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# The Types of Investment Assets Held by Private Pension Funds and Their Impact on Economic Output

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## Abstract

The types of investment that are undertaken by pension institutions, especially private pension funds has been a debate in most countries. The desire of whether to invest in alternatives investment such as infrastructural or government securities may be a matter of policy guidelines issued by the government authorities. The objective of this study was to investigate the effect of the types of investment of private pension funds on the economic output in Ghana. The motivation behind this research was the fact that other researchers focused more on public pension schemes without recourse to the private sector of administering pension in Ghana. This is a quantitative research study that employed Ordinary Least Squared method using quarterly data set from National Pension Regulation Authority ranging from 2018-2023. The findings revealed that the investment of private pension funds in government securities has influenced the economic output of Ghana significantly. Thus, for every unit increased of investment in the purchase of the government securities had a 0.4409 increase in economic activities of the country. Likewise, other assets such bank securities and equities have all had a positive and significant impact on the economy. The study recommends that the private pension fund assets allocation spectrums are widened to promote diversification, reduce risk and to influence the economic output.

## Keywords

Private Pension, Investment, Portfolio, Assets Allocation, Pensions

## 1. Introduction

Private Pension fund assets as to the type of investments held should be a concern for policymakers and most countries. The fact that the type of investments held may or may not add to the growth of the portfolio requires critical investigation for asset allocation purpose. The higher the allocation of investment to risky assets, the higher the returns as well as the volatility [23, 31]. Where the interest rates on the short-term risk-free assets are higher, the Pension funds would have no incentives to invest in long-term variable income assets such as stocks and shares to achieve a target return [35]. In most advanced countries, pension investment has been pivotal to the infrastructural development process while in others such as the developing ones, the impact has been limited to financial-

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ization rather than the real sector [9, 17, 36]. Pension fund investments in whichever way contributes to a country's national outputs [3, 13, 21, 22, 34].

As institutional welfare asset managers [21], pension funds play significant role in economy such as providing funds through the purchase of Government bonds for roads constructions, schools and infrastructure generally [16]. The large pension funds manage assets that yields good and fair returns for pensioners and enabling retirees to get a decent share of the investment and the development of the economy [13].

In fact, without the cash on hand to finance the necessary projects, governments or companies create debt securities to borrow from pension funds to repay overtime usually at a lower cost. The United States of America (USA) cities development was based on the creation of bonds market to finance infrastructural projects such as parks, schools and stadium since the 20$^{th}$ century [12, 20]. The USA States and Local Government used revenue from the specific projects financed through bonds as part of their ability to repay. The bonds were sold to investors such as pension funds, banks, wealthy individuals and insurance companies [20]. Approximately, 89% of public pension assets were held in USA government securities in 1942 [5, 16]. At the time of America experience, the return and risk were low for bondholders unlike the case of Ghana in recent past. The problem for the bondholders and issuers in Ghana was the rate and returns for government bonds and treasuries were higher than corporate debts that made the risk to be higher as well.

There were unprecedented events in Ghana between 2017 and 2019 such as the collapsed of indigenous banks, microfinance institutions and loss of jobs as well as business disruption made the investment climate to be difficult [1, 14].

The macroeconomic instability such as high inflation, hikes in fuel prices, exchange rate volatility, and rising unemployment levels culminated to the tough macroeconomic condition [18]. In 2018/19, due to the collapse of the indigenous banks and investment companies, the only safer assets class was the government securities and the local government bonds [1]. Ironically, the private pension funds asset holdings in the government securities and the local government and statuary agencies bonds also grew as large as 95-97% (National Pensions Regulatory Authority (NPRA), [29]). To fuel the ongoing rally, the pension regulator, NPRA, also increased the limits of investment in local government bonds from 15% to 25%, and government bonds from 60% to 75% which meant that private pension funds could hold only two assets and be compliant. The change of the investment guidelines and the nature of the investment environment propel most private pension funds to increase their assets holdings of government and local government securities. In fact, the more profound happening during the whole period was the concentration of the maturities on government securities in a single year, that is 2023. This was clearly a major problem the government as an issuer should have envisage but might have ignored the warning signs.

