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The Analysis of a Pension Fund Allocation and its Impact on the Economy of Ghana

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Abstract
Many governments in many countries pay a great attention to pension schemes. Pension schemes play a large role in the development of the economy. This work is to examine the extent to which a pension fund has influenced the Ghanaian economy.

The data for the research used was eight consecutive years of data, the data was basically a secondary data. The descriptive aspect of the research employed summary tables. The Lorenz curve, Gini-Coefficient and logarithmic linear regression analyses were the major inferential statistical tools employed for the research.

The results of the research revealed that the level of contribution, benefits paid and the total assets under the management of the scheme experienced an upward trend but the growth rate has been erratic. There are also enough funds for payment of pensions when due but there are disparities between pensioners. The analysis also revealed that the pension fund invest in three portfolios these are fixed income, equity (both listed and unlisted) and alternatives (real estate and economic target investment). It was found that among the three investment portfolios only fixed income has a significant impact on the scheme investment income, the other portfolios have a positive impact on the growth of the economy.

The researcher recommends that the management of the funds should review the pension paid so as to improve the financial security of the pensioner. The researcher suggests that funds which bring about lower returns of public portfolios should be avoided.
Keywords: Pension schemes, Ghanaian economy, eight consecutive years of data, Lorenz curve Gini-Coefficient, Logarithmic linear regression, fixed income, Equity, Alternative

1.0 Introduction

1.1 Background of the Study

In every economy both the developed and developing world, various Pension Fund organizations have been established to provide basic economic security and the welfare for individuals including their dependents, for example social insurance, people receive benefits for their services and recognition of contributions to an insurance scheme.

These programmes classified under the term Social Security differ from one country to another; they are established to provide some kind of monetary payment to defray a loss or a deficiency in income as a result of old age, disability provision for survivor's medical care, unemployment and a loss of social service.

Before the inception of a formal Social Security system from the advanced nations, Africans had an informal Social Security system. The African always have faith in the extended family system as a means of Social Security in the event of natural disasters (fire outbreak, floods and war), the dependent widows and children, the aged; disabled all depend on the family system as a means of social security. Children are also considered as a proceed of social security protection against old age.

The inheritance system among kinship group was also a form of traditional social security. People accumulated wealth in anticipation of what future members of the group are entitled to benefit. For instance, in the inheritance system of the Akans, especially the Ashantis in Ghana a sister's son (nephew) took over the uncle's wealth after his death, brother and sister bond had a more significant bond than the marriage bond. Amongst the Frafras, the clan head accumulates wealth for the payment of a marriage dowry of every member of the family.
Globalization fuelled by westernization, modernization and urbanization has led to the gradual and systematic disintegration of the extended family system and render it ineffective as a social security institution. The prevailing harsh economic conditions and poverty has further compounded the problem. In general the existence of the extended family system cannot make any significance contradiction in the lives of the aged, handicapped

and children. Some children find it difficult to support their parents; this undermines their role as a source of social protection during old age.

The first social security attempt in Ghana was in the private sector where workers were paid cash benefits through the working compensation ordinance (No. 52), passed in July 1940. Shortly after the government instituted a non-contribution pension scheme in 1946 called CAP (30) which derives its name for chapter 30 of the pension ordinance. Subsequently amendments in 1955 have made it contributory to civil service and teachers. These members contribute 5% of their pre-tax salary. The contribution were not saved but recycled into the consolidated fund, (AP (30) is still a non-contributory plan for the armed forces, the police, and the prison service. These employees take home all their earning no deductions are affected for pension coverage.

In 1960, a compulsory savings scheme was introduced for compulsory deductions from wages and salaries of all workers and paid into government chest. The workers would be paid their savings with interest at the appropriate pensionable age. This scheme was however abolished in 1965 and replaced by a broader social security system.

However, in the western world there are various impacts of a pension funds. Pension funds are becoming the largest institutional investment in global financial market. They help individual save for old age and protect the value of their pensions. In so far as they improve risk sharing a long time and across individuals pension funds support innovation and growth in an economy.

There appear to be conflicting views on the benefits of funding. The European Union (EU) Green Paper Sees funding as desirable, and associates the establishment of retirement funds with increased investment in the economy, which is believed to be good. On the other hand many commentators in the UK have argued that increased funding of pension funds to meet solvency standards would result in reduced consumption, which is believed to be bad for the economy. The Eu Green paper on Pension Reforms found that "Low rates of return on pension funds affect the indirect costs of labor and therefore have an adverse impact on the EU's job creation ability"

Interestingly the countries like the Netherlands and Switzerland where pension funds have historically invested more in bonds do not appear to have suffered as a result of these higher costs or experienced higher unemployment when compared with the UK, where pension funds invest more in equities. The paper assertion found that substantial gains in the UK economic efficiency could potentially be achieved if equity holdings were eliminated in favor of UK pension funds investing instead in matching corporate or government debt securities. By eliminating equity holdings they argue that the UK economy substantially reduce frictional costs, thereby reducing the cost of capital in the UK economy and increasing capital investment.

