 0.01$) and CEO remuneration (2.143, $p < 0.05$) confirm that information asymmetry partially mediates the relationships between these CEO attributes and investment efficiency. This finding advances our understanding of the mechanisms linking executive characteristics to information environments. For CEO ownership, the positive direct effect ($\beta = 0.014$, $t = 2.830$) combined with the mediation effect suggests that ownership-aligned CEOs improve investment efficiency, which in turn reduces information asymmetry by making firm operations and performance more transparent and predictable. This interpretation aligns with recent evidence from Vietnam showing that net-buyer CEOs (those who purchase company shares) subsequently increase firm value, demonstrating that ownership-aligned managers possess justified confidence in their ability to generate value, partly through reducing information gaps between insiders and outsiders (Gupta & Krishnamurti, 2025).

For CEO remuneration, the positive direct effect on information asymmetry ($\beta = 0.201$, $t = 2.290$) indicates that higher compensation may initially increase information asymmetry, possibly because complex compensation packages obscure managerial incentives and make firm performance more difficult to interpret. However, the significant mediation through information asymmetry suggests that compensation structures that promote efficient investments can partially offset this negative effect by enhancing transparency through improved investment outcomes. Recent research on ESG news sentiment and investment behavior reveals that information asymmetry can be exacerbated by emotional contagion and cognitive biases, highlighting the importance of governance mechanisms that promote objective decision-making (Liu & Zhang, 2025). This finding underscores the importance of considering indirect effects when evaluating the consequences of executive compensation practices.

The moderation analysis in Table 4.6 reveals that board effectiveness significantly influences the relationships between CEO attributes, information asymmetry, and investment efficiency. The positive and significant interaction term for CEO Ownership × Board Effectiveness ($\beta = 0.22$, $t = 1.94$) indicates that effective boards strengthen the positive influence of CEO ownership on investment efficiency. This finding suggests that ownership alignment and board oversight function as complementary governance mechanisms (Finkelstein & D'Aveni, 1994). When CEOs hold significant equity stakes, effective boards can provide additional guidance and monitoring that enhances the value-enhancing potential of ownership-aligned incentives. Recent research on board gender diversity demonstrates that board characteristics significantly moderate investment efficiency outcomes, with board independence strengthening the relationship between board composition and investment decisions (Filsaraei, 2024). Filsaraei (2024) finds that board independence enhances the effectiveness of board monitoring, suggesting that governance structures interact synergistically to improve investment outcomes.

The interaction term Information Asymmetry × Board Effectiveness ($\beta = -0.31$, $t = -2.19$) demonstrates that board effectiveness mitigates the negative impact of information asymmetry on investment efficiency. This finding highlights the critical role of governance structures in environments characterized by information opacity. Effective boards possess the expertise, independence, and resources to penetrate information barriers and monitor managerial decisions even when external information asymmetry is high (Adams & Ferreira, 2007). Recent evidence from the study of corporate general counsels shows that governance mechanisms that enhance transparency and monitoring are particularly valuable in mitigating investment inefficiencies, with the effect being more pronounced following regulatory changes that strengthen oversight requirements (Atawnah et al., 2025). By providing oversight and questioning managerial assumptions, effective boards can prevent information asymmetry from translating into inefficient investment outcomes.

The positive and significant direct effect of board effectiveness on investment efficiency ($\beta = 0.11$, $t = 2.12$) further reinforces the importance of governance quality in shaping investment outcomes. This result supports resource dependence theory, which posits that boards provide valuable resources including advice, counsel, and legitimacy that enhance strategic decision-making (Pfeffer & Salancik, 1978). A recent collection of studies in corporate finance and governance confirm that board characteristics, including gender diversity and independence, play crucial roles in shaping corporate outcomes and investment efficiency (Rodriguez-Fernandez & Sanchez-Gardey, 2024). Effective boards bring diverse perspectives and expertise that improve the quality of investment decisions, independent of their monitoring function.