In 2019, Ghana's total pension fund under management increased to GHS26.3 billion from GHS22.2 billion in 2018. This represented about 7.6% of the GDP and this growth was largely caused by the private pension funds [26]. Again, the Pension fund assets increased from GHS26.3 billion in 2019 to GHS33.4 by the end of 2020, representing approximately 27% growth in a single year [27]. By the end of 2022, the total pension assets were almost doubled to GHS 46.6 billion [29]. Of this, the private pension constituted about GHS34.5 billion in 2022. The level of growth of the pension schemes in the height of the Covid-19 pandemic has been a remarkable achievement.

The paper contributes to investigate the type of investment assets undertaken by the private pension funds and the effect on the economic outputs of a developing country. The study on private pension funds investment in Ghana is particularly timely and important in the aftermath of the country's Domestic Debt Exchange programme (DDEP) in 2023. The pension funds are weighing the options of continue investment in the old way of giving money to government or look elsewhere to risky alternative assets class. The country is challenged with underdeveloped capital market, lack of long-term assets class and under International Monetary Fund (IMF) extended credit facility programme, especially, from late-2022 to mid- 2025 and the only major available liquid assets class in the market has been the government treasuries (e.g., 91, 182 and 364 Days Treasury bills). Operating and investing pension funds asset continued to pose a major challenge that can bring a nation close to its collapse [10, 23].

For instance, [19] argue that Greece had to resort to the IMF for assistance in 2010 when its pension system became difficult to manage. The major problem of operating pension funds includes liabilities surpassing provisions made for payment especially non-contributory defined benefit schemes, employer delay in making mandatory contributions to pension fund to invest, limited avenues to invest, and high inflationary environment that may devalued long-term assets such as pension schemes and low level of benefits payment. The lack of available long-term investible assets to place money exposes the pension funds to concentrated risk in government securities [7, 21]. Additionally, there are limited approved alternative investment assets to purchase as pension funds e.g., Securities & Exchange Commission (SEC) approved only two real estate investment trust (REIT), two Private Equity and four Venture Capital as at September 2025.

Another issue in Ghana context is the small size of listed equities market capitalization of about GHS 25 billion as against the pension funds size holdings in government securities that signed up for the DDEP of about GHS 29 billion. This makes the equity market highly volatile and concentration in few securities. Studies conducted in Nigeria indicated that the lack of investment outlets is one of the primary issues confronting Nigeria's contributory pension schemes [30]. There are just few investment outlets accessible for investing pension assets in Nigeria and Ghana. The problem of

restricted investment makes it difficult for the equity market to absorb the pension funds amassed assets in Nigeria like Ghana [3, 8].

In this paper we address the question, "what is the effect of investment assets held by private pension funds and its impact on the overall economic output?" This is important because it provides the opportunity to shed light on the asset's allocation mix available to private pension funds to select and eventually it effects on schemes performance. The rest of the paper is structured as section 2 presents literature review while Section 3 explains the data type and source, empirical model specification and estimation strategy. The section 4 presents the results and 5 concludes with policy recommendations.

## 2. Literature Review

Previous studies conducted on analyzing pension schemes in Ghana focused on the public pension schemes [2, 4, 11] and neglecting the effects of private pension schemes on economy. Other studies conducted also examined the effect of pension contributions on the national savings in Ghana, taking into consideration the relationship between public pension fund and national savings in Ghana [25] and yet little is known about investment of private pensions on the economic output. Across the world, pension assets have been invested in direct bonds and equities, where the larger proportion of the assets have been invested in government bonds (e.g., 100% in Albania and Serbia in 2022) compared to corporate [31]. The reasons why a larger proportion was in government securities to aid gross fixed capital formation. Also, investment in banks deposit had the most significant impact compared to investment in public sector securites.

Empirical evidence questioned whether the degree of funding of pensions affects economic development [37]. The study adopted quantitative research approach and ordinary least squared method to analyze the data. Secondary data from 54 countries of which 29 were from Organization for Economic Co-operation and Development (OECD) countries. The findings of the study were that in the short-run, there was no relationship between funding of pension and economic growth but there was possible positive effect between funding of pension and economic growth in the long-run.

Research undertaken in Nigeria investigated the funded pension scheme and economic growth [15]. The author used quarterly time series data between 2005-2014. The model specified the dependent variable as real gross domestic product while the independent variables were public sector pension funds contribution, private sector pension contribition, total pension fund contribition, market capitalisation, and total pension fund assets. The study used error correction and OLS analysis. The study finds a positive and statitically significant impact of funded pension scheme on the economic growth in Nigeria. The operation of funded pension may have increase capital adequancy, liquidity in the country and the volume of market capitalisation on the Nigeria stock exchange.