Campbell and Vicera (2002) also state that long-term investors, such as pension funds, should take substantial position in bonds. In practice, we do see quite a different composition of pension fund portfolios. Many funds hold between 40% and 60%, and sometimes even more especially in the UK, their wealth in equities and real estate. The remainder is often invested to a large extent in medium –term nominal bonds, and only a small fraction of pension fund assets is index linked bonds. The risk - return profile of this investment portfolio is quite different from the risk return profile of pension plan's liabilities

The expected return on the actual portfolio is higher than the expected return on index linked bonds, if there is a positive equity premium. But the risk is even larger; especially the inflation hedge of the portfolio is used rather than weak numbers. This has led to a lot of criticism of the pension funds investment managers that they take too many risks at the expense of the pension funds participants who see their benefits endangered at the expense of low returns

Inderst ,G (2005) .assess the validity of this criticism and review the case for investing in equities and real estate .In his paper he considered the optional investment policy of pension funds using a continuous time long term investment frame work. He shows that the optimum portfolio consists of two parts, a speculative part and a hedge part, that covers the long term interest rate and price risks. According to him the speculative part is a fairly standard stock-bond portfolio with roughly a 50-50 mix for stocks and medium term nominal bonds, and a 65-35 mix for stocks and long term index linked bonds. The hedge part depends on whether index link bonds are available

With nominal bonds only, the model suggests to invest in medium term, around 4-year, nominal bonds (for a twenty year investment horizon).The hedge effectiveness of this portfolio is low, however, because of substantial

unhedgeable inflation risk that these bonds carry, a long term index linked bonds is much better as it provides the pens ion fund with a perfect hedge instrument. If long term index linked bonds are unavailable, medium term index linked bonds are a good substitute with almost a perfect hedge.

One Researched case in the Chilean economy by Lefort and Walker (2002) found evidence of a positive impact of pension fund equity investment on the cost of capital of firms as proxied by price-to-book rates and dividend yield. Schimd H. (1999) found evidence of a direct impact of pension funds investment on total savings and economic growth. They estimate that approximately half of the increase in total savings between 1981 and 2001 (4.9% of GDP) was due to pension investments. They also established that the pension fund explains 20 percentage points of the 1 percent growth in Total Factor Productivity (TFP) growth over the period (as a result of financial development) and 0.5 percentage points of the 4.6 growth in real GDP over the period. For other countries, the evidence on the impact on savings, financial market development and growth is mixed but generally positive, especially as far as developing countries are concerned. Murphy L. and Musalem A. R. (2004) show that the introduction of mandatory funded pension system contributed to higher savings in a sample of developing countries analyzed. Various studies have focused on the impact of pension funds on the development of financial markets and most results show that pension funds and other institutional investors have contributed to the development of equity markets and in particular explain the size of the stock market.

E Philips Davis (2004) analyzing data on pension funds investment in the OECD (organization for economic co-operation and development) countries confirms that international investment allows superior investment performance in terms of risk and return. He showed that pension funds are well placed to take advantage of the benefits of international investment, to an extent that depends on the maturity of the fund and the investment approach. These are sizeable differences in international investment by the pension fund sectors in the countries studied

Some studies have established a link between the growth of pension funds and economic growth. Davis (2002) finds a significant direct effect of the share of equities held by pension funds and life insurance companion on Total Factors Productivity (TFP) growth in 16 organizations for economic co-operation and development (OECD) countries. Davis and Hu (2004) using a data set covering 38 countries also found a direct positive link between pension assets and growth of output per worker.

Investing in infrastructure has become a new topic for pension funds in recent years. Institutional investors are trying to spread their investment across a much wider spectrum of investments than in the past. They are looking for new sources of return and a better diversification of investment risk. Hence, they are searching beyond the traditional asset classes of equities, bonds, cash and real estate. Some asset managers and consultants make a case in favor of listed infrastructure against unlisted investments. They mention the advantages of higher liquidity, lower transaction and fund management costs, less leverage, market pricing, market size etc. However, listed infrastructure will be more volatile and more correlated with the stock market.

In 1946,the Finland National Pension institution(FNPI),invested NPI funds in housing ,which was an ongoing problem in Finland .As early as in the 1950s,for instance, families in Helsinki lived in provisional housing in bomb shelters. However instead of investing in housing which was the recommendation of the Ministry of Social Affair the NPI decided to follow the recommendation made by the Treasury and concentrate on producing electricity. The country had lost one-third of its power stations in wa, hence the urgent need to replace them. It can be argued that the needs of industry (more electricity) were placed before the needs of the people (more houses) on the list of priorities.

Generally, the NPI funds formed an important basis for building up the basic infrastructure that later provided a solid foundation for rapid industrialization of the country. The NPI funds provided a common good infrastructure that served the interest of the whole nation (Olli E.K. 2006)

To conclude, it would be advantageous if pension fund are collected from labor contributions to the expansion of the labor base and, consequently, the base for solid pension finances. However, capital, even pension capital, tends to seek the highest short term profits. In the long run such a strategy may be detrimental to the maintenance of the national system that created general prerequisites, of course, if such a boom in global investment leads to acceleration in the developmental process in less developed countries, this will probably lead to a more balanced situation between the formerly rich and the formerly poor countries, which from a global perspective is a more welcome process. Here the Robin Hood principle (transfer of those who have to those who have not) is more justifiable

1.2 Statement of the Problem

With the current demographic trend and the structure of funded schemes, it is obvious that pension funds will increase remarkably in the coming decades. These funds are long-term liabilities in nature in that people make claims on the fund after retirement which is at a future date. There has also been a growing international consensus on the rationality of using social security protections mechanism such as pension funds as complementary instrument for fighting poverty. Thus pension funds are invested in various assets in the financial markets and are also diversified into other sectors of the economy.

