

Research Article

Board Gender Diversity Impact on Investment Efficiency in Nigerian Deposit Money Banks

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Abstract

The corporate governance (CG) research extensively documents the significance of board of directors, given its pivotal position in strategic decision-making. Women's traits, like reduced overconfidence, effective monitoring, and risk aversion, contribute to diversity and transparency in CG through the representation of diverse genders on boards. Hence, this study examined board gender diversity (BGD) impact on investment efficiency (IE) among Nigerian Deposit Money Banks (NDMBs). The study adopted an *expo facto* research design. Secondary data were collected for this study from the Annual Reports of the selected banks. The population for the study comprised 23 NDMBs on the Nigerian Exchange Group (NGX) from 2012 to 2021. A total of 10 NDMBs were purposively chosen based on data accessibility during the study period. The base year, 2012 was adopted because it marked the period listed banks adopted International Financial Reporting Standards (IFRS). Data collected were analyzed using multiple regressions, as the inferential. The results showed that variable of returns on assets (ROA) had a coefficient value of 1.1620 which is statistically significant (p-value = 0.0110), firm size (SIZE) (coefficient = 0.0281 and probability = 0.9920), firm age (AGE) with coefficient value of 1.7121 and probability value of 0.6945, BGD had a coefficient value of 0.0394 on investment efficiency of NDMBs which is statistically significant (p-value = 0.0087), and risk (coefficient = 0.0704 and probability = 0.0279). The study recommends that banks should ensure that their risk-taking is measured and controlled to avoid excessive risk-taking, which can lead to financial instability. Banks should also ensure that their risk management practices are robust and effective. Also, banks should strive to improve their gender diversity at the board level to improve their investment efficiency. The study concluded that BGD enhanced changes in the level of investment efficiency of NDMBs.

Keywords

Board Gender Diversity, Investment Efficiency, Firm Size, Risk, Deposit Money Banks

1. Introduction

The company's board of directors is expected to maximize every investment opportunity and use its authority to allocate funds among investment projects as appropriate, based on the availability of positive net present value projects. Efficiently allocated funds show investment efficiencies that can lead to

profitability and growth sustainability for the company. But the prevalence of dodgy operations and insider trading aimed at defrauding firms for personal gain is one of the causes of poor investment efficiency [32, 30]. Women's gender features and risk aversion attributes add variety and transparency to

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CG and might help to moderate the prevalence of dodgy operations and insider trading aimed at defrauding firms for personal gain. BGD could be seen as an indicator of how many women are on a company's board of directors. It is said to be structured to mirror the company's social structure, with sufficient representation of gender, professional backgrounds, and ethnicity [37]. The purpose of the diversity of the board is to promote a varied range of demographic traits and qualities in the boardroom. Promoting heterogeneity on the board is an easy and frequent practice. Globally, policymakers, shareholders, and board directors have made gender equality within publicly traded corporations one of their top priorities [31]. Nigeria, however, is not exempted because gender diversity is a problem and women are clamoring for more positions both in governmental and private companies. Women recently convened in the Senate and House of Representatives and decided to work towards owning 35% of the appointments into public positions in the country. Scholars have lately become more interested in board gender inclusion, particularly when it comes to examining how it affects firm performance and CG [38, 25, 24, 17, 6, 2]. Though few studies have examined the link involving diversity on boards and investment inefficiency, this effect is still a contentious research subject because the majority of the studies in this field concentrate on the way board gender heterogeneity affects business performance and business risk. Furthermore, a number of studies have suggested that increased monitoring brought about by a gender-diverse board affects company investment. Therefore, this study examines this topic from a different perspective by identifying this effect based on the unique characteristics of female directors. This study examines BGD's impact on Investment Efficiency in NDMBs.

2. Conceptual Review

2.1. Investment Efficiency

Investment efficiency is the relationship between risk, return, and overall management costs, subject to restrictions that investors must adhere to [19]. These limitations include both monetary and non-monetary factors, like the investors ability to monitor the arrangements for investments, their duty as fiduciaries, or any applicable laws. One could think of investment efficiency on account of balance between financial and non-financial efficiency. Under fiduciary and other restrictions that investors must abide by, it is consequence of return, risk and overall cost of investment management system. Through investment management frameworks, institutional investors carry out their investment strategies. The system that decides how to distribute investment assets across various investment managers and investment methodology referred to structure for investment management [19]. The predicted risk, return, and style elements of the investment strategy can vary. The ultimate result is the creation of a number of levels with the necessary number of investment

managers in each layer, with each containing different kinds of investment managers.

