Effect of Portfolio Investment on Performance of Pension Funds in Nigeria

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Abstract

This study examines effect of portfolio investment proxied by comprising equity, bond, and money market instruments on performance of pension funds in Nigeria, measured by Return on Investment (ROI). The study applies the Risk-Return Trade-Off Theory to assess how asset allocation influences financial outcomes. A descriptive-correlational research design and a census of all 19 licensed Pension Fund Administrators were employed. Using panel data from 2012–2023, the study applied fixed-effects regression with Panel-Corrected Standard Errors following diagnostic evidence of heteroskedasticity and serial correlation. Findings show that equity and bond investments have significant negative relationships with pension fund performance, while money market investments exhibit no significant direct effect. The results underscore the need for improved diversification, stronger risk management frameworks, and more balanced asset allocation strategies to enhance long-term pension fund sustainability in Nigeria.

Keywords: Portfolio Investment; Pension Fund Performance and Asset Allocation

1.0 Introduction

Pension funds, composed of cumulative contributions into Retirement Savings Accounts (RSAs) under the Contributory Pension Scheme (CPS), play a vital role for individuals, organizations, and the broader economy. They contribute significantly to capital and money market development by complementing and sometimes substituting traditional financial institutions like commercial and investment banks (Nwogwugwu & Ojo, 2022), while also serving as major contributors to a nation's Gross Domestic Product (GDP) and key drivers of capital formation (Obasa, 2022). The relationship between investment strategies and pension fund performance is crucial for long-term growth and solvency. For example, in the USA, pension funds averaged 6.5% returns over the past decade, though solvency remains a concern due to aging populations and low interest rates (Brown & Liang, 2016).

Japan's GPIF achieved 3.5% returns between 2018 and 2022 but faces sustainability challenges from demographic shifts. Brazil recorded strong 9% annual returns from 2018 to 2023, benefiting from a younger population and favorable investment conditions (Silva & Gonzalez, 2019), while India experienced more volatile returns of 5%–7% due to market and regulatory complexities. Mexico and Ghana reported returns of 8% and 9%, respectively, bolstered by regulatory reforms despite governance issues (Lopez & Ramirez, 2020; Acheampong & Addo, 2019). Indonesia and Poland achieved similar returns through strategic asset allocations and reforms (Suryanto & Wibowo, 2021; Kowalski & Nowak, 2022). Australia managed 8.5% returns amid volatility through strong diversification, Chile led South America with 10% returns, and South Korea maintained stability with 6.9% returns despite geopolitical tensions (Smith & Jones, 2021; Gonzalez & Martinez, 2020; Kim & Lee, 2020). Across regions, effective asset allocation remains a critical factor in balancing risk and ensuring sustainable pension fund performance.

Saudi Arabia's pension funds achieved 8.5% returns, supported by diversified investments across various sectors (Al-Hamdi & Al-Khaldi, 2019), while Egypt reported steady growth at 7.2% due to regulatory reforms (Mahmoud & Hassan, 2020). South Africa consistently posted 8% returns under a robust regulatory framework, whereas Nigeria and Kenya experienced more volatility, with returns ranging from 6% to 10% due to economic and regulatory challenges (Koornhof & Botha, 2020). Nigeria's pension industry, in particular, has struggled to meet its performance goals effectively and efficiently. According to Adeniyi, Adeyinka, and Babayaro (2019), Pension Fund Administrators (PFAs) in Nigeria face challenges such as limited investment vehicles and inadequate risk management frameworks. This often results in pension operators being overly cautious, leading to suboptimal fund performance (Obalola & Abass, 2023). Although the introduction of the Contributory Pension Scheme (CPS) in 2024 marked a shift from the underfunded Defined Benefit Scheme (DBS), bringing improved coverage and savings, it also raised concerns over fund performance due to limited investment returns, necessitating continuous policy revisions to respond to economic realities (Obasa, 2022).

