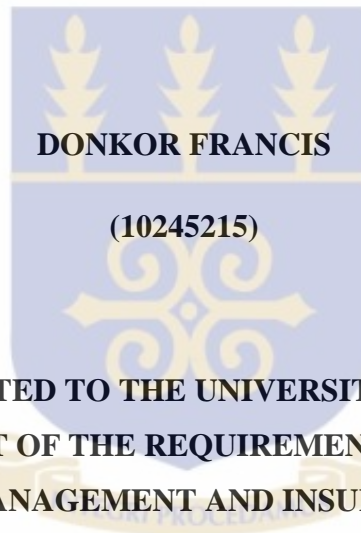


**UNIVERSITY OF GHANA**

**DEFINED CONTRIBUTION AND DEFINED BENEFITS: INHERENT RISKS AND  
RISK TRANSFERS IN GHANAIAN PENSION SCHEMES**



**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN  
PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF  
MPHIL RISK MANAGEMENT AND INSURANCE DEGREE**

**FEBRUARY, 2016**

**DECLARATION**

I do hereby declare that this work is the result of my own research and has not been presented by anyone for any academic award in this or any other university. All references used in the work have been fully acknowledged.

I bear sole responsibility for any shortcomings.

.....

.....

DONKOR FRANCIS

DATE

(10245215)



**CERTIFICATION**

I hereby certify that this thesis was supervised in accordance with procedures laid down by the University

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.....

Dr. Eric Oforu-hene

DATE

(SUPERVISOR)

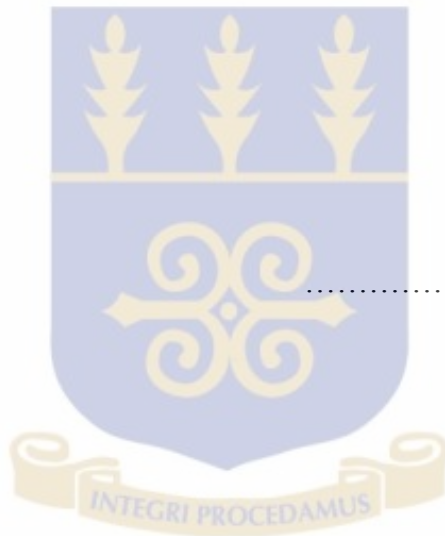
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Prof. Joshua Abor

DATE

(SUPERVISOR)



## DEDICATION

This work is dedicated to the Lord Almighty for seeing me through my education, providing me numerous opportunities and setting in my path very inspiring persons so I do not stray.

To my folks Mr. and Mrs. Francis Donkor and siblings Selina and Davida for assistance and encouragement when times got tough and morale was low.

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**LIST OF ABBREVIATIONS**

CAP 30	-	1950 British Colonial Ordinance (Pension Ordinance No. 42)
DB	-	Defined Benefit
DC	-	Defined Contribution
GHC	-	Ghana Cedi
PAY-GO/ PAYG	-	Pay-as-you-go
NPRA	-	National Pensions Regulatory Authority
SSNIT	-	Social Security and National Insurance Trust
U.K	-	United Kingdom
U.S	-	United States

## ABSTRACT

Ghana, due to various economic and demographic factors, also growing concern among the general populace on the adequacy of pension benefits has undergone pension reform. The new Ghanaian Pension scheme set with the objective of securing pension income of plan members is a combination of the Defined Benefit (DB) and a Defined Contribution (DC) pension plans in a three-tier structure. This thesis examines three major issues affecting pension provision in Ghana. That is, the risks associated with pension schemes, and the effect of the structural and parametric changes of the new scheme on pension provision. Thirdly, a demonstration of the adequacy of pension benefits from the new scheme relative to that receivable prior to the reform considering investment risk (market risk).

A simulation methodology was adopted using 10,000 simulations of risk scenarios of a plan member over a projected 40yr contributory period to demonstrate whether pension benefits under the new Pension scheme was adequate relative to a DB benchmark as was the case prior to reform. Three major conclusions are drawn; firstly, a DC pension plan may promise higher benefits relative to a DB benchmark, however, it is subject to more risk hence pension ratios are less predictable. Secondly, the asset allocation strategy used by fund managers has an influence on pension provision and one with high equity weightings in investment delivers higher benefits compared to that with less weight in equities as prescribed by the National Pensions Regulatory Authority (NPRA). Lastly, contributions to Tier 3 of pension scheme by formal sector plan members towards a personal pension or provident fund may significantly increase pension benefits.

*Keywords:* Defined Contribution pension plan; Defined Benefit Pension Plan; Asset-allocation strategy; Social Security and National Insurance Trust (SSNIT)

## CHAPTER ONE

### INTRODUCTION

#### 1.0 Research Background

As put by the wise man Solomon, for everything there is a time and a season; a time to be born and a time to die, for workers there is a time of active service and a time to retire. For a retiree or an individual forced out of service due to ill health or invalidity, there are pensions and returns on other investment options to maintain the standard of living as it was during active service. Pensions also contribute in poverty alleviation of the elderly.

Worldwide, with an aging population and increase of risks due to various economic and demographic factors such as falling interest rates, capital market risks (systemic risks) and declining mortality associated with pension schemes, there has been a shift from Defined Benefit (DB) plan- where plan members due receive benefits despite the performance of the investment of the scheme, to the Defined Contribution (DC) plan- where a members benefit is defined by the investment performance of his contributions (Byrne, 2007; Clymer, Rappaport & Schaus, 2010).

In Africa, there have been pension reforms not only to ensure adequate retirement income to retirees but also to introduce social protection systems (Stewart & Yermo, 2009). The reform of pension schemes in Africa has been attributed to efforts to deal with poverty- emphasis on the elderly, reduce government costs on pensions for efficient and effective use of funds on other sectors of a country's economy, restructuring current schemes to resolve problems associated with them to ensure they effectively and efficiently meet the objective for which they were established; also encourage national savings and capital market development. These coupled with increased longevity and reduced fertility has instigated pension reforms in the direction of partial or full funding (Oosthuizen, 2013). With differing structures and challenges, there have been structural and parametric changes to pension schemes.

The Kenyan Pension scheme under reform introduced a multi-pillar system. The first pillar is a mandatory Defined Contribution scheme for workers in the formal sector with a voluntary component that promises a lump sum benefit. On the second pillar, there are two plans, one that is a non-contributory Defined Benefit scheme managed by the Civil Service Scheme that promises lump sum and monthly retirement benefits for those in the public sector; the other is a voluntary Occupational pension scheme which is privately managed with contributions of up to fifteen per centum (15%) of employee salary. The third pillar is a voluntary Defined Contribution personal pension scheme whose contribution varies depending on the employee with tax deductions as part of benefits (Oosthuizen, 2013).

In Nigeria, there has been a reform to the second pillar of the scheme with a mandatory Occupational pension scheme affecting workers of both the private and public sector. This involves a fifteen per centum (15%) contribution of employee salary with allowance for voluntary additions; as a Defined Contribution scheme, it is privately managed with tax deductibles promising a pension and/provident fund. There is also a multi-fund structure for varied life stages in adherence to the Shari'ah Law ( Uche&Uche, 2002; Oosthuizen, 2013).

In Ghana, before the reforms, there existed two major pension schemes - the Social Security and National Insurance Trust (SSNIT) which covered employees of the private sector, civil and public servants, and the self-employed; and the CAP 30 which covered the military, police and some civil servants; and eight other micro-pension schemes such as the Ghana University Staff Superannuation Scheme (GUSSS) for members of public universities and CRIG Pension Scheme for staff of the Cocoa Marketing Board (Stewart & Yermo, 2009; BGL Pension Report, 2010; National Pensions Regulatory Authority [NPRA], 2012) .

Following cries from public servants, organised labour organisations and pensioners of the inadequacy of benefits of the pre-existing scheme to sustain the retired after their period of active service under the SSNIT Pension Scheme a Presidential committee was set-up in August 2004 to fix the problems of the existing scheme; inadequate investment returns, low coverage, high administrative costs and low efficiency, and slippages in real value of pensions (Stewart & Yermo, 2009; NPRA, 2012).

The commission presented its final report in March, 2006 to the President. The findings revealed that the existing pension schemes could not deliver benefits for adequate and sustainable income security hence recommended a unified pension structure -the New Pension Scheme. This scheme established upon the recommendations was to ensure that retirement income (made up of pensions and gratuities; emphasis on the lump sum paid) of Ghanaian workers especially those in the public sector was adequate (NPRA, 2012).

The enactment of the National Pensions Act, 2008 (Act 766) introduced a three-tier pension scheme under the purview of the National Pension Regulatory Authority. The reform resulted in changes in the regulation, governance, solvency and investment strategy which affects pension provision in the country. Comprising of three tiers; the first tier is a mandatory basic Social Security Scheme; the second tier- a mandatory Occupational scheme; and the third tier- a voluntary Provident fund and Personal pension scheme with the objective of providing pension benefits to ensure retirement income security for workers and a better standard of living. The third tier, also made provision for workers in the informal sector who make up about eighty-five percent (85%) of the country's working population to plan towards their retirement (NPRA, 2012).

The first tier, managed by the Social Security and National Insurance Trust (SSNIT) is the largest DB pension scheme operating in the country partly sponsored by the State for employees in the public sector and partly sponsored by the employers for those in the private sector. All employees are by law required to join the scheme under this tier, those not covered under this scheme can however be enrolled into the second and/or third tiers. Lastly, private companies are not required to finance deficits of the scheme, and contributions raised only if stated by law.

The second tier, a mandatory DC occupational pension scheme by law enrolls all workers covered under the first tier. Tier 3 as earlier mentioned, offers voluntary schemes and comprises a provident fund and personal pension schemes. Managed by licensed and selected pension fund managers, the third tier offers tax relief to a maximum of 16.5 percent (16.5%) of contributor's monthly income above required minimum contribution rate required by law.

Other implemented recommendations of the commission were the establishment of the National Pensions Regulatory Authority to regulate Pension Schemes in the country; increase pension coverage to the informal sector; phasing out of the 1950 British Colonial Ordinances (Pension Ordinance No. 42) popularly known as CAP 30 Scheme; the restructuring of SSNIT and the SSNIT Law; and the unification of pension schemes in the country (NPRA, 2012).

As aforementioned, the new scheme has both pension plan arrangements with the first tier being a Defined Benefit scheme and the second and third tier, Defined Contribution schemes. This paper delves in to the risks and transfer of risk associated with the Ghanaian Pension Scheme.

### **1.1 Research Problem**

Findings of the Presidential Commission on Pensions revealed that unlike other countries, the needs of the Ghanaian retiree rather increased upon retirement. This was due to demands of traditional norms and customs such as family engagements and leadership; also funds to meet other needs such as vehicles and house which should have been acquired during the period of active service. It is therefore necessary for retirement income of the retired to be at a level that will meet the requirements of these social factors. It was therefore recommended that income replacement ratio be at sixty-seven percent (67%) instead of sixty-five percent (65%) as was previously the case for a life aged 35 with a retirement age of 60. This results in a 0.08 percent (0.08%) increase in retirement replacement income per annum (now 2.68% per annum from 2.6% per annum when retirement ratio was 65%) (NPRA, 2012).

However, amidst cries from the general public for restoration of pensions to that under the CAP 30, submissions of the committee recommended a three-tier system also a shift to defined contribution pension plans. The problem stems from the fact that in an attempt to reduce investment risk among others in Defined Benefit pension schemes where retirement income is somewhat guaranteed considering risks such as insolvency - where the plan sponsor is unable to pay out benefits promised, under the Defined Contribution pension schemes retirement income is solely dependent on the total contributions paid and return on investments. There is also the transfer of risk from the Government and/ employers to employees who are far less able to manage them (Rulof, 2005). This risk entails the longevity

or life expectancy risk when a beneficiary's predicted life expectancy is less than their actual life expectancy questioning if his/her benefits will meet future consumption needs, a risk which is less in a Defined Benefit plan due to pooling of individual risks; also investment risk since benefits are subject to return on investments made with contributions (Boyer et. al, 2011). The question at hand is whether the new Pension scheme following the pension reform is the best way to address the plight of Ghanaian workers.

The most significant variable affecting benefit outcome of Defined Contribution schemes is the investment returns (Rulof, 2005). This is based on research findings which reveal that about one-third (33%) of members final retirement income was made up of their total contributions during a typical 30-40 year period of active service and the rest made up of accumulated investment returns. The main challenge for the success of the Pension scheme is to ensure that such returns are adequate.

Early studies have sought to determine why there has been a global shift from Defined Benefit pension schemes to Defined Contribution pension schemes; also the factors that make an individual prefer a pension scheme under a Defined Contribution arrangement to that of the Defined Benefit and vice versa (Blake, 2000; McCarthy, 2003; Yang, 2004; Stewart & Yermo, 2009; Oxaera Report, 2010). Other researchers, including Bodie, Marcus and Merton (1988) have explored from both the employee and employer perspective which plan dominated the other considering the trade-offs amidst risks such as inflation and interest rate which affect returns on investments (Cocco & Lopes, 2004; Poterba, Ruth & Wise, 2006).

Blake, Cairns and Dowd (2001) carrying out a research similar to that used in this study in the United Kingdom, sought to establish if the Defined Contribution pension scheme could replicate benefits under a Defined Benefit pension arrangement using varied asset allocation strategies and asset-return models.

Other research work in Ghana were by Kawor (2008), Stewart and Yermo (2009) and Ashidam (2011) on the Ghanaian pension schemes. The National Pensions Regulatory Authority (2012) delved into the challenges of the pension scheme and why the need for reform. However, missing from literature is a study of the adequacy of the pension provision from the Ghanaian pension scheme after the reform in comparison to that prior to the reform.

This paper will fill the gap in literature. It differs from previous studies, for example work of Blake et. al (2001), who compared pensions from DC plan to a DB benchmark. This paper looks at the Ghanaian plan members pension (with both DB and DC arrangements) to a DB plan as was the case prior to reform. The research also emphasises on the inherent risks and risk transfers following the reform of the Ghana Pension Scheme.