Investment Categories

Investments focused on growth and investments with a fixed source of income. A fixed income strategy seeks to preserve the value of the investment while generating a consistent (and occasionally rising) stream of income that can be distributed to investors or reinvested. In contrast, an investment with a growth focus strategy seeks to increase the value of the capital over time [19].

Under these two investment styles, the following, are the different types of investment:

Mutual funds investment: Investing in mutual funds can be done through Systematic Investment Plans (SIPs) or lump sums. Mutual funds are financial products that pool the funds of numerous participants and use them to finance securities investments like bonds, stocks, and financial instruments depending on the effectiveness of the underlying assets of the fund on the market. Investors can use mutual funds to help them reach their short- or long-term financial goals [19].

Stock: also known as equities or shares, are some of the popular growth-oriented investments. One can share in the profits of a publicly traded firm by purchasing shares, which makes you a part owner of the business. Investing in equity frequently have a higher risk-to-reward ratio than the majority of other types of investments [19].

Bonds: a bond, also referred to as fixed income security, is a type of debt instrument simulates loan made by investor to business or any level of government. When buying a bond, the buyer agrees to let the bond issuer using their money in exchange for the guarantee of a set interest rate. Bond types include corporate bonds, Treasury notes, municipal bonds, government securities, and more [19].

Exchange traded funds: are a group of investments that follow an underlying index, including shares, bonds, money market instruments, etc. They combine many investment options that provide finest qualities of two types of assets: equities and mutual funds. Exchange Traded Funds are traded on stock markets and, in terms of management, regulation, and structure, are similar to mutual funds in many ways. But key distinction between exchange traded funds and mutual funds is that first can be actively traded on stock markets, allowing investors to benefit from price disparities. On the other hand, active or inactive mutual funds could only be purchased or offered at the end of the business day [19].

Deposits that are fixed: are among of the most secure investments available to investors. They are provided by banks and let investors store their unused funds for a set period of time and interest rate. Because interest rates are predetermined and not influenced by market changes, the investment is more secure. For risk-averse investors, fixed deposits are a blessing because of their simplicity and diversity of options.

Planning for retirement: Financial planning involves two most crucial elements which are managing retirement income and saving for it. A wide range of retirement plan types are

available to investors. Investment options for retirement planning include the National Pension System (NPS), Public Provident Fund, Senior Citizens Savings Scheme, and bank fixed deposits. Investors who almost ready to retire might want to consider going with safer investment strategies [19].

Cash and cash equivalents: work to protect an investor's initial investment while also delivering high liquidity. They frequently yield the lowest returns, nevertheless, when compared to other investment types. Even though they frequently do not generate capital growth, they have the ability to deliver steady returns. Additionally, they can be quite beneficial in protecting funds and greatly reducing the risk involved with investing portfolio [19].

Real estate investment: In order to generate significant returns on investments in this market, which offers enormous potential for a number of industries, investors have the option of purchasing either commercial or residential property and real estate mutual funds, across a variety of industries, including hospitality, retail, commercial housing, manufacturing, and much more. Timing is a crucial consideration when thinking about real estate investments. One should be mindful of the risk that real estate assets may be challenging to sell quickly in the event of an urgent need for money [19].

Provident funds: The majority of retirement fund is made up of (Public Provident Fund and Employee Provident Fund). A required government-sponsored plan for retirement called the provident fund aims to provide employees lump sum payment at the time of retirement or resignation [19].

Insurance: is regularly used in a financial plan. They are available in a wide range of sizes and forms, including term insurance, kid plans, endowment plans, life insurance and others. A term policy is intended to assist beneficiaries in the dreadful event of dying, while to meet demands as people age, life insurance was developed. Insurance products are developed to accomplish specific goals. Each type of investment has a different risk-to-reward ratio. Risk and returns, however, should not be only criteria when deciding which types of investment products to use. Aspects including asset allocation, costs, historical performance, and liquidity, among others, should be taken into account by investors. Investment planning should make sure that the portfolio fits the investor's risk appetite, investment objectives, and time horizon [19].