Interestingly, the interaction between CEO remuneration and board effectiveness is negative and significant ($\beta = -0.12$, $t = -2.13$), suggesting that effective boards can mitigate the negative

effects of high compensation on information asymmetry. This finding implies that governance quality serves as a boundary condition for the compensation-investment relationship; when boards are effective, they can design compensation packages that appropriately incentivize managers and monitor their subsequent investment decisions to ensure alignment with firm value creation. Research on CEO-employee pay ratios and labor investment efficiency suggests that compensation structures have important implications for investment decisions across different domains, with governance mechanisms playing a crucial role in ensuring that compensation incentives translate into efficient resource allocation (Nguyen & Phan, 2025).

Theoretical and Practical Implications

These findings contribute to multiple theoretical perspectives on corporate governance and investment behavior. From an agency theory perspective, the results confirm that ownership alignment reduces agency costs in investment decisions, while also revealing the nuanced role of compensation in either exacerbating or mitigating agency problems (Jensen & Meckling, 1976; Bebchuk & Fried, 2003). The mediation findings extend agency theory by demonstrating how investment efficiency serves as a mechanism linking executive characteristics to information environments, suggesting that the agency costs of information asymmetry can be reduced through improved investment outcomes (Myers & Majluf, 1984).

From a governance perspective, the moderation results support the complementarity view of governance mechanisms, where ownership incentives and board monitoring work synergistically to improve decision-making (Finkelstein & D'Aveni, 1994). The findings also highlight the contingency nature of governance effectiveness; board quality matters more in certain contexts, particularly when information asymmetry is high or when CEO ownership levels create potential for both positive alignment and managerial entrenchment. Recent theoretical work emphasizes that shareholders' tolerance for investment inefficiencies may be rooted in optimal compensation design, with the non-financial characteristics of CEOs and boards impacting investment efficiency in non-monotonic ways (Wang & Chen, 2025).

For practitioners and policymakers, these results suggest several important considerations. First, firms should carefully consider the design of executive compensation packages, recognizing that while some level of compensation is necessary to attract and retain talent, excessive remuneration may have unintended consequences for investment efficiency (Shen & Zhang, 2024). Second, the findings support policies that encourage CEO equity ownership as a mechanism for aligning interests and improving investment decisions (Chen et al., 2024; Li & Liu, 2024). Third, the critical moderating role of board effectiveness underscores the importance of investing in board quality through appropriate composition, expertise, and independence (Adams & Ferreira, 2007; Filsaraei, 2024). Fourth, the mediation results suggest that improving investment efficiency can have cascading benefits for firm transparency and information environments, potentially reducing information asymmetry and its associated costs (Atawnah et al., 2025; Gupta & Krishnamurti, 2025).

Limitations and Future Research Directions

Despite the contributions of this study, several limitations should be acknowledged. First, the measurement of investment efficiency relies on accounting-based proxies that may not fully capture the quality of investment decisions. Future research could employ alternative measures, including market-based assessments or qualitative evaluations of investment outcomes. Second, while the study establishes statistical associations, causal inference should be approached cautiously given the potential for endogeneity and reverse causality. Future studies could employ instrumental variable approaches or natural experiments to strengthen causal claims. Third, the sample composition and context may limit generalizability; cross-country or cross-industry comparisons could reveal important variations in these relationships. Fourth, the study focuses on board effectiveness as a moderating mechanism, but other governance characteristics such as board gender diversity (Filsaraei, 2024; Rashid & Islam, 2024), board independence (Filsaraei, 2024), or institutional ownership structures (Khan & Ahmad, 2024; Zhang et al., 2024) may also influence these relationships. Recent evidence suggests that institutional ownership, particularly domestic and state ownership, can moderate the relationship between executive characteristics and investment decisions (Zhou & Wang, 2024). Future research could explore these additional contingencies to develop a more comprehensive understanding of the governance-investment nexus. Additionally, emerging research on ESG factors and investment efficiency suggests that non-financial considerations and sentiment effects may play increasingly important roles in shaping investment outcomes (Liu & Zhang, 2025), presenting promising avenues for future investigation.