## **1.2 Research Purpose**

This research looks at the inherent risks associated with both schemes (the Defined Benefit and Defined Contribution Scheme) and risk transfers of the new Pension Scheme under the New Pensions Act; also if the new scheme will meet its objectives given the parametric and structural changes to the Pension Scheme.

## **1.3 Research Objectives**

The objectives of the research are to:

- i. ascertain the inherent risks associated with the Defined Benefit and Defined Contribution plans of Pension Schemes.
- ii. examine the structure and pension provisions as a result of the new Ghanaian Pension Scheme.
- iv. evaluate the effect of the parametric and structural changes of the new scheme on retirement income of retirees.

## **1.4 Research Questions**

- i. What are the risks associated with Pension Funds; Defined Benefit and Defined Contribution Schemes?
- ii. How does the parametric and structural change associated with the new scheme affect its pension provision?
- iii. Will the new pension scheme provide adequate retirement income for the Ghanaian retiree?

### **1.5 Significance of Research**

Since literature on risks associated with the new Ghanaian Pension Scheme is arguably non-existent, the study will provide an empirical study of the field. This will provide literature for further study into the Ghanaian Pension Scheme.

Another significant contribution of this research will be in practice and policy. From a survey by Byrne (2007), there is the need for members of the general public to be educated on the need to make pension arrangements. This involves investment advice and choosing pension scheme options to sustain life after retirement. This research will educate the general public on the need for a planned pension, also policy based on research findings.

### **1.6 Scope and Research Limitations**

Due to the dynamic nature of the financial environment (interest rates, inflation, market risk among others), assumptions will be made for some parameters of the model. Having used these assumptions, result findings may not hold for other conditions.

As a simplified study of the Ghanaian Pension scheme, the researcher did not incorporate fund manager and other administrative expenses associated with the operation of such institutions in the calculation of fund value, that is, the accrued amount in the retirement account of a plan member. Also due to lack of data and the varying investment strategy of SSNIT and other registered pension fund managers, investments were limited to the assets, Bonds and Equities though there are more options according to the NPRA into which fund managers can invest in such as real estate, bank deposits and securities, debentures among others (NPRA, 2011).

### **1.7 Chapter Outline**

The dissertation is divided into five (5) chapters. Chapter One, the introductory chapter of the research gives a background to the study, informs and establishes the state of the Ghanaian Pension Scheme, and the purpose of the study. Chapter Two, Literature Review provides a review literature on risk associated with Defined Benefit and Defined Contribution Pension Schemes carried out by scholars and researchers. It also outlines the structural and parametric changes to the Pension Scheme after the pension reform. Chapter Three, the Research

Methodology reveals how the research was conducted and the assumptions used in modelling the Ghanaian Pension Scheme. Chapter Four, a chapter on Results and Discussion contains the findings after simulation of various scenarios of the Ghanaian experience and the discussion on the results of the simulation. Lastly, Chapter 5, the concluding chapter of the dissertation details the summary, conclusion and recommendations of the study.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0 Introduction

This chapter focuses on the theoretical and conceptual issues relevant to the study. Specific issues, concepts and theories addressed are the history and definition of Social Security Schemes, Pension schemes, history of global pension reforms in the world and the Ghanaian case. Other issues addressed are the risks associated with the pension schemes and factors that make one preferred to the other.

#### 2.1 History and Definition of Social Security

Social security is aimed at providing some level of assistance, be it financial or otherwise to meet the continuing needs of scheme members or reduce the need for other social assistance measures (Whitaker, 1998). Kaseke (2000) mentioned that though there are varied social protection programmes in use all over the world, not all could be adopted in developing countries as needs differ across various economies of the world -developing and developed countries. He added that it is needful countries developed their own programmes based on the needs and aspirations of the people, and available resources.

Social protection in African societies before the coming of the Europeans and rise of modern states, to address major social risks that may occur in life's phases was done through collective and mutual help. The structure of these societies took the form of the village, the clan, the extended family and nuclear family which provided social assistance to its members in the event of old age, ill-health or invalidity (Kumado&Gockel, 2003).

Some social and economic support and/or benefits meted out to members of the extended family, until recently the most intimate of the social structure are family assistance, health, maternity, sickness benefits, invalidity benefits, old age benefits and survivor's benefits. These benefits, which are results of wages, goods and services of members cushion others should their expected earnings reduce or cease due to unemployment, ill-health, incapacity or old age (Whitaker, 1998).

The introduction of industrialisation and rural-urban migration amidst resource constraints confronting traditional systems however led to the collapse between the urban migrant and the extended family hence the level of social protection received (Kumado&Gockel, 2003). Individuals therefore resorted to formal social protection programmes. However, according to Triegaardt and Patel (2005), there was very limited coverage of existing formal social protection programmes, taking care of only certain type of workers -coalminers, factory workers among others. Though coverage of Social Security programmes is poor, the African case was very poor with about ninety percent (90%) of the population uncovered (Van Ginneken, 1997). This could be attributed to the fact that most social protection programmes concentrated on formal sectors with well organised workforce because of the ease of administration, but the majority of workers in the region were in the informal sector.

Generally, African social security schemes are characterised by economic features such as high inflation rates, limited productivity, expanding workforce in the informal sector, skewed income distributions and demographic characteristics with reference to uneven population densities, low life expectancies, high birth rates, varying retirement patterns, and governance considering emerging democracies and weak subsystems for public administration (Olivier, 2005).

Research by Barbone and Sanchez (2000) revealed that the social security programme used in African societies is tied to the considerations and preferences of social security provisions of their colonial masters. In British colonies for instance, the main concern was geared towards employment injury and liability placed on employers; also the schemes being generous to workers in the public sector. Just as in British colonies, social security programmes in French colonies of the sub-Saharan Africa also prioritized employment injury schemes, with family and maternity benefits later introduced in the 1950s.

Though it is clear the benefits received by members of social security programmes such as medical care, sickness, maternity, unemployment, family, employment injury, old-age and survivor benefits, there are various challenges hindering the effective operation of such schemes in Africa. One such is the perception of the populace of such programmes as more tax due to deductions from their salaries and/or wage(s) to be used as contributions to fund schemes, and the mistrust of financial institutions due to periodic sector crises. Having such a

perception, members of the population are unwilling to join any formal social security schemes. Also gross dissatisfaction expressed by members of service rendered by the scheme mainly centred on inadequate benefit, delays in payments, inaccurate and outdated information on contributions made and estimated benefits and records of the scheme (Sanchez, 2000; Olivier, 2003). Also, little or no education on their rights, and required details and procedures in making claims. This has left some not claiming their entitled benefits because they are unaware and/or difficulties in accessing them, especially those in the rural communities.

Knowing governance of the schemes is critical to their success in terms of viability and sustainability, it is problematic when governments can control the composition of governing boards, management and investment decisions of funds of the scheme (Barbone & Sanchez, 2000). This intrusion of government raises questions on the independence of the board due to the political interference. Olivier (2003) identified mismanagement as one of the primary reasons for public distrust in social security institutions attributed to the inadequate training and prudent social security principles. This is evident by the inability of the scheme to give reliable information to contributing members such as interest earned, due to incomplete registration processes, double registration and stakeholders of the scheme not representative of those for whom it was established.

## **2.2 Pensions**

Pension according to the Presidential Commission on Pensions (2006:19) is "a generic name of long-term periodical cash benefits that social security systems pay in case of invalidity, in old age and on the death of the breadwinner. Whether the method of affording protection is social insurance, public service or social assistance, the three kinds of pension should be coordinated" (as cited in International Labour Organization [ILO] Conventions, 1970).

A good pension is considered as one that meets two main objectives; to provide consumption security after active service due to retirement, ill health or invalidity, and to sustain their standard of living as prior to retirement (Blake, Cannon & Tonks, 2010).

Pensions play a significant role in the social protection system (poverty alleviation, demographic pressures and family support) of a country which contributes towards its development. Van Dullen (2007) mentioned that one out of five of the world's poorest people, estimated to be over 100 million, who live on less than a dollar a day are over sixty (60) years. He encouraged developing countries in Africa, to use their 'demographic sweet spot', as aging is currently not a major issue on the continent, to address issues of aging populations such as pension, beforehand putting into consideration social pressures from urbanisation, collapse of social protection structures like the extended family, and falling dependency ratios.

In light of research by Van Dullen (2007), that over one in five of the world's poorest living on less than a dollar a day are over sixty and World Bank report (Holzman&Hinz, 2001) that about 85% of the world's population who are over 65 have no retirement, it is clear that pensions play a significant role in poverty alleviation of the elderly, even the broader society as benefits received are shared with members of the household (Stewart &Yermo, 2009). Also sharing the pension better integrates the elderly into families as it proves them as not being a burden. Findings from Help Age International (2006b) show that families who receive pension in South Africa are 11% less likely to become poor, it also reduces the poverty gap ratio by 13%, and increases the income of the poorest by 50%.

Studies show that a properly funded pension scheme reduces the burden on government, this helps it properly appropriate available funds investing them in other areas which are critical to the development process such as education and agriculture (Stewart &Yemo, 2009). In developing countries in Africa where a large fraction of the workforce is in the informal sector, the reform of unsustainable pay-as-you-go (PAYGO) schemes are welcomed as it reduces fiscal burden placed on the population and future generations. Also fiscal imbalances as most schemes in Africa are designed to cover specific workers with high degree of political power, benefit formulas also being more generous to public sectors workers than those in the private sector and non-beneficiaries, mostly those in the informal sector also made to fund schemes through tax paid.

## **2.3 Funding Pensions**

The funding of pension schemes/plan provisions can be classed; unfunded, funded and partial funded benefit plans.

### **2.3.1 Unfunded Pension Scheme**

In an unfunded pension scheme, no funds are set aside to meet claims/benefits, however, benefits to beneficiaries are paid for by the employer or pension sponsor as and when due. This is popularly referred to as pay-as-you-go (PAY GO). Most state pension schemes are unfunded with benefits paid directly from worker's contributions and taxes (Government (UK) Actuary's Dept., 2001). Amidst economic and social pressures, there is always the risk of plan sponsor going bankrupt which leaves beneficiaries with no retirement money. This is usually offset by governments increasing taxes and/or contributions or channelling funds towards pensions in the wake of other sectors critical to development.

Blake (2000) mentioned that unfunded pension schemes are not viable as the dependency ratio increases with increasing unemployment rates. He added that unfunded schemes will be viable only if the pension growth rate was zero -an impossibility as it means pensioners will receive decreasing portions of the plan sponsors resources, or if there was a reduction in retirement period to a significant increase in working life of members -that is, little or no case of retirement before normal retirement age.

### **2.3.2 Fully Funded Plan**

In a fully funded plan, contributions -from employer/plan sponsor and/or plan members, are invested in a fund to meet upcoming claims/benefits. Since there is little or no guarantee that claims will be met due to uncertainty regarding investment returns, periodic valuation of the plans assets and liabilities is done to ensure fund meets its obligations (Haberman, 1990). Aaron (1966) demonstrated the circumstance under which funded schemes become viable and superior to unfunded schemes. This he found to be the case when the real rate of return on assets in a scheme (funded) is far generous compared to the real growth rate in the wage bill.

According to Valdes-Prieto (1997) some benefits of funded schemes are transparency and accountability as members require details on what has been done with their contributions to the fund; also international investments which reduce risks which may exist locally or in the sub-region. It also has the potential of boosting the capital markets as there is an increase in national savings. Blake (2000) added that despite the positives, members are privy to risks such as political risks which may remove tax exemptions associated with most funded schemes.

### **2.3.3 Partially Funded Plan**

In a partially funded plan, though a fund is setup to invest contributions by plan sponsor and/or plan member, benefits are beefed up by plan sponsor - normally the government, to meet what is due beneficiaries from contributions and taxes paid. For example, the first tier of the Ghana Pension scheme is a partially funded pension plan.

### **2.3.4 Prefunding Pension Schemes**

Countries round the world are now prefunding their pensions, a shift towards fully-funded, privately managed pension systems done by establishing public pension reserve funds or developing fully-funded private pension systems to help the government meet its fiscal pressures from ageing populations. According to Stewart and Yermo (2009), prefunding pension plans may facilitate tax smoothing thereby almost keeping contribution rates constant; also allow government to meet its economic objectives. This also can be achieved by using prudent management of public debt and assets in reserve funds and national savings.

Some macroeconomic benefits realised from prefunding pensions are *increased national savings* which not only reduces government expenditure on pensions but also improves the debt position of the government; *international diversification* as investment of the funds can be done in countries that do not face similar economic and demographic shocks thereby raising national wealth and safeguarding the welfare of the populace. It also results in financial *market development* as institutions can from the funds access finances needed for their ventures. Also, make markets become more liquid, efficient and transparent encouraging innovation in the financial markets (Stewart & Yermo, 2009).

## **2.4 Types of Pension Schemes**

Due to differences in factors such as tax policy, social security programs, legislation, regulation and culture there are different approaches used by employees, employers or pension sponsors in addressing the issue of retirement due to old age, ill health or invalidity. Pension schemes can be divided into two main categories: Defined Benefit schemes and Defined Contribution schemes.

### **2.4.1 Defined Benefit Schemes**

These are pension schemes whose benefits are defined by factors independent of investment performance of the scheme. Factors considered include the members period of service or rate of members salary or amount of State social security pension (Key, 1984; Broadbent, Palumbo & Woodman, 2006).

Types of defined benefit pension schemes are described below.

#### **i. Fixed benefit**

This is a pension scheme where the pension to be paid on retirement is known. Another version of this promises a specified amount to be paid the pensioner for each year of service. The pension is however subject to amendment from time to time either before or after retirement. Some public service pensions are of this type.