Despite impressive growth—evident in the increase of total pension funds to N20.22 trillion by May 31, 2024, from N19.78 trillion in April—the heavy allocation of 63.22% to federal government securities has limited potential returns (TheCable, 2024). Other assets include corporate debt (10.2%) and equities (8.6%), but overall investment performance remains a concern. Coverage remains low, with only 10.19 million RSA holders. Historical losses, such as the depreciation of pension funds by 6.32% in 2020 (₦6.53 billion) and 8.22% in 2021 (₦8.23 billion), were largely attributed to poor investment decisions and weak risk management frameworks (Nairametrics, 2024). The prevailing conservative investment strategy, though low risk, underscores the need for diversification into alternative assets to optimize returns and strengthen financial sustainability (Nwogwugwu & Ojo, 2022). Portfolio investment management, which involves strategic allocation across stocks, bonds, estates, and cash, is crucial to balancing liabilities with risk tolerance (Salaudeen, 2021). Stakeholders need confidence in how these risks and opportunities are managed to make informed strategic decisions. Broader lessons from corporate failures in financial institutions underline the importance of effective risk management and well-structured investment strategies that align with market dynamics and internal controls (Basel Committee, 2015; Berger et al., 2016; Elamer & Benyazid, 2018). Hence, achieving stable returns and economic contributions from pension funds in Nigeria hinges on risk-aware, diversified investment strategies supported by strong governance frameworks.

The underperformance of Nigerian pension funds has sparked serious concerns regarding the effectiveness of their investment strategies, risk management practices, and the regulatory framework overseeing the industry (This Day Live, 2024). A major contributing factor is the limited diversification of investments, with a disproportionate allocation to federal government securities, which has raised doubts about the ability of Pension Fund Administrators (PFAs) and Pension Fund Custodians (PFCs) to fulfill their roles under the amended Pension Reform Act (PRA) 2014, aimed at ensuring the sustainability of the Contributory Pension Scheme (CPS) (Adams & Ibrahim, 2023). Effective portfolio decisions are vital for optimizing returns but are often constrained by market volatility and investment risks, particularly in the stock and bond markets (Ogunleye, 2023). Consequently, a robust risk management framework is essential to mitigate these risks and enhance overall performance (Eze & Okoro, 2024). Asset allocation, as a core component of investment strategy, significantly influences pension fund performance by determining the balance between risk and return. Diversifying across asset classes such as equities, bonds, real estate, and alternative investments helps reduce portfolio risk and improves the likelihood of consistent, higher returns, even in volatile markets (Brown & Jones, 2021). Each asset class serves distinct roles: bonds offer stability with lower risk,

equities provide the potential for higher returns but with greater volatility, and money market instruments prioritize liquidity with modest yields (Oyedokun, Akingunola, & Somoye, 2022; Antony, 2020). Risk management, therefore, is pivotal in strengthening the link between investment strategy and performance, ensuring long-term stability and the solvency of pension funds (Antony, 2020).

The lack of diversified investment options and the absence of a comprehensive performance benchmark have further hindered the ability of Pension Fund Administrators (PFAs) to make optimal portfolio decisions. These limitations restrict strategic asset allocation and reduce the potential for maximizing returns while managing risk effectively. The study is specifically designed to examine how different components of portfolio investment influence the performance of pension funds in Nigeria. It seeks to determine the effect of equity investment on pension fund performance, and further assess how bond investment contributes to or detracts from fund outcomes. In addition, the study aims to evaluate whether money market investment plays a significant role in shaping the financial performance of pension funds.

2.0 Literature Review

Financial performance refers to the extent to which an organization achieves its financial objectives, serving as a critical element of risk management and overall business success. It is typically measured in monetary terms to assess the outcomes of a firm's policies and operations over a specific period, reflecting its financial health and enabling comparisons across similar firms or industries (Damodaran, 2013). Profitability serves as a shield against unexpected losses, strengthening capital positions and fostering future profitability through reinvested earnings (Odawo et al., 2019). Financial performance encompasses key elements such as revenue, equity, expenditures, and liquidity to ensure stakeholders can make informed decisions (Naz et al., 2016). Persistent losses erode an institution's capital base, endangering both equity and debt holders, and hindering its wealth creation goals. Performance, therefore, is evaluated not only by profitability but also through efficiency, risk-taking, and the ability to minimize costs while meeting operational and financial targets (Maeenuddina et al., 2020; Hasanaj & Kuqi, 2019).

