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Efficiency of Pension Fund Investment in Shares, Bonds and Treasury Bills

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Abstract

This research investigates the efficiency of pension fund assets investment in shares, bonds and treasury bills in Nigeria. The study is a time series analysis using ex-post factor research design with a population of 22 pension fund administrators (PFAs) in Nigeria. Secondary data were obtained from Pencom, CBN, NBS and NSE from 2006 to 2020 in the country. Linear regression analysis was used to estimate the data with SPSS-version 22. The finding reveals that, investment in shares and bonds has a positive and significant effect in return on the investment, with treasury bills recording insignificant returns. The researcher therefore, recommends that the pension fund administrators (PFAs) should focus more on the investment of shares and bonds and less on treasury bills.

Keywords: Bonds, Return on pension investment, Shares, Treasury bills

1.1 Introduction

Pension is simply the amount set aside either by an employer, employee or both to ensure that at retirement there is something for employees to fall back on as income. It ensures that at old age workers will not be stranded financially, which aimed at providing workers security by building up plans that is capable of providing guaranteed income to them when they retire or to their dependent when death occurs. The reasons for the pension scheme stem from the fact that, an organization has a moral obligation to provide a reasonable degree of social security for workers especially those who have served for a long period. Secondly, the organization has to demonstrate that it has the interest of its employees at heart through pension schemes. The most popular way to determine the amount of an employee's pension is to base payment upon a percentage of the employee's earnings computed at an average over several years multiply by the number of years the employee has served the company (Fapohunda., 2013).

Pension funds are usually described as long-term investments that are inherently risky, it could be in the choice of the input or the output realized which focus more on lower risk investments, particularly where such investments or solvency regulations require a relatively conservative approach. Therefore, pension fund assets are expected to be directed more towards capital and money markets instruments, such as, shares, bonds Treasury bills, commercial papers etc. The basic risk factors relevant to investments can be broadly cluster into markets risk, credit risk, liquidity risk and operational risk (Herring, 2011). Markets risk refers to changes in the value of investment due to changes

in factors such as interest rate, exchange rate or stock markets. Credits risk is the potentials that a borrower or counter party will fail to meet its obligations in accordance with the agreed terms, liquidity risk, is one that firms are not able to settle a position at a Markets value due to liquidity disruption in the markets, while Operational risk is the prospect of loss resulting from inadequate or failed procedures, system or policies. Base on the factors mentioned above, investors would be afraid to invest because the realization of return on investment is uncertain. Studies have shown that given a set of investment is often influenced by investment factor decisions, as well as environmental factors, thus, certain investment factors may contribute positively to realization of investment returns while others may not (Just and Pope, 1979). Management of investment risk is greatly influenced by the investor's attitude towards risk for example; a risk adverse investor would like to use more of risk reducing factors than risk neutral investor. Performance in pension on the other hand try to look at the level of efficiency of pension investment, the degree of success at which the investors want to achieve in investing their available resources and the expected return.

Pension fund efficiency depends strongly on competition and the regulating environment which may result to incentives for consolidation and portfolio restrictions. Active investment management helps to keep markets efficient, as well minimize risk to ensure the flow of funds to the most successful enterprises, also playing a major role in the allocation of resources within the economy (Bauer., 2005). Efficiency can also be seen as the ability to invest pension fund in order to produce the possible range of output with minimum possible range of inputs. Efficiency unit is the one that is not able to increase its production without consuming more resources or reduce the use with at least one input while maintaining the same level of production, (Bojana et.al, 2019). Pension funds management companies are particularly important in this respect in contemporary economies given the increase in the size of the aged and retired populations and the consequent problems in guaranteeing the financial sustainability of social security.

Shares are one among the capital market instrument that forms part of a larger amount as capital of investment which is divided among a number of people or to which a number of people contributes. It can also be seen as one of the equal parts into which a company's capital is divided, entitling the holder to a portion of the profits, (Haslam et al., 2011). Pension funds are the largest single institutional investors in Corporate. From this statement, it is clear that employees and employers' contribution are invested in the corporate shares. Majorly, this investment in shares is done in existing securities which are bought and sold in secondary market, also in capital markets and it is meant for long-term investment Stock (PenCom, 2019).