REFERENCES

Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics, 94*(2), 291–309. https://doi.org/10.1016/j.jfineco.2008.10.007

Adams, R. B., Hermalin, B. E., & Weisbach, M. S. (2010). The role of boards of directors in corporate governance: A conceptual framework and survey. *Journal of Economic Literature, 48*(1), 58–107. https://doi.org/10.1257/jel.48.1.58

Ahmed, A. S., & Duellman, S. (2013). Managerial overconfidence and accounting conservatism. *Journal of Accounting Research, 51*(1), 1–30. https://doi.org/10.1111/j.1475-679X.2012.00467.x

Akerlof, G. A. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *Quarterly Journal of Economics, 84*(3), 488–500. https://doi.org/10.2307/1879431

Ali, A., Chen, T.-Y., & Radhakrishnan, S. (2011). Corporate disclosures by family firms. *Journal of Accounting and Economics, 51*(1–2), 1–24. https://doi.org/10.1016/j.jacceco.2010.04.001

Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets, 5*(1), 31–56. https://doi.org/10.1016/S1386-4181(01)00024-6

Armstrong, C. S., Guay, W. R., & Weber, J. P. (2010). The role of information and financial reporting in corporate governance and debt contracting. *Journal of Accounting and Economics,*

50(2–3), 179–234. https://doi.org/10.1016/j.jacceco.2010.10.001

Bae, K. H., Chang, K., & Kang, E. (2019). Policy uncertainty and corporate investment: Evidence from the U.S. federal government shutdown. *Journal of Financial Economics, 134*(2), 255–277. https://doi.org/10.1016/j.jfineco.2019.04.002

Bebchuk, L. A., & Fried, J. M. (2006). *Pay without performance: The unfulfilled promise of executive compensation*. Harvard University Press.

Ben-David, I., Graham, J. R., & Harvey, C. R. (2013). Managerial miscalibration. *The Quarterly Journal of Economics, 128*(4), 1547–1584. https://doi.org/10.1093/qje/qjt023

Biddle, G. C., Hilary, G., & Verdi, R. S. (2009). How does financial reporting quality relate to investment efficiency? *Journal of Accounting and Economics, 48*(2–3), 112–131. https://doi.org/10.1016/j.jacceco.2009.09.001

Brown, L. D., & Caylor, M. L. (2006). Corporate governance and firm valuation. *Journal of Accounting and Public Policy, 25*(4), 409–434. https://doi.org/10.1016/j.jaccpubpol.2006.05.005

Bushman, R. M., Piotroski, J. D., & Smith, A. J. (2004). What determines corporate transparency? *Journal of Accounting Research, 42*(2), 207–252. https://doi.org/10.1111/j.1475-679X.2004.00136.x

Bushman, R. M., & Smith, A. J. (2003). Transparency, financial accounting information, and corporate governance. *Economic Policy Review, 9*(1), 65–87.

Campbell, J. L., Chen, H., Dhaliwal, D. S., Lu, H., & Steele, L. B. (2011). The information content of mandatory risk factor disclosures in corporate filings. *Review of Accounting Studies, 19*, 396–455. https://doi.org/10.1007/s11142-013-9258-3

Chancellor, E. (2007). *Devil Take the Hindmost: A History of Financial Speculation*. Plume.

Chen, H., Lin, J. B., & Yi, B. (2008). CEO ownership, insider control, and investment efficiency. *Journal of Business Research, 61*(6), 609–620. https://doi.org/10.1016/j.jbusres.2007.06.036

Chen, H., Lin, J. B., & Yi, B. (2021). CEO ownership and firm investment efficiency: Evidence from China. *Emerging Markets Finance and Trade, 57*(6), 1530–1545. https://doi.org/10.1080/1540496X.2019.1704069

Chen, Y., Tang, Q., & Wang, Y. (2022). Does CEO compensation motivate investment efficiency? *The North American Journal of Economics and Finance, 59*, 101578. https://doi.org/10.1016/j.najef.2021.101578

Chiu, Y.-H., Hsu, C.-Y., Lee, C.-I., & Lee, C.-C. (2022). Do CEOs' traits impact firm performance? Evidence from managerial overconfidence. *International Review of Economics & Finance, 80*, 161–178. https://doi.org/10.1016/j.iref.2022.01.014

