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Board Characteristics and Its Impact on Investment Efficiency: Moderating Role of Free Cash Flow

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Abstract
The purpose of the study is to look into the characteristics of the board and how they affect investment efficiency and the moderating role of free cash flow. The sample size for this research was 75 non-financial firms listed in the Pakistan stock exchange over a period of 2012-2021. The data were collected from statistical model using panel least squares. EVIEW has been utilized for data analysis. The findings of the demonstrate the presence of numerous combinations of characteristics as well as the significance of mutual impact that either increases or inhibits the influence of a particular variable, it can be concluded that various combinations of board characteristics (board directors, board size, ownership, and director qualification) lead to high firm performance. The entirety of Pakistan's businesses and stockholders should take note of the findings of this study. This study examines how a company's capacity to make wise investment decisions is impacted both individually and collectively by the size, independence, and CEO duality of its board. By exploring particular qualities like these, these insights will be offered. In addition to offering useful implications for boards seeking to enhance their decision-making processes, the findings of this comprehensive study advance the theories now in use addressing corporate governance. Even if the study uses panel data, the cross-sectional structure of the dataset will still have an impact on the analysis. This might make it more difficult to spot long-term patterns and impacts in corporate governance and investment efficiency.

Keywords: Board Characteristics, Investment Efficiency, Non-Financial Firms, Free Flow Cash.

Introduction

The degree to which a company's investment decisions contribute to the organization's overall effectiveness and productivity is known as investment efficiency. Investment efficiency is defined by Li and Wang (2010) as a positive net value (NPV) project investment undertaken by an organization under a predictive scenario, free from market friction such as adverse selection or agency cost. McNichols and Stubben (2008), a firm's decision to make investment is largely based on several predetermined criteria such as expected returns and interest from investments, e.g., projected future growth and anticipated product demand from the market. A company must establish a robust capital structure in order to maximize

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return on investment. According to Li & Wang (2010), a company's ability to fund or finance an attractive investment opportunity when it arises depends on this. According to Naimah (2017), the corporate governance mechanisms of bored size, board independence, outside directors, audit committee size, audit committee meeting, and corporate governance perception index are all examples of corporate governance mechanisms. This study finds that board independence negatively influences profitability, audit committee meeting positively influence profitability and governance perception index also positively influence profitability.

Nor et al. (2017) explain that corporate governance refers to board independence, board size and managerial ownership, while investment position level was based on whether the company was at an under or overinvestment level. Board independence share owned by the executive director over the total number of shares issued by the company. The study found that only the size of the board had an effect on the level. Board size is determined by the proportion of independent non-executive directors on the board, while board size is determined by the total number of directors on the board. Managerial ownership was calculated based on percentage investment of the company, while board independence and managerial ownership prevent inefficiency pertaining to investment decision making. The findings confirm that corporate governance plays a key role in improving a company's performance, particularly in protecting shareholders' interests through board size. Yan et al. (2021) explain that there is a negative relationship between the size of the board of directors and corporate performance; after dividing the sample into high-tech and non-high-tech industries, they interpret that this negative relation is more prominent in the high-tech field. After classifying the sample according to the parity of the number of directors, the results show that the odd number of directors is more effective than the even number of directors.

According to Vaidya (2019), the company's financial performance is influenced by board size. They find that small size of board effects more positively than the large and found that medium board size which is between 8 to 10 member is more efficient than small and large board size. CEO duality and its effect on firm performance is discussed and results shows that firms in which the CEO and chairperson is the same person have significantly higher performance. There is positive association between CEO duality and return on equity, return on capital and other return on investment (Amaral-Baptista et al., 2011). In the context of Pakistan (Azhar et al., 2019) reveal that investment efficiency is decreased as the concentration of the ownership increases. Managerial ownership has a positive and significant influence on the investment efficiency. Furthermore, the presence of CEO duality has negative effect on investment efficiency. In addition, the presence of mutual funds significantly boosts investment efficiency in investee firms, in contrast to other forms of institutional ownership. Investment efficiency is not significantly impacted by institutional ownership or board size. Overall, results emphasize the important role of ownership structure and corporate governance in determining firm’s investment efficiency.