Bonds are assets that require a fixed payment to the holder, usually with interest. Example of debt instruments includes bonds (Government or Corporate) and mortgages. bonds is one among the most common assets in fund portfolios which are traded in the capital markets with reasonable return on investment and some degree level of risk. Chovancova et'al. 2019). Pension Fund Assets can be invested in Federal Government Nigeria (FGN) or Central Bank of Nigeria (CBN) Bonds and Securities to a maximum of 80% of pension assets under management. Pension Fund Assets may be invested in bonds issued by State and Local government or State Government Agencies or wholly owned

companies, provided that such securities are fully guaranteed by Irrevocable Standing Payment Orders (ISPOs) or external guarantees by eligible banks or development finance institution or Municipal Development Fund Office (MDFOs).

Treasury Bills (TB) are issued by the central government and known to be one of the safest money market instruments available. Besides they carry minimal risk, so the returns are not attractive, also they come with different maturity period like one year, six (6) months or three (3) months and are also circulated by primary and secondary markets. Pension funds are also invested in money markets meant for buying and selling of short-term (less than one year maturity) government and corporate debt securities with the motive to achieve a fair return on investment with minimum risk as reported by (Horne and Kotaskova 2019)

Capital Markets is meant for buying and selling of long-term securities with more than one year maturity, such as shares, bonds, debentures etc. on the other hand, money markets is meant for buying and selling of short-term securities (less than one year maturity) like treasury Bills, commercial papers etc. (JBMS, 2009). Shares, bonds and treasury bills are securities traded in capital and money markets that pension funds are invested with the intention to generate fair return on investment for the purpose of maintaining the value of the pension firms, as well as a way of giving back to the Pension contributor's earnings as dividend through their Retirement Savings Account. Pension Company's invest in Shares, Bonds and Treasury bills to attract return on investment and as such, the ability of an investor to obtain the maximum output from a given inputs is known as the efficiency on investment. Thus, this study intends to investigate the effect of risk and efficiency on pension fund investment in Nigeria, specifically looking at the return on investment in Shares, Bonds and Treasury Bills, for the period of fifteen (15) years, ranging from 2006-2020.

This study significant to Pension Fund Administrators (PFAs), pension regulatory bodies, such as PenCom and the government, researchers, analyst and students who may like to carry out similar research in the future.

The broad objective for this study is to analyze the efficiency of pension fund assets investment in shares, bonds and treasury in Nigeria. The specific objectives are to;

i. Evaluate efficiency of pension fund assets investment on Ordinary Shares
ii. Estimate efficiency of pension fund assets investment on bonds
iii. Asses efficiency of pension fund assets investment on Treasury Bills.

2.1 Literature Review

2.1.1 Conceptual Review

The concept of efficiency is established on the economic theory of production. Efficiency has to do with relative performance of process that turn input into output. For instance, a factory that produces milk utilizes; materials, work and capital (contributions) to deliver milk (yield). The performance of this organization can be defined from multiple points of view. A normal appraisal of performance is the proportion of yield to inputs; where bigger estimation of this proportion is related with better execution, thus, performance is a relative idea. Efficiency is the degree of utilization of resources. It is the connection between what a system (maker, generation unit, or any basic leadership unit) produces

and what could possibly create, under the assumption of full use of assets. Efficiency is the level of accomplishment which producer accomplish in assigning the accessible inputs and output they produce so as to accomplish their goal which is to accomplish prominent level of productivity in cost, income or benefit (Kumbhakar and Lovell, 1998). The production frontier is therefore the extreme yield achievable by a given arrangement of inputs and existing generation innovations. The generation frontier characterized technical efficiency in terms of least arrangement of inputs in request to deliver a given yield. On the off chance that a maker delivers not as much as what he could practically create, at that point he is lying below the frontier. The separation by which a maker lies beneath the generation frontier is a proportion of his wastefulness (García del Hoyo *et al.*, 2004).

Farrell (1957) who pulls on the study of Debreu (1951) and Koopmans (1951) was the first to empirically quantify beneficial productivity deviation from a perfect frontier. He separated economic efficiency into technical efficiency and allocative efficiency. Technical Efficiency (TE) is characterized as the limit of a firm to produce on the isoquant frontier, meaning that a firm with a small-scale capacity may be able to reach frontier of production function. Conversely, there may be firms whose yields are nearer to the frontier, given their levels of inputs. The idea of how close the individual generation strategies are to the extreme levels, as characterized by the frontier and given inputs dimensions, is the proportion of technical efficiency for each firm. Allocative Efficiency (AE) refers to the limit of a firm to produce at a given level of output utilizing the cost limiting input proportion. When the Marginal Rate of Substitution (MRS) is equal to the pair of inputs with the input price ratio, then it is said to allocative efficiency. On the other hand, Economic Efficiency (EE) is when every resource is optimally used and the change in production of one product would impact the production of other products. It is characterized as the ability to produce from pre-decided amount of output at least cost for a given level of technology (Farrell, 1957).