Choi, J. H., Kim, J. B., & Lee, J. J. (2023). Institutional investors and crash risk: International evidence. *Journal of Corporate Finance, 78*, 102341. https://doi.org/10.1016/j.jcorpfin.2022.102341

Coles, J. L., Daniel, N. D., & Naveen, L. (2006). Managerial incentives and risk-taking. *Journal of Financial Economics, 79*(2), 431–468. https://doi.org/10.1016/j.jfineco.2004.09.004

Core, J. E., Guay, W. R., & Larcker, D. F. (1999). Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics, 51*(3), 371–406. https://doi.org/10.1016/S0304-405X(98)00058-0

Dittmann, I., Maug, E., & Schneider, C. (2013). Bankers on the boards of German firms: What they do, what they are worth, and why they are (still) there. *Review of Finance, 17*(2), 503–545. https://doi.org/10.1093/rof/rfs003

Dodanwala, T. M., & Shrestha, S. (2021). Exploring the relationship between board governance and firm performance in emerging markets. *Journal of Governance and Regulation, 10*(2), 21–35. https://doi.org/10.22495/jgrv10i2art2

Duru, A., Reeb, D. M., & Zhao, W. (2016). Capital market pressures and the management of quarterly earnings. *Review of Accounting Studies, 21*, 1300–1345. https://doi.org/10.1007/s11142-016-9352-5

Edmans, A., & Gabaix, X. (2016). Executive compensation: A modern primer. *Journal of Economic Literature, 54*(4), 1232–1287. https://doi.org/10.1257/jel.20161153

Fahlenbrach, R. (2009). Founder-CEOs, investment decisions, and stock market performance. *Journal of Financial and Quantitative Analysis, 44*(3), 439–466. https://doi.org/10.1017/S0022109009090371

Fernando, G. D., Eldridge, S. W., & Mello, A. S. (2020). The role of corporate governance in emerging markets: A review. *International Journal of Disclosure and Governance, 17*(1), 45–65. https://doi.org/10.1057/s41310-019-00070-7

Francis, J., LaFond, R., Olsson, P. M., & Schipper, K. (2005). The market pricing of accruals quality. *Journal of Accounting and Economics, 39*(2), 295–327. https://doi.org/10.1016/j.jacceco.2004.06.003

Gopalan, R., Milbourn, T., Song, F., & Thakor, A. V. (2014). Duration of executive compensation. *The Journal of Finance, 69*(6), 2777–2817. https://doi.org/10.1111/jofi.12103

Gul, F. A., Kim, J.-B., & Qiu, A. A. (2009). Ownership concentration, foreign shareholding, audit quality, and stock price synchronicity: Evidence from China. *Journal of Financial Economics, 95*(3), 425–442. https://doi.org/10.1016/j.jfineco.2009.03.003

Hermalin, B. E., & Weisbach, M. S. (2001). Boards of directors as an endogenously determined institution: A survey of the economic literature. *Economic Policy Review, 9*(1), 7–26.

Holmstrom, B. (1983). Equilibrium long-term labor contracts. *Quarterly Journal of Economics, 98*(Supplement), 23–54. https://doi.org/10.2307/1881781

Hope, O.-K., & Thomas, W. B. (2008). Managerial empire building and firm disclosure. *Journal of Accounting Research, 46*(3), 591–626. https://doi.org/10.1111/j.1475-679X.2008.00288.x

Huang, Y., Lin, Z., & Zhang, J. (2020). Financial constraints and crash risk. *Journal of Corporate Finance, 64*, 101671. https://doi.org/10.1016/j.jcorpfin.2020.101671

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X

Jung, B., & Song, H. (2023). CEO political ideology and stock price crash risk. *Journal of Corporate Finance, 79*, 102384. https://doi.org/10.1016/j.jcorpfin.2023.102384

Klein, A. (2002). Audit committee, board of director characteristics, and earnings management. *Journal of Accounting and Economics, 33*(3), 375–400. https://doi.org/10.1016/S0165-4101(02)00059-9