Similarly, studies conducted in Nigeria provided insight into the impact of contributory pension scheme on economic growth [30]. The study employed secondary data collected from Pension Commission Annual reports, and CBN Statistical Bulletin between 2004 and 2012. The economic growth was specified as dependent variable while the independent variables were pension funds investment in specified investment outlets and pension savings contribution by the private and public sectors in Nigeria. The OLS regression method was used for analysis. The study finds that pension funds investment outlets had a negative and significant impact on economic growth in Nigeria and recommends an increase in the number of assets class to avoid diminution of increase. Additionally, the study finds that pension savings has significant effect on economic development and increase in pension savings will result in investment of pension funds in more investments assets which then will promote economic development in Nigeria.

Research in Ghanaian context investigated the effect of pension fund assets on Ghana's GDP [6]. They used annual data from 2012 to 2017 and specified GDP as the dependent variable and the pension fund assets as the independent variable. The study used the OLS estimation method for the analysis and had a statistically significant positive relationship between pension fund assets and the Ghana's GDP. However, there are three significant gaps in the previous studies. First, study on Ghana combined private and public pension assets effects on Ghana's GDP. Second, the previous studies could not breakdown and analyse the different types of investment that the pension fund assets are held in. Third, although the previous studies focused on total size of pension funds in the country, it used only SSNIT assets and multiplied by some figures to arrive at the total assets size in the country. The concern was the lack of distinction between the type of investment assets and the effect on the economy, and it is this gap this study seeks to contribute. The type of investment assets that are held by pension funds are important because they impact the real sector of the economy. It is again important because its demonstrate whether the funds that are in short-term instruments which could worsen government indebtedness to the schemes.

## 3. Methodology

This section presents the empirical approach that was adopted as well as the source and type of data employed for the study. Quarterly data from 2018 Q4 to 2023 Q3 were used for the analyses. We used this data period due to data availability. The investment type data were sourced from the National Pensions Regulatory Authority (NPRA). The inflation and gross domestic product (GDP) data were sourced from the Ghana Statistical Service, and the exchange rate data was from the Bank of Ghana.

## 3.1. Empirical Model Specification

This section specifies the empirical model based on the objective to investigate the effect of the type of investment assets the private pension funds undertake on the economy. The study specifies the model in line with previous literature (see [15, 22]):

$$GDPpen_t = \beta_0 + \beta_1 GOG_t + \beta_2 LGSAS_t + \beta_3 CB_t + \beta_4 BS_t + \beta_5 CIS_t + \beta_6 E_t + \beta_7 AI_t + \beta_8 Ca_t + \beta_9 ifl_t + \beta_{10} FX_t + e_t$$

where *GDPpen* represents real GDP per total private pension funds investment and is measured as the real GDP of the respective quarter divided by total assets held by the private pension within a quarter. Thus, a measure of the contribution of private pension to the overall economic output. GOG represents investment held in the Government of Ghana bonds. LGSAS represents investment in the local Government and Statutory Agencies bonds. CB represents investments held in corporate bonds and BS represents investment held in commercial banks securities such as the fixed deposits and repurchase agreements. CIS represents investments held in collective investment schemes such as mutual funds and unit trusts. E represents listed equities on the Ghana Stock Exchange. AI represents investment in alternative investments and Ca represents cash in bank. Ift and FX represent inflation and foreign exchange rates also of the respective quarters as others. The $\beta_0$ represents constant with the rest of the β terms as coefficients of the respective variables and *e* as the error term.

## 3.2. Description and Measurement of Variables

In this section, the paper describes and measures the variables specified in the model. The section further explained the theoretical justification of the independent variables and the control variables. The independent variables were transformed due to the large investment values in billions of Ghana cedis. The dependent variable was not transformed. The dependent variable was linear and part of the independent variables were logged. To measure the GOG, the study used the quarterly investments of debt securities issued by the government of Ghana held by the private pension institutions within a quarter. These securities were treasury bills, treasury notes, bonds and Eurobonds. The securities were in different tenors and the total was divided by entire assets under management by the private pension schemes in the period. The GOG was transformed because within the portfolio setting, the assets class are held as fraction of the entire portfolio that usually summed up to one (1). The transformation makes the variable more reliable and valid estimates [24].