Portfolio investment involves constructing a diversified group of financial assets—including bonds, stocks, cash, and commodities—aimed at optimizing returns while managing risk (World Bank, 2014; Wara & Karlsen, 2022). Rooted in Markowitz's (1952) Modern Portfolio Theory (MPT), the concept emphasizes maximizing expected returns and minimizing risk through diversification, particularly by investing in assets with low or negative correlations. These investments are typically passive, lacking control over the underlying entities, and are structured to reflect the investor's risk appetite, income, and financial goals (Liu, 2022). Asset allocation and diversification are key strategies, balancing capital across various classes to reduce risk exposure. Bonds offer predictable returns and lower risk, while stocks provide ownership stakes with higher volatility and return potential (Nwafor, 2020; Singh & Yadav, 2022). Equity and debt securities, such as debentures and mutual fund shares, further expand diversification, making portfolio investment a cornerstone of financial planning and performance enhancement (Jayakody, 2021; Lang et al., 2020).

2.1 Empirical Review

A substantial body of empirical research has explored the dynamics between portfolio investment components and the financial performance of pension funds across different economic contexts. While most studies converge on the importance of strategic asset allocation

and risk management, the magnitude and direction of their effects tend to vary depending on market efficiency, regulatory structures, and investment culture within each jurisdiction. This section reviews existing empirical evidence along the key portfolio investment proxies—equity, bond, and money market investments—while also examining the moderating role of risk management on pension fund financial performance.

2.1.1 Equity Investment and Pension Fund Performance

Studies generally emphasize the significance of equity allocation in enhancing long-term returns, although outcomes differ across markets. Boyante, Muturi, and Gekara (2022) found that portfolio rebalancing strengthens the effect of equity allocation on pension fund performance in Kenya, showing that actively managed equity positions yield better risk-adjusted returns. Similarly, Wahyudi, Hasanudin, and Pangestutia (2020) reported that equity allocation and institutional ownership positively impact portfolio performance in Indonesia, highlighting the critical role of diversification and governance structures.

In contrast, environmental and policy dynamics also shape equity performance. Ji et al. (2021) showed that green equity funds in BRICS markets—particularly China—outperform conventional funds due to strong environmental regulations and lower volatility. Martí-Ballester (2020) further demonstrated that equity investments aligned with SDG-focused sectors, especially technology, produced superior risk-adjusted returns, whereas energy-sector funds underperformed due to weaker stock-picking capabilities.

2.1.2 Bond investment and pension fund performance

Bond investments constitute the largest component of many pension fund portfolios, especially in heavily regulated markets. Evidence from Boyante et al. (2022) shows that bond allocations significantly benefit from active portfolio rebalancing, although guaranteed or fixed-return instruments remain largely unaffected. Kamau and Maina (2019) also confirmed that bond diversification significantly enhances financial performance in Kenyan mutual funds, suggesting that well-structured bond portfolios provide stability while improving returns through risk reduction.

However, López and Walker (2021) revealed complexities in Chile, where pension fund returns closely mirrored regulatory benchmarks, implying that rigid quantitative investment limits may restrict the potential performance gains of bond portfolios. These findings suggest that while bond investments can enhance stability, overly conservative regulatory frameworks may limit their contribution to long-term returns.

2.1.3 Money market investment and pension fund performance

Money market instruments often serve as low-risk, liquidity-preserving components of pension portfolios. Although not extensively highlighted in the reviewed studies, related empirical evidence provides useful insights. Wahyudi et al. (2020) indicated that diversification across liquid asset classes contributes positively to portfolio efficiency, indirectly affirming the stabilizing role of money market investments. Edo and Kanwanye (2022), though focused on Sub-Saharan Africa more broadly, emphasized that inflation and currency depreciation erode returns on short-term financial instruments, suggesting that money market allocations may yield mixed performance depending on macroeconomic stability.

Furthermore, recommendations from Ikwor and Egbunike (2022) imply that reliance on conservative instruments such as money market assets may be insufficient for generating substantial long-term returns in Nigeria's pension industry, especially in the absence of innovative investment strategies.

2.2 Theoretical Framework

This study is grounded in the Risk-Return Trade-Off Theory, which supports the relationship between the predictor (portfolio investment), the moderator (risk management), and the outcome (pension fund performance). According to the theory, investors expect a higher return as compensation for taking on higher levels of risk (Markowitz, 1952; Fama & French, 2001). This central premise aligns with the decisions made by Pension Fund Administrators (PFAs), who must allocate resources across various asset classes with differing risks and return profiles.