2.1.2 Conceptual Framework

Below is the conceptual framework of this study, it described the direction of the study showing the relationship between the dependent and independent variables, also the efficiency and risk associated with pension fund asset investment in Nigeria.

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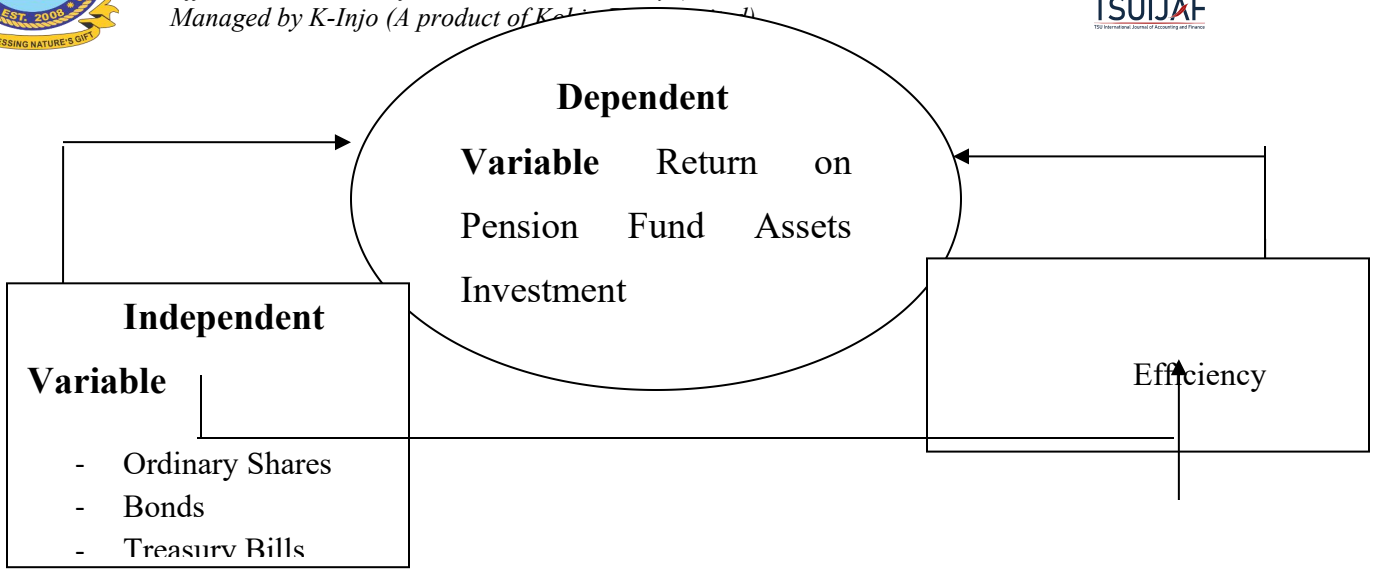

Figure 1: Conceptual framework
Source: Musa, (2021).

2.2 Theoretical Review

The underpinning theory adopted for this study is Modern Portfolio Theory (MPT) by Markowitz 1952. This is because it captured the objectives for the study which centered on investigating return on pension fund assets investment in Nigeria, while in the other hand, the theory in question try to look at the performance of securities in terms of efficiency that are invested in the market on a particular business and the resulting return on the Investment over time. Markowitz's theory is today known as the Modern Portfolio Theory (MPT). The MPT is a theory of investment which attempts to maximize portfolio expected return for a given amount of portfolio risk, or equivalently minimize risk for a given level of expected return, by carefully choosing the proportions of various assets.

2.3 Empirical Review

Kimeu's (2015) study sought to determine the effects of portfolio composition on the financial performance of investment companies listed in Nairobi securities exchange. He studied 5 investment companies in Kenya for a three years period from 2012-2014 using inferential statistics through ANOVA and multiple regressions. The study found that investment in bond real estate and equity positively affects financial performance.