The allocation of funds amongst investment projects will be greatly influenced by returns on assets. The difficulty lies on the fact that investment projects yield profits over a given period of time and it is the prediction of such cash flows that creates uncertainty in fund allocation. There has been some conflicting arguments as what portfolios should the pension fund invest in order to get the required returns which will enable them to pay pensions when they fall due and at the same time will have a positive impact on the economy.

This paper aims to establish a point whether pension fund growth is a potential engine of economic growth through it effect on corporate performance at the macro level.

Another fact is can pension fund be allocated in reliable and profitable investment programs to ensure steady and good returns devoid of fluctuations to promote the long term planning of the fund to honor the payment of pensions.

1.3Objectives of the Study

The study seeks to investigate how effectively pension funds are allocated amongst its investment projects and the impact of these funds on the Ghanaian economy. For these objectives to be fulfilled the research to achieve the following:

(i) The growth of the pension fund.
(ii) The monthly income distribution of pensioners.
(iii) Whether the fund is able to maintain the economic security of its beneficiaries.
(iv) The impact of the pension fund on the economy.

1.4 Hypothesis

The major hypothesis set for the study is

Ho: Allocation of the pension fund has an impact on the economy.
Ho: Allocation of the pension fund has no impact on the economy.

2.0 Methodology

The methodology that was employed for the researcher to achieve the solution to the set out objective is as follows:-

Both primary and secondary data was used in the research. The pension fund has 46 branches all over the country in-charge of collection contributions, maintenance of members financial data and bio-data and registration of members. The researcher actually used the Pension House since it's the institution mandated to take decisions on pension assets allocation/investment in the country and is likely to provide the corrected data.

The study collected the primary data by means of a face to face interview with the fund administration. Various officials of the pension fund were interviewed. A list of attached questions were used to guide the discussion and interviews. In addition structured questionnaire was designed to obtain information on the growth of the GDP (Gross Domestic Product) from the year 2002-2009 from the department of National Accounts of the Ghana Statistical Service. All these were done by means of a personal visit to the institution.

The researcher also obtained secondary data in the form of annual reports from the record of pension funds investment at the public affairs directorate headquarters. The required data was extracted from the annual report into contingency tables. The use of the statistical service to obtain accurate and timely data from government socio-economic and demographic policies.

The major statistical tool use of the regression model. The Lorenz curve and the Gini Coefficient were also employed to explain the income disparities.

The research aimed at examine the impact of the pension fund investment on the economy. The regression model can be used to examine this relationship. The general equation represented by the model as represented as
$y = B_o + B_1(x) + E$

The equation depicts a regression equation. The value of y represents the influence affecting the economy under question, the value x represents the various investments of the pension fund. That is the investment of the pension fund and its impact on the overall economy.

The vertical interval B_o reflects the relationship at the population level between x and y. B_1 represents the shape or the gradient. The random error term represented by E is designed to capture variation above and below the regression line due to all other factors not included in the model.

The objective is to examine the pension funds allocation and the impact on the economy by making use of GDP as a measure of economic growth, this is represented by y i.e. GDP = y. The GDP values are logarithmically transformed for all the data collected. The reason for transforming the GDP values was to obtain a more normal distribution. The logarithmic model will take the form.

$\log y = b_o + b_1 \log x$ (5)

The variables required to build the model is as follows:
GDP = Gross Domestic Product (2002-2009)
Equity = Equity Investment (2002-2009)
FII = Fixed Income Investment (2002-2009)
ALT = Alternative Investment (2002-2009)

Sco equation (5) in developing the model for the study the model equation will take the form
$\log_c GDP = b_o + b_1 \log(EQI)$
$\log_c GDP = b_o + b_1 \log(FII)$
$\log_c GDP = b_o + b_1 \log(AIT)$

The table below develops the procedure for determining the regression model coefficients.
Table 1

Y_i GDP	X_i - EQI	$\log y_i$	$\log x_i$	$(\log x_i)^2$	$(\log x_i)(\log y_i)$	$(\log y_i)^2$
Y_1	X_1	$\log y_1$	$\log x_1$	$(\log x_1)^2$	$(\log x_1)(\log y_1)$	$(\log y_1)^2$
Y_2	X_2	$\log y_2$	$\log x_2$	$(\log x_2)^2$	$(\log x_2)(\log y_2)$	$(\log y_2)^2$
Y_3	X_3	$\log y_3$	$\log x_3$	$(\log x_3)^2$	$(\log x_3)(\log y_3)$	$(\log y_3)^2$
Y_n	X_n	$\log y_n$	$\log x_n$	$(\log x_n)^2$	$(\log x_n)(\log y_n)$	$(\log y_n)^2$
$\sum_{i=1}^n y_i$	$\sum_{i=1}^n x_i$	$\sum_{i=1}^n (\log y_i)$	$\sum_{i=1}^n (\log x_i)$	$\sum_{i=1}^n (\log x_i)^2$	$\sum_{i=1}^n (\log x_i)(\log y_i)$	$\sum_{i=1}^n (\log y_i)^2$