#### **ii. Average salary**

This pension scheme pays a pension on retirement of an amount the average of total salary earned by a member during his/her period of service. The pension paid is therefore a specified portion of the members total salary earned during period of active service. Due to inflation this scheme has lost popularity as members realise benefits are not adequate compared to their salary prior to retirement. Most employers have resorted to final salary schemes as a result.

#### **iii. Final salary**

This pension scheme is a derivative of the average salary scheme. Pensions are an average of members salary earned however over a shorter period prior to retirement usually one, three or

five years prior. Based on the short period used in pension calculations, pension received are similar to income received immediately before retirement.

Generally, the expected pension is designed to replace a pre-determined percentage of 'final salary' based on a specific tenure of active service typically ranging between 35 to 40 years. The social security programme of Ghana governed by SSNIT uses the final salary Defined Benefit pension scheme taking income a period of three years prior to retirement, referred to as the employees' best years. To qualify, a member should have made contribution of no less than fifteen years (180 months).

#### **iv. Revalued Salary**

This is also a derivative of the average salary where pension paid is calculated based on the average salary over part or the whole of an employee's period active service. However, early salaries based on the period used are 'revalued' for them to be comparable with salary immediately before retirement.

This revaluation may be done on an arbitrary basis as determined by the employer or trustees, an official index of prices or earnings, or pay increases as granted by the employer concerned (Ashidam, 2011).

#### **2.4.2 Defined Contribution Schemes**

This is a pension scheme where the benefit is dependent on the investment performance of the scheme. Individual accounts are set up for members into which contributions - which may be fixed, a percentage of members salary or related to profit, individual performance or the discretion of employee and/employer, are paid and pensions an accumulation of contributions and investment returns (Key, 1984; Broadbent et. al., 2006).

With reference to the nature of investment return, there are three main categories of defined contribution pension schemes.

### **i. Fixed benefits**

Under this arrangement member contributions are invested towards a benefit fixed at the time of payment of the contribution. The amount of contribution and benefit depends usually on the age and sex of the member and the assets non-profit deferred annuities or endowment assurances.

This scheme has lost popularity as members realised that pension received was less than that received from other arrangements.

### **ii. With-profit benefits**

Though similar to the fixed benefit scheme, the differentiating feature of this pension scheme is that the benefit secured by the pensioner at the date of contribution payment is calculated on a conservative basis and "bonuses" added to the benefit periodically to reflect the investment return from the underlying assets.

In insurance terms it is equivalent to the purchase of with-profit deferred annuities or endowment assurances and has the advantage of providing capital security and an investment return loosely related to market rates over the period of investment.

### **iii. Unit-linked**

In this arrangement, each contribution allocates a share (number of purchased units) of the fund- if the fund is unitised, to members. Their account in the fund is therefore a sum total of the individuals fund amount -their account in the fund, and the portion of investment return credited to the individuals account.

The creation of insurance company managed funds, and of unit-linked individual pension policies, and the increased use of investment performance measurement services have helped make this arrangement of defined contribution scheme both practical and popular at the present time (Ashidam, 2011).

## 2.5 Risks of Pension Schemes

Due to difference in pension plan design, legislation, regulation and taxation there are varying risks that employers/plan sponsors and employees face in administering or being members of a plan. Below are risks and risk bearers associated with pension schemes previously outlined.

### 2.5.1 Risks associated with a Defined Benefit Scheme

As previously stated there are varied risks associated with the pension scheme in operation or chosen by an employee or plan sponsor. These risks may be borne by the employers/plan sponsors and/or employees. Employers/plan sponsors bear the risk of providing employees with benefits which replace a specified portion of an employee's earnings prior to retirement.

One such risk borne by employees is the *insolvency risk*, a risk when plan sponsor cannot meet their financial obligations, say they declare bankruptcy. This is mitigated by setting up pension guaranty agencies that provide a portion of benefits promised to retirees in the event of insolvency as done by the U.S Pension Benefit Guaranty Corporation and U.K Pension Protection Fund. The risks are however usually passed to the taxpayers.

Another risk, borne by the employer/plan sponsor is the *investment risk* -comprising of market timing or temporal risk, credit and other risks that come with investments, a risk that the plans assets may fall short of what is needed to meet its obligations. By pooling of risks - of other DB pension plan holders, this financial risk is mitigated or minimised as compared to an individual bearing the risk or an increment in employer contributions. Plan sponsors can also invest in fixed income securities that match the cash flows of their accrued liabilities in an effort to hedge the market risk; also in highly-rated fixed income securities to minimise credit risk (Broadbent et. al., 2006).

Employers/pension sponsors also bear the *longevity risk* as Defined Benefit pension schemes benefits are generally deferred life annuities (Broadbent et. al., 2006). This is the risk that beneficiaries, on average will live longer than expected, hence an increase in duration for the payment of the benefit.

The *inflation risk* is borne by employees, the risk that due to inflation the value of benefits received will not be adequate to meet needs of beneficiary.

Employees bear the *portability or accrual risk* that benefits favour employees in long period of employment with an employer/plan sponsor as benefit payments (nominal) is a product of product earnings and tenure with much of the final benefit accruing in the final years before retirement. Changes at this period (final years) such as plan terminations, employment separation or the payment formula can significantly reduce accrued benefits in relation to that expected. This risk can also result due to long vesting periods where employees may forfeit all of their benefits if the plan terminates or there is separation from employer (Bodie et. al., 1988; Broadbent et. al., 2006).

If the pension plan has the portability feature -which is not common in private sector plans, employee can still access his/her accrued benefit despite changing employers. According to Blake (2000), a typical worker who on the average changes jobs six (6) times during their working career would suffer a loss of 25-30 per cent of their full service benefit they would have received if they stayed with the same employer all through their career.

Accrual risk is however less of an issue in multi-employer plans where pension plans are generally portable across employers in the plan, as observed in the Netherlands (Broadbent et. al., 2006).

In summary, employers bear all the investment risk - market, credit, inflation and other risks associated with asset investments; the employees on the other hand bear inflation risk-post-retirement risk, vesting risk and shortfalls of benefits as compared to expected salary replacement level at retirement. Apart from multi-employer and other portable defined benefit plans, accrual risk is high for employees who change employers during the working career.

## **2.5.2 Risks associated with a Defined Contribution Scheme**

Defined Contribution pension schemes, unlike the Defined Benefit pension schemes do not backload accrued benefits. They are portable across employers or through a members

working career. An employer therefore transfers or moves along with him through his career, the assets accrued from previous employer/plan sponsor. The plan sponsor/employer has no fiscal responsibility but to make periodic payments to the plan as legislated or determined.

The salary replacement risk, the risk that benefit will replace a specified portion of the members' earnings prior to retirement is borne by the employee. He/she may be left to make investment decisions such as which assets to invest in (asset allocation) and contribution amounts to meet retirement goals.

Unlike the case of Defined Benefit schemes, the employee bears the market timing risk -risk that accumulated benefit made up of contributions and investment returns will fall short of what is expected, at the point of retirement. Employees therefore bear the *investment risk*. They may have to bear the effects of such risks given no choice in asset selection and allocation or be provided with limited options that may not fit their investment objectives and constraints. This affects both cash balance of a members account at retirement and the amount of annuity that can be bought (also influenced by prevailing interest rates at retirement). This risk could be mitigated by plan regulation and design which may make provision for more increased employee involvement (Broadbent et. al., 2006).

The employee also bears the *longevity risk*, that the individual will live on average longer than expected. This risk, also considering the investment risk throws much on the shoulders of the employee as he/she risks not only the risk of not buying adequate annuities but that he may outlive the provision. Employers may in that regard face legal/financial risk if the employee retires without sufficient retirement income.

On *portability and job mobility*, since portability is related to the member's pension accrual pattern which also relate to his contribution rate, the risk is just as problematic in a DC as in a DB. The variation lies in the fact that unlike in DC schemes, contribution rates in a DB depend on tenure and age which makes it favourable for employees likely to stay with employer through their working career. This explains why employees- usually the youth, who may change career path or employers, prefer DC to DB pension plans, on the grounds of portability (Bodie et. al., 1988; Blake, 2000). However DC schemes are not portable between scheme administrators nor over funds under the same pension fund administrator or provider.

In summary, the employee bears almost all risks associated with the DC scheme -investment, salary replacement, inflation and longevity except legal/fiduciary risk.

The shift from DB pension plans to DC pension plans also means the transfer of risk from the employer or firm sponsoring the plan to the employee (Scott, Gillian, David, John, Gareth, Viktor, Peter,...& Anthony, 2012). Below is a table of risk bearers under each pension scheme.

**Table 2.1: Risks and Risk bearers of DB and DC Pension Plans**

Type of risk	Defined Benefit	Defined Contribution
Investment	Employer	Participant
Pre-retirement Inflation	Employer /Sponsor	Participant
Post-retirement Inflation	Employee	Participant
Market timing	Employer	Participant
Accrual(portability)	Employee	Plans are portable
Vesting	Employee	Participant
Employer insolvency	Employee/ tax payers	Plans are full-funded
Salary replacement risk	Employer	Participant
Longevity	Employer	participant

Other risks that pension schemes are exposed to are explained below.

### 2.5.3 Political and Regulatory Risk

Daykin (2002), defines political risk as the risk of the government delving into the affairs and operations of pension schemes without considering the health of the scheme and its objectives. Kay (2003) on the other hand defines it to be "the ineffective governance with respect to pension funds or more broadly as any government action (or inaction) that

adversely affect the interest of pension fund account holders". The role of government in pension provision is no news as they intervene in the event of inadequacy of pension funds to meet benefits due beneficiaries or top up difference for individuals who cannot meet minimum contribution -as evidenced in Chile. In just the same way they have proved saviours, they have contributed to the deteriorating state of pension schemes by reducing contribution rates to the scheme at the same benefit level or increasing benefits without revision of contribution rates usually during political campaigns, for example, by ex-presidents Juan Perón and Getúlio Vargas of Argentina and Brazil respectively who promised unrealistic benefits as claims will not be made till decades in the future when they are out of office. In other cases, the seizure of pension funds/assets which may be directly invested towards social or political objectives which do not make economic sense (also promise returns that are way below optimum levels) but makes the government politically favoured (Borzutsky, 2002).

Kay (2003) categorised political risk under risk of expropriation, governance risk, default risk and inflation risk. The risk that government will sequester pension funds from fund administrators is referred to as *expropriation risk*. Such risk was materialised in Argentina when government pressured pension funds to accept debt swaps -with lower returns and also further delayed maturity, as it attempted to address the financial issues of the country (Clarín, 2001). The level of effective supervision and regulation of the pension system is referred to as *governance risk*. This entails ensuring compliance of employers and employees to regulations, for example, the enrolment and payment of contributions of all workers of firms into the first and second tier in the case of the Ghana Pension scheme (Barr, 1987; Messa-Lago, 2002; NPRA, 2012). Also that management and investment guidelines are adhered to and insurance companies or fund administrators who do not abide or perform poorly so that they are not able to meet liabilities are penalised as required. Blake (2000) encouraged that the government in an effort to strengthen pension in the private sector should "minimize compliance costs, and charging structures should be made simple and transparent to enable consumers identify the most competitive providers more easily. Also enable full exploitation of the economies of scale". *Default risk* results when the government is unable to meet its financial obligations, this may be the result of bad leadership or policies that do not protect the interest of fund members and beneficiaries. Kay (2003) adds that this risk could "lower a

country's credibility, elevate country risk levels and result in a loss of access to international capital". Similar to default risk which could result from bad policies effected, changes in inflation rates could aside being a result of external shock, be driven by monetary and fiscal policies, the result of political motives of governments. Barr (1994) argues that countries with underdeveloped capital markets are more likely to face the harshness of this risk. He added that as an uninsurable risk, only the government could help ameliorate the risk, through financial policies or the issuance government-indexed bonds (Barr, 1987; 1992).

The global pension reforms and shift from PAY-GO schemes to Defined Contribution schemes increased arguments that pension funds will be insulated from political interference as its operation will not be subject to decisions of political entities under the assumption that government will be in violation of property rights after the privatisation of pension plans (Pinera, 1999; Acuna& Iglesias, 2001). Beattie and McGillivray (1995) thought otherwise, explaining that government in the event of financial crisis will be impervious to this and have its way regarding the investments and operations of fund administrators. Barr (2002) agrees to this pointing out that all pension schemes depend on effective government and hence face political risk.

#### **2.5.4 Investment Risk**

This is the risk that returns on investments (made up of contributions) will not meet expectations. This risk comprises of the market and credit risk among other risks associated with the investment strategy used. Though this risk is borne by the employer or plan sponsor in DB plans, the grunt of the risk is borne by the employee or plan member in DC plans (Broadbent et. al., 2006).

Bodie et. al. (1988), also the Oxera report (2010) argue that this risk can be mitigated by either investing in safer assets or transferring them, for instance, to say an insurance company. This was evident in the research of Bodie (1980) using commodity futures to hedge against inflation. There is however a trade-off between risk and return, and this also significantly affects funds accumulated. It has been realised despite that investments in equity result in higher returns compared to investments in bonds over the long run as periods of low returns are levelled off with others of higher return. Rulof (2005) suggests that fund administrators ameliorate the risk using a portfolio well divided between bonds and equities;

the highly taxed assets (bonds) in tax shelter of corporate pension plans and the lower taxed assets (equities) in unsheltered accounts. This reduces risk faced by participants due to investments.

As in the case of Nigeria from the BGL Report (2010), restrictions also have the tendency of limiting the potential gain or return on pension funds as its mostly concentrated on risks privy to investment instruments or assets. Pension fund managers should be given the chance to creatively develop an optimum portfolio mix with such diversification that reduces risk and also promises returns to meet future liabilities (Oxera Report, 2010).