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Companies' investment efficiency improves when there are active owners (Richardson, 2006), board independence (Chen and Chen, 2017), no CEO duality (Aktas et al., 2019), a high percentage of managerial ownership (Gao et al., 2017), a high percentage of institutional ownership (Chen and Chen, 2017; Lei and Chen, 2019; Cao et al., 2020), female directors (Shin et al., 2020; Mirza e These studies persuade to probe the link of board traits and ownership form with investment efficiency in the context of Pakistan. Jensen's (1986) concept of FCF refers to the extra cash that is available after financing profitable ventures. This is calculated as net operating income fewer capital expenditures (CAPEX), inventory costs, and dividends distributed. Brealey et al. (2005) describe FCF as net income; add depreciation and amortization, minus CAPEX, minus change in non-cash working capital, plus net borrowing. According to Richardson (2006), firms with surplus funds run the risk of wasting them on ventures that do not generate a profit. Additionally, since FCF are financial resources that managers can allocate at their discretion, they are also referred to as idle cash flows (Mutende et al. 2017).

Corporate Governance in Pakistan

In 2002, the Code of Corporate Governance (CCG) legislation was developed by the Security and Exchange Commission of Pakistan (SECP). Amendments to these rules were made in 2012, 2017, and most recently in 2019. This is true even if other international regulatory organizations are trying to make sure that the governance structure has a board feature. The modified CCG, which was incorporated into the businesses Act of 2017, mandated that all public interest businesses have a minimum of one female director on their board of directors. As a result, it is projected that over the next several years, the proportion of women directors working for listed companies a subset of public interest corporations will rise from 6.4% to 14.3%. The ratio of market capitalization to book value is another market metric. By examining the moderating impact (FO) of family ownership, this study also adds to the expanding corpus of research on governance and corporate success. One technique to assess the moderating effect of family ownership is to look at the percentage of total shares held by family members (Ghaleb et al., 2020). By investigating the moderating effect of family ownership, this study empirically contributes new insights to the literature on the relationship between the number of women on board and financial performance. This supports the claim that a family-owned business's structure hinders its profits and has an impact on minority shareholders' holdings. By analyzing the moderating effect of free cash flow, this study adds to the body of information on the relationship between the number of women on board and financial performance.

Research Gap and Problem Statement

The literature now in publication shows contradictions and gaps in our knowledge of how specific board attributes—like size, independence, and CEO duality—interact with free cash flow to affect investment choices. The complex interrelationships among these components have particular implications for companies seeking to optimize the efficacy of their investment strategies. Given this,

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empirical research that methodically examines the connections among board characteristics, free cash flow, and investment efficiency is desperately needed. Both scholarly discussions and real corporate governance initiatives would benefit from such studies. This study aims to address this gap by examining the moderating role that free cash flow has in the relationship between investment efficiency and board features. By doing this, we intend to deepen our comprehension of the intricate relationships that affect business investment decisions.

Research Objectives

The objective of this research is to investigate the board characteristics and its impact on investment efficiency and the moderating effect of free cash flow. Specifically, the study aims to:

To examine how various board characteristics—such as size, independence, diversity, education, and frequency of meetings—influence investment efficiency.

To investigate how CEO duality affects a company's free cash flow management and investment efficiency.

To explore the relationship between free cash flow and investment efficiency with in the context of corporate governance.

To assess how board attributes affect the level and utilization of free cash flow in firms.

Literature Review and Hypothesis Development

Ensuring a healthy balance between the companies' individual and collective interests, as well as between its economic and social goals, is one of the main goals of corporate governance. By using a variety of mechanisms, including audit committees, auditors, and directors, who are responsible for overseeing and controlling management performance and decision-making, it attempts to ensure responsible behavior. Organizations must create and implement outstanding corporate governance due to the growing level of competition in the business sector. Businesses with well-established corporate values will be seen favorably by stakeholders. Corporate governance is a framework that keeps an eye on and regulates businesses that function to produce benefits. The transfer of free cash inflows back to the shareholders' wealth can effectively reduce the agency cost. Agency theory states that outside investors were forced to prioritize dividends over managers due to the existence of asymmetric knowledge or moral hazards (Jensen & Meckling, 2019). Retained earnings may eventually be expropriated as a result of this. La Porta et al. (2000) argue that dividends are a substitute for shareholders' rights in the context of their substitution model. Investors are unclear about their returns in a system with inadequate governance, but they are guaranteed dividend payments on a regular basis in a situation with great governance.

Furthermore, dividend policy can also be connected to the statement that was just stated to highlight the important function that corporate governance plays. The dividend policy has an impact on the company's worth. Because it determines whether the company will keep its earnings for itself or distribute them to shareholders as

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dividends, the dividend policy has a significant impact on the business. The company will undoubtedly go through an evolution as it works to increase its value, and this evolution will inevitably lead to a rise in social inequality. Many empirical studies about the dividend policy have been conducted since the first study on dividends was completed by Miller and Modigliani in 1961 and Battista, Coppick, Howsmon, Morehead, and Sisson in 1956. The agency theory, which uses agency costs to explain dividends, is one of the most well-known of them. The conflict of interest between management and shareholders is the cause of these expenses.