2.2. Board Gender Diversity

One indicator of a board that is gender diverse is the proportion of women members. Women face obstacles to rising to the upper levels of companies, many people had anticipated that the massive influx of women into the workforce would break down this barrier; however, there has not been much change at the top of organizations [1]. However, both men and women are equally capable of performing the duties of a director. In order to promote gender equality at the top of businesses, the government of several nations set a minimum needed number of women, or so-called gender quota in order

to encourage more female directors to fill board seats at publicly traded firms.

2.2.1. Gender-Specific Ethical Conduct

Adding more female CEOs could influence organizations' ethical behavior for the better. There is evidence that women and ethical behavior are related in a number of ways. Some reveal that many women believe unethical corporate tactics and some imply that women are more perceptive of unethical behavior unlike men. According to some, the main reason why men and women have distinct orientations toward moral principles is because of how differently social positions have helped women internalize ethical and communal values. This inference, which shows in contrast to men, women are more inclined to hold higher moral standards and ethical views, received a great deal of support [18]. It is shown that ethical standards will be raised in company's business operations, and that female managers have a tendency to have more positive attitudes toward the implementation of the ethics code in firm. Additionally, there is a proof that female independent directors are more prone to become irritable when there are signals of irregularities since they are more aware of the potential for rule infractions [8]. Businesses with larger percentages of female board members and chairpersons were less likely to commit fraud or break security laws. Illegal share repurchases, overstated profits, the fabrication of assets, shareholder theft, and pricing manipulation are examples of violations. Some stockholders even believe that boards of directors with a majority of women offer stronger assurances that investments are not in conflict with a criminal conversion while also demonstrating better adherence to ethical behavior. Since women are more prone to query management with "thought" questions, gender diversity can stop corporate dishonesty and fraud. By enhancing corporate reputation, percentage of female members on corporate boards has favorable connection with the ethical behavior of a corporation [18].

2.2.2. Forms of Diversity at Work

Diversity of culture: it is a means of developing forums for workplace conversations so that workers may learn from one another and potentially transcend cultural differences. The culture of a person reflects heritage, upbringing, and mannerisms, languages, distinct worldviews, eating habits, and speech patterns. Understanding and successfully integrating these are the foundation of any successful business culture; hence, such variances should be highly respected [27].

Diversity of race: - is primarily a biological construct, whereas culture is linked to a way of life. It is not possible to tell from one's race alone whether a person of Nigerian heritage considers themselves Yoruba, Hausa, or Ibo, but it does affect how they are viewed by others.

Diverse gender: As much as the diversity of the firm as a whole, leadership positions need to be taken into account. Don't restrict thinking when evaluating gender diverse to a binary of male or female. Recognizing the range of gender

expression and accommodating people properly, such as through the use of gender pronouns, will help foster an inclusive workplace [27].

Physical impairments: Given how broad the definition of a handicap is, people with physical disabilities are among the most different categories of diversity to consider. All employees should be treated with more inclusivity in the workplace. Giving employees the ability to provide direct, personal feedback is a great way to increase engagement and advance diversity [27].

Diverse interests: Even while it shouldn't be a decisive element in the hiring process or a factor to be taken into consideration when it comes to leadership posts, understanding personal interests of employees can have a big impact on their sense of belonging. This is a chance to engage with staff members more closely, discover their goals, and ensure that they feel at home in the office setting. Given that many workers work from home or in hybrid workplaces, providing the opportunity for colleagues to connect across departmental and geographic boundaries depending on shared interests is a great way to promote natural connections. Any successful campaign for belonging and diversity should have as its end objective a connected, inclusive, and engaged workforce [27].

2.2.3. How to Achieve Diversity on a Board

Conduct a diversity audit: To determine the make-up of the organization, conducting a diversity audit is a great first step. Compare the demographics of the board and the workforce to see if there are any notable differences. If gaps can be found, it could be time to review recruitment procedures. The audit ultimately offers a perspective of progress and suggestions for improvement [1].

Ensure board diversity commitment: By making particular programs their top priority and committing the necessary finances, the board and senior management set the example for diversity. If there is no board diversity policy, one should be created. A diversity policy might be brief and straightforward or lengthy and complex. As an organization grows, one can adjust their plan as needed [1].

Intensify recruitment efforts: One supposition is that new directors must be C-Suite employees. While taking this method can be advantageous, it would be wise to extend the search beyond the executive level. To increase recruitment efforts, form a task team [1].