### **2.5.5 Longevity Risk**

With increased awareness of healthy eating habits, access to basic healthcare and gargantuan leaps in medicine the life expectancy of persons in many nations has been on the increase. The result, a retiring population almost catching up with the workforce increasing the exposure of pension plan sponsors and/or employees to longevity risk especially those that guarantee benefits over the lifetime of plan members, for instance government sponsored plans such as Social security and insurance companies (Ross & Wills, 2002; Crawford et. al., 2008).

According to Blake (2010) however, in most schemes longevity risk is usually underestimated which exposes the various stakeholders -individuals, company pension funds, annuity providers (insurance companies), government (public pension systems) and investors in longevity-linked products, to the harshness of the risk. On the issue whether longevity of plan members is likely to improve or decline in the future, Blake (2010) referenced Vaupelet. al. (1998), optimists who believe that in the face of recent and future scientific advances there is no evident limit to human life; referencing Olshansky (1990) a pessimist, he believed that there is the likelihood of a decline if no levelling off considering issues such as poor health, global warming and obesity among others.

Reports from the Aon Consulting poll on March 2010 in the UK attribute 21% of risk of DB plans to longevity risk. In light of this, individuals are at risk of outliving their savings or retirement income; plan sponsors, especially government that provide benefits to members till

death risk increasing pension expenditure in the face of other developmental sectors such as education, agriculture, or investment programmes; also annuity providers not having enough reserve to meet future obligations (Blake, 2010). He mentions gender, geographical location (demographics), social class, income/wealth and the cohort's year of birth as the underlying factors of longevity.

On the issue of purchasing annuities for pension provision during retirement, one of the forms in which pension benefits may take aside a lump sum, Blake (2000) reveals that annuitants and annuity providers are exposed to a number of risks. One such is adverse selection, associated with longevity risk, where only individuals with higher life expectancy purchase annuities. Another is mortality trends which if not studied or underestimated by annuity providers could increase their liabilities which cannot be catered for by their assets. There is also the inflation risk which not only reduces the amount of annuities that can be purchased but the value of annuities (pensions) paid, and lastly interest rates.

He further suggested that second pensions be made mandatory to mitigate risk of adverse selection, also that governments make available survivor bonds to aid insurance companies hedge against mortality trends (Blake & Orszag, 1998; Blake, Burrows & Orszag, 1999).

## **2.6 Global Trend in shifting from DB to DC Pension Schemes**

According to the Oxera report (2010), in the face of risks under DB schemes such as wage path risk where pension benefits of beneficiaries are related to their earnings just about retirement period unlike in DC where benefits are dependent on accumulated contributions throughout the members career and its investment returns; also the back loading feature of DB schemes tied to the members years of service so that one may forfeit some benefits accrued should there be a change in his career path; and the risks of underfunding and insolvency where plan sponsor is unable to make payments promised. Also, risks under DC schemes, such as the investment risk which is borne by the employer or plan sponsor in a DB, and longevity risk if benefits will meet member's needs in the event that he lives longer than expected. Also considering the benefits such as plan sponsor bearing investment and longevity risk in case of DB; flexibility and control to adjust contributions and investment strategy in line with their pension needs and preferences as members have individual retirement accounts and portability in the event of changes in career path in the case of DC

schemes. From these economic factors, one scheme does not dominate another, however one preferred to another considering certain factors (Blake, 2000).

According to Yang (2004) despite the promise of a guaranteed retirement benefit for the period of service depending on final salary of employee with risks due to longevity and investment among others borne by employers, there has been a global shift of pension provisions from DB to DC. This he attributed to the rising expenses of DB pension schemes; also its benefits to employees - such as portability among others which encourages employee job mobility, and employers who see it in their interest to transfer risk to employees. The Oxera report (2010) opined the shift to be the result of changes in countrywide legal and regulatory frameworks to encourage individuals being concerned of their life after active service. Ostaszewski (2001) referenced the work of Bharmal, Holmes and McCaw who mentioned the risk averse employer theory, the excessive regulation theory and new economy theory as reasons for the shift to DC plans.

Rulof (2005) argued that plan sponsors shift from DB plans to DC plans to reduce investment and longevity risk actually increases the risk as it has only shifted to employees who are less capable of managing them. Also, should the value of assets fall, employee motivation to work is also affected which spirals to the employer; staff members due retirement will also be unwilling to leave their post as proceeds from the retirement account may not meet retirement needs increasing payroll costs. In times of good economic conditions when employers may want to increase their workforce, employees may retire before their normal retirement age as their account is sufficient to meet retirement needs, this means plan sponsor not only has to hire new staff to meet increasing market demand but also replace retiring staff. Lastly, society may have to come to the aid of members who made wrong investment decisions or saved inadequately towards retirement, this usually comes in the form of tax increments.

The research of Yang (2004) sought to explain factors that informed the decision of employees to opt for either a DB or DC when given the choice to shift from a DB to a DC plan. He realised that demographic and economic factors informed the decision. His findings further revealed that workers with little working years ahead, with lower DC benefits and those who have ever participated in a DC scheme were likely to choose DC schemes. The

shocking finding of the research was of young employees who defaulted to the DB plan though they could potentially receive higher benefits under a DC scheme. Others members defaulted to the DB plan because they could not make a decision on the scheme to be enrolled onto before a stipulated time, these were found to be similar to those who switched to DC schemes when the opportunity came -more similar than those who consciously chose DB scheme.

Bodie et. al. (1988) explored the trade-off from employee's perspective in choosing either a DB or DC plan considering the role of inflation, funding and regulatory bodies to benefits. With an initial hypothesis that DC will dominate DB due to the flexibility in DC plan design, this proved untrue. However, one plan may only dominate another under certain circumstances. Using a three-period model to explore the influence of wage and interest uncertainty on DB and DC plans, he realised that DB plans do not exhibit dominance over DC plans.

### **2.6.1 Occupational Pension Scheme**

Researchers have argued that Occupational pension schemes were introduced to improve employer-employee bond as the success of a company depended on this bond built on trust, loyalty and company-specific knowledge. Others opined that employers provided pension schemes to employees to be competitive in the labour market; attract new recruits and also retain them; to encourage old staff to go on retirement; to treat members equitably; also for its tax efficiency. The scheme, traditionally DB schemes, which promised benefits to workers, strengthened the bond, and motivated workers to plunge the company to significant heights. (Key, 1984; Hannah, 1986; Ghilarducci, 1992; Armstrong & Murlis, 1994; CBI, 1994).

Advancement and changes in technology, also changes in factors such as firm-specific skills, a mobile workforce in terms of career path have resulted in the gradual shift away from DB schemes (Aaronson & Coronado, 2005; Oxera Report, 2008). Cooper (1999) mentions the shift to be the result of extensive regulation of plan sponsors/employers in DB plans due to expectations -meeting a defined benefit or income replacement; also obligation of employers to put up the difference to meet liabilities should the assets of the scheme not be sufficient. As referenced by Aaronson and Coronado (2005) and Neuberger (2005), the Employee

Retirement Income Security Act in the USA, and Pension Protection Fund in the UK have increased administrative and compliance cost in the provision of DB scheme, which is non-evident in DC schemes as employers liability is only in paying contributions.

Rulof (2005) opined this shift as an effort for plan sponsors to reduce investment and longevity risk. Findings of the Pensions Regulator (2006a) of the UK confirm this from estimates suggesting a 3-4% increase in scheme liabilities from an additional year lived beyond life expected by plan sponsor. He added that against their motive, the risk was instead increased as employee output is affected in the event of poor economic conditions; or retires earlier than the normal retirement age should good economic conditions prevail and retirement account be sufficient to meet retirement needs. Another was that employees/plan members are less capable of managing the risk they are exposed to by virtue of the shift; even if capable, they may not be given the chance to decide assets into which their contributions will be invested.

Also, research which suggests employees are mobile -changing employers in their career path, have also contributed to the shift from DB plans (Owyang, 2004). This coupled with the shift from employee-specific skill to 'transferable skills' has reduced provision of DB plans towards DC schemes where employees also benefit from the portability feature (Aaronson & Coronado, 2005; Oxera Report, 2008).

Cooper (1999) referencing Davies and Ward (1992) and Cooper (1997), added that despite the notion that DC plans seem suitable to employees likely to change employers along their career path, they are under the most risk under the DC plans. Reason being that, though DC plans may promise better returns for contributions, there is the likelihood of a slump -a risk borne by the plan sponsor under DB plans. Also, benefits such as death, ill health and survivor benefits which one is entitled to usually come at an extra cost -increase in contribution rates in DC plans compared to DB plans. The level of security sought usually 25 percent of pensionable salary may still not be achieved considering investment performance, interest rates and inflation (GAD, 1996).

Insurance companies invest assets - made up of contributions and returns on investments, towards claims from plan members during retirement. Inconsistent contributions from members, usually due to spasms of unemployment or lay-offs, affects the investment strategy of scheme providers, also increases their administrative work and cost. An increment in contribution rates may be thus required to offset periods of non-payment and administrative expenses (Cooper, 1999).

McCarthy (2003) using a life-cycle model to determine which plan a risk averse individual would prefer realised younger people preferred DC plans as they are potential material at that phase of their career life and unsure of their wage and career path. However, over time this uncertainty falls and DB plans become attractive promising benefits such as the death benefit to their dependents among others. Research by Cocco and Lopes (2004) in the UK also showed that individuals likely to realise higher income growth preferred DB final salary plans to DC; and those whose earnings are uncertain prefer DC to DB plans. Findings of the research of Schragger (2006), who compared the two plans considering job change patterns and earning history of individuals showed DC as being the better promising higher retirement wealth accumulation due to increase in wage variance and separation rates. Similar research carried out by Poterba, Ruth and Wise (2006) on retirement wealth accumulated under the two plans showed DC plans dominated private DB plans, however inconclusive on public schemes as contributions are more generous. They however concluded saying should historical patterns of equity returns prevail, DC plans will provide better outcome than public sector DB plans.

## **2.7 Pension Reform in the World and Ghana**

Globally, there has been reforms of existing pension schemes by pension managers to improve asset allocation criteria -investment strategies, and to meet obligations to contributors/plan members, partly due to the economic recession, also increased liabilities while asset returns dwindle. Others mention the reform to be due to the trend in demography, increased dependency ratios, cost and inadequacies of government-run pension scheme, governance issues and response to international policies, declining benefits of defined benefit scheme, worker mobility where employees frequently change jobs, increased

awareness of longevity risk, regulation and accounting reforms to manage financial risks associated with DB plans (BGL Pension Report, 2010; John et al., 2006).

According to the BGL Pension report (2010), in 2008 while the equity market crashed in developed countries, in emerging countries, due to restrictions set by regulatory bodies invested largely in government bonds realised some growth in their asset value. In light of this among other factors such as increased life expectancy and reduced fertility which makes PAY-GO schemes unsustainable, pension managers see the need to fund the schemes in operation hence reforms which contributed to the decline of Defined Benefit pension scheme and increased popularity of the Defined Contribution scheme. The reform towards funded pension plan is believed to promote national savings and capital market development. This according to the BGL report also results in growth in pension assets as happened between 2001 and 2007 before the financial meltdown in 2008 (Oosthuizen, 2013; Stewart & Yermo, 2009).

Also, close monitoring of funding requirements and compliance to guidelines of pension regulators, observing the risk management framework, operation and investment strategies (asset allocation especially exposure to equities) to better mitigate risks thereby protecting benefits due beneficiaries - as evident in Nigeria. Asset allocation restrictions by regulators have been spoken against with calls for flexibility and fund managers encouraged to be creative and innovative in developing an optimum portfolio mix (BGL, 2010).

On the issue of asset allocation, in light of the global meltdown, investment in equities by fund managers in the UK fell from 67% in 2003 to 56% in 2008, it remained stable in the US, Australia and the Netherlands, but there was an increase in Japan from 44% to 51%. Pension fund managers in Japan and the US also reduced allocations to bonds from 45% to 32% and 34% to 30% respectively.

According to Oosthuizen (2013), pension reforms could be minor changes to existing schemes primarily to correct its anomalies and delay fiscal problems or major changes that may change a country's overall retirement system. Pension reforms refer to reformers making policy choices such as either the public or private sector; for a publicly managed scheme or a

privately managed one; a compulsory contributory scheme or voluntary one; a funded or unfunded scheme; a pension or provident fund; a Defined Benefit pension plan or a Defined Contribution plan; a single-pillar or multi-pillar pension scheme.

Traditionally, a basic multi-pillar pension system with 3 pillars has its first (1<sup>st</sup>) pillar aimed at poverty alleviation, publicly managed and may be either unfunded or partially funded; the second (2<sup>nd</sup>) pillar is mandatory funded scheme which may be privately or publicly managed operating as either a DB or a DC pension scheme towards employee consumption smoothing; the third (3<sup>rd</sup>) is a funded voluntary pension scheme setup to accommodate for individual preferences which according to regulations may provide tax benefits. They are privately managed and may operate as either DB or DC pension schemes (Oosthuizen, 2013). The reformed Ghanaian pension scheme is similar in structure with three tiers; a universal publicly managed defined benefit schemes as the first tier, a mandatory funded DC occupational pension scheme that is privately managed, and the third a voluntary DC pension scheme that is privately managed with tax benefits (NPRA, 2010).

In Africa, there have been pension reforms considering the fiscal pressures of civil service pensions, and to find solutions to issues associated with existing schemes. Also, under five percent of the population are covered under the systems- majority being civil servants; and the workers of the informal sector who form majority of the working population are not covered. As the structure and challenges of pensions systems in Africa differ per the country, so do the reforms (Stewart & Yermo, 2009).

### **2.7.1 Pension Reform in Nigeria**

Prior to the reform in Nigeria was a Defined Benefit Scheme introduced by the Pension Ordinance of 1951 to provide pension and gratuity to employees of the public sector which took effect on January 1, 1946. To address pension needs of the private sector, the National Provident Fund was established in 1961 using contributions from employees and employers to provide lump sum benefits to employees. This was later taken over by the Nigeria Social Insurance Trust Fund (NSTIF) established by the Decree No. 73 of 1993, and required all private sector employers and employees to enrol as members of the scheme as soon as they started operation. The National Provident Fund was however preceded by schemes which

took care of needs of workers of the Nigerian Breweries Limited and United African Company. As these were unfunded or PAYG schemes, there were arrears in pensions and gratuities to be paid -estimated to be about one trillion Naira.