Directors are the most important management group in companies operating in the modern world, according to Ferguson et al. (2019). According to Ferguson et al. (2019), they are responsible for creating strategic plans, carrying out dictionary actions, and facilitating financial and business transactions. Previous research has emphasized the connection between dividend policy and corporate governance, financial advantage, and financial success. According to Benlemlih (2019), company board participation and dividend policy are significantly correlated. According to Pahi and Yadav (2018), the dividend policy is significantly influenced by the board's qualities. According to earlier research, a variety of factors, such as board duality (Sawicki, 2009), foreign directors (Boumosleh & Cline, 2015), board size (Mosa, Taher, & Al-Jaberi, 2017), and directors' age (Custódio & Metzger, 2014), affect the dividend policy.

The idea of board diversity in the business sector is becoming more and more popular among academics and professionals, according to corporate governance studies. A review of previous studies has revealed that, from the standpoint of efficient investing, there is a significant wealth gap among owners. The corporate sector can provide a strong foundation and execution by referencing the wealth and dividends paid to shareholders by companies engaged in cost-cutting and optimal or efficient investment (Abor & Bokpin, 2010). A variety of business tactics can be used to achieve this. A business can increase its profitability and subsequently re-distribute the earnings to its shareholders in the form of dividends by improving the efficiency of its investments or cutting expenses. According to Macaulay et al. (2018), better financial performance in the corporate sector is linked to the participation of foreign directors on corporate boards. The culture of the organizations and the cultural makeup of the directors are correlated. Companies should work to promote cultural diversity in order to better serve the interests of shareholders.

An increasing number of investors are eager to invest in companies with a more diverse culture. The dividend policy is greatly impacted by the presence of ethnic diversity on the board of directors, in contrast to its counterpart, a board of directors devoid of any drivers. According to Hunt et al. (2015), boards of directors with members from diverse ethnic origins can reduce the amount of money spent on commissions between common investors and managers. Board member diversity may be a sign for stakeholders inside and outside the company. The value of the business is positively impacted by an indicator of symbolic significance, which in turn attracts a diverse range of members and investors to a given business. Diversity on the board

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of directors has a significant impact on communication both inside and outside the organization.

According to Thanetsunthorn and Wuthisatian (2018), this makes it possible for the diversity board of directors to carry out their duty of monitoring equipment more successfully. According to Gompers and Kovvali (2018), the performance of an investor's investments is strongly correlated with their ethnic background. It has been demonstrated that the dividends given to shareholders and the diversity of races are positively and significantly correlated. According to Kolev and McNamara (2020), boards of directors are under pressure to make independent judgments about dividend distribution because of the presence of varied ethnic ties on the board. According to Roach and Slater (2016), the CEO's personal characteristics have an impact on the decisions the company makes. The financial performance of businesses is influenced by the combined skills and knowledge of a chief executive officer (CEO), and these skills and knowledge extend beyond what is taught in academic curriculum. Based on studies done in Australia, this study concluded that business school degree might not significantly increase a company's financial success (Linford, 2013).

Furthermore, educational institutions must change their emphasis from knowledge-based skills to knowledge-based skills in order to guarantee the corporate world's future survival (Hughes et al., 2018). According to Riaz et al. (2020), this correlation is no longer significant during financial crises. What makes an investment optimal is one of the most basic questions in corporate finance. According to Modigliani and Miller (1958), the options for investing in a frictionless market decide investment. Dividend payments are crucial because of the conflict of interest that exists between management and shareholders. Bhagat and Welch (1995) found that the main reason for unnecessary investment was managers' self-interested behavior. According to Chen et al. (2014), because managers benefit from their work, agency issues are comparable to growing investment inefficiency. According to Guariglia and Yang (2016), there is strong evidence that agency conflicts lead to investment inefficiencies in the Chinese market. Excessive and insufficient investment leads to an increase in agency challenges and conflicts of interest. In order to serve their own interests, managers are stealing resources from the business. They would prefer to use their free cash flow for investments with a negative net present value rather than paying dividends.

Agyei-Mensah (2021), the increasing amount of corporate governance literature has shown that managers are unable to make the best investment choices because of agency conflicts and knowledge asymmetry between them and external investors. Tan et al. (2020) study found that board education leads to information asymmetry, which significantly affects investment efficiency. Because there are fewer agency conflicts, businesses can increase shareholder interest. Cheng et al. (2017) found that the efficiency of corporate investment is positively correlated with the participation of outside directors. This shows that agency costs can be reduced, which in turn promotes shareholder interest and ultimately leads to higher dividend distributions. According to Mirza et al. (2020), gender diversity contributes to a decrease in agency conflicts, which improves corporate sector investment efficiency.