(Kamwaro, 2013) investigated on the effects of the investment portfolio on firm's financial performance. The study entailed a census of all the investment companies operating in Kenya and listed in the Nairobi Securities Exchange. Data was analyzed using multiple linear regressions and the study found that investment in bonds, equity and real estate positively influenced the financial performance of investment companies listed in the NSE.

Addo and Sunzuoye, (2013) examined the joint impact of interest rate and Treasury bill rate on stock market returns on Ghana stock exchange from 1995 to 2011 using Johansen's multivariate cointegration model and Vector Error correction model. The result showed that the treasury bill rate and interest rate both had a negative relationship with stock market returns and were not significant.

Rii Zamuee (2015). Measured and evaluated the relative financial efficiency of 79 pension funds in Namibia during the period 2010–2014. To obtain empirical results, four inputs (retirement funding contributions, administration costs, investment costs and total fund expenses) and three outputs (fund credits at the end of 5 years, investment returns and average assets) were used as DEA variables. The research findings reveal that most of the pension funds are operating below the efficiency frontier set by the efficient peers. Furthermore, the efficiency results also indicate that funds have relatively low efficiency scores compared to Kenya and Australia.
Mavlutova et'al., (2016). Examined the efficiency of private voluntary pension schemes in order to provide appropriate pension level in actual financial markets situation. They found that Latvian government is obliged to stimulate Latvian securities market development in order to achieve the Latvian population pension saving investment.
Özbek, (2015). Investigated the performance of 19 private pension companies in Turkey in the period 2010-2014 by applying efficiency analysis technique with output satisfying. In the study, three inputs (number of staff employed, total assets and total shareholders' equity) and two outputs (premium production and pension contracts) were used. According to the analyzed literature, the above-mentioned studies applied DEA methodology in analyzing efficiency of pension funds and other financial institutions. This is a non-parametric method that allows creation of ranking of decision-making units (DMUs) (in our case mandatory pension funds) indicating the units that could achieve higher outputs at given inputs. If the result of DMUs is equal to 1.0 this means that DMUs is efficient, in other case, when DMUs have efficiency results smaller than 1.0, it is inefficient unit. Technical efficiency measures the ability of DMUs to produce maximal output from a given set of inputs.

3.1 Methodology

This study made use of secondary data from various sources such as PenCom quarterly and annual report, CBN bulletin, NSE, NBS etc. Mean and standard deviation were used to analyze the components of pension fund assets investment in Nigeria, while linear regression analysis was used to estimates shares, bonds and treasury bills on pension fund assets investment in Nigeria.
The model used of return on investment of pension fund assets investment in Nigeria as the explained variable, while the explanatory variables are shares, bonds and treasury bills. Since the focus of this study is the return on investment on pension fund assets investment in Nigeria.
The functional form on which our econometric model based is given as;
Y=f(X1, X2, X3, μ)…………………………………………………………………………...(1)
Where Y is the return on pension fund assets investment in Nigeria as the explained variable that is dependent variable, X1-X3 are independent variables (Shares, Bonds and Treasury Bills).
This can be specifically stated as;
(Return on pension fund assets investment) = *f* (Shares, Bonds and Treasury Bills)…………..(2)

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$$\sum_{i=1}^{n}(\text{ROPI}) = \text{a0} + \sum_{i=1}^{n}(\text{SHARES}) + \sum_{i=1}^{n}(\text{BONDS}) + \sum_{i=1}^{n}(\text{TREASURY BILLS}) + \mu 1 \ldots . (3)$$

4.1 Results and Discussion

4.1.1 Summary statistics of pension fund assets investment in Nigeria

The statistics for variables obtained from secondary data on pension fund assets investment from quarterly and annual PenCom reports 2006-2020 by pension fund administrators in Nigeria are demonstrated in Table. 1. The average return on investment in pension fund assets investment was 9.3136 billion naira, the minimum value was 8.3984 and maximum of 10.0730 billion naira with standard deviation of 0.5167. The average investment value on shares was 8.3857 billion naira with a minimum and maximum investment of 7.5314 and 9.8100 billion naira respectively. The standard deviation stood at 0.5744. The variability of investment on shares is less than one-third of the mean.