The LGSAS which is Local Government Bonds and Statutory Agencies bonds include securities such as ESLA Bond, Daakye bond, and Cocoa Bills. Approximately, 15% of pension funds asset was invested in Local Government and Statutory Agency securities [28]. The LGSAS was measured by dividing the total LGSAS investments by the total private pension assets and was then logged. The *CB* are the debts securities issued by corporate entities to investors with a clearly defined terms and conditions to repay the principal amount with the corresponding coupons. Pension funds invest in corporate bonds which are listed on an approved stock exchange. For example, IZWE bond, and Bayport bond were some of the corporate bonds that were approved by the Securities and Exchange Commission (SEC) and issued in accordance with the laws of Ghana. The *E* constitutes the total equity investment held in private listed companies by the pension funds. In Ghana, the maximum limit of 20% was provided under the NPRA Investment Guidelines for the private pension schemes but actual holdings were low. The equity figure was logged.

Further, the *BS* was the investment in the Commercial Bank Securities such as fixed deposits, negotiable certificates of deposits, and repurchase agreement issued by the universal banks licensed by the Bank of Ghana. The *CIS* was the private pension funds holdings of Unit Trusts, Exchange Traded Funds and Mutual Funds. The pension funds can only invest their fund in collective investment schemes authorized by the SEC (NPRA, 2016). The *BS* and CIS were logged. The private pension scheme investment in *AI* was rather broad as per the NPRA investment guidelines, to include private equity, real estate investment trust (REIT) and off-shore investment [27, 28].

The study controlled for inflation rate and exchange rate. Ift is the general increase in price of goods and services which affects the purchasing power of pensioners because the value of their required benefits may fall. The FX is the price paid for the use of another country currency. In Ghana the major foreign currencies used are the United States dollar (US$), Great Britain pound sterling (GBP) and European Union Euro. However, the most dominated foreign currency in the country is the US dollar and the study used it as a proxy for foreign currencies. The study used the end-period quarterly interbank average figures in the various years. The population of interest was all time series observations of the various types of investments by the private pension funds held by the National Pensions Regulatory Authority. Each variable of the equation in the model is estimated by using quarterly data from the last quarter of 2018 to the first quarter of 2023.

## 3.3. Estimation Strategy

We employed the ordinary least squared (OLS) in estimating the relationship between the type of investment assets held by the private pension funds and its effect on the economic output of Ghana.

To deal with the biases of the OLS, the assumptions of OLS were tested due to time series nature of the data to ascertain the robustness of the results. The diagnostic tests conducted include unit root, normality, multicollinearity and correlations.

## 4. Empirical Results

This section presents the descriptive statistics, and diagnostic tests for the variables and the results obtained. In Table 1, we present the descriptive statistics of the type of investment assets held by the private pension funds. The mean of gross domestic product (GDP) per private pension (GDPpen) was 0.0020 that have standard deviation of 0.0006 and the range of minimum and maximum between 0.0013 and 0.0032 respectively. This shows that private pensions when compared to the country's economic output is small about 0.20 percent on average.

The logarithm of private pension investment held in the government of Ghana (logGOG) securities has a mean of 0.0030 with a variation of 0.0011 and the minimum and maximum of 0.0018 and 0.0053 respectively. The coefficient of variation was 36.67% showing low variability. This demonstrates consistent and stable investment in the government securities overtime. The concentration of private pension funds' assets in government securities has existed since the inception of the current pension reforms implementation in 2010.

The investment in equities (LogE) had a mean of 0.0981 as one of highest among the financial assets but constitutes the least in nominal terms. The standard deviation of the equities was 0.0395 and the minimum and maximum ranges between 0.0495 and 0.1778 respectively. The coefficient of variation was approximately 40.3%. This is relatively high variability. Overall, there are about 40 listed stocks on the Ghana Stock Exchange and of the 40, about 20 have some form of trading activities over the period. Thus, the capital market is thin and less liquid which is phenomenon associated with developing financial markets.