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According to Liu et al. (2012), having a family CEO lowers agency conflicts between managers and external shareholders, which eventually improves the company's performance. The family CEO has a positive effect on investment efficiency, which eventually leads to the highest returns on investment.

According to Easterbrook (1984) and Aggarwal et al. (2011), institutional investors significantly influence corporate governance. This element reduces the amount of window-dressing and self-interest that managers conduct. Furthermore, managers are under pressure from institutional investors to focus on the organization's long-term performance and to direct effectively (Admati & Pfleiderer, 2009). The company's ability to provide returns on investment is increased when institutional investors own a sizable ownership position in it. According to Cao et al. (2018), institutional ownership improves the company's investment efficiency. According to this research, institutional investors play a big role in how corporate boards operate, and their impact is particularly noticeable when it comes to maximizing wealth (dividend payments). According to Majeed et al. (2018), an organization with efficient investment aims to minimize agency conflicts and maximize wealth and interest for its owners. Effectively managed investments increase the company's profitability, which is subsequently paid out as dividends to shareholders.

Hypothesis

To investigate how corporate governance influences investment efficiency and free cash flow management, a number of hypotheses have been developed in accordance with the study's goals. The hypotheses specifically examine the ways in which CEO duality and different board attributes—like size, independence, diversity, education, and meeting frequency—affect these financial results. By looking at these connections, the study hopes to shed more light on how internal governance practices support better financial performance and decision-making in businesses.

H_1: There is significant relationship between board size and a firm's investment efficiency.
H_2: There is positive significant relationship between the level of board independency investment efficiency.
H_3: There is significant relationship between board diversity and investment efficiency.
H_4: There is significant relationship between the educational qualifications of the board and a firm's investment efficiency.
H_5: There is significant relationship between board meetings and investment efficiency.
$H_{6:}$ There is positive relationship between CEO duality (combined roles of CEO and chairperson) and a firm's investment efficiency.
H_7: There is significant relationship between free cash flow and investment efficiency.
H_8: There is significant relationship between board size and free cash flow
H_9: There is significant relationship between board independency and free cash flow.
H_{10}: There is significant relationship between board diversity and free cash flow.
$H_{11:}$ There is significant relationship between board education and free cash flow.

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H_{12}: There is significant relationship between board meetings and free cash flow.
H_{13}: There is significant relation between CEO duality and free cash flow.

Research Methodology

The hypotheses in this study were tested utilizing a quantitative research design. The information was obtained from secondary sources, including the financial statements and annual reports of non-financial companies listed on the Pakistan Stock Exchange. The 75 non-financial companies that made up the sample were all selected using a technique called stratified random sampling. The strata were based on the enterprises' classification into various industries, including manufacturing, services, and others. The researchers in Pakistan employed a quantitative study methodology to assess the moderating effect of free cash flow and the influence of board qualities on investment efficiency.

The study's sample population consisted of Pakistani publicly traded corporations. A sample of 75 companies spanning a range of industries, including the manufacturing, service, and financial sectors, was chosen using the purposive sampling technique. We were concentrating on the 75 businesses that were listed on the Pakistan Stock Exchange between 2012 and 2021. Secondary data obtained from the Pakistan Stock Exchange for the fiscal years 2012–2021 was used to build our sample. Non-financial companies listed on the Pakistan Stock Exchange (PSX) were used in this study. The relevant data were gathered from the firms' annual reports. Annual reports are key to in an organization's image to its stakeholders (Gray et al., 1995).

Table 1: Sample Size

Variable	Sample Size	Percentage
Automobile Assembler	11	14.7%
Cable & Electric Goods	3	4.0%
Cement	21	28.0%
Chemical	12	16.0%
Commercial Bank	11	14.7%
Engineering	8	10.6%
Fertilizer	6	8.0%
Insurance	3	4.0%
Total	75	100.0%

Sources: Authors Collected

Proposed Model

This study examines the effect of board characteristics on investment efficiency and the moderating effect of free cash flow. The estimates of ordinary least squares can be misleading. The firm-specific control variables in both models include the year and industry dummies to account for time and industry trends. In accordance with the hypothesis, we proposed following model:

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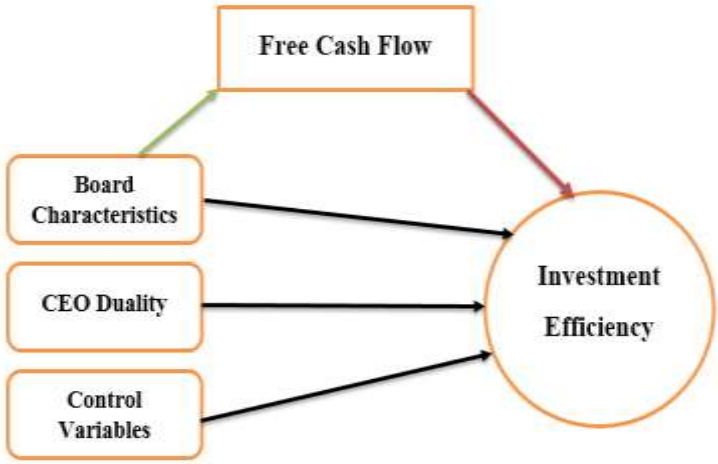

Figure 1: Theoretical Model

$$IE_{it} = \beta_o + \beta_1 BS_{it} + \beta_2 BI_{it} + \beta_3 BQ_{it} + B_4 BM_{it} + \beta_5 BD_{it} + \beta_6 CEOD_{it} + \sum_{i=0}^{1} \gamma\, Control_{it} + \varepsilon_{it}$$

$$IE_{it} = \beta_0 + \beta_1 FCF_{it} + \sum_{i=0}^{1} \gamma\, Control_{it} + \varepsilon_{it}$$

$$IE_{it} = \beta_o + \beta_1 (BS * FCF)_{it} + \beta_2 (BI * FCF)_{it} + \beta_3 (BQ * FCF)_{it} + B_4 (BM * FCF)_{it} + \beta_5 (BD * FCF)_{it} + \beta_6 (CEOD * FCF)_{it} + \sum_{i=0}^{1} \gamma\, Control_{it} + \varepsilon_{it}$$

β_0 are intercept and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9$ are coefficients for BS, BI, BQ, BM, BD, CEOD and their interactions, ε is error term.

Data Analysis

In order to verify the validity of the hypotheses, the data were subjected to panel least square and examined. The investment efficiency served as the dependent variable, while board size, board diversity, board qualification, board meetings, CEO duality and board independency served as the independent variables. The analysis also took into account control variables such as the leverage, firm age, ROA, firm size and ROI of firms in which it operated. EVIEW, v.12 was utilized in order to do the analysis on the data.

Results and Discussion

The total number of observations is 9750, which is denoted by the symbol n. Both the standard deviation and the mean are quite large. It indicates that the data follow a normal distribution, and the sample size is larger.

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Descriptive Statistics

The statistical outputs including minimum, maximum, mean and standard deviation, are presented in Table 2.

Table 2: Descriptive Statistics of the Variables

Variable	Min	Max	Mean	SD
IE	72.38	96.58	85.65376	5.475089
BS	2	9	6	1.48423
BD	23.3	43.6	32.4348	5.694865
BQ	72.49	95.47	85.3208	5.244096
BM	74.25	91.23	82.98933	4.553724
CEOD	0	1	0.42	0.493888
BI	26.8	43.6	37.03233	3.585984
FCF	190900	18689000	5813699	6057859
LV	0.02533	3.29389	0.676571	0.839031
PFT	0.63862	72.9174	19.79322	15.68118
ROA	0.05732	26.72014	6.261229	7.12979
FS	107900	8.23E+10	5.22E+09	1.42E+10
ROI	1.03	42.5	6.735667	6.111668

Sources: Export from EVIEW software

The descriptive statistics for the variables included in the dataset are presented in Table 2. Investment Efficiency (IE) has a mean value of 85.65, with values ranging from 72.38 to 96.58, and a standard deviation of 5.48. This suggests that the businesses in the sample generally keep the same level of performance. With a mean of 6 and a standard deviation of 1.48, board size (BS) ranges from 2 to 9 members, indicating moderate variation in board composition among the examined businesses. The average value for Board Diversity (BD) is 32.43, with values ranging from 23.3 to 43.6 and a standard deviation of 5.69, indicating that board members come from a diverse range of backgrounds and perspectives. A high average score of 85.32, values ranging from 72.49 to 95.47, and a standard deviation of 5.24 on the Board Qualification (BQ) indicate that the sample's board members are generally well-qualified. The frequency of Board Meetings (BM) varies slightly, with a mean of 82.99, a range from 74.25 to 91.23, and a standard deviation of 4.55, indicating that most firms conduct board meetings with moderate regularity. The binary variable known as CEO Dualism (CEOD), which indicates whether the CEO also serves as board chair, has a mean value of 0.42, indicating that approximately 42% of the businesses that were observed exhibit CEO dualism. The average value for Board Independence (BI) is 37.03, with scores ranging from 26.8 to 43.6 and a standard deviation of 3.59, suggesting a relatively high level of independence among board members. With a mean of 5,813,699, a minimum of 190,900, and a maximum of 18,689,000, Free Cash Flow (FCF) reflects the varying financial conditions of the various businesses. Control variables such as Leverage (LV), Firm Age (PFT), Return on Assets (ROA), Firm Size (FS), and Return on Investment (ROI) also display