In this study, portfolio investment reflects the asset allocation decisions made by PFAs. The theory implies that higher-risk investments (like equities or alternative assets) should yield higher expected returns, thereby improving the financial performance of pension funds, which is the dependent variable. However, this return is not guaranteed, and the variability of outcomes introduces uncertainty.

Furthermore, as explained by Navas, Dhanavanthan, and Lazar (2020), investor tolerance to risk varies, and pension fund managers must strike a balance between low-risk, low-return and high-risk, high-return assets. This balance is central to constructing a portfolio that not only meets regulatory requirements but also aligns with the long-term financial objectives of the pension scheme beneficiaries. Ultimately, the Risk-Return Trade-Off Theory justifies the need for a dynamic interaction between investment choices and risk mitigation practices to improve pension fund outcomes.

3.0 Methodology

This study adopts a descriptive-correlational research design to investigate the moderating effect of risk management on the relationship between portfolio investment and the performance of pension funds in Nigeria. The descriptive aspect enables the presentation of data characteristics as they naturally occur, while the correlational design supports empirical testing of the relationships among variables. Given the quantitative orientation of the study, a positivist philosophical paradigm was employed to ensure objectivity, reliability, and generalizability. Under this paradigm, the study assumes an objective reality (ontology) that can be understood through observable and measurable facts (epistemology), with minimal researcher bias (axiology), and presented using neutral, third-person rhetoric.

The study follows a deductive research approach, which is suitable for hypothesis testing based on established theories. This method aligns with the research objective of testing the influence of equity, bond, and money market investments on pension fund performance. The research population consists of all 19 licensed Pension Fund Administrators (PFAs) in Nigeria, as listed by the National Pension Commission (PenCom, 2024). A census sampling technique was adopted to include the entire population, thereby avoiding sampling bias and enhancing the study's validity. Data was collected from secondary sources such as audited financial statements of PFAs, the Nigerian Exchange (NGX), and the Central Bank of Nigeria (CBN) statistical bulletin, covering a twelve-year period from 2012 to 2023.

To analyze the data, the study employed panel regression techniques, using multiple linear regression models that accommodate both cross-sectional and time-series characteristics. Robust estimation methods will be used to address potential issues of heteroscedasticity and serial correlation (Gujarati, 2003). Additionally, diagnostic tests were conducted, including the Variance Inflation Factor (VIF) for multicollinearity, the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity, the Hausman Specification Test to determine the appropriateness of fixed versus random effects models (Habbash, 2010; Yermack, 1996), and the Breusch and Pagan Lagrangian Multiplier (LM) Test to confirm the presence of random effects. These procedures aim to ensure the accuracy and robustness of the regression outcomes.

The study adapts a panel regression model to estimate the relationship between portfolio investment and pension fund performance.

Base Model:

$$ROI_{it} = \beta_0 + \beta_1 EI_{it} + \beta_2 BI_{it} + \beta_3 MMI_{it} + \beta_4 RM_{it} + \beta_5 FSZ_{it} + \varepsilon_i$$

Where:

i = Firm

t = Year

ROI = Return on Investment

EI = Equity Investment

BI = Bond Investment

MMI = Money Market Investment

FSZ = Firm Size

ε = Error term

3.1 Variable Measurement

Variable	Proxy	Type	Measurement
Return on Investment	ROI	Dependent Variable	Profit Before Tax / Equity (Shehu, 2017)
Equity Investment	EI	Independent Variable	% of total portfolio invested in equities (Harford & Uysal, 2014)
Bond Investment	BI	Independent Variable	% of total portfolio invested in bonds (Harford & Uysal, 2014)
Money Market Inv.	MMI	Independent Variable	% of total portfolio invested in MM instruments (Kacperczyk & Schnabl, 2013)
Firm Size	FSZ	Control Variable	Natural log of total assets or equity

4.0 RESULTS

4.1 Descriptive Statistics

The descriptive statistics on individual variables, as well as a summary of the data on explained and explanatory variables are presented in Table 4.1. Based on the mean and standard deviation, this is taken into account. The data's minimum and maximum values, skewness, and kurtosis, as well as their associated standard errors, are among the others.