To address these issues amongst others, there was the need for a reform - Pension Reform Act 2004, which introduced a new scheme that was regulated and mandatory for employees of the Federal Government, Federal Capital Territory (FCT) and private sector organisations with at least five employees. Upon adoption of the scheme by state governments, state government employees could also be enrolled into the scheme. The Pensions Reform Act 2004 introduced a contributory, fully funded scheme which opens individual accounts for each employee through their working life, staying the same across different employers. The new scheme was set up to ensure all employees receive their benefits when due; encourage individuals to save towards their retirement; establish a uniform set of rules, regulations, and standard for administration and payments of benefits of all under the scheme, also prevent the growth of pension liabilities.

Under the scheme, employees of both the private and public sectors are to contribute a minimum of 7.5% of their basic salary and allowance (deducted immediately after salary payment), also employers to contribute 7.5% of the employee salary except for military personnel who contribute 2.5% with 12.5% contribution from the Federal government. Employers could also contribute the entire 15% on behalf of employees. They are to deduct and remit contributions from employees to the Pension Fund Custodian within seven days of salary payment and the custodians notify the Pension Fund Administrators -licensed private managers of the funds- within 24 hours of receipt of contributions.

The Pension Fund Administrators open accounts for employees containing contributions which they invest (as per the regulatory guidelines) and manage, also provide regular updates on account transactions and investment strategies, and pay benefits to beneficiaries as defined by the Act. Withdrawals can be effected from the account at age 50 or upon retirement taking the form of monthly or quarterly withdrawals; purchase annuity for life from a licensed life insurance company for monthly or quarterly payments; lump sum from balance to the credit of employees account.

The reform is expected to resolve anomalies of the pre-existing pension scheme and improve the standard of living of workers during retirement; also increase national savings which mean investments towards better infrastructure development and a boost of the economy, increasing capital market activities such as the stock market.

Challenges to pension fund managers regarding the Nigeria Pension Scheme are unreliable statistical data - reports mentioning that a larger portion of the working society is in the formal sector whose truth has been questioned. As in most African countries, a majority of the working population is in the informal sector and operators encouraged to get them subscribed to the scheme. Challenges to this are the irregular contribution payments that will be made, also plan members believe they are better equipped to manage their funds. Another is the non-compliance of firms to guidelines set by pension regulation authority such as joining the scheme hence enrolling their staff. This remains despite public education and persuasion on moral grounds; threats on legal grounds may be needful as in the case of Occupational Pension scheme (Tier 2) of the Ghana Pension Scheme (NPRA, 2010; BGL Pension Report, 2010).

Also, the lack of assets into which investments can be made considering restrictions set by regulators. This coupled with further restrictions on asset allocation of fund managers portfolio may result in sub-optimal portfolio mix and their competitiveness. Lastly is the adherence to good governance principles and effective operation of the regulatory body on principles of accountability and transparency with no interference from government (Uche&Uche, 2002; BGL Pension Report, 2010; Oosthuizen, 2013).

### **2.7.2 Pension Reform in Kenya**

The reform of pension schemes in Kenyan was effected to ensure the provision of pension benefits to beneficiaries when due; also encourage national savings which could also improve the financial and capital markets; also ensure proper supervision and regulation of pension fund administrators using frameworks that protect the benefits of contributors and beneficiaries (Odundo, 2004).

The Kenyan Retirement Benefit industry is made up of a number of schemes; the civil service scheme, the National Social Security Fund (NSSF), the occupational scheme and other individual pension schemes offered by insurance companies which cover about 15% of the workforce, usually employees of firms without pension plans and the self-employed. All but the civil service scheme are subject to regulation of the Retirement Benefit Authority and funded.

Covering all members of the civil service, the civil service Pension scheme, a PAY-GO system was established under an Act of Parliament. Currently an unfunded scheme, steps are being taken to make it contributory.

The NSSF, established under an Act of Parliament, is a funded public provident scheme into which employers with at least five employees must register, also covering the self-employed and workers in the informal sector (since 2004). Under the scheme, members contribute a minimum of 5% of their earnings monthly, however not exceeding KShs.200 (US\$ 2.80) for workers who earn about KShs.4000 (US\$ 56.00). Employers are also obligated to contribute 5% of their monthly earnings not exceeding a maximum of KShs.400 (US\$ 5.60). For contribution purposes, self-employed members of the scheme also contribute 5% of their monthly earnings but not subject to their maximum or minimum earning limits as is for the employed. It also promises old age benefits at age 55 for those retired from insured employment and at age 50 for those from uninsured employment

An occupational pension scheme, one of the schemes of the Retirement Benefit industry, is a voluntary scheme administered through pension funds or provided funds using either DC or DB plans. For covered employees, membership is compulsory. However, employees who join an employer five years short of the retirement age are not eligible for membership if a DB plan is being operated (Odundo, 2004; Stewart & Yermo, 2009; BGL Pension Report, 2010).

### **2.7.3 Pension Reform in Ghana**

In the Ghanaian context, there are two major pension schemes, the Social Security and National Insurance Trust (SSNIT) which covers workers from all sectors and the phasing-out

CAP 30 program which covers the military, police and some civil servants. However, both schemes cover less than ten percent of the labour force of the country. Also in operation are about eight other minor schemes, for example the Ghana Universities Staff Superannuation Scheme (GUSSS), the CRIG Pension Scheme and the Ghana Armed Forces Pension scheme (Kawor, 2008; Stewart & Yermo, 2009; Ashidam, 2011).

The CAP 30 Pension Scheme established in 1950 covers some members of the public service, civil servants and police force. Operating under a DB arrangement, the scheme started out as a non-contributory plan, it however became contributory after January 1st of 1972 where some members were required to contribute 5% of their monthly earnings complemented with 12.5% of member's pre-tax salary by the government. Members of the security and intelligence agencies including the immigration and prison services, the police, fire, and judicial and legal services are exempted from making contributions to the plan. Promising benefits such as lump sum gratuity, monthly pensions, survivors benefit and invalidity benefits, it is financed as a PAYG scheme using budgetary allocations from the consolidated fund (National Pensions Act, 2010; Ashidam, 2011).

The GUSSS is a partially funded scheme that covers senior members and junior members (enrolled on to the scheme as at 1st January, 1976), research fellows, University administrative staff, library and professional staff, and teachers with status comparable to a university. To provide benefits such as cash lump sum, monthly pensions, and survivor gratuity on death of pensioner, members are required to make a monthly contribution of 10% of their monthly earnings complemented with 12.5% of the earnings from the government. Unlike the other schemes, the GUSSS management team have complete autonomy on where to invest and the investment policy. Similar to the CAP 30 scheme, there is budgetary allocation to support payment of pension to beneficiaries (Ashidam, 2011).

The CRIG Pension Scheme covers the Research and Senior Administrative Staff of the Cocoa Research Institute of Ghana (CRIG). Established in 1979, the scheme no longer enrolls new members, present members are those who were part of the scheme since April 1984. The scheme is funded with contributions from employee earnings (10% of monthly earnings) and

12.5% from employers -the Cocoa Marketing Board, with budgetary allocations to meet benefits in case of shortfalls (Dei, 2001; Ashidam, 2011).

The Ghana Armed Forces Pension Scheme, operating under the Armed Forces Regulations Vol. III Art. 206, is based on the CAP 30 model. It is a non-contributory Defined Benefit scheme which requires members to have worked a minimum of 10 years commissioned for some ranks and 15 years for other ranks. The scheme pays family pensions to members who die during active service or during retirement; also civilians who form part of the armed forces are either enrolled in the CAP 30 pension scheme or the SSNIT scheme where they are required to make contributions -5% of their monthly salary with 13.5% from the government, towards their retirement. Officers appointed as judges are privy to retirement benefits given to judges of the court of appeal (Ashidam, 2011).

The Social Security National Insurance Trust (SSNIT) Pension Scheme is a mandatory partially funded contributory social insurance scheme which operates under a Defined Benefit arrangement. Established in 1972 under the NRCD 127 after the repeal of the Social Security Act 279 in 1965 to administer a social security fund for the country, it was formerly operated by the Department of Pensions and the State Insurance Company (SIC). It was later transformed under the PNDC Law 247 in 1991 from a provident fund to a DB scheme - the largest in the country. By law, private sector employers and employees are to join the scheme. They are however not obligated to finance deficits of the scheme in pension provision. SSNIT is responsible for collecting contribution from both employers and employees, also keep records of contributors, manage funds of the scheme and pay claims/benefits to beneficiaries. The scheme promises benefits such as the superannuation/old age benefit for which employees should have worked at least 180 months and be aged 60 if retirement is compulsory or aged 55 should the employee wish to retire voluntarily; invalidity pension for members rendered invalid after a minimum contribution period of 12 months within the last 36 months before occurrence of invalidity also certification of invalidity from a medical board, and the survivor and lump sum benefits (Ashidam, 2011).

Due to challenges in the existing scheme, such as "inadequate investment returns, low coverage, high administrative cost and low efficiency, and substantial slip in the real value of pensions", a Presidential committee was set up in July 2004 to examine and recommend

measures for a sustainable pension scheme (Stewart & Yermo, 2009). The final report of the committee which was presented in July, 2006 to the government made a number of recommendations some of which are, the setting up of a new contributory pension scheme, establishment of a regulatory authority to administrate pension schemes in the country also provide the legal framework and structure for their operation; the restructure of SSNIT considering complaints of the inadequacy its promised benefits compared to that under CAP 30, bad record keeping; and lastly, the coverage of the informal sector which accounts for about 85% of the workforce. In the course of implementing the recommendations of the committee, which required a new Pension Reform bill be written the National Pensions Act, 2008 (Act 766) was enacted (NPRA, 2012).

Findings from the committee revealed that upon retirement, the needs of retirees increase as a result of traditional demands and responsibilities such as family leadership; and funds needed to acquire properties such as houses or vehicles which should have been obtained during an individual's period of active service. In the light of these social factors, the committee concluded that the present scheme could not meet its objectives hence the need for the reform of the country's pension system. This resulted in the introduction of the three tier pension structure made up of two mandatory tiers and a voluntary one (Stewart & Yermo, 2009; NPRA, 2012).

Tier 1: This is a Defined Benefit scheme managed by SSNIT. It is a mandatory Basic National Security scheme which provides benefits from contributions of employees and employers. As required by law, both public and private sector employers are to enrol their employees into the scheme. Contributions to this tier are defined by law and increments of contribution also done through legislation.

A tripartite board consisting of 13 members with representation from workers, employers and the government are responsible for the policy formulation and direction of the SSNIT scheme under this tier. Of the 13 members, four representatives are elected from organised labour, four directly elected by the government which includes the Chairman and Director of the Trust. Two other members are indirectly elected by the government from the Security services and Finance Ministry, a representative from the Pensioners Association and two

from the Ghana Employers Association. The new membership structure is an improvement from the pre-reform structure with greater influence of government in board constitution; the President of Ghana however still appoints the Chairman and Director of the scheme.

Tier 2: This is a mandatory fully-funded Occupational pension scheme handled by privately managed by trustees approved by the National Pensions Authority. Operating under a Defined Contribution arrangement, it pays out a percentage of the accounts accumulated funds as a lump-sum benefit with option for the contributor to purchase additional annuities to enhance monthly pension benefits. An added benefit is tax exemption on investment income and pension. As a mandatory occupational pension scheme, employees in Tier 1 are automatically enrolled into Tier 2 of the Ghana Pension Scheme.

Tier 3: This is voluntary fully funded pension scheme with some tax incentives to encourage savings. It also makes provision for pension benefits of workers in the informal sector. Similar to the scheme under Tier 2, it is managed by licensed and selected pension fund managers (PFM) approved by the National Pensions Regulatory Authority. As earlier mentioned, Tier 3 promises tax relief up to a maximum limit of 16.5 per centum of contributor's monthly income above required minimum contribution rate of 18.5 per centum. To fund the scheme, members are to make a minimum contribution of 5.5 per centum of their monthly earnings with employers contributing 13 per centum of the employee's monthly salary. Out of the total contributions made, 13.5 per cent is transferred towards the national Social Security scheme under the administration of SSNIT of which 2.5 per centum is transferred to the National Health Insurance Fund; and 5 per centum to the Occupational pension scheme. Additional contributions made are transferred to the Personal pension scheme that is privately managed by approved trustees of the Regulations Authority. The total contribution shall be transferred to the Occupational pension scheme for employees who do not qualify for the social security scheme (NPRA, 2012).

From contributions made to the pension scheme, members are promised superannuation benefits after contributing for a minimum of 15 years and having attained the retirement age 60 or a voluntary retirement age of fifty-five years; survivor's lump sum benefits paid to

deceased or beneficiaries nominated by contributor; invalidity and hazardous employment benefit for employees of hazardous industry such as underground miners and steel works.

Some benefits associated with the pension reform considering findings are improved lump sum payments, future benefits for mortgage considering most Ghanaians obtained properties such as a house upon retirement, and also workers of the informal sector are covered as they can make payments towards the social security scheme or into the third tier. Also the improved qualification age of contributors from 20 years to 15 means members potentially have a promising retirement benefit after active service. This could be a step in the right direction as Blake (2000) demonstrated that an individual can amass a decent pension with an almost insignificant contribution rate should he enrol into the scheme at an early age and consistently paying contributions over a long period. In his study, a 25 year old male with a contribution rate of 11% of earnings can expect about two-thirds of his final salary. On the socio-economic front, the reform will improve living standards - especially for the elderly/retired, increase national savings, also improve the capital market (growth of the local stock market) leading to growth and development in other sectors as government pension expenditure is reduced. Also enhances the real estate markets as fund administrators invest in real estate (Stewart & Yermo, 2009; NPRA, 2012).