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diverse means, ranges, and standard deviations. Leverage (LV), for instance, has a range of 0.02533 to 3.29389, with a mean of 0.676571 and a standard deviation of 0.839031, indicating that the sample firms' financial leverage is highly variable.

Pairwise Correlation

The pairwise correlation coefficients that exist between the variables in the dataset are detailed in Table 3. The strength and direction of the linear relationship that exists between two variables can be determined by the correlation coefficients.

Table 3: Pairwise Correlation

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
IE (1)	1												
BS (2)	-0.12	1											
BD (3)	-0.08	0.10	1										
BQ (4)	0.62	0.08	-0.11	1									
BM (5)	0.09	0.17	0.16	0.33	1								
CEOD (6)	0.04	-0.07	-0.13	0.07	0.17	1							
BI (7)	-0.13	0.20	0.32	0.12	0.17	-0.02	1						
FCF (8)	-0.18	0.16	-0.05	0.19	-0.02	0.03	0.19	1					
LV (9)	0.21	0.06	-0.19	-0.16	0.03	0.16	0.18	0.06	1				
PFT (10)	0.00	-0.04	0.12	0.00	0.11	0.20	0.10	0.07	-0.02	1			
ROA (11)	-0.06	0.06	0.21	0.00	0.11	-0.15	0.30	0.06	0.40	-0.17	1		
FS (12)	0.06	0.20	0.38	0.00	0.07	0.10	0.04	0.61	0.08	0.05	0.02	1	
ROI (13)	0.15	0.23	0.33	-0.04	-0.03	0.02	0.13	0.16	0.51	0.04	0.51	0.24	1

Sources: Export from EVIEW software

Investment Efficiency (IE) shows a moderate positive correlation with Board Qualification (BQ) (0.62), Free Cash Flow (FCF) (0.19), Leverage (LV) (0.21), and Return on Investment (ROI) (0.15), suggesting that higher levels of board qualification, free cash flow, leverage, and return on investment tend to be associated with greater investment efficiency. There is a modest tendency for bigger board sizes to be related with worse investment efficiency, as indicated by the fact that there is a weak negative correlation between Board Size (BS) and Investment Efficiency (IE) (-0.12). Both Board Diversity (BD) and Board Meetings (BM) have weak correlations with other variables, which indicate that there are limited direct linkages between the variables that are being considered. CEO dualism has a limited direct impact on the variables that were analyzed because the CEOD variable has weak associations with other factors. There is a modest negative association between Board Independency (BI) and Investment Efficiency (IE) (-0.13), which suggests that higher levels of board independency may be related with lower levels of investment efficiency. Free Cash Flow (FCF) has moderately favourable correlations with Board Qualification (BQ) (0.19) and Leverage (LV) (0.16), which suggests that there may be connections between these variables.

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Leverage (LV) exhibits correlations that range from weak to moderate with a number of variables, such as Board Independency (BI) (0.16) and Return on Assets (ROA) (0.06), which suggests that there may be relationships between leverage and these issues. Return on Assets (ROA) has somewhat favourable correlations with Return on Investment (ROI) (0.40) and Firm Size (FS) (0.05), which suggests that there may be linkages between these variables. There is a moderately positive association between Firm Size (FS) and Free Cash Flow (FCF) (0.61), which suggests that larger enterprises have a tendency to have higher free cash flows. The fact that the Return on Investment (ROI) has correlations with Board Qualification (BQ) (0.51), Board Independence (BI) (0.51), and Free Cash Flow (FCF) (0.16) that are somewhat favorable suggests that these variables may be linked.

VIF Analysis

The variables included in the panel least square are outlined in Table 4, together with their respective coefficients, uncentered VIF and centered VIF.