Table 4.1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
ROI	0.174	0.132	0.0003	0.559	0.969	3.624
EI	0.113	0.055	0.020	0.221	0.317	2.328
BI	0.632	0.082	0.489	0.791	0.127	2.347
MMI	0.110	0.041	0.027	0.187	-0.040	2.804
FSZ	2.892e+10	1.558e+11	133,433,000	1.605e+12	9.057	86.757

Source: Author's computation using STATA 13.

The results in Table 4.1 shows descriptive statistics for the variables in the study, the average ROI of 0.174 indicates that Nigerian pension funds generate a 17.4% return on equity, which reflects moderate financial performance. This performance level can be attributed to the regulated nature of the pension fund industry, where investments prioritize stability over high-risk, high-return ventures. The minimum ROI of 0.0003 shows that some funds experience almost zero returns during certain periods, likely due to poor market performance, economic downturns, or mismanagement of portfolios. On the other hand, the maximum ROI of 0.559 demonstrates periods of exceptional performance, possibly driven by favorable market conditions, strong asset allocation strategies, or significant gains from high-performing asset classes. This variation highlights the diverse risk-return dynamics across the industry.

Equity investments represent 11.3% of the average portfolio allocation (mean EI = 0.113), indicating a conservative investment approach by Nigerian pension funds. This low average reflects the inherent risks of equities, especially in an emerging market like Nigeria, where market volatility and economic uncertainties are prevalent. The minimum of 0.020 implies that some funds invest as little as 2% in equities, which could be attributed to restrictions on their side, or simply the desire to avoid risks. On the other hand, evidence of the maximum EI of 0.221 or 22.1% indicates that funds use a riskier approach during periods of economic stability or rising equity markets to capture better returns.

Bonds constitute the largest portion of pension fund portfolios, with a mean allocation of 63.2% (BI = 0.632). This significant allocation aligns with the traditional preference for low-risk, fixed-income investments in the pension fund industry, ensuring steady and predictable returns. The minimum allocation of 48.9% reflects funds diversifying into other asset classes like equities and money markets. In contrast, the maximum allocation of 79.1% reveals the highly risk-averse nature of certain funds, particularly during periods of economic uncertainty when bonds offer stability. This strong reliance on bonds highlights their role as a cornerstone of pension fund portfolios in Nigeria.

In addition, Money market investments account for an average of 11% (MMI = 0.11) of pension fund portfolios, signifying their role as a complementary asset class. These short-term, liquid

investments provide funds with the flexibility to meet immediate obligations or adjust to market changes. The minimum allocation of 2.7% indicates funds with minimal reliance on money markets, possibly due to higher returns from other assets. On the other hand, the maximum allocation of 18.7% reflects funds leveraging money markets during uncertain times or when interest rates are favorable. This range suggests that money markets serve both as a liquidity buffer and an opportunistic investment option.

Table 4.1 indicates that the data, despite being negatively skewed, is expected to follow a normal distribution. Additionally, the kurtosis value from Table 4.1 suggests that the distribution's peakness is within the expected normal range. Numerous studies have highlighted how assessing skewness and kurtosis can help determine if data is skewed or if the kurtosis deviates from the norm (Bai & Ng, 2005; Barato & Seifert, 2015).

Table 4.2: Correlation Matrix (Including Firm Size – FSZ)

Variables	(1) ROI	(2) EI	(3) BI	(4) MMI	(5) FSZ
(1) ROI	1.000				
(2) EI	-0.286* (0.000)	1.000			
(3) BI	-0.186* (0.010)	-0.015 (0.836)	1.000		
(4) MMI	-0.057 (0.521)	-0.015 (0.832)	0.356* (0.000)	1.000	
(5) FSZ	0.241* (0.002)	0.091 (0.315)	-0.048 (0.588)	0.132 (0.142)	1.000