The coefficient of the regression become

$$b_O = \frac{n\sum_{i=1}^n (\log x_i)(\log y_i) - \sum_{i=1}^n los\, y_i \sum_{i=1}^n log\, x_i}{n\sum_{i=1}^n log\, x^2 - (\sum_{i=1}^n los\, x_i)^2}$$

$$\bar{b}_1 = \log y_1 - b_o \log \bar{x}_1$$

Testing inference about the population regression coefficient.
The null and alternative hypothesis
Ho: bi = 0 (The constant regression coefficient is not significant)
Hi: $b_1 \neq 0$ (The constant regression coefficient is significant)
The test uses a t – statistic defined as

$$t = \frac{b_i^n}{s_b} \qquad (7)$$

S_{bi} is the standard error of the regression coefficient $b_1$and is defined as $S_{bi} = \frac{S\epsilon}{VSS_x}$ (8)

(9) $$S_\epsilon = \sqrt{\frac{\sum_{i=1}^n \log y^2 - bo \sum_{i=1}^n \log y) - b1 \sum_{i=1}^n (\log x)(\log y)}{n-2}}$$

(10) $$SS_x = \sum_{i=1}^n \log x^2 - \left(\frac{\sum_{i-1}^n \log x}{n}\right)^2$$

Decision rule

Do not reject Ho: $b_1 = 0$ if the t-value calculates a less than the table value. Reject if the t-value calculated is greater than the table value (critical value)

We will now consider the analysis of the research

Pearson Correlation Coefficient:

To quantify the strength of the linear relationship between the pension funds investment and the growth of the various sectors of the economy ,we would calculate the Pearson correlation coefficient denoted by(ρ) .In algebraic notation ,if we have two variables say "x" representing pension funds investment portfolios and "y " indicating the growth of the s the sectors of the economy. The data will take te form of "n" pairs that ($(x_1y_1),(x_2y_2,)\dots\dots(x_ny_n)$ the correlation coefficient is given by the following equation

(11) $\rho = \frac{\sum_1^n (x_i - x_i')(y_i - y_i')}{\sum_1^n (x_i - x_i')^2 (y_i - y_i')^2}$

Where $x_i' = \sum_1^n \frac{x_i}{n}$ $y_i' = \sum_1^n \frac{y_i}{n}$ and i= (1, 2 ,3…….n)

Testing for the significance of (ρ)

A hypothesis test is performed on the sample correlation coefficient to determine whether it is significantly different from zero.Our hypothesis are:

$$H_o: \rho = 0 (The\ correlation\ in\ the\ population\ is\ zero)$$
$$H_o : \rho > o (The\ correlation\ in\ the\ population\ is\ positive$$

This test employs the T –test statistic given by t=$\frac{\rho}{s_r}$ (12) where $s_r = \sqrt{\frac{1-p^2}{n-2}}$ (13) ,which is defined as the standard error of the sampling distribution of ρ .A level of confidant ,such as 95% ($\alpha = .05$) is chosen at which the null hypothesis $\rho = 0$ is chosen

Decision rule:

Reject the null hypothesis H_o = that is $\rho = 0$ if the t-value calculated is greater than the t-value read from the table.Do not reject $\rho = 0$ if the value calculated is less than the t-value from the table

Gini Coefficient and Lorenz curve

The Gini Coefficient is a very widely used measure of a terribly important problem income inequality. To calculate the coefficient we need to know the area between two curves in the diagram.If we obtain a method of calculating the area under the Lorenz curve(curved) line we and subtract it from the area of the triangle formed by the diagonal and the axes ,we then divide the resulting area by the area of the triangle. The Gini Coefficient is calculated from the formula

Gine Coefficient= $\frac{Area\ under\ perfect\ equality\ line - Area\ under\ the\ Lorenz\ curve}{Area\ under\ perfect\ equality\ line}$ (13)

Another formula which is used is G=1- $\sum_1^n (x_k - x_{k-1})(y_k - y_{k-1})$ (14) where x_k is the cumulative proportion of the population variable ,for k= 0,1,…n y_k the cumulative proportion of the income variable, with the Gini coefficient we are only interested in the modulus

The P-value:

Conventional phrases tend to be used to describe the P-value

$0.05 < p - value < 0.1$ weak evidence against H_0

$0.01 < p - value < .05$ evidence against H_o

$0.001 < P - value < .01$ strong evidence against H_0

$\rho - value < .001$ very strong evidence against H_0

3.0 Analysis of Data

3.1 Preliminary Analysis

Table 2
The Area Distribution of the Pension Funds Pensioners as at 2009 Ending

Area	Number of Pensioners	% Total	% Cumulative
Accra	27,783	28.16	28.16
Koforidua	7,201	7.30	35.46
Kumasi	17,642	17.88	53.39
Takoradi	13,166	14.16	67.50
Tamale	19,730	20.00	87.50
Tema	4,923	4.99	92.49
Sunyani	7,412	7.51	100.00
Total	98,658	100	

The table above represented the area distribution of the funds pensioners as at December 2008. The fund has seven area offices in the country which include Upper East, West and Northern Region; constituting the Tamale area, Eastern and Volta Regions, make-up the Koforidua area, Central and Western Regions constitute the Takoradi area. From the table the total number of pensioners as at December, 2009 was 98,658 constituting 85.1% of mates and 14.9% females. The region of Accra recorded a maximum percentage of 28.16%, followed by Tamale, 20% the least, Tema is 4.99%.