Table 4: VIF Analysis

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
BS	0.01224	21.55856	1.24159
BD	0.001588	79.39645	2.37136
BQ	0.000982	330.7253	1.24304
BM	0.00155	493.6882	1.47999
CEOD	0.100337	1.943014	1.12695
BI	0.003181	203.0425	1.88371
FCF	7.97E-16	2.587702	1.34619
LV	0.062104	3.323832	2.0131
PFT	0.000106	3.100923	1.1948
ROA	0.000734	3.043821	1.71751
FS	1.77E-22	1.865691	1.64395
ROI	0.000852	3.248229	1.46565
C	12.93328	596.3138	-

Sources: Export from EVIEW software

Table 4 presents the results of the multicollinearity analysis, using both uncentered and centered Variance Inflation Factor (VIF) values to assess potential issues among the independent variables. For Board Size (BS), the uncentered VIF is relatively high at 21.56, but the centered VIF is only 1.24, which falls within the acceptable threshold. This indicates that multicollinearity is not a significant concern for this variable, despite the fact that there may be some correlation between BS and the intercept. In contrast, Board Diversity (BD) shows stronger signs of multicollinearity. Its centered VIF is 2.37 and its uncentered VIF is 79.40, respectively, indicating that BD may be correlated with other model independent variables. In a similar vein, the Board Qualification (BQ) has a low centered VIF of 1.24 but an extremely high uncentered VIF of 330.73, indicating that the observed

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multicollinearity is primarily attributable to its relationship with the constant term rather than other predictors. Board Meetings (BM) displays the highest uncentered VIF of 493.69, but like BQ, its centered VIF is relatively low at 1.48. This means that while BM appears to be strongly correlated with the intercept, its correlation with the other variables in the model is not particularly problematic.

The variable CEO Dualism (CEOD) presents no multicollinearity concerns, with an uncentered VIF of 1.94 and a centered VIF of 1.13, both well within safe limits. On the other hand, Board Independence (BI) shows a high uncentered VIF of 203.04 and a centered VIF of 1.88, indicating a notable level of correlation with other variables, particularly those related to board structure. For Free Cash Flow (FCF), the uncentered VIF is 2.59 and the centered VIF is 1.35, suggesting a moderate level of multicollinearity. Leverage (LV) follows a similar pattern, with an uncentered VIF of 3.32 and a centered VIF of 2.01, also indicating moderate correlation with other variables. Firm Size (FS), Return on Investment (ROI), Firm Age (PFT), and Return on Assets (ROA) all have low uncentered VIF values, indicating that multicollinearity is not a concern for these variables. Lastly, the constant term (C) has a very high uncentered VIF of 596.31. However, this has no effect on the reliability or interpretation of the regression results because the constant is not an important explanatory variable.

Panel Least Square

The variables included in the panel least square are outlined in Table 5, together with their respective coefficients, standard errors, t-values, and p-values.

Table 5: Panel Least Square

Variable	Coefficient	Std. Err.	t-Statistics	Prob.
BS	-0.246035	0.110636	-2.223831	0.0265
BD	0.084424	0.039849	2.118578	0.0345
BQ	0.707717	0.031331	22.58819	0.0000
BM	-0.169362	0.03937	-4.30176	0.0000
CEOD	-0.00919	0.31676	-0.029014	0.9769
BI	-0.041577	0.056403	-0.737145	0.4613
FCF	-9.33E-08	2.82E-08	-3.307094	0.0010
LV	0.57312	0.249207	2.299769	0.0217
PFT	0.016076	0.010272	1.564935	0.1180
ROA	0.047857	0.027088	1.766702	0.0777
FS	4.51E-11	1.33E-11	3.393721	0.0007
ROI	-0.138347	0.029192	-4.739249	0.0000
C	39.84112	3.596287	11.0784	0.0000

Sources: Export from EVIEW software

Numerous significant insights into the variables influencing investment effectiveness are offered by the investigation. In particular, the association between board size and investment efficiency is statistically significant (p = 0.0265), with an

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increase of one unit leading to a decrease of 0.246 units, indicating that board size has a negative effect. On the other hand, a one-unit increase in board diversity is linked to a 0.0844-unit improvement in investment efficiency, which is likewise statistically significant ($p = 0.0345$). Board certification is the characteristic that had the biggest positive impact out of all those that were looked at. The correlation between a 0.7077-unit increases in investment efficiency and a one-unit rise in board certification is extremely statistically significant ($p < 0.0001$). More frequent board meetings seem to make investments less efficient. There is a 0.1694-unit drop for every extra meeting, which is statistically significant ($p < 0.0001$). However, there is no discernible correlation between investment efficiency and board independence or CEO duality. These associations are not statistically significant, as indicated by their near-zero coefficients and p-values of 0.9769 and 0.4613, respectively.