***Table 1.*** *Descriptive Statistics.*

| Variables | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|
| GDPpen | 0.0020 | 0.0006 | 0.0013 | 0.0032 |
| logGOG | 0.0030 | 0.0011 | 0.0018 | 0.0053 |
| logLGSAS | 0.0187 | 0.0119 | 0.0081 | 0.0395 |
| logCB | 0.0463 | 0.0262 | 0.0250 | 0.1103 |
| logBS | 0.0320 | 0.0111 | 0.0161 | 0.0544 |
| logCIS | 0.0907 | 0.0361 | 0.0445 | 0.1525 |
| logE | 0.0981 | 0.0395 | 0.0491 | 0.1778 |
| AI | 15.526 | 28.613 | 0.000 | 91.396 |
| logCa | 0.1883 | 0.1870 | 0.0312 | 0.8164 |
| INFL | 16.864 | 14.032 | 7.600 | 50.46 |
| FX | 6.5347 | 1.8873 | 5.2848 | 11.563 |

*Source:* Authors' estimates.

### 4.1. Share of Private Pension Investment Held in Various Assets Class

***Table 2.*** *Share of private pension investment held in various assets class.*

| YEARS/QTRS | logGOG | logLASGA | logCB | logBS | logCIS | logE | AI | CASH |
|---|---|---|---|---|---|---|---|---|
| 2023 Q1 | 0.72 | 0.11 | 0.04 | 0.04 | 0.02 | 0.02 | 0.00 | 0.04 |
| 2022 Q4 | 0.73 | 0.12 | 0.05 | 0.02 | 0.02 | 0.02 | 0.00 | 0.04 |
| 2022 Q3 | 0.73 | 0.13 | 0.05 | 0.03 | 0.02 | 0.02 | 0.00 | 0.02 |
| 2022 Q2 | 0.71 | 0.15 | 0.05 | 0.03 | 0.03 | 0.02 | 0.00 | 0.02 |
| 2022 Q1 | 0.67 | 0.15 | 0.05 | 0.05 | 0.03 | 0.02 | 0.02 | 0.01 |
| 2021 Q4 | 0.67 | 0.13 | 0.06 | 0.07 | 0.03 | 0.01 | 0.00 | 0.03 |

| YEARS/QTRS | logGOG | logLASGA | logCB | logBS | logCIS | logE | AI | CASH |
|---|---|---|---|---|---|---|---|---|
| 2021 Q3 | 0.60 | 0.20 | 0.04 | 0.08 | 0.04 | 0.03 | 0.00 | 0.02 |
| 2021 Q2 | 0.63 | 0.19 | 0.04 | 0.07 | 0.02 | 0.04 | 0.00 | 0.01 |
| 2021 Q1 | 0.64 | 0.18 | 0.04 | 0.08 | 0.02 | 0.04 | 0.00 | 0.01 |
| 2020 Q4 | 0.64 | 0.17 | 0.04 | 0.08 | 0.02 | 0.04 | 0.00 | 0.00 |
| 2020 Q3 | 0.70 | 0.11 | 0.02 | 0.12 | 0.02 | 0.01 | 0.00 | 0.01 |
| 2020 Q2 | 0.68 | 0.11 | 0.03 | 0.13 | 0.02 | 0.02 | 0.00 | 0.01 |
| 2020 Q1 | 0.66 | 0.11 | 0.03 | 0.12 | 0.02 | 0.02 | 0.02 | 0.01 |
| 2019 Q4 | 0.72 | 0.07 | 0.03 | 0.09 | 0.02 | 0.02 | 0.05 | 0.01 |
| 2019 Q3 | 0.61 | 0.07 | 0.09 | 0.09 | 0.02 | 0.02 | 0.07 | 0.03 |
| 2019 Q2 | 0.59 | 0.08 | 0.11 | 0.08 | 0.02 | 0.02 | 0.06 | 0.03 |
| 2019 Q1 | 0.60 | 0.08 | 0.11 | 0.08 | 0.02 | 0.02 | 0.06 | 0.03 |
| 2018 Q4 | 0.60 | 0.08 | 0.11 | 0.08 | 0.02 | 0.02 | 0.06 | 0.03 |

DVD = GDPpen, N =18
*Source:* Authors' estimates.

Table 2 presents the actual share of private pension investments held in the various assets class based on set limits of the percentage of the assets that should be held in the individual assets class. The Investment Guidelines were issued to balance risk and return taking into consideration the number of asset classes in the country.