The Ghanaian Pension system is regulated by the NPRA, a corporate body established under the 2008 Pension Reform. The Authority established in 2011 consisting of 11 members appointed by the President of Ghana, oversees pension provision in Ghana. Since establishment, between November 2012 and the present, the pension market has attracted 15 registered corporate trustees, 15 registered pension fund custodians and 36 registered PFMs. These stakeholders manage 165 pension schemes of which 104 are fully registered. Of the 165 pension scheme, 92 are occupational DC pension schemes, 64 are provident fund pension schemes, 6 are group personal pension schemes and 3 are personal pension schemes.

Despite the major changes brought about by the 2008 pension reform to improve pension provision in the country, there are some challenges to the success of the reform. Some challenges to the scheme are that individuals believe that they are better equipped and should be given the freedom of investing in assets of their choice, also the shrinking of the labour market, market volatility which can drastically affect pension provision or its adequacy

considering investment risk. Others see deductions from their monthly salary to serve as contributions towards the pension schemes as extra taxes reducing their monthly consumption.

There is also the problem of governance and operation of the regulatory authority in transparency and accountability without political interference. Both historically and currently, the board of the SSNIT pension scheme and NPRA are composed of members appointed by the President of Ghana and changes in government result in changes in their management structure. This implies that the boards of these institutions are not independent of the government as should be the case, and may mean decisions, policies or directives of the body may be influenced by government for political or ideological reasons and not for necessarily the provision of adequate and sustainable pensions as described by Daykin (2002) and Kay (2003).

Another challenge is the enrolment of workers into the scheme as required by law. Periodical news sheets published by SSNIT reveal defaulting employers who do not make contributions to the scheme as required by law, also employers who do not enrol their staff to the scheme. For instance, the SSNIT Annual Report (2011) mentioned that about 6.6 per centum of the fund's net assets are unpaid. Upon this basis, there seems to be the need for further reform to strengthen the legal capacity and enforcement machinery of the NPRA and Board to ensure employers comply with provisions of the 2008 Pension Act.

Rappaport (1998) adds that where DB plans promise high minimum benefits, individuals are not motivated to save personally. In the Ghanaian case, with contributions made to Tier 1 and Tier 2 under DB and DC pension arrangements respectively, most are not motivated to contribute towards the third tier.

Another challenge faced by SSNIT is the increase in benefits without an associated increase in contribution - or better stated as increase in allocation to the scheme, which may actuarially render the scheme unsustainable. Another was ensuring equity, that is, providing benefits of the old scheme (PNDC Law 247) to those exempted from the new scheme (Act 766) as members of that scheme enjoyed superior benefits (SSNIT Annual Report, 2011).

#### 2.7.4 Other Relevant Literature

Blake et. al. (2001) paint a gloomy picture of a DC plan member beginning with charges and costs by the scheme provider for marketing, administration among others, the risk of inadequate contributions which could be attributed to unemployment, ill health, and investment. Upon retirement, he also endures the harshness of interest rate risk as he buys annuities, also inflation risk during retirement which may significantly reduce the value of pensions not to mention longevity risk. Insurance companies are not exempt from this as they bear re-investment risk should their assets not meet liabilities, also longevity risk should there be an unexpected increase in life expectancy. Their research sought to determine if and to what degree a DC plan could promise benefits as that received under a DB plan using the value-at-risk. Using different asset-return models to obtain the optimum asset-allocation strategy at which a DC pension scheme replicates a benchmarked DB arrangement, they realised parameter uncertainty was a major issue to be resolved than the model risk.

On the issue of asset allocation strategy to be used, they realised high investments in equities promise better results over the long term than one invested in bonds. There is therefore the need for the increase in contribution rates for a strategy with heavy investments in Bonds to be at par with one in Equities. Lastly, they encouraged a constant investment in an asset over the long term and not a lifestyle strategy where there's high investment allocation in equities during early years and high in bonds towards retirement.

As mentioned by Blake et. al. (2001), unlike other industries where you can evaluate almost immediately whether a product meets its intended purpose, that is not the case for pensions as beneficiaries are not due their benefits till years later (mostly after about 20-30 years into the future). Though research has been carried out on the better pension plan - that is the DB or DC pension plan, the Ghanaian case is different as pension provision is dependent on all two arrangements. With literature arguably non-existent and no research carried out in the Ghanaian case on whether a DB, DC or a hybrid scheme, as is presently will better promise beneficiaries higher retirement income, this research will answer that gap.

## 2.8 Chapter Summary

Pensions which are cash benefits paid to members of a pension scheme according to Blake et al. (2010) have two main objectives; to provide security after active service and to sustain the individuals standard of living as prior to retirement. Pension scheme plans which ensure provision of these benefits can be categorised as DB or DC plans. DB plans promise benefits independent of investment performance of the scheme whereas benefits received under a DC plan are dependent on the schemes investment performance. It was realised that differences in plan design, legislation, regulation and taxation meant different risks associated with the pension schemes and risk bearers. There are pre-retirement risks such as the insolvency, market timing, accrual, investment, political and regulatory risk, and post retirement risks such as inflation risk and interest rate which affect annuities purchased by a pension scheme plan member. Unlike the case under a DB plan, most of the risk is borne by the plan member under a DC arrangement who is mostly unequipped to manage the risks.

Research showed that one plan does not dominate the other, however may be preferred under a particular risk. The youth regarded as potential material and unsure of their wage and career path preferred DC plans to DB, they however tend to favour DB plans as uncertainty falls and due to the benefits associated with the scheme. Also, plan members could mitigate investment risk by using a portfolio that was well divided between bonds and assets to mitigate investment risk. Research on other risks associated with pension schemes and strategies to mitigate them were also discussed.

Studies also showed that due to increased liabilities of firms, dependency ratios, worker mobility, awareness of longevity risk, regulation and accounting reforms to manage financial risks among other factors, there has been a global reform of pension schemes not only towards funded schemes but also from DB to DC plans. The Ghanaian pension scheme has also undergone such reform introducing a new Pension scheme, a combination of the DB and DC plans under a three-tier structure governed by the NPRA. There are however challenges hindering the effective operation of the scheme such as non-compliance of employers in payment and enrolment of their staff, also the potential of political interference as some members of the NPRA are appointed by government.

## CHAPTER THREE

### METHODOLOGY

#### 3.0 Introduction

This chapter provides a description of the various methods and procedures that were used in addressing the main objectives of the study: demonstrating and evaluating if the new Ghanaian pension scheme after the reform better addresses the needs of the Ghanaian retiree. It includes information on the data collected, the asset model, variables used and analysis tools used for the main thesis.

At this section, using a simple and practical-to-implement methodology the researcher evaluates the current pension scheme as compared to the scheme prior to the reform of the pension bill. Recalling the risk a plan member is exposed to under a DC arrangement, the researcher evaluates the current Ghanaian pension scheme - with tiers under both DB and DC arrangements, as compared to benefits of a scheme solely under a DB arrangement as was the case prior to the reform. In particular, we aim to demonstrate and evaluate how best the current pension plan replicates the pension benefits under a DB arrangement -the scheme prior to the pension reform (a pension relative to final salary) with a specified degree of probability, and in so doing quantify the degree of pension risk - the potential difference between the DC pension and a target final-salary pension, inherent in a DC plan.

#### 3.1 Ghana Pension Scheme

Prior to the reform of the Ghana Pension Scheme, the Ghanaian Pension scheme was managed by SSNIT who operated a Defined Benefit scheme with a total contribution of 17.5% of employee's basic earnings (5% of contributions paid by employee and 12.5% by employer). Under this arrangement, a retiree was promised pension income of about two-thirds of the average annual salary for the best three years of the member's working life.

This benefit believed to be inadequate in the light of the fact that the needs of Ghanaians increased during retirement, hence their expenses; also pension benefits received in comparison to benefits received under the CAP30 arrangement, a committee was set up to

investigate and make recommendations on a pension scheme promising benefits that meet retirement needs and maintain standard of living of the retired as that prior to retirement.

The National Pensions Act, established following the investigations and reform of the former pension scheme introduced a three-tier Pension scheme with a total contribution of 18.5% of employee basic earnings (5.5% of contributions paid by employee and 13% by employer). The arrangements under the new pension scheme are:

Tier 1: This is a mandatory social security scheme managed by SSNIT under a Defined Benefit plan. Of the 18.5 per centum of employee salary contributed to the scheme, 11% is remitted to this tier and SSNIT remits 2.5% of member contributions to the National Health Insurance Agency for members Health Insurance.

The minimum pension benefit according to the NPRA from this tier for a member who contributes to the scheme (for the minimum contribution period of fifteen years) will be fifty per centum of the average annual salary for the best three years of member's working life. The pension payable however will be subject to a one and half percent increase for every additional twelve months for member's who work and contribute beyond the minimum contribution period up to a maximum of eighty per centum.

Tier 2: This is a mandatory fully-funded occupational pension scheme handled by privately managed by trustees approved by the National Pensions Regulatory Authority (NPRA). Operating under a Defined Contribution arrangement, 5% of plan member's contribution to the scheme is remitted to this tier.

Tier 3: This is a voluntary fully funded pension scheme also managed by trustees approved by the NPRA. Extra contributions are made to this tier, this could be privately set-up by the employee or done by the employer as provident fund. The self-employed populace are also encouraged to remit towards their pension to this tier of the Pension scheme.

Benefits under the second and third tiers are made up of investment returns and contributions paid to scheme minus administrative charges. There are also tax incentives privy to members who contribute to the tier.

### 3.2 Outline of Methodology

First, a stochastic asset model is developed, consisting of four economic variables: Equities, Bonds, Interest rates and Inflation rates. Bonds and Equities serve as assets into which contributions of plan members are invested, interest rates used to calculate annuities to determine pension from DC component of the scheme and inflation as it helps determine the value of money after retirement. The model captures the distribution and correlations of path of economic risk drivers in an integrated environment with parameters estimated from historical data. This enables the researcher make projections into the future, also measure risk faced by plan member.

This involves not only modelling the distribution of the variables to make projections but also their inter-dependencies with other variables. Other characteristics of the historical data, such as the mean, standard deviations, correlation among others are derived and their impact studied from the dataset used. Also, risk due to investment such as market risk, and that of interest rate which affect annuities purchased are the risks considered in the study. Other risks such as longevity risk, political and regulatory risk are not incorporated in the model.

Other parameters and assumptions that are used in modelling risk scenarios that a plan member faces during the accumulation phase are also modelled. Parameters such as the contribution made to the various tiers of the pension scheme are modelled as defined by the National Pensions Regulatory Authority (2012), also assumptions such as career hence wage path of plan member are established.

Using the asset return model developed and with the various parameters and assumptions established, a simulation of a plan member is run with 10,000 risk scenarios to demonstrate the risk faced during the accumulation phase and the impact it has on the pension received at retirement. A case of a member in the informal sector covered under a DC arrangement is also considered. Different asset allocation strategies are used to determine how that influences retirement income.

Lastly, using the prevailing interest rate at retirement, the annuity factor is calculated hence the pension provision from the DC scheme (Tier 1 or 2) of the Pension scheme. This

complemented with that from SSNIT under the DB arrangement is compared to a benchmarked DB plan promising two-thirds of average salary three years prior to retirement to obtain the Pension Ratio. Analysis of the output of the simulation forms the basis of concluding if the new Ghanaian pension scheme provides adequate retirement income to plan members or not amidst the inherent risks and risk transfer as a result of the reform.

### **3.3 The Accumulation Model**

The study will use monthly data over the aforementioned period as it best captures all economic situations or events peculiar to Ghana during the understudied period, also results in better projections.

This is illustrated using a simple case of an individual who joins the scheme at age twenty (20), making contributions throughout his working life till he is 60 years. The individual in the scheme will be subject to asset-return risk which affects the value of his pension considering contributions; interest rate risk which affects the value of his pension when he retires as it determines the value of his pension (annuity). Also inflation risk which affects retirement income over retirement period, which we assume to be till age 100.

The researcher in this study considers the investment risk, a market risk which affects return on investment. It is the risk that the plan's assets may fall short of what is needed to meet its obligations; in this case regarding Equities and Bonds. Also inflation and interest rate risk which define the value and amount of annuities that can be purchased respectively. Other risks such as longevity, political and regulatory risk, also credit risk are not incorporated into the model.

### **3.4 Data Source**

The study is conducted using secondary data over a ten year period (that is, 2000 - 2010) from the Bank of Ghana and Ghana Stock Exchange databases. Of these is the composite index from the Ghana Stock Exchange to model Equity returns; yields on 1-year bond notes to model return on Bonds; 91-day Treasury bill rates to represent Interest rates; and that on Inflation over the period. Monthly data on the assets are used for the study.

### 3.4.1 Risk factors

### 3.4.2 Asset returns

According to SSNIT, the pension fund is invested largely in short, medium and long term investments: Government stocks, Bonds, Equities, and Commercial properties, Loans and Short-term cash deposits (SSNIT Financial Statement, 2011). The researcher for simplicity and due to lack of data assumes that the pension fund is invested in the assets: Bonds and Equities. Using historical data on the economic variables mentioned, a stochastic model is developed on the returns on the assets.

Research by Blake et. al. (2001), used different well-known asset return models. For instance, the multivariate normal model where return on assets is given as  $r_i = \mu_i + \sigma_i z_i$  where  $\mu_i$  represents the mean return on asset  $i$  and  $\sigma_i$  the standard deviation of the return on asset  $i$ .  $z_i$

on the other hand is derived from the formulae  $z_i = \sum_{j=1}^k l_{ij} \zeta_j$  where  $l_{ij}, \zeta_j$  represent values in the lower-triangular Cholesky decomposition of the correlation matrix of the historical dataset made up of  $k$  economic variables, and standard normal random numbers respectively.