Make succession plans official: Boards regularly talk about succession planning when a director is getting ready to retire. Boards should codify succession plans in advance and communicate them with the directors rather than not being always honest about what those plans are even at that time. This strategy offers additional chances to find varied, in-demand people [1].

To increase board diversity, add a New Seat: The fact that most boards have very low turnover is one of the main obstacles to boosting board diversity. Without waiting for a director to resign or retire, one straightforward solution to this

is to create a new board seat. In the long run, boards should think about implementing measures that shorten director tenure and encourage turnover to address low turnover rates [1].

Encourage openness: Accountability and transparency go hand in hand. Utilizing a new benchmarking tool for board diversity disclosure is one method to promote transparency. The application enables staff, other experts, and board members to compare board diversity practices by industry and business size to identify patterns. This tool will assist gauge progress and identify gaps as calls from stakeholders for disclosure of board diversity as well as policies and practices continue to grow [1].

Monitor and evaluate progress: In order to remain dedicated to diversity, track progress periodically. Choose significant metrics and make them public using a diversity tracker. This strategy will show commitment and hold the team to account. A tracking device will make it easier to identify areas that need improvement [1].

3. Review of Related Literature

The hypotheses of agency served as the cornerstones and anchors of the study's foundation. It is explained through agency theory how the agent and principal are related. A basic tenet of this philosophy is that a diverse board will act impartially and independently and will be effective watchdogs for the interests of shareholders when the agent and principal interest are in conflict. According to [22], self-interested managers build their businesses by utilizing free cash flows to reap both financial and non-financial rewards from increased firm size (agency conflict). Such managerial practices result in inefficient use of resources where there is no adequate monitoring mechanism. An adverse selection dilemma occurs when firms accept negative net present value (NPV) projects but reject positive net present value (NPV) projects due to imperfect market conditions [26, 41].

According to [42], firms with large levels of free cash flow are prone to overinvesting, which can be prevented by adding governance systems. Moral hazards and the informational disparity between managers and stockholders lead to adverse selection, which ultimately influences firms' investment decisions [26, 42, 41]. Lack of supervision can cause overinvestment and can also cause shareholders to demand higher rates of return, which can lead to underinvestment. This issue can be resolved by using a variety of agency risk-reducing governance procedures [22].

In CG literature, the boards of directors' responsibilities are well known as they play an essential role in developing strategic decisions. An important governance mechanism is gender diversity as it is affecting the firms' efficiency of investment [26, 8, 16]. These studies showed that governance mechanisms improve with the inclusion of women. The study of [13] has also shown that regardless of the rise in proportion of women working in high management, women's participa-

tion is much less than that of men. Furthermore, [41] engaged in various debates about the connection between female board membership and firms' decision-making, while [21] have argued that female directors exercise greater caution than male directors. Also, various studies including, [26] as well as [40] revealed that gender diversity improves the reliability and truthfulness of company activities by counteracting good CG and introducing diversity of view to the governance process. Their results show that inclusion of more female directors on a board is likely to lead to increased investment efficiency. Hence this study examines the BGD impact on investment efficiency among NDMBs in Nigeria.

The risk, return, and overall cost of investment management determine the IE, given the limitations that investors must work within. These limitations consist of both non-financial as well as financial components like the investor's time availability to oversee investment agreements, trustworthy responsibility, or legal obligations. Thus, it is appropriate to think of investment efficiency as a blend of non-financial and financial efficiency [19]. This investigation examines two constructs: investment efficiency and BGD. In the investment efficiency framework, a company is considered to be investing efficiently if it takes on initiatives that, when market differences such as agency costs or negative choices are absent, decisions are based on positive NPV. Thus, inadequate investment (under-investment) involves ignoring investment possibilities that, in the absence of adverse choice, would have a positive NPV. Similarly, investing in initiatives that have a negative NPV is referred to as over-investment [15].

According to [35], companies that have substantial free cash flow tend to overinvest, a tendency that can be avoided by implementing governance processes. Negative choices and moral hazards are brought about by the inequality of knowledge among managers and shareholders (information asymmetry), and these factors eventually impact the firms' investment decisions [10, 9, 7, 22]. Inadequate oversight could lead to excessive investment; however, it additionally allows shareholders to ask for a higher rate of return, which could end in underinvestment. Nevertheless, there are a number of governance processes that can be used to address this issue and lower agency hazards [20, 9].