Table 2 shows in 2019, the share of private pension fund assets in GOG grew beyond the 60% limit set out by the pension regulator to 72% of the total asset under management. Again in 2020, the allocation in GOG was 70% of assets under management. The percentage of private pension funds that should be invested in government securities varies across the developed and developing countries such as Ghana [22, 37]. In most advanced economies a small percentage of private pension fund assets are invested in government securities as compared to the developing countries. For example, [22] notes that about 54% and 64% of pension assets were invested in public sector securities in Hungary and Czech Republic respectively in 2019. This compares to the less than 10% in government securities in Australia and Sweden [31].

## 4.2. Diagnostic Test of Variables

This section presents the results of the specific diagnostic tests that were conducted. The unit root test, Shapiro -wilk normality test, and correlation coefficient.

### 4.2.1. Unit Root Test

The study presents the results of the unit root test conducted using Dickey-Fuller in Table 3. The test was necessitated because of the time series data which expects that the structural relationship described in the equation is stationary [33]. From Table 3, government of Ghana bonds, bank securities, equity and alternative investment reject the null hypothesis indicating that the data did not have a unit root and is a stationary data set. This implies that the variables are stationary and have significant effect on the economy and remain constant over time. This study is consistent with [25] pension contributions and national savings in Ghana: trends, prospect and challenges. However, the local government and statutory agency bond, corporate bonds, collective investment securities, and cash have a p-value greater than 0.05 which indicated that they fail to reject the null hypothesis meaning that it is non-stationary and has a unit root.

***Table 3.*** *Unit Roots Test.*

| Variables | P-Value | Conclusion |
|---|---|---|
| GDPpen | 0.4597 | Not Stationary |
| logGOG | 0.0312 | Stationary |
| logLGSAS | 0.145 | Not stationary |
| logCB | 0.7341 | Not stationary |
| logBS | 0.0288 | Stationary |
| logCIS | 0.1106 | Not Stationary |
| logE | 0.0404 | Stationary |
| AI | 0.0008 | Stationary |
| logCa | 0.1525 | Not stationary |
| INFL | 0.0934 | Not stationary |

| Variables | P-Value | Conclusion |
|---|---|---|
| FX | 0.0915 | Not stationary |

*Source:* Author's estimates.

### 4.2.2. Shapiro-Wilk Normality Test

The Shapiro-Wilk Normality Test was done to check if the data was normally distributed in Table 4. In as much as there are many types of normality test, [32] indicate that the Shapiro-Wilk Normality Test is the most appropriate and performs well even when sample size is small. The Shapiro-Wilk normality test was conducted at 95% confidence level. The value of W might be anything between 0 and 1. A 'W' number of one indicates that the data is properly normalized, while a 'W' value of zero indicates the reverse. The test results shows that private pension funds investment assets data is distributed normally. The variables showed strong signs that they are normalized. The research conducted by [32] affirms our position on the Shapiro-Wilk Normality Test where the null hypothesis of the research was rejected based on one variable showing non-normality. See Table 4 for details.

***Table 4.*** *Shapiro-Wilk Normality Test.*

| Variables | W | P-values |
|---|---|---|
| GDPpen | 0.903587 | 0.0663731 |
| logGOG | 0.913441 | 0.0989478 |
| logLGSAS | 0.742114 | 0.00025763 |
| logCB | 0.769019 | 0.00057267 |
| logBS | 0.956909 | 0.543233 |
| logCIS | 0.920433 | 0.131573 |
| logE | 0.932426 | 0.21419 |
| AI | 0.590033 | 5.40E-06 |
| logCa | 0.726855 | 0.00016676 |
| INFL | 0.664428 | 3.17E-05 |
| FX | 0.644857 | 1.95E-05 |

Source: Author's estimates.

### 4.2.3. Correlation Coefficients

To examine the relationship between the dependent and independent variables, correlation test was conducted in Table 5. Some of the asset classes were highly positive correlated as shown in the correlation Table 5. The correlation between the local government and statutory agencies bond and government bond was 0.883 that was very strong. Considering extremely high risk and average return profile of these two assets, indicates that they should not be included in the same portfolio, since the high positive correlation coefficient is evidence that it is less favorable to select it in the portfolio for investment. With those asset classes which are not highly correlated but are positive, they can be looked at by considering them into the portfolio.