The mixed multivariate model, another model used in the study assumes the distribution for the return on asset  $i$  to be a mixture of two normal distributions with different means and

variances so that  $\Pr(I_i = 1) = p_i$   $r_i = \begin{cases} \mu_{i1} + \sigma_{i1} z_i, I_i = 1 \\ \mu_{i2} + \sigma_{i2} z_i, I_i = 2 \end{cases}$ , where  $I_i$ 's are independent random variables with  $\Pr(I_i = 1) = p_i$  and  $\Pr(I_i = 2) = 1 - p_i$ .

Also used was a multivariate t model where return on assets are given as

$r_i = \mu_i + \sigma_i \frac{z_i}{\sqrt{\frac{V_i}{d_i}}} \sqrt{\frac{d_i - 2}{d_i}}$  where  $\mu_i$  represent the mean return on asset  $i$ ,  $\sigma_i$  the standard deviation of the return on asset  $i$ .  $V_i$ 's represent independent chi-squared random variables

with  $d_i$  degrees of freedom. Other models used were the multivariate non-central t model, bootstrap model, a Markov switching model and the Wilkie (2005) model.

The research of this study uses the multivariate log-normal model to obtain a model for the returns on the economic variables considered in the study. Returns obtained are used in the projection of the returns on the economic variables over the period considered in the study using the R software to simulate 10,000 40-year scenarios of the investment pattern of a plan member using assumptions and parameters to be discussed in the next sections.

### 3.4.2.1 Calculation of Return on Economic Variables

The stochastic asset return model is derived from the historical data on economic variables aforementioned. This is done by first calculating return on the assets considered for the study with the assumption that changes in natural log of assets are linked by a multivariate normal distribution.

As described by Samuelson (1963), there is evidence that prices of certain stocks can be adequately modelled as a random walk, that is, logarithms of changes of successive prices can be modelled as independent, identically distributed random variables. Given price index series from the Ghana Stock Exchange in the historical data to model equities, return on Equity is calculated as  $\ln X_{t+1} = \ln X_t + \mu + \sigma Z_t$  where  $X_t$  is the price index at time t,  $\mu$  the expected returns,  $\sigma$  the standard deviation of equity returns, and  $Z_t \sim N(0,1)$ .

To model return on Bonds, changes in log of bond yield are simulated and projected with an assumed duration as a log-normal random variable as discussed by Black and Karasinski (1991). Using the Black-Karasinski model, a log-normal model, given  $X_t$  as bond yield at time t, return on bond yields is calculated as  $\ln X_{t+1} = \ln X_t + \mu + \sigma Z_t$  where  $\mu$  is the expected changes in log of bond yields,  $\sigma$  the standard deviation of change in log of bond yields, and  $Z_t \sim N(0,1)$ .

Bond returns,  $R_{t+1}$  are calculated thereafter, after having projected and simulated 10,000 scenarios of bond yields. This is calculated with the assumption that an annual par fixed coupon bond with a given duration is purchased, held for a year and rolled over into a new bond with a given duration parameter  $n$ . The value of the bond is calculated using the standard bond pricing approach from the discounted present value of the coupon payments

and nominal face value, given no default occurs as

$$R_t = X_t + \frac{X_t \left( 1 - \left( \frac{1}{(1 + X_{t+1})^{n-1}} \right) \right)}{X_{t+1}} + \frac{1}{(1 + X_{t+1})^{n-1}} - 1$$

where  $n$  denotes the duration or term of the bond.

Given historical data on rate of inflation denoted as  $X_t$  though usually calculated as  $[(CPI_t - CPI_{t-1}) / CPI_{t-1}]$  where  $CPI_t$  represents the consumer price index at time  $t$ , changes in the log of inflation are modelled as log-normal with  $\ln X_{t+1} = \ln X_t + \mu + \sigma Z_t$  where  $\mu$  represent the expected changes in log of inflation,  $\sigma$  the standard deviation of change in log on inflation and  $Z_t \sim N(0,1)$ . Changes in log of interest rates are modelled similarly as log-normal with  $\ln X_{t+1} = \ln X_t + \mu + \sigma Z_t$  where  $\mu$  represent the expected changes in log of interest rates,  $\sigma$  the standard deviation of change in log of interest rates and  $Z_t \sim N(0,1)$ .

To model and generate future returns which represent the real economy, the correlations between the economic variables considered must be modelled. The returns are projected into the future over the investment period of 40 years, ensuring that the correlation between the variables is maintained, generating the returns into the future.

This is done by first obtaining the lower-triangular Cholesky decomposition,  $L_1$  of the correlation matrix,  $C$  such that  $C = L_1 * L_1^T$  where  $L_1 = [l_{ij}] = \mathbf{0} \forall j > i$ . It is assumed here that  $L_1$  is positive semi-definite and a (4 x 4) matrix just as the (4 x 4) correlation matrix from which it is obtained where  $l_{ij}$  are elements of the matrix. A matrix of 10,000 by 4 independent random normal variables  $r_j$  is then generated. Once  $L_1$  is found,  $Z_{it}$  representing

correlated standard normal random variables are generated by  $Z_{it} = \sum_{j=1}^4 l_{ij} * r_j$  where  $r_j$  represents independent standard normal random variables ( $r_j \sim N(0,1)$ ). This is represented in the models as  $Z_t$ . This is multiplied by the volatilities of the economic variables obtained from the historical data to obtain  $\sigma Z_t$ .

Expected return on the economic variables is next calculated, represented as  $\mu$  to which  $\sigma Z_t$  is added and further calculations effected as described. This is obtained using a specially written code in R to obtain the return on the economic variables over the 40 year period.

## Assumptions and Parameterisation for simulation

### 3.4.3 Entry Age

According to the NPRA (2012), the entry age into the Ghana Pension scheme is fifteen. However, for the purposes of the study it is assumed that a life enters the scheme at age twenty (20).

### 3.4.4 Earnings

According to Blake et. al. (2001), an individual's income grows exponentially during the early stages of a plan members career -due to job changes or early promotions hence leaps in earnings, but this slows down from mid-life as he/she stays put with an employer or career stabilizes relying more on cost-of-living increases than experience and promotion. The life-time earnings of an individual is therefore said to have a concave shape.

It should be noted that income peak periods however differ across industries or fields. For instance, in the mining industry, this is reached years before retirement age; in other positions such as managerial, plan members may take early retirement or be made redundant in their late 50s or early 60s. In view of this, Blake et. al. (2001) opined how important it is to model the earnings or wage profile of plan members as it influences the contributions and forecast of final salary of members.

The researcher however for purposes of the study, assumes the cohort stays employed all through his career life with no episodes of unemployment - that is, between age 20 and 60 years. Also, considering the impact of volatile financial asset returns on the pension wealth accumulation, it is assumed that labour income is deterministic, that is, not risky; and that it grows at an annual rate  $g$  over the life cycle given as  $Y(s) = Y(s-1) * (1+g)$  where  $Y(s)$  represents the income of the cohort at age 's' as modelled in the Oxera Report (2008).

The growth in Gross Domestic Product (GDP) is made up of growth in investments, expenditure, net income and exports. Considering the contribution of salaries -captured in expenditure, to Ghana's GDP, its economic environment and sustainability, the starting labour income at the age of 20 is set at GHC 10,000 increasing at a rate of 1% per annum.

#### **3.4.5 Contribution Rate**

As per the contribution rate set by the pension bill, a contribution rate of 18.5 percent of employees earnings with 16% of this remitted to the scheme towards pension is used for simulation (NPRA, 2012).

Of the total contribution remitted to the scheme, 11 per centum of the contribution is remitted towards the first tier (DB plan) and 5 per centum to the second tier (DC plan). This is used to represent a typical Ghanaian employed staff referred to in the study as a plan member in the formal sector. A case where the total contribution of 16 per centum of income is remitted to the third tier (a DC arrangement) is considered as a case of an individual in the informal sector, here referred to as a plan member in the informal sector.

#### **3.4.6 Asset allocation Strategy**

This defines the strategy used by the fund manager in investing contributions paid by plan members to the fund. Research by Samuelson (1989, 1991, 1992) seems to suggest lifestyle strategy where there is high investment in Equities - to benefit from the equity risk premium, during the early stages of plan and higher investments in Bonds close to retirement period. Blake et. al (2001) espoused that for long term investments, as applied by pension scheme managers, where liabilities are tied to the growth rate of the economy over the long term,

fixed-income bonds pose higher risk than equities. He however added that fund managers in studying the nature of equity returns should critically observe its leptokurtosis, a property that fat tails in the distribution of the equity returns increase the chance of extreme positive or negative outcomes. Just as positive outcomes could boost the pension funds and retirement income of plan members, negative outcomes could also have detrimental effect on pension funds hence retirement income of members. To mitigate this he mentioned is why some fund managers adopt the lifestyle strategy (Timmermann, 1999; Blake et. al., 2001). For simplicity, it is assumed that returns are normally distributed, that is, leptokurtosis is absent.

As an academic exercise and for simplicity, the strategy prescribed by the policy document of NPRA is adopted. That is a 70/30 low-risk strategy with 70% of pension fund invested in bonds and 30% in equities. A strategy with 60% in Equities and 40% in Bonds is experimented to study how the investment strategy impacts retirement income of a plan member.

### 3.4.7 Retirement age

The researcher assumed a retirement age of 60 with no early retirement due to ill-health or invalidity. The retirement period is also considered to be about 40 yrs (that is, age 60 to 100).

### 3.4.8 Interest Rates

To establish the annuity factor at retirement for a plan member, the projected interest rate modelled as a multivariate log-normal is used. This helps determine the fund value at retirement, that is, pensions to be paid all through the retirement period. Pension annuity is obtained by dividing pension fund at the retirement date by the annuity factor as demonstrated by Blake et. al. (2001).

The annuity factor is calculated as 
$$\overline{a}_{60} = \sum_{k=0}^{39} \left( \frac{1}{(1+i)} \right)^k * \text{Pr}(\text{survival})$$
 where  $\text{Pr}(\text{survival})$  is the probability that the life aged 60 survives to age  $(60+k)$ , and  $i$  the average interest rate when plan member is aged 60.

### 3.5 Simulation

As an academic study, also to accommodate different assumptions relating to different type of pension arrangements, and to carry out what-if tests to see how sensitive results of the study are to changes in these assumptions of the study, a simulation methodology is adopted. The basic structure of the simulation carried out is explained in the subsequent paragraphs below.

After obtaining the model, also established parameters and assumptions to be used to project the returns on the assets considered in the study, 10,000 40-year scenarios are simulated to represent the risk faced by a plan member using a specially written programme in the R software.

To capture the sector in which a plan member may fall, two experimental cases are modelled for the study; the Formal and the Informal sector plan member. The formal sector plan member is used to represent a plan member with employment in the formal sector of the Ghanaian economy making contributions to only Tiers 1 and 2 of the Pension scheme. The informal sector plan member on the other hand represents plan members in the informal sector of the Ghanaian economy who make contributions only to Tier 3 of the Pension scheme.

As earlier mentioned, a plan member is assumed to enter the scheme at age 20 with contributions paid to scheme as per the pension bill over the period. Since the benefits under a Defined Benefit arrangement is independent of contributions to the scheme, emphasis is placed on contribution to the second tier for a formal sector plan member, that is, *Contribution, C* = 0.05 \*  $Y(s)$ , where  $Y(s)$  represents the income of the plan member at age 's'. In the case of an informal sector plan member, 16% of monthly earning is remitted to Tier 3 of the Pension scheme, that is, *Contribution, C* = 0.16 \*  $Y(s)$  where  $Y(s)$  represents income of the plan member at age s.

Return on investment in Equities and Bonds from contributions to the scheme at time  $t$  is calculated as  $r_t = w_1 * r_{et} + w_2 * r_{bt}$  where  $w_1, w_2$  are the weights of investments in

Equities and Bonds respectively and  $r_{et}, r_{bt}$  the return on Equities and Bonds at time  $t$  respectively.

The fund size of a plan member at time  $t$  is given as,  $F_t = F_{t-1} * (1 + \tilde{r}_t) + C$  where  $F(t)$  represents the Fund size at time  $t$  and  $\tilde{r}_t$  the return on investments at time  $t$ . This is with the assumption that contributions,  $C$  are paid at the end of the month. This is projected for a forty year period over 10,000 scenarios to obtain the fund size at retirement -age 60. To determine if benefits under the new scheme replicates that prior to the reform, the pension provision for a member from the DC arrangements of the Pension scheme is calculated, given as  $F(t)/\bar{a}$  where  $\bar{a}$  is the average annuity factor for retirees at age 60 as done by Blake (2001).

As already mentioned, a plan member in the formal sector pays contribution to both Tiers 1 and 2 of the Pension scheme hence receives benefits as such. Benefits from the DC component is obtained as described in the previous paragraph, that from the DB component which is irrespective of contributions to the scheme is given as  $0.8 * \text{average annual salary}$ . This is arrived at following the benefit formulae defined under the first tier as per the National Pension Regulatory Authority (2012) that a plan member receives a minimum of fifty per centum of average salary after making contribution over the minimum contribution period of 15 years with one and a half per centum increments every year up to a maximum of eighty per centum of average annual salary. Considering the contributory period of a plan member as earlier defined with no episodes of unemployment or lapse in payment of contributions, the plan member is due the maximum percentage of average salary payable, that is, eighty per centum.

A member's average annual salary is calculated as the average of a member's income three years to retirement, taken to be the best three years of a retiree's career life. As earlier mentioned, the pension under the scheme is compared to a benchmarked final salary scheme as was provided by SSNIT under a DB arrangement promising two-thirds of member average annual salary.

The pension ratio of a plan member in the formal sector is therefore given as

$$\text{Pension ratio} = \frac{(F(t)/\bar{a}) + \text{DB component}}{\frac{2}{s} * \text{member average annual salary}}$$
 and that for a member in the informal sector

given as: 
$$\text{Pension ratio} = \frac{(F(t)/\bar{a})}{\frac{2}{s} * \text{member average annual salary}}$$
 as there is no benefit from the first tier.