Table 3
Income Distribution of Pensioners of the Fund as at 2009

Income Range GH¢	Number of Pensioners		Total	% of Total	Cumulative (%)
	Male	Female			
26 - 30	911	216	1,127	1.14	1.14
31 - 40	4,200	833	5,033	5.10	6.24
41 - 50	10,444	1,745	12,189	12.35	18.59
51 - 70	29,663	4,447	34,110	34.57	53.16
71 - 90	10,497	1,458	11,955	12.12	65.28
91 - 200	19,342	3,501	22,843	23.15	88.43
201 - 400	6,803	1,854	8,657	8.77	97.20
401 - 1000	1,791	1,558	2,349	2.35	99.55
1001 - 2000	309	33	342	0.35	99.99
∠2001	46	7	53	0.05	100.00
Total	84,000	14,652	98,658		

From the table above the income level ranges from lower amount of GH¢9(26-30) and a higher amount of ∠2,000. From the table, majority (34.87%) of the pension as receive between GH¢(71-90) and few number (0.05%) receive above GH¢ ∠2000) a month. Referring to the cumulative percentage approximately 88.43% of the Pension population receives between GH¢(91-200) and lower. The male population in every income category shadows that of their female counterpart. With the female registering only 4.9% of the total population of 98,698.

The overall trend shows that few pensioners receive higher monthly income compare with a majority of them receiving less income.

Table 4
Pearson multiple correlation matrix of the funds investment portfolios and the performance of the components of GDP

	Agriculture	Industry	Service	Tax	Alternative	Fixed Income
Industry	0.997					
Service	0.993	0.996				
Indirect Tax	0.983	0.988	0.994			
Alternative	0.945	0.947	0.971	.965		
Fixed Income	0.955	0.937	0.942	.916	.935	
	0.865	0.848	0.860	.812	.892	.950

Source minitab
The table above indicates that the pension fund exhibited a positive influence on the total output of the economy.

3.2Further data analysis
The section uses inferential statistics to establish the validity of some of the set out objectives we are investigating.

Table 5
THE LORENZ CURVE AND GINI CO-EFFICIENT ANALYSIS OF INCOME DISTRIBUTION PENSION FUNDS PENSIONERS AS AT DECEMBER, 2009.

Income categories	Midpoint income	$x = \frac{1}{n}$	y = income per category	σ_x	σ_y	A $\sigma y_{t-1} + \sigma y_t$	B $\sigma x_{t-1} - \sigma x_t$	A⋆ B
1	28	0.1	0.0057	0.1	0.0057	0.0057	0.1	0.00057
2	35.5	0.1	0.0072	0.2	0.0129	0.0186	0.1	0.00186
3	45.5	0.1	0.0093	0.3	0.0222	0.0351	0.1	0.00351
4	60.5	0.1	0.0123	0.4	0.0345	0.0567	0.1	0.00567
5	80.5	0.1	0.0164	0.5	0.0509	0.0854	0.1	0.00854
6	145.5	0.1	0.0297	0.6	0.0806	0.1315	0.1	0.01315
7	300.5	0.1	0.0614	0.7	0.1420	0.2226	0.1	0.02226
8	700.5	0.1	0.1430	0.8	0.2850	0.4270	0.1	0.04270
9	1500.5	0.1	0.3063	0.9	0.5913	0.8763	0.1	0.08763
10	2001	0.1	0.4085	1.0	1.0000	1.5913	0.1	0.15913
Total	**4,898**	**1.0**	**1,0000**					**6.34502**

$x = \frac{1}{n}$ where n is the number of observations, thus the number of income categories = 10
$y =$ midpoint income per income category. Example $y_1 = \frac{28}{4,898} = 0.0057$
σ_x and σ_y are the accumulation of x and y respectively.
$\sigma y_{t-1} + \sigma y_t \Rightarrow \sigma y_1 + \sigma y_o$ Example $\sigma y_1 = 0.0057 + 0.0000 = 0.0057$
$\sigma y_2 = 0.0129 + 0.0057 = 0.0186$
$\sigma y_3 = 0.0222 + 0.0129 = 0.0351$
$\sigma x_{t-1} - \sigma x_t \Rightarrow \sigma x_1 - \sigma x_o$ Example $\sigma x_1 = 0.1 - 0.0 = 0.1$
$\sigma x_2 = 0.2 - 0.1 = 0.1$
Gini Co-efficient = $|1 - \sum(\sigma y_{t-1} + \sigma y_i)(\sigma x_{t-1} - \sigma x_t)|$
$\Rightarrow 1 - 0.34502 = 0.654$