Some of the asset classes are highly negatively correlated as reported in Table 5. Most negatively correlated asset is desirable for the portfolio for the purposes of diversification of the portfolio. For example, Bank Securities and alternative investments were negatively correlated to GDP per private pension. The study by [6] affirms correlation coefficient of similar work. See Table 5 for details on correlation analysis among the asset classes.

***Table 5.*** *Correlation coefficients among the various assets class.*

| | DPV | GOG | LGSAS | CORP. DEBT | BANK SEC. | CIS | EQUITY | AI | CASH | INFL | EXCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DPV | 1 | | | | | | | | | | |

| | DPV | GOG | LGSAS | CORP. DEBT | BANK SEC. | CIS | EQUITY | AI | CASH | INFL | EXCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| logGOG | 0.983 | 1 | | | | | | | | | |
| logLGSA | 0.918 | 0.883 | 1 | | | | | | | | |
| logCB | 0.356 | 0.212 | 0.262 | 1 | | | | | | | |
| logBS | -0.31 | -0.29 | -0.079 | -0.593 | 1 | | | | | | |
| logCIS | 0.907 | 0.871 | 0.863 | 0.383 | -0.2 | 1 | | | | | |
| logE | 0.653 | 0.538 | 0.731 | 0.603 | -0.233 | 0.573 | 1 | | | | |
| AI | -0.45 | -0.46 | -0.353 | -0.324 | 0.372 | -0.53 | -0.221 | 1 | | | |
| logCa | 0.23 | 0.195 | -0.004 | 0.514 | -0.511 | 0.167 | 0.026 | -0.26 | 1 | | |
| INFL | -0.64 | -0.64 | -0.409 | -0.418 | 0.675 | -0.42 | -0.404 | 0.136 | -0.41 | 1 | |
| EXCH | -0.63 | -0.63 | -0.41 | -0.399 | 0.644 | -0.41 | -0.416 | 0.106 | -0.39 | 0.982 | 1 |

*Source:* Authors' estimate.

## 4.3. Regression Results of the Type of Investment Assets of Private Pension Funds on the Economic Output

The regression estimates conducted was to investigate the effect of private pension funds on GDP per total private pension funds. Thus, how well the behavior of the Ghanaian economic output is predicted by the type of investment pursued by the private pension funds. The results show that the adjusted R squared for the entire model was 0.9997, indicating 99.98% of the variation in the Ghanaian economic output was accounted for by the private pension funds' assets holding. The over 99% R square makes the model explanation power unquestionable.

The results in Table 6 show that one-unit increased investment in the government of Ghana bonds, will lead to 0.4409 increase in the economic output. The result is statistically significant at 1% significance level making it the most statistically significant variable of the entire model. The regular mobilization of contributions and purchasing of government of Ghana bonds provides the scarcely needed funds to the government to pursue its developmental agenda. This collaborated with [15, 17, 22, 36] findings that pension funds investment aided the development of USA, Central and Eastern Europe and Nigeria economies. The private pension fund investment in government of Ghana securities is dominate contribution to growth of GDP per private pension.

***Table 6.*** *Regression results of the type of investment of Private funds on economy.*

| Variables | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* | |
|---|---|---|---|---|---|
| Const | 0.000129331 | 0.000124689 | 1.037 | 0.3341 | |
| LogGOG | 0.440915 | 0.0254323 | 17.34 | 0.0001 | *** |
| logLGSAS | 0.00295469 | 0.00112281 | 2.632 | 0.0338 | ** |
| logCORPDEBT | 0.00261495 | 0.000755321 | 3.462 | 0.0105 | ** |
| logBANKSEC | 0.00292465 | 0.00140843 | 2.077 | 0.0765 | * |
| logCIS | 0.00155229 | 0.000605516 | 2.564 | 0.0374 | ** |
| logEQUITY | 0.00116508 | 0.000495266 | 2.352 | 0.0509 | * |
| AI | 4.70890e-07 | 4.05862e-07 | 1.160 | 0.2840 | |
| logCASH | 7.60139e-05 | 3.96583e-05 | 1.917 | 0.0968 | * |
| INFL | −1.22635e-06 | 3.57463e-06 | −0.3431 | 0.7416 | |
| EXCH | 8.96041e-07 | 2.41884e-05 | 0.03704 | 0.9715 | |