The correlation matrix above presents the relationships among four key variables: Return on Investment (ROI), Equity Investment (EI), Bond Investment (BI), and Money Market Investment (MMI). ROI is significantly and negatively correlated with both EI ($r = -0.286$, $p < 0.01$) and BI ($r = -0.186$, $p < 0.05$), indicating that higher allocations to equity and bond investments are associated with lower pension fund returns within the observed period. MMI shows a moderate positive correlation with BI ($r = 0.356$, $p < 0.01$), suggesting that funds allocating more to bonds may also favor money market instruments. However, MMI has no significant correlation with ROI or EI, implying a weaker direct relationship with overall returns. The non-significant correlations ($p > 0.05$) are denoted in parentheses, highlighting where associations are not statistically meaningful. The correlation between Bond Investment and Firm Size is weak and non-significant ($r = –0.048$, $p = 0.588$), indicating no meaningful association between the size of a firm and its bond investment decisions. Finally, Money Market Investment and Firm Size also show a weak, positive, and non-significant correlation ($r = 0.132$, $p = 0.142$), suggesting that larger firms do not necessarily invest more in money market securities.

The diagnostic tests conducted to validate the appropriateness and reliability of the panel regression model produced several important results. The Hausman test yielded a chi-square value of 27.88 with a p-value of 0.005, indicating statistical significance at the 1% level. This result confirms that the Fixed Effects model is more suitable than the Random Effects model for the data, as it provides consistent and unbiased estimates. To assess the presence of

multicollinearity among the independent variables, the Variance Inflation Factor (VIF) was examined. All VIF values were below the commonly accepted threshold of 5, showing that multicollinearity is not a problem in the model and that the explanatory variables are sufficiently independent of one another.

The normality of residuals was tested using the Shapiro–Wilk W test, which produced a W value of 0.997 and a corresponding p-value of 0.341. Since this value exceeds the 0.05 significance level, it indicates that the model's residuals are normally distributed, satisfying one of the assumptions of regression analysis. However, the test for autocorrelation revealed issues. The chi-square value of 7.071 with a p-value of 0.0179 indicates the presence of serial correlation in the error terms, significant at the 5% level. This suggests that the residuals are not independent over time, which could bias the efficiency of the estimates if not corrected.

Additionally, the heteroskedasticity test conducted using the Group-Wise Modified Wald method for ROI returned a statistic of 1251.15 with a p-value of 0.000. This result is significant at the 1% level and provides strong evidence of heteroskedasticity in the panel data. The presence of both autocorrelation and heteroskedasticity implies that ordinary estimation techniques such as standard Fixed Effects may yield inefficient standard errors.

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Table 4.3: Panel Corrected Standard Error regression

ROI	Coef.	St.Err.	t-value	p-value	
EI	-0.7331	0.3543	-2.07	0.039	
BI	-0.0022	0.0005	-4.98	0.000	
MMI	-0.8017	0.4904	-1.63	0.102	
FSZ	0.0016	0.0002	8.09	0.000	
Number of obs	192		Chi-square		158.57
Prob > chi2	0.000		R-Square		0.3931

*** p<.01, ** p<.05, * p<.1

Source: Author's computations generated with STATA 14 software

4.2 Discussion of findings

The regression results provide insights into the relationships between the independent variables, their interactions, and the dependent variable, Return on Investment (ROI). The model's goodness of fit is supported by the high Chi-square value (158.57) with a p-value of 0.000, indicating that the model is statistically significant overall. The R-squared value of 0.3931 suggests that approximately 39.31% of the variations in ROI are explained by the independent variables and their interactions, showcasing a reasonable explanatory power for this type of study.

The coefficient for equity investment is -0.7331, with a standard error of 0.3543, a t-value of -2.07, and a p-value of 0.039. This indicates a statistically significant negative relationship between EI and ROI at the 5% significance level. The negative coefficient suggests that an increase in equity investment is associated with a decrease in ROI. This outcome may be attributed to the volatility and higher risks associated with equity investments, which, when unmanaged, can lead to lower financial returns. However, this result also emphasizes the

importance of employing effective strategies to mitigate these risks and improve outcomes. Hence, null hypothesis was rejected that equity investment has no significant effect on ROI

The coefficient for bond investment is -0.0022, with a standard error of 0.0005, a t-value of -4.98, and a p-value of 0.000. This shows a highly significant negative relationship between BI and ROI at the 1% significance level. The small negative coefficient indicates that a marginal increase in bond investment leads to a slight reduction in ROI. This may reflect the conservative nature of bonds, which generally provide lower returns compared to other investment options like equities. Despite their stability and lower risk, bonds may not contribute significantly to ROI unless combined with other high-yield strategies. Hence, null hypothesis was rejected that bond investment has no significant effect on ROI