Free cash flow has a very small detrimental impact on investment efficiency, as indicated by its coefficient of -9.33E-08. The association is statistically significant ($p = 0.0010$), though, suggesting that too much internal funding could lead to ineffective investment. A one-unit increase in leverage results in a 0.5731-unit increase in investment efficiency ($p = 0.0217$), demonstrating a positive and substantial effect of leverage. However, because their p-values are higher than the conventional 0.05 threshold, factors including firm age, return on assets, and return on investment do not show any discernible relationships with investment efficiency. With a coefficient of 4.51E-11, a company's size has a statistically significant ($p = 0.0007$) but minor positive impact, suggesting that larger organizations may have moderate efficiency benefits. The model's constant term, which represents the initial level of investment efficiency, is 39.84112, when all independent variables are set to zero. Overall, these findings demonstrate that not all governance factors are significant, but they also emphasize the significance of board credentials, diversity, and financial structure in determining investment efficiency.

Table 6: Panel Least Square Statistics

R-squared	0.466053	**Mean dependent var**	85.6538
Adjusted R-squared	0.457359	**S.D. dependent var**	5.47509
S.E.	4.033179	**Akaike info criterion**	5.64417
Sum squared resid	11988.44	**Schwarz criterion**	5.72425
Log likelihood	-2103.563	**Hannan-Quinn Criter.**	5.67503
F-statistic	53.60716	**Durbin-Watson stat**	1.32695
Prob(F-statistic)	0		

Sources: Export from EVIEW software

When using adjusted R-squared, which penalizes the inclusion of factors that are not important, the adjusted R-squared value is 0.457, which is slightly lower than the value of R-squared. The average deviation of investment efficiency values from the values predicted by the model is 4.033, which is the standard error of panel least square, and this provides an indication of the average variance. The value of R-

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squared is 0.466, meaning that the independent variables account for approximately 46.6% of the variance in investment efficiency. A measurement that determines how well a statistical model fits a certain data set in comparison to other models. It strikes a compromise between the number of parameters that are included and the degree to which the model fits the data. AIC values that are lower indicate a better match.

In this case, AIC is 5.644. a sum that is the squared difference between the values of the dependent variable that were observed and those that were anticipated. This demonstrates the overall error of the panel least square model. This particular instance has a sum squared residual value of 11988.44. Higher log likelihood values indicate a better match between the model and the data. It is -2103.563 for the log likelihood in this case. This metric is used to assess the panel least square model's overall significance. This step checks to see if the coefficient of at least one of the independent variables is non-zero. Considering that the probability is zero and the F-statistic is 53.607, it can be said that the panel least square model is statistically significant overall. An analysis of whether or not the data's residuals show autocorrelation in a least squares model. Autocorrelation can vary from 0 to 4, with values near 2 indicating no autocorrelation. The Durbin-Watson statistic for this specific case is 1.327, indicating a probability of positive autocorrelation in the residuals.

Conclusion

This research provides a clear picture of how corporate governance affects both investment efficiency and free cash flow. It finds that certain board features—like size, diversity, qualifications, and meeting frequency—positively influence how efficiently a company invests. In short, boards that are well-educated, diverse, and actively engaged tend to make smarter investment decisions. Interestingly, it does not appear that having independent board members or combining the CEO and chair roles has a significant impact. This suggests that what matters more is how involved and capable board members are, not just their formal roles or titles. This study paints a clear picture of the relationship between corporate governance and free cash flow and investment efficiency. It concludes that a company's ability to invest effectively is positively impacted by specific board characteristics, such as size, diversity, qualifications, and frequency of meetings. To put it briefly, boards that are diverse, well-educated, and actively involved typically make better investment choices. Curiously, neither the combination of the CEO and chair positions nor the presence of independent board members seems to have a major effect. This implies that board member's abilities and level of involvement—rather than their official positions or titles are more important.

Directions for Future Studies

Future studies could benefit from adopting a longitudinal approach to better capture how board characteristics influence investment efficiency and free cash flow over time, reflecting the evolving nature of corporate governance. Researchers are also encouraged to apply advanced econometric techniques—such as instrumental

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variables or difference-in-differences methods—to address potential endogeneity issues and strengthen causal interpretations. Expanding the scope of analysis to include other governance factors like ownership structure, executive compensation, and broader economic or market conditions could provide a more comprehensive understanding of the drivers behind investment efficiency and cash flow management. Additionally, examining governance practices across different industries and regions may reveal important variations, helping to enhance the relevance and generalizability of future findings.

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