*Table 7. Other Diagnostic Test 1.*

| Statistics | Value | Statistics | Value |
|---|---|---|---|
| Sum squared resid | 18.14324 | S.E. of regression | 1.609935 |
| R-squared | 0.999766 | Adjusted R-squared | 0.999431 |
| F(10, 7) | 2985.676 | P-value (F) | 9.91e-12 |
| Log-likelihood | −25.61223 | Akaike criterion | 73.22446 |
| Schwarz criterion | 83.01855 | Hannan-Quinn | 74.57493 |
| Rho | −0.151192 | Durbin-Watson | 2.186242 |

*Table 8. Other Diagnostic Test 2.*

| Statistics | Value | Statistics | Value |
|---|---|---|---|
| Mean dependent var | 0.002012 | S.D. dependent var | 0.000620 |
| Sum squared resid | 1.13e-08 | S.E. of regression | 0.000040 |

*Source:* Authors' estimates.

However, the purchase of the government securities by private pension funds has not been without a cost to the government as the government has had to pay high interest rate (or coupon rates) to attract such funds in the case of Ghana. The government of Ghana had to pay on average over 20% coupon rates to the private pension funds as one of the largest holders of government securities besides the banks. For instance, the last 3 years bond issued by the government in the mid 2022 before the DDEP in 2023 had a coupon of 23%.

The results in Table 6 also show that a unit increase in bank securities will lead to approximately 0.0029 increase in the economic expansion. The private pension funds were heavily investing in bank securities prior to the banking clean-up exercise in Ghana, but this reduced significantly after the exercise. Tables 7 and 8 are diagnostic with the results.

The findings show that GDP per total private pension changes with 0.0116 of private pension fund investments in equities. Thus, the GDP per total private pension changes by 0.0116 for a unit increase in private pension funds investment in equities in Ghana. This result is positive and significant at 5% level. Thus, on average, for every increase in investment in equity by the private pension funds, the increase in economic output is 0.0116 Ghana Cedis.

## 5. Conclusion and Policy Recommendations

The study investigates the effect of the type of investment assets of private pension funds on the economic output per private pensions in Ghana. Thus, it seeks to investigate the extent to which the overall economic output changes with the type of investments held by the private pension funds. The dependent variable employed in the study was the real gross domestic product divided by total private pension fund. The control variables were inflation rate and exchange rate. The variables of interest were Government of Ghana securities, Local government and statutory agency bonds, Equity, Alternative Investments, Collective Investment Schemes (CIS), Banks securities, Cash and Corporate Bonds that investment instruments held by private pension funds affect the Ghanaian economy. The data on these investments were obtained from the National Pensions Regulatory Authority spanning between Q4, 2018 and Q1, 2023.

The results attest that private pension funds are effective institutional investors that are deepening financial market and contributing to the country's economic expansion. The investments in instruments such as the government of Ghana securities, the bank securities and equities have positive impact on the economy. The data for these types of investments were stationary, and the results were statistically significant. Among these investments, the investment in the government securities had the most impact on economy in the Ghanaian case. This is contrary to the findings of [22] where the investment in government securities had the least impact on economic output in post-socialist countries and Ukraine.

Recommendation: Policymakers should aim at increasing efficiency of the private pension funds as a source of enhancing economic investment to the country. There should be further widen of investible assets class to include offshore investible assets under the alternative investment to diversify against

systematic risk and hedge of value for the private pension funds in periods of macroeconomic volatility.

## Abbreviations

| | |
|---|---|
| BS | Bank Securities |
| CB | Corporate Bonds |
| CIS | Collective Investment Schemes |
| DDEP | Domestic Debt Exchange Programme |
| E | Equity |
| FX | Foreign Exchange |
| GDP | Gross Domestic Product |
| GDPpen | Gross Domestic Product per Total Private Investment |
| GOG | Government of Ghana |
| Ift | Inflation rate |
| LGSAS | Local Government and Statutory Agencies Bonds |
| NPRA | National Pensions Regulatory Authority |
| OECD | Organization for Economic Cooperation and Development |
| OLS | Ordinary Least Squares |
| SEC | Securities and Exchange Commission |

## Author Contributions

**Andrews Doeh Agblobi:** Supervision
**Emmanuel Asigbey:** Writing – original draft
**Ohene Rachel Ofosua:** Writing – original draft

## Conflicts of Interest

The authors declare that there is no conflict-of-interest situation among the authors and the institutions that data were collected for the analysis in this study.

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