Extant studies indicate that a culture of open information is created by improved financial reporting quality, which lowers agency costs and encourages managerial greed [7, 9, 10]. Similarly, financial analysts' governance function helps managers be better monitored, which leads to better investment choices [30]. Additionally, better quality data supplied by auditors with industry areas of expertise, or greater proficiency, additionally raises investment efficiency, decreases agency confidence, and enhances information accountability [29, 5, 12].

Additionally, [9] contend that institutional investors from abroad reduce agency problems through increasing openness, which eventually leads to more efficient investments. Ac-

cording to these studies, agency disputes and information imbalances are major factors in influencing how well companies make investments. Agency disputes and information imbalances tendency that can be avoided by implementing CG processes which include a board that is gender diverse. Based on the reviewed pieces of literature, this study examined the BGD impact on investment efficiency among NDMBs. CG processes are measured by BGD to test the research null hypotheses formulated that BGD has a negative impact on IE.

One indicator of a board that is gender diversity is the proportion of women members. Women face obstacles to rising to the upper levels of companies, many people had anticipated that the massive influx of women into the workforce would break down this barrier; however, there has not been much change at the top of organizations [1]. However, both men and women are equally capable of performing the duties of a director. In order to promote gender equality at the top of businesses, the governments of several nations set a minimum number of women, or so-called gender quota in order to encourage more female directors to fill board seats at publicly traded firms.

Organizational demography, according to [34], is the constitution of social groupings, examined in terms of basic traits like gender, age, educational attainment, ethnicity, service duration, and residency. The demand for more women to serve on corporate boards of directors is rising [11]. In response to corporate controversies and the downfall of certain large corporations, regulators and scholars have placed a strong emphasis on board diversity [37]. However, it has been empirically shown that there is conflicting evidence linking BGD to investment efficiency. This is because, in [23], a minority of women's BGD impact on board performance is insignificant. [4] also indicated that BGD's impact on a firm financial performance is insignificant, whereas, in [33], a negative result was reported about BGD on share price. In addition, [14] showed that the proportion of women as directors has a negative impact on firm performance. These contradictory findings show the inconclusive nature of empirical results from previous studies and point to the need for more empirical studies to be carried out on the BGD impact on investment efficiency. This study's goal is to investigate the BGD impact on IE among NDMBs to test the following research null hypotheses formulated:

H_1 : BGD has negative impact on IE

4. Theoretical Framework

The principles of resource dependence and agency will be core premise that this study stands upon. According to diversity academics, the more complicated business environment of today demands leadership from people who can make resources, such as legitimacy and diversity, available. The external resources a business employs have an impact on organizational behavior. Companies are supposed to generate

value not just for their shareholders but for all stakeholders, and companies are also expected to maximize their value and efficiency. Contracts with agents are based on trust and interest in achieving corporate objectives and goals [22, 30, 34].

5. Research Methodology

The effect of BGD on IE was evaluated using an *expo facto* design that made it easy to collect and analyze quantitative data. The population for this work comprised 23 money deposit banks on the NGX as of the end of the accounting year 2021. A total of 10 NDMBs will be purposively selected as a sample. The selection of the banks was based on their continued existence during the study's timeframe and the ease with which the researcher could obtain their data. A secondary source was employed as the data origin used in this study. Data were gathered specifically from NDMBs audited annual financial reports over a period of ten (10) years from 2012 to 2021. The data to be extracted ranges from BGD parameters (female in boards, gender in executives, gender in non-executives, etc.) and the relevant investment efficiency indicators such as Cash Flow, ROA, SIZE, AGE and risk/leverage (LEV) of the selected NDMBs [30]. Both inferential and descriptive statistics were used to analyze the data which was gathered. The study adopted the model of [26], to achieve the objective. The model depends on the agency and resource dependence theories to predetermine the extent diverse boards could be impartially, independently, and effective watchdogs of the interests of shareholders on investment efficiency across NDMBs. The female on boards, gender in executives, and gender in non-executives are considered a function of BGD [36, 39].

6. Model Specification

Investment Efficiency (IE_{it}) = F (Board Gender Diversity variables + Control Variables)

$$IE_{it} = \beta_0 + \beta_1 BGD_{it} + \beta_2 ROA_{it} + \beta_3 RISK_{it} + \beta_4 Size_{it} + \beta_5 Age_{it} + \varepsilon_{it}$$

6.1. Dependent Variable

The dependent variable is IE. Ratio of net cash flow from (/used in) financing activities. The proxy is used because an increase or decrease in the net cash flow used in financial activities affects the return on investment and affects the level of investment. In other words, a negative net cash flow from financing activities shows inefficiency on such financing activities while a positive net cash flow from financing activities is an indicator of efficiency in investment. This proxy may seem inadequate because of the non-disclosure of projects embarked upon by the company in their annual reports which may render the method unusable [30].