The coefficient for money market investment is -0.8017, with a standard error of 0.4904, a t-value of -1.63, and a p-value of 0.102. While the negative coefficient suggests a potential inverse relationship between MMI and ROI, the result is not statistically significant at conventional levels ($p > 0.05$). This insignificance implies that money market investments may not have a direct or consistent effect on ROI. Given their typically low-risk and low-return nature, money market investments might serve as a stabilizing factor rather than a major contributor to ROI. Further investigation may be needed to explore their impact in different contexts or under varying conditions. Hence, null hypothesis was rejected that money market investment has no significant effect on ROI.

The regression analysis reveals a statistically significant negative relationship between equity investment (EI) and Return on Investment (ROI), suggesting that an increase in equity allocation leads to a decline in ROI. This finding is aligned with Prospect Theory (Kahneman & Tversky, 1979), which posits that investors are loss-averse and often react negatively to volatility in equity markets. In the context of pension funds in Nigeria, where regulatory and economic instability can amplify market fluctuations, increased exposure to equities may lead to underperformance if not carefully managed. Empirically, this result is consistent with the work of Meng and Pfau (2010), who found that overly aggressive equity allocations in retirement portfolios could result in suboptimal returns due to heightened exposure to market downturns.

Regarding bond investment (BI), the regression result also shows a statistically significant but modest negative effect on ROI. Although bonds are traditionally considered safe and stable investment instruments, the low return characteristics may explain their inverse relationship with ROI in this study. According to Modern Portfolio Theory (Markowitz, 1952), optimal diversification includes assets with varying risk-return profiles, but over-reliance on low-yield instruments like bonds may dilute the overall portfolio return. Similar outcomes were observed in the study by Davis and Steil (2001), who emphasized that excessive bond holdings could hamper pension fund performance, especially in developing economies where inflation and interest rate risks further erode bond yields.

Finally, money market investment (MMI) shows a negative but statistically insignificant relationship with ROI. This aligns with the general understanding that money market instruments—while liquid and low-risk—tend to offer minimal returns, serving primarily as a cash preservation strategy rather than a growth vehicle. The Liquidity Preference Theory (Keynes, 1936) supports this, as it suggests that investors may prioritize short-term liquid assets in uncertain environments, which could explain their limited impact on ROI. The findings resonate with those of Bikker et al. (2012), who argued that although money market instruments offer safety, their negligible returns limit their effectiveness in enhancing pension fund performance unless used strategically within a broader, balanced portfolio.

5 Conclusion and Recommendation

5.1 Conclusion

This study investigated the moderating effect of risk management on the relationship between portfolio investment (equity, bond, and money market investments) and the performance of pension funds in Nigeria, with ROI as the performance metric. The findings indicate a statistically significant negative effect of both equity investment and bond investment on ROI, while money market investment had an insignificant effect. The negative association suggests that higher allocations to equities and bonds may have led to suboptimal returns, likely due to inadequate risk-mitigation strategies and poor timing or selection within those asset classes. Despite the general expectation that diversified portfolio investment should improve pension fund performance, the observed outcomes imply that Nigerian PFAs may not be effectively managing the risks inherent in volatile or interest-sensitive investment instruments.

5.2 Recommendations

Since both equity and bond investments significantly and negatively impact ROI, PFAs should adopt dynamic and data-driven risk management frameworks. These frameworks should include market sensitivity analysis, stress testing, and scenario planning to manage downside risks, particularly in volatile equity markets and interest rate-sensitive bond markets.

Given the negative impact of traditional asset classes on performance, PFAs should reevaluate their asset allocation strategies. The current concentration in equities and bonds appears counterproductive without strong risk controls. Emphasis should be placed on optimizing the risk-return trade-off through strategic rebalancing based on economic cycles.

While money market investments showed no significant effect on ROI, they can still play a valuable role in stabilizing portfolio cash flows. PFAs should continue using them primarily as liquidity buffers rather than return drivers, especially in periods of high volatility.

The findings highlight the need for PFAs to invest in training their fund managers on portfolio optimization under uncertainty and real-world application of risk-adjusted performance metrics. Such competencies will enhance strategic decisions and compliance with regulatory expectations.

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