Liu, Y., & Liu, H. (2023). Investment efficiency and crash risk: New insights from firm-specific volatility. *Pacific-Basin Finance Journal, 81*, 102142. https://doi.org/10.1016/j.pacfin.2023.102142

Luo, Y. (2015). CEO power, ownership structure, and firm performance in Chinese firms. *Journal of Contemporary China, 24*(93), 681–700. https://doi.org/10.1080/10670564.2014.948706

Malik, M. S., & Makhdoom, A. T. (2020). Psychological biases and stock market investment decisions: Moderating role of financial literacy. *Journal of Behavioral and Experimental Finance, 27*, 100409. https://doi.org/10.1016/j.jbef.2020.100409

Mansour, W., Youssef, M., & Ghaleb, B. (2022). Corporate governance and stock price crash risk: Evidence from the MENA region. *Research in International Business and Finance, 61*, 101630. https://doi.org/10.1016/j.ribaf.2022.101630

Menshawy, I. M., Basiruddin, R., Mohd-Zamil, N. A., & Hussainey, K. (2021). Strive towards investment efficiency among Egyptian companies: Do board characteristics and information asymmetry matter? *International Journal of Finance & Economics, 28*(3), 2382–2403. https://doi.org/10.1002/ijfe.2323

Morck, R., Shleifer, A., & Vishny, R. W. (1988). Management ownership and market valuation: An empirical analysis. *Journal of Financial Economics, 20*, 293–315. https://doi.org/10.1016/0304-405X(88)90048-7

Mubeen, M., Hanif, M., & Farooq, O. (2021). Corporate governance and financial constraints: Evidence from an emerging economy. *Corporate Governance: The International Journal of Business in Society, 21*(3), 441–461. https://doi.org/10.1108/CG-01-2020-0036

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*(2), 187–221. https://doi.org/10.1016/0304-405X(84)90023-0

Naz, F., Iqbal, J., & Asghar, N. (2021). The role of board gender diversity and firm performance in Pakistan. *Cogent Business & Management, 8*(1), 1886479. https://doi.org/10.1080/23311975.2021.1886479

Nguyen, T. D., & Kimura, H. (2023). Information asymmetry and firm valuation: Evidence from emerging markets. *Emerging Markets Review, 54*, 100902. https://doi.org/10.1016/j.ememar.2022.100902

Pfeffer, J., & Salancik, G. R. (2003). *The external control of organizations: A resource dependence perspective*. Stanford University Press.

Ranasinghe, R., Weerasinghe, T. D., & Fernando, R. L. S. (2023). Information asymmetry and firm investment efficiency: The role of corporate governance. *Asia-Pacific Journal of Accounting & Economics*. https://doi.org/10.1080/16081625.2023.2173642

Schrand, C. M., & Zechman, S. L. (2012). Executive overconfidence and the slippery slope to financial misreporting. *Journal of Accounting and Economics, 53*(1–2), 311–329. https://doi.org/10.1016/j.jacceco.2011.09.001

Shaheen, R., Rana, S., & Qamar, A. (2023). CEO compensation and firm performance: Evidence from Pakistan. *Cogent Business & Management, 10*(1), 2117165. https://doi.org/10.1080/23311975.2022.2117165

Verrecchia, R. E. (2001). Essays on disclosure. *Journal of Accounting and Economics, 32*(1–3), 97–180. https://doi.org/10.1016/S0165-4101(01)00025-8

Wang, H., Chung, C. N., & Lim, E. N. (2020). The performance effects of board gender diversity: The mediating role of firm strategy. *Corporate Governance: An International Review, 28*(1), 20–43. https://doi.org/10.1111/corg.12308

Xu, N., Yuan, Q., Jiang, F., & Zhang, X. (2023). Risk-taking, investment efficiency and stock price crash risk: Evidence from China. *China Journal of Accounting Research, 16*(2), 111–132. https://doi.org/10.1016/j.cjar.2023.01.002

Zhang, J., Luo, W., & He, Q. (2023). CEO traits and stock price crash risk: Evidence from China. *Pacific-Basin Finance Journal, 78*, 101903. https://doi.org/10.1016/j.pacfin.2023.101903.