IE = Investment efficiency

6.2. Independent Variable

BGD = It is measured with female participation or representation ratio in the board, gender in executive and gender in non-executive.

6.3. Control Variables

Risk (Leverage Ratio) = Total debt to shareholders equity

AGE = Measured age of incorporation of the company.

ROA = Measured profitability of company's assets in terms of generating revenue.

SIZE = Natural logarithm of the total assets.

7. Pre-estimation Tests Results

7.1. Lagrange Multiplier Tests for Random Effects

This is done to test the presence of individual effects in panel data models. The null hypothesis of the test is that there are no effects, which means that individual effects are equal to zero. The alternative hypothesis is either two-sided (Breusch-Pagan test) or one-sided (other tests). Table 1 shows results of the test for each type of alternative hypothesis (Cross-section, Time, and Both). For the Breusch-Pagan test, the p-values are 0.8663 for Cross-section, 0.4022 for Time, and 0.3929 for both. Since all of these p-values are greater than the significance level of 0.05, we come to the conclusion that there is no proof of specific impacts in the model after failing to dismiss the null hypothesis. Therefore, we can interpret the results as there are no significant individual effects in the model, and variation in the dependent variable is due to time-invariant and time-varying covariates included in the model.

Table 1. Lagrange multiplier tests for random effects.

	Cross-section	Time	Both
Breusch-Pagan	0.028341 (0.8663)	0.701616 (0.4022)	0.729957 (0.3929)

Source: Authors Compilation, 2023

7.2. Redundant Fixed Effects Tests

These are used to determine if cross-sectional fixed effects are redundant, meaning they do not have a significant impact on the model. In this case, test results indicate that cross-sectional fixed effects are significant in Table 2. The

Cross-section F-statistics test has a statistic of 2.086908 with 10 and 100 degrees of freedom and a probability of 0.0243. This suggests that cross-sectional fixed effects are significant. The "Cross-section Chi-square" test has a statistic of

26.371427 with 10 degrees of freedom and a probability of 0.0095. This also suggests that cross-sectional fixed effects are significant. Therefore, test findings reveal that cross-sectional fixed effects are significant and not redundant.

Table 2. Redundant fixed effects tests.

Effects Test	Statistic	d.f	Prob.
Cross-section F	2.086908	(10,100)	0.0243
Cross-section Chi-square	26.371427	10	0.0095

Source: Authors Compilation, 2023

7.3. Hausman Test Results

Test to compare whether fixed effects or random effects model is more appropriate for panel data analysis is conducted and the results are showed in Table 3. In this case, test is done to know whether the cross-sectional random effects model is a better fit for the data than cross-sectional fixed effects model. There are two possible outcomes: either the fixed effects model is superior or the random effects model is acceptable. The test summary shows that Chi-Square Statistic is 15.806785, with 5 degrees of freedom, and a probability of 0.0074. We reject the null hypothesis because the probability value is less than 0.05 and come to the conclusion that the fixed effects model fits the data more accurately compared to the random effects model. Therefore, cross-sectional fixed effects should be used in the analysis of data.

Table 3. Correlated random effects - hausman test results.

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	15.806785	5	0.0074

Source: Authors Compilation, 2023

7.4. Panel Cross-section Heteroskedasticity LR Test

This statistical test is used to check for the presence of heteroscedasticity (non-constant variance of errors) in the panel data model and the findings showed in Table 4. The test is based on comparing likelihood ratio statistics against an equal-number chi-squared population with degrees of freedom and regressors in the desired direction. In this case, the test is performed on the specification of IE, ROA, SIZE, AGE, BGD RISK, and C. The null hypothesis of the test is that

residuals of the model are homoscedastic, meaning that the variance of errors is constant across all observations. The value of the likelihood ratio statistic is 34.0525 and the degrees of freedom are 10. The p-values related with the test is 0.7763, which indicates that there is no evidence of heteroscedasticity in residuals at a 5% significance level (since p-value is greater than 0.05). Therefore, we come to the conclusion that model's residuals are homoscedastic after failing to reject the null hypothesis.