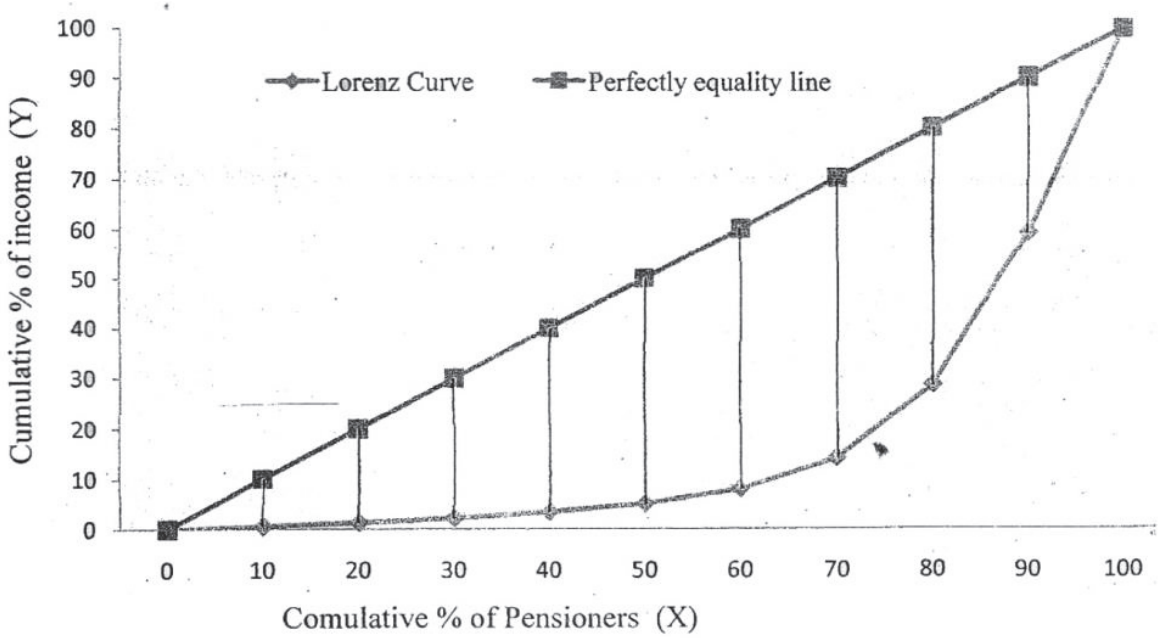

Fig. 1. Lorenz curve showing monthly pensions income disparities

Fig. 1 above is plotted using the x and y values from table 3 which are expressed in percentages and cumulated. It represents the Lorenz curve analysis describing monthly income distributions among the Pension Funds Pensioners as at the end of 2009. The Lorenz curve has both x and y axis that begins at 0% and ends at 100%. The purpose of the curve is to demonstrate relative proportion of x verse y. the perfect equality line shows a 1:1 relationship and allows as in determining how equal or unequal the situation is by illustrating the distance between the Lorenz curve and the equality line. The curve is flatter and strength far away from the equality line indicating that there are income inequalities. The shaded portion of the graph represents the margin of income disparities and is measured by calculating the Gini Coefficient.

The Gini Coefficient found (0.654); (See Table 5) is close to (1) and indicates that there are serious income inequalities amongst the pension funds Pensioners.

This means that few of the funds pensioners hold on to large proportion of the total wealth. A Gini Coefficient close or equal to zero (0) represents perfect equality whereas a value close to (1) represents income inequalities.

Table 6:
Analysis of variance on the impact of alternative
Investment on GDP

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	.310	1	.310	298.582	.000
Residual	.005	5	.001		
Total	.315	6			

a. Predictors: (Constant), Log alternative
b. Dependent Variable: log GDP

Table 7:
Analysis of variance on the impact of equity investment on GDP

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	.274	1	.274	32.978	.002
Residual	.041	5	.008		
Total	.315	6			

a. Predictors: (Constant), Log equity

b. Dependent Variable: log GDP

Table 8:
Analysis of variance on the importance of
Fixed income investment on GDP

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	.284	1	.284	46.292	.001
Residual	.031	5	.006		
Total	.315	6			

a. Predictors: (Constant), Log fixed
b. Dependent Variable: log GDP

Table 9:
Insignificant portfolio returns variable

Independent Variables	Beta In	t-Value	Sig.	Partial Correlation
Government and registered bonds	.111	.752	.494	.352
Students loans	-.214	-.592	.585	-.284
Term deposits and treasury bills	.417	1.060	.349	.468
Dividends	.111	.370	.730	.182
Rent	.260	.411	.702	.201
Miscellaneous income	.295	4.987	.008	.928
Government and registered bonds	-.030	-.410	.709	-.230
Students loans	.223	1.571	.214	.672
Term deposits and treasury bills	.306	3.953	.029	.916
Dividends	-.101	-.789	.488	-.415
Rent	-.120	-.422	.702	-.237
Government and registered bonds	.051	1.880	.201	.799
Students loans	.040	.331	.772	.228
Dividends	.073	.984	.429	.571
Rent	.151	1.187	.357	.643

Source: SPSS output
The data above provides a summary of the insignificant portfolio return variable. The table provides a summary of the Beta In, t-value, significance and partial correlation between the variables concerned.