Similarly, the average investment on bonds was 9.0717 billion naira with minimum and maximum value of 8.1231 and 9.8009 billion naira only, the coefficient of variation of bonds was not large (0.5357). Furthermore, the mean investment of treasury bills was 8.4150 billion naira with the minimum and maximum of 7.672098 and 9.121176 billion naira respectively. The standard deviation stood at 0.457065.

Table 1: Summary Statistics of Pension Fund Assets Investment Variables and Return on Investment

VARIABLE	MEAN	MIN	MAX	STD
ROPI	9.313655	8.398424	10.07306	0516728
SHARES	8.385762	7.531479	9.810031	0574476
BONDS	9.071727	8.123198	9.800098	0.535711
TREASURY BILLS	8.415072	7.672098	9.121176	0.457065

Source: PenCom Annual Report Data 2006-2020.

Regression result and analysis of pension fund investment in shares, bonds and treasury bills

Table.2. Shares has a positive coefficient estimate of 0.188084 and a p-value of 0.0264 significant at 5%. This indicates that shares were a statistically significant positive predictor of pension fund investment in Nigeria. That is, for every one unit increase in shares, there is a predicted increase of 0.18% on return on investment in pension fund investment on shares in Nigeria. This finding agrees with Itodo, (2014), Ozbek (2015), Yannick et al. (2016), and Kimeu (2015) investigations. Pointing out that, shares have positive and significant effect on investment. But in contrast with the finding of Riizamue, (2015) which indicates that, there is negative and insignificant return on pension fund investment in some classes of securities including shares. The differences in findings could be as the result of the study area, this is because the above study was carried out in Namibia compared to Nigeria system of operation and economy condition.

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Table 2. Bonds has a positive coefficient estimate of 0.624683 and a p-value of 0.0000 significant at 1%. This indicates that bonds were a statistically significant positive predictor of the level of return on pension fund investment in Ngeria. That is, for every one unit increase in bonds, there is a predicted increase of 0.62% on the return on pension investment in Nigeria on bonds. This result is in line with the one reported by Kamwaro (2013), Kimeus (2015), Itodo, (2014), and Anna, (2019) whose findings indicates positive and significant return on the investment of bonds.

Table 2. Treasury bills has a positive coefficient estimate of 0.184431 and insignificant p-value of 0. 1124.This finding indicates that treasury bills were statistically insignificant but with a positive coefficient of 0.184431. This also implies That, for every one 1% increase in the investment of treasury bills, there is a predicted insignificant increase of 0.18% in the return on pension fund investment in Nigeria.The finding concurs with the study of Addo and Sunzouye (2013) and Amina, (2020). But contrary to the findings of Ezugwu (2014) which indicates that, treasury bills has Positive return on pension fund investment. The differences in the above findings could be as the results of the disparity in the types of research carried out, as this study used time series analysis for fifteen (15) years, while above study undergo survey research methods.

Table 2 Regression result for analysis of Nigeria pension fund investment in shares, bonds and treasury bills

Variables	Coefficient	Std-Deviation	T. Statistic	Probability
Constant	1.358529	0.474156	2.865155	0.0168
Shares	0.188084	0.072270	2.602504	0.0264
Bonds	0.624683	0.089273	6.997417	0.0000
Treasury Bills	0.184431	0.105969	1.740421	0.1124
R-squared	0.968071			
Adjusted R-squared	0.958492			
F-statistic	101.0646			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.364073			

Source: PenCom Annual Report Data 2006-2020.

The coefficient of determination gives 0.9680 or 96% meaning that the regression model is approximately 96% significant, hence a variation or increase in the dependent variable (return on pension fund assets investment in Nigeria) is 96% attributable to the changes or increase in the independent variables (shares, bonds and treasury bills). This result is also supported by the high value of the adjusted R2, which is to the tune of 95%. The F and probability statistics also confirm the significance of this model. This indicates a positive and significant return on investment in shares and bonds with positive but insignificant return on the investment in treasury bills.

5.1 Conclusion

The study examined the efficiency of pension fund investment in shares, bonds and treasury bills in Nigeria. From the results of the analysis, it showed that there exist positive and significant returns on the investment in shares and bonds with a positive but insignificant return on the investment in treasury bills

The study concluded that pension fund investment by PFAs in share and bonds has positive and significant return on the money invested but insignificant return on treasury bills. The researcher recommends that, investors should increase the percentage of investment on shares and bonds, where by reduce the percentage of monies invested in treasury bills because of it insignificant return on investment.

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