Table 4. Panel cross-section heteroskedasticity LR test results.

	Value	df	Probability
Likelihood ratio	34.0525	10	0.7763

Source: Authors Compilation, 2023

7.5. Arellano-bond Serial Correlation Test

It is used to detect serial correlation in panel data and the results are showed in Table 5. Serial correlation refers to correlation between the errors in a time series model, which violates the assumption of independence between observations. In this case, the test is conducted for two orders of autoregressive models (AR(1) and AR(2)). The m-statistic is a measure of serial correlation in the residuals, while rho represents estimated coefficient for AR model. For the AR(1) model, the m-statistic is NA, which means that the test cannot be conducted for this order. The estimated coefficient for rho is -0.005102, which is negative but very small in magnitude. The standard error for rho is not available. For the AR(2) model, the m-statistic is -0.435174, which is negative and larger in magnitude compared to AR(1) model. The estimated coefficient for rho is -0.076726, which is also negative but larger in magnitude compared to the AR(1) model. The standard error for rho is 0.176311. The probability value (Prob.) associated with this model is 0.6634, which is higher

than the conventional significance level of 0.05. This suggests that there is no significant serial correlation in residuals for AR(2) model. Therefore, Arellano-Bond Serial Correlation Test suggests that there is no significant serial correlation in residuals for the AR(2) model, but the test cannot be conducted for the AR(1) model.

Table 5. Arellano-bond serial correlation test.

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	NA	-0.005102	NA	NA
AR(2)	-0.435174	-0.076726	0.176311	0.6634

Source: Authors Compilation, 2023

8. Regression Analysis Results and Discussion of Findings

The regression analysis result is presented in Table 6 where dependent variable is IE. The results of the Hausman test, Lagrange multiplier test, and redundant fixed tests show that cross-sectional fixed effect test reports the best fit for the data. In line with the test and result of the diagnostic test, the study will report and interpret the outcome of the fixed effect model as presented in Table 6. The R-squared indicates that 40.4% of the variation in IE is explained by the independent variables included in the regression model. An adjusted R-squared value of 0.285989 indicates that after adjusting for a number

of independent variables, the variation in IE explained by the model is 28.6%. The F-statistic tests whether there is a significant relationship between the independent and dependent variables. The value of 6.572511 indicates that there is a significant relationship between the independent variables and IE. Therefore, we can reject the null hypothesis that there is no relationship between the independent variables and IE, and conclude that there is a significant relationship.

However, the coefficient of BGD with the value of 0.039442 and t-statistic of 2.694991 shows that BGD significantly influences the investment efficiency of Nigerian NDMBs. Hence null hypothesis one (H_1) which states that BGD is negatively associated with investment efficiency is rejected, and the alternative hypothesis is accepted. More so, the coefficient of RISK is 0.070458, which means that a rise in the leverage of the banks will lead to an increase in their IE. The coefficient is statistically significant at 0.05 levels, as indicated by its t-statistic of 2.231240 and probability of 0.0279, there is a significant relationship. The coefficient for the independent variable ROA is 1.162051, indicating that a one-unit increase in ROA is associated with an increase in investment efficiency of 1.162051 units, holding all other variables constant. ROA reports a positive relationship with IE. The coefficient is statistically significant at 0.01 levels, as indicated by its t-statistic of 2.591418 and probability of 0.0110. The SIZE of the banks reports a coefficient value of 0.028157 and the t-value and p-value of variables show that it failed to exhibit a statistically significant relationship with the investment efficiency of the banks. In the same vein, the age of the bank reports a statistically insignificant coefficient of 1.712130, with a p-value greater than 0.05.

Table 6. Regression result.