Table: 10

	All figures in (GH¢'000)				
Year	Agriculture	Industry	Service	Indirect Tax	GDP
2002	1717420	1235020	1427500	506300	4886240
2003	2417760	1667830	1922990	607190	6615770
2004	3031950	1974570	2290990	691230	7988740
2005	3642700	2443710	2812270	827120	9726060
2006	4157660	3030640	3515560	968120	11671990
2007	4761650	3552900	4503780	1227530	14045850
2008	5950380	4236820	5740460	1523950	17451600
2009	7185780	5303490	7177630	2079900	21746800

Source: National account department (Ghana statistical service)

Table 11

	Funds investment portfolios allocation (GH¢'000)				
YEAR	Equity	Fixed income	Alternative	Economic	Real Estate
2002	80859.6	237130.3	76587.7	32724.6	43863.1
2003	172227.5	334063.2	83998.7	33176.3	50822.4
2004	323319.3	673258	95080.4	32960	62120.4
2005	282540.2	762597.2	107821.8	37184.6	70637.2
2006	357608.6	669508.6	121069.5	55727.3	65342.2
2007	-	-	-	-	-
2008	922461	1430684	158454	184492	73962
2009	613880	1356189	195625	197118	98507

Source: Funds annual report

Table12

	Investment income of various portfolios including total returns (GH¢'000)							
YEAR	Gov. Registered bonds	Students loan	Corporate loan	Term deposits and treasury bills	Dividends	Rent	Miscellaneous	Total Returns
2002	1090.6	7024.6	2828.8	19259.6	5374.5	1520	1623.7	38921.8
2003	1091.7	12580.7	1915.8	35991.9	5691.6	1814.5	8961.7	68047.9
2004	3280	8671	4840.8	38834.6	6744.6	2318.9	17054.4	81744.3
2005	247	7206.2	10139	43729.1	7822.2	2639.3	4779.1	76561.9
2006	4487.5	2159.9	10890.3	37230.6	11292.7	3278.3	61990.3	131329.6
2007	-	-	-	-	-	-	-	-
2008	6115	16204	48924	52646	20054	7170	6311	157424
2009	118	36764	84292	99107	17012	8210	11486	256989

Source: Funds annual report

Table 13

All amounts in Gh¢ million					
Year	Contributions	Benefits paid by categories			Fund size
		Lump sum refund	Invalidity pension	Survivors benefit	
2001	72.84	0.82	6.79	3.08	
2002	100.17	1.01	10.59	4.43	379.85
2003	134.02	1.14	16.65	7.04	630
2004	163.25	1.55	32.57	10.61	877.6
2005	190.6	2.94	45.6	14.48	932.75
2006	286.8	3.58	62.19	14.1	1195.2
2007	384.97	4.84	91.96	20.64	1639.84
2008	418.75	9.09	124.65	29.69	2163.84
2009	667.6	9.96	183.3	29.98	1994.47

Source: Funds annual reports

Table 14: Regression analysis on the impact of alternative investment on the Ghanaian economy

Predictor	Coef	StDev	T	P
Constant-	0.7895	0.4513	-1.75	0.141
Log x	1.54189	0.08923	17.28	0.000
	S = 0.0322	R-Sq = 94.4%	R-Sq(adj) = 98.0%	

Sources: Minitab output

Regression analysis using the forced entry method was performed to assess the relative importance of alternative investment on the growth of the economy. Table 14 displays, regression coefficients, standard deviation and the value of i and it's associated p – values of the variable that entered into the equation. As shown in table, the regression equation is given by log GDP = -07895 + 1.54190 log x where x = Alternatives investment.
The first noticeable thing about the above result is that Gross Domestic Product is positively related to alternative investments. The responsiveness of GDP to log x to 1.54189 indicates that a one percent increase in alternative investment leads to an increase of 1.54189 percent in gross domestic product.

A correlation coefficient of 0.992 ($\sqrt{R-Sq}$) indicates a very strong relationship between economic growth (measured by GDP) and alternative investments. Thus this leads to the rejection of our alternative hypothesis and acceptance of our null hypothesis which states that there is a relationship between pension funds investment and economic growth.

Also, a test of the significance of the intercept was found not to be statistical significant but the gradient of our model is found to be statistically significant through a test of standard error. Thus given that:

$H_0 : b_0 = 0$
$H_0 : b_0 \neq 0$, for significance of the intercept
$H_1 : b_1 = 0$

And

$H_0 : b_1 \neq 0$, for significance of the gradient

For the intercept or constant, since the computed value of t = -1.75, p(0.141) > a(0.05), we fail to reject H_o which states that the intercept has no impact on economic growth. For the gradient, since the computed value of p(0.000) < a(0.05), we reject H_o and accept H_o which states that there is a relationship between alternative investment and economic growth. The result also shows that alternative investment explained about 94.4% (R-Sq) of the variance in GDP leaving 5.6% unexplained. The overall significance of the model was also found to significant in the analysis of variance where our p (0.002) < a(0.05), see table 6.

Table 15: Analysis of the relative importance of the pension funds equity investment on the economy

Predictor	Coef	StDev	T	P
Constan t	3.6328	0.5885	6.17	0.002
Log x_2	0.6148	0.1071	5.74	0.002
	S = 0.09109	R-Sq = 86.8%	R-Sq(adj) = 84.2%	

Sources: Minitab output

The table 15 above shows a two-tailed hypothesis of the relationship between equity investment and economic growth. This was tested using the student's t −test and Pearson's correlation method (p). As shown in the table, equity investment performance significantly correlated with economic growth (GDP), this is indicated by (p =0.932) thus $\sqrt{R-Sq}$ has a strong positive correlation in the variance of the GDP. The positive significance suggests that increase or improvement in equity investment may result in improvement of economic growth. The regression equation from the table is also found to be log GDP = 3.6328 + 0.6148log x_2, where x_2 represent equity investment. The overall significant of the model was also found to significant through the analysis of variance where p(0.002) < a(0.005), see (Table7). Also, a test of the significant of the intercept and gradient of our model is found to be statistically significant through a test of standard error. Thus given that:

$H_0 : b_0 = 0$
$H_1 : b_0 \neq 0$, for significance of the intercept

$H_0 : b_1 = 0$

And

$H_1 : b_1 \neq 0$, for significance of the gradient

For both the constant and the gradient, since the computed value of ($p=0.002 < 0.05$) are the same, we reject H_o and accept H_1, which states that the inflow of pension funds equity investment is associated with the growth of the economy. Equity investment explains approximately 86.8% of the variation in GDP. This means that there are other factors also contributing to the remaining 13.2%.

Table 16 Analysis of the relative importance of the pension funds fixed income investment on the economy

Predictor	Coef	StDev	T	P
Constant	2.6184	0.6456	4.06	0.010
Log x_2	0.7543	0.1109	6.80	0.001
	S = 0.07838	R-Sq = 90.3%	R-Sq(adj) = 88.3%	

Sources: Minitab output

The above results show a positive relationship between GDP and Fixed income investment. The model was found to be $\log GDP = 2.6184 + 0.7543 \log x_2$, where $\log x_2$ = Fixed income investment. The elasticity of the index of GDP production with respect to fixed income investments of 0.7543 indicates that one percent increase in fixed income may lead to seventy-five percent increase in the level of GDP output.

The correlation coefficient of 0.95 shows high positive relationship between GDP (dependent) variable and the response variable (fixed income investment). The analysis of variance showed in table 8 where the p – value (0.001) is less than the α – value (0.05) indicates that the regression model is significant.

Also, a test of the significance of the intercept and gradient of our model is found to be statistically significant through a test of standard error. Thus given that:

$H_0 : b_0 = 0$
$H_1 : b_0 \neq 0$, for significance of the intercept

And

$H_0 : b_1 = 0$
$H_1 : b_1 \neq 0$, for significance of the gradient

For the intercept or constant, since the computed value of $t = 4.06$, $p(0.010) < \alpha(0.05)$, we reject H_o in favor of H_1 which states that there is a strong linear relationship between fixed income investment and economic growth. For the gradient, since the computed value of $p(0.001 < 0.05)$, we reject H_o and accept H_1 which states that there is a relationship between fixed income investment and economic growth. The result also shows that fixed income investment explained about 90.3% (R-Sq) of the variance in GDP leaving 8.7% unexplained.

4.0 Discussion, conclusion and recommendation

4.1Discussion

The objective of the research was to analyze the extent to which the allocation of a pension fund has impacted on the economy.

Due to the steady growth of the GDP, this has indirectly affected the overall returns of the fund, for example from the table 10 when the GDP was 4886240 the return from the fund was 3821.8, with a GDP of 6615770 the overall return from the fund 68047.9. Thus, on the whole there was a steady growth in the GDP which also had an indirect impact on the total returns.

The various investment portfolios allocation of the fund from 2002 to 2009 had a positive impact and it was quite significant, this can be seen from table 11 and table 12. We can say that the investment portfolio allocation indirectly had a rippling impact on the GDP of the economy from this we can conclude that the overall trend in the growth of the pension fund was quite substantial.

From the table 3 which describes the income of pensioners it can clearly be seen that there exists a wide disparity in the income to pensioners. The value obtained from the Gini Coefficient clearly depicts this level of income in equality.

Referring to the table on the Benefit Paid by categories (Table 13), a look at the fund size indicates that the fund has been trying to maintaining a significant growth on the amount paid to its pensioners from 2002 to 2009, but due to the value obtained from the Gini Coefficient (.645) it clearly shows income disparity. This means that more measures must be taken to enhance the benefit paid to the beneficiaries.

4.2 Conclusion

A sample of eight consecutive years data consisting of contributions, payment of benefits and investment was analyzed. Both contributions and payment of benefits experienced an upward trend but a little bit of erratic growth rate. There is also enough fund payment of pensioners when due but pensioners income have wide disparities. Finally, the logarithmic regression analysis reveals the pension funds investment has a significant impact on the growth of the economy. For example, the alternative investment explains 94.4% of the variance in the GDP leaving 5.6% unexplained. Equity investment explained 86.8% of the GDP leaving 13.2% to other factors and the fixed investment explained 90.3% of the GDP leaving 8.7% unexplained. Hence, the different sectors all had a positive impact on the GDP.

Examining the significance of the gradient in all the three scenarios, the alternative hypothesis H_1 was accepted against the null hypothesis H_0 .Thus, the gradient had a significance influence throughout the study.

The number of pensioners revealed that there are more men receiving pension than women. Thus, the active labor force comprises of more men, however, the Gini Coefficient of 0.654 indicates more work has to be done by the management of the fund to close the income disparities.

4.3 Recommendations

1. The management of the fund should review the minimum pension paid this will improve the financial security of pensioners who earn low pensions.

2. Management of the fund should keep an open eye on the nature of projects they entangle themselves with, some projects might erode the fortunes of the fund. For example, projects which are driven by politics.

3. The stakeholders of the fund should monitor the fund consistently.

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