	Pooled OLS			Fixed Effect Model			Random Effect Model		
	Co-eff.	t-value	p-value	Co-eff.	t-value	p-value	Co-eff.	t-value	p-value
ROA	0.0128	0.0309	0.9754	1.1620	2.5914	0.0110	0.1009	0.2514	0.8019
SIZE	-1.8458	-1.1206	0.2648	0.0281	0.0100	0.9920	-1.9352	-1.1801	0.2404
AGE	0.0343	0.0336	0.9732	1.7121	0.3939	0.6945	0.1232	0.1194	0.9052
BGD	-0.0799	-1.4715	0.1440	0.0394	2.6949	0.0087	-0.0741	-1.3939	0.1661
RISK	0.0693	2.3179	0.0223	0.0704	2.2312	0.0279	0.0696	2.4095	0.0176
C	12.4338	0.8152	0.4167	-14.3852	-0.5751	0.5665	12.7072	0.8401	0.4026
R-squared	0.1300			0.4042			0.1129		
Adjusted R-squared	0.0911			0.2859			0.0733		
F-statistic	3.3480			6.5725			2.8517		
Prob (F-statistic)	0.0074			0.0000			0.0183		

Source: Authors Compilation, 2023

The study found that BGD impacts investment efficiency positively among the banks in Nigeria. This result is in line with prior research that has suggested that BGD can have a positive impact on corporate performance, including financial performance [28, 3, 27]. Methods of decision-making may benefit from a more varied board's experiences and points of view, which could result in better-informed decisions that are more sensible choices. One possible explanation for the gender-diverse boards' positive impact on investment efficiency in Nigerian banks is the potential for greater social and cultural sensitivity among diverse board members. Nigeria is a diverse country with multiple ethnic and religious groups, and a more diverse board may be more adept at navigating the intricate cultural and social terrain in which Nigerian banks operate. This finding emphasizes the value of inclusion and diversity in CG, particularly in emerging markets where social and cultural diversity is high. By promoting gender diversity on boards, Nigerian banks may be able to improve their IE and ultimately enhance financial performance.

The finding that there is a positive effect of risk on the IE of NDMBs is somewhat counterintuitive, as it suggests that banks that take on more risk are more likely to make efficient investment decisions that enhance their overall financial performance. One possible explanation for this relationship is that banks that take on more risk are more likely to invest in high-risk, high-reward opportunities that have the potential to generate higher returns. Additionally, banks that are more risk-tolerant may be more likely to pursue innovative investment strategies that can lead to higher investment efficiency. It is important to remember, though, that there is a convoluted link between risk and IE that may hinge on many different elements, including the nature of risks being taken, risk management practices of the bank, broader economic and regulatory environment. This finding indicates that banks should carefully evaluate their risk appetite and risk management practices when making investment decisions, and should seek to balance potential benefits of higher-risk investments with the need to maintain a stable and sustainable financial position.

9. Conclusion and Recommendations

This paper examines the BGD impact on IE. The results reveal that BGD positively and significantly impacts on IE of NDMBs. This study suggests that companies with more diverse boards tend to make better decisions, as they are more likely to consider a greater variety of perspectives and ideas. Additionally, higher gender diversity can lead to a more inclusive and collaborative work environment, which can improve employee morale, productivity, and firm profitability. All of these factors contribute to higher investment efficiency, as companies are better equipped to decide with knowledge of their long-term goals and values as well as in

accordance with their long-term goals and values. This study concluded that BGD is an important determinant of the investment efficiency of NDMBs. In light of the above, the study recommends that banks should ensure that their risk-taking is measured and controlled to avoid excessive risk-taking, which can lead to financial instability. Banks should also ensure that their risk management practices are robust and effective. Also, banks should strive to improve their gender diversity at the board level to improve their investment efficiency. A diverse board brings in new viewpoints and ideas, which can aid the bank, in making better investment decisions. All of the financial institutions in Nigeria were not included in this study, which would have given more details about the BGD and investment efficiency of all financial institutions. Furthermore, data were obtained from audited annual financial reports of firms that operated in banking sectors not all the sectors. Further studies may adopt different methodology. Attention could also be paid to other areas like manufacturing and other non-financial sectors, and longer observation periods could be covered in determining effect of BGD, corporate social responsibility on IE. Conducting diversity audit to ascertain demographics characteristics of board members and employees, this could lead to a review in recruitment procedures. Investigate types of investments embarked on by the firms and IE.

Abbreviations

CG	Corporate Governance
BGD	Board Gender Diversity
IE	Investment Efficiency
NDMBs	Nigerian Deposit Money Banks
NGX	Nigerian Exchange Group
IFRS	International Financial Reporting Standards
SIZE	Firm Size
AGE	Firm Age
ROA	Return on Assets
LEV	Risk/Leverage
NPV	Net Present Value

Author Contributions

Abiodun Oyebamiji Oladejo: Methodology, Supervision, Validation, Visualization

Peter Temitope Okedun: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Project administration, Resources, Software, Writing – original draft, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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