A pension ratio of unity means pension provision under the new scheme (which serves as the numerator) replicates that of the DB benchmark (pension received prior to reform). A pension ratio less than unity can be interpreted as, pension provision under the new scheme does not replicate that prior to the reform, that is, benefits under the new scheme are inadequate relative to pension provisions prior to the reform. A pension ratio greater than unity however means that pension provision under the new scheme not only replicates but provides much better benefits compared to that prior to the reform.

The cumulative distribution function of the pension ratio of a plan member is derived and a plot of that to the pension ratio is obtained for analysis. This is done for the asset allocation strategies considered. The plot is then analysed to conclude if the new pension scheme provides adequate retirement income as compared to that prior to the reform. A point on the curve from the plot shows the probability that a pension ratio falls below a particular level. At the  $i^{\text{th}}$  percentile, that is, the  $(100-i)$  confidence interval, if less than unity, we conclude that the pension plan does not successfully replicate the DB. If greater than or equal to unity, we conclude that it does replicate the DB scheme. A curve that rises more steeply from 0 to 1 than the others is said to be one that demonstrates a strategy that is less variable than the others, hence pension ratio also more predictable as opined by Blake et. al. (2001).

## CHAPTER FOUR

### ANALYSIS AND DISCUSSION OF FINDINGS

#### 4.0 Introduction

This chapter presents the output of simulation carried out, and a discussion of the simulated output as well as findings of the study in line with objectives of the research outlined in Chapter 1.

#### 4.1 Empirical Investigation

Future economic scenarios of returns are generated using the return dynamics described in the preceding chapter. Once the model has been completely specified, the stochastic model is used to simulate projections of future scenarios of the economic variables. In particular, the returns are projected with predefined parameters assuming a start date of 31st December, 2010 to simulate 10,000 40-year scenarios projecting forward from that date.

Table 4.1 shows the characteristics of historical data used for the research. The first row represents the expected returns on Equities and Bonds, and expected changes in Inflation and Interest rates. Other parameters such as the median and volatility of the data are also shown in the table. Equities have the highest peak with kurtosis value of approximately 9.44, the next highest being Inflation.

**Table 4.1: Summary Characteristics of Historical Data (2000 - 2010)**

	Equity	Inflation	Interest Rates	Bonds
Mean	0.01753	0.01582	0.01845	0.01753
Median	0.01000	0.01413	0.01632	0.01634
Standard Deviation	0.06449	0.00709	0.00899	0.00561
Standard Error	0.00561	0.00062	0.00079	0.00049
Kurtosis	9.44058	3.34121	2.51995	1.87167

*Source: Author's calculations*

## 4.2 Characteristics of Simulated Future Returns

In making projections on bond returns, an initial value of 1.05 per centum is used for bond yields, the current interest rates and inflation used for projection of those economic variables are 1.02 and 0.71 per centum respectively. Other parameters are set as described in the previous chapter.

Table 4.2 reports summary statistics over the first year of projection and 4.3 on the entire projection period respectively. Comparing simulated expected returns, expected changes and volatilities of the variables in Table 4.1 with parameters determined in Table 4.2 using the historical data set, very minimal deviations are observed.

**Table 4.2: Summary Statistics of Simulated Returns (Year 1 of Projection)**

	Equity	Inflation	Interest Rates	Bonds
Mean	0.01731	0.08532	0.12217	0.01753
Standard Deviation	0.06455	0.00709	0.00899	0.00561

*Source: Authors calculations*

**Table 4.3: Summary Statistics of Simulated Returns over Entire Projected Period**

	Equity	Inflation	Interest Rate	Bonds
Mean	0.01734	0.08533	0.12217	0.01051
Standard Deviation	0.06445	0.00631	0.00903	0.00059
Coefficient of Variation	371.612	7.39391	7.39176	5.59177
Kurtosis	3.00008	3.08775	3.08292	3.04655
Skewness	-0.00152	0.22268	0.22253	0.16777

*Source: Authors calculations*

Table 4.4 shows the lower triangular correlation matrix of historical monthly data for the economic variables: Equity, Inflation, Interest Rates and Bonds. It is observed that there is a strong correlation between log changes in Interest rates and the log changes in Bonds. That is, as Interest rates rise, so do return on investments in Bonds. Correlation between other economic variables is however weak.

It is observed that there is a weak positive relationship between Interest rates and Equities but a strong positive relationship with Bonds. Intuitively, this positive relationship could be attributed to fund managers investing in assets with less risk such as Bonds when Interest rates are high and in other assets when rates are low. Regarding the negative relationship between Interest rates and Equities, intuitively, this could be due to fund managers investing in equities to offset reduced returns from less risky assets such as Bonds. The negative relationship between Equity and Bonds confirms this as it shows them as diversifying assets.

**Table 4.4: Correlation Matrix of Log Changes in Data Series**

	Equity	Inflation	Interest Rates	Bonds
Equity	1.00000			
Inflation	0.03592	1.00000		
Interest Rates	0.08815	0.11862	1.00000	
Bonds	-0.08030	0.13000	0.60716	1.00000

*Source: Authors calculation*

The lower triangular Cholesky decomposition matrix of the correlation matrix, C (shown in Table 4.4) is obtained such that  $C = L_1 * L_1^T$  with the assumption that  $L_1$  is a positive semi-definite as described on page 80. This is shown in the figure below:

**Figure 4.1: Cholesky Decomposition of Correlation Matrix**

$$L_1 = \begin{pmatrix} 1.000 & 0 & 0 & 0 \\ 0.0359 & 0.9993 & 0 & 0 \\ 0.08815 & 0.1155 & 0.9894 & 0 \\ -0.0803 & 0.1330 & 0.6053 & 0.7807 \end{pmatrix}$$

*Source: Authors calculations*

### 4.3 Demonstration Of The Calculation Of $Z_i$ 's

As earlier stated, the calculation of the  $Z_i$ 's of the economic variables is given as

$$Z_i = \sum_{j=1}^4 l_{ij} * r_j$$
 where  $l_{ij}$  are terms of the Cholesky decomposition matrix and  $r_j$  standard normal random numbers.

Given the lower triangular matrix of the Cholesky decomposed correlation matrix of the four economic variables, and a (1x4) matrix representing standard normal random numbers, say

$$r_j = (0.0452 \quad -0.2889 \quad 0.3215 \quad 0.1661)$$

The  $Z_i$  for the first economic variable, equity used in the study is calculated as:

$$Z_1 = (1.00 * 0.0452) + (0 * (-0.2888)) + (0 * 0.3215) + (0 * 0.1661) = 0.0452$$

A similar approach is used in calculating the  $Z_i$ 's for the other economic variables considered in the study.

10,000 risk scenarios of  $Z_i$ 's for a life enrolled onto the scheme are simulated over a 40-year period.

### 4.4 Return on Investment

The table below shows the return on investment by the scheme in equities and bonds given as

$r_i = w_1 * r_e + w_2 * r_b$  where  $r_e$  and  $r_b$  are projected returns on equities and bonds; and  $w_1, w_2$  the weight of investment to the scheme in equities and bonds respectively (described on page 53 under subsection 3.5).

Table 4.5 below shows the return on investment for 5 of 10,000 risk scenarios simulated with 30% in Equities and 70% in Bonds at the end of the tenth, twentieth, thirtieth and fortieth year:

**Table 4.5: Return on Investment in Equities (30%) and Bonds (70%)**

	10th year	20th year	30th year	40th year
Scenario 1	0.00764	0.01721	0.01947	0.01355
Scenario 2	-0.00108	0.02172	0.01377	-0.04974
Scenario 3	-0.00855	0.01411	0.01870	-0.01452
Scenario 4	0.00526	0.00676	0.02982	0.03395
Scenario 5	-0.01587	0.04897	0.05053	0.01540

*Source: Authors calculations*

#### 4.5 Income and Contribution to Pension Scheme

As earlier mentioned, it is assumed that a plan member has an annual salary of GHC 10,000 (monthly salary =  $\frac{10,000}{12} = 833.33$ ) with an annual growth rate of 1%. This is modelled as described in the previous chapter (on page 51 under subsection 3.4.4), also contributions to Tiers 1, 2 and 3 (on page 51 under subsection 3.4.5).

Table 4.6 below shows the monthly salary and contributions by the plan member to the scheme. The first row of the table shows the salary at the end of the various defined time periods (entry, 10th, 20th, 30th and 40th year). The next rows of the table show contributions to Tiers 1, 2 and 3 of the pension scheme at the end of the predefined time periods.

**Table 4.6: Monthly salary and contribution to Pension Scheme Tiers**

	Entry	10th year	20th year	30th year	40th year
Salary	833.333	919.404	1,016.057	1,122.87	1,240.911
Contribution:					
Tier 1 (11%)	91.667	101.135	111.766	123.516	136.500
Tier 2 (5%)	41.667	45.970	50.803	56.143	62.046
Tier 3 (16%)	133.333	147.105	162.569	179.659	198.546

*Source: Authors calculations*

#### 4.6 Fund Size

As earlier described in the preceding chapter, the fund size shows the fund value or the amount in the retirement account of a plan member. This constitutes the return on investment

and contributions to the scheme assumed to be paid at the end of the month. Since pension provision from Tier 1 of the Pension scheme is independent of contributions to the scheme, the fund size is assumed to be made of contributions to Tiers 2 and 3.

Table 4.7 below shows one scenario of the fund value at various time periods of a plan member, the Formal fund to represent the value of the fund or money in the retirement account of a plan member in the formal sector (with contributions to Tiers 1 and 2) and Informal fund (with contributions to Tier 3) representing the value of a plan member in the informal sector. The reader is reminded that the amount of money in the retirement account of a plan member in the formal sector is made up of only contributions to Tier 2, that is, 5 per cent of monthly earnings as contributions to Tier 1 are pooled together by SSNIT towards pension provision at the end of active service.

The retirement account of a plan member in the informal sector is however made up of contributions to Tier 3, parameterised to be 16 per centum of monthly earnings.

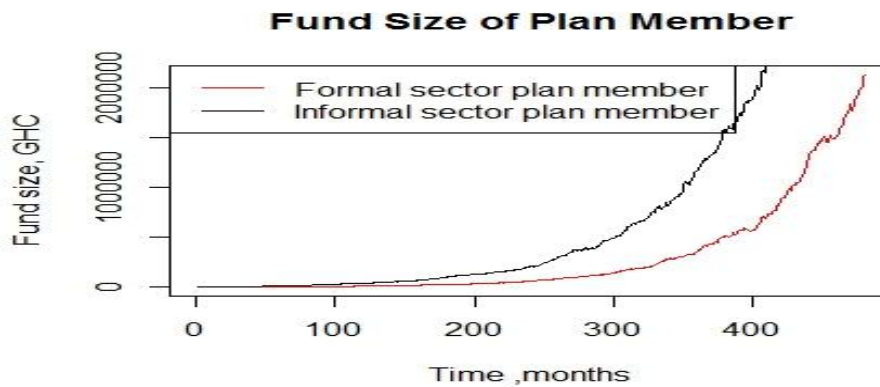
**Table 4.7: Fund Value of a Plan Member**

	10th year	20th year	30th year	40th year
Formal Fund	9,145.58	62,892.08	364,032.80	2,131,821
Informal Fund	29,265.85	199,334.60	1,164,905.00	6,828,227

*Source: Authors calculations*

The first and second rows of Table 4.8 shows the fund value of a plan member in the formal and informal sector at the end of the 10th, 20th, 30th and 40th year respectively. A plot of the fund size of plan member for the first scenario is displayed in figure 4.2 below.

**Figure 4.2: Fund Size of Plan Member (Formal and Informal Sector) over the contributory period**

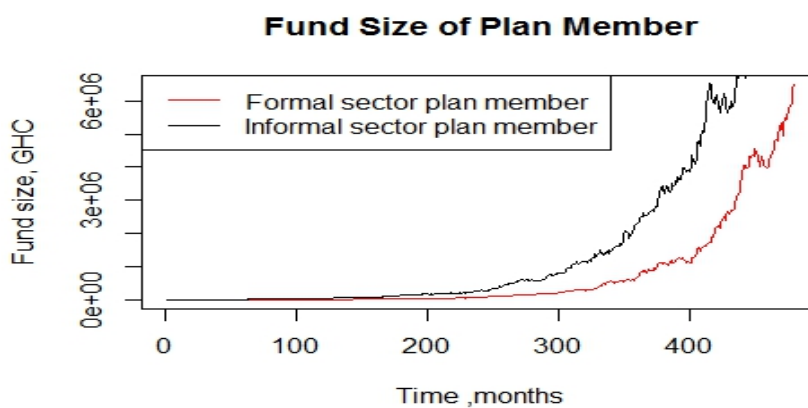


*Source: Authors calculations*

Figure 4.3 below shows a plot of one risk scenario of the fund size of a plan member in the formal and informal sector over the 40 year contributory period with weights of investment in Equities and Bonds being 60% and 40% respectively.

Comparing the plot in figures 4.2 and 4.3, it is clear the fund size of a plan member is much larger in the case where more contributions are invested in equities than bonds.

**Figure 4.3: Fund Size of Plan Member (Formal and Informal Sector) over the contributory period**



*Source; Authors calculations*

#### 4.7 Survival Probabilities and Annuities

To obtain the pension ratio, the annuity factor at the member's retirement date has to be obtained. This is the present value, at the time of retirement, of one unit of an annuity for the remaining life of the annuitant. Firstly, the interest rate at the retirement date of the plan member was obtained which from simulated results is 1.02%.

The probability of survival of a life aged 60 to age  $(60+x)$ , that is,  ${}_xP_{60}$  was then calculated using a specially written program in the software R (as described under subsection 3.4.8). The results of the calculation are represented in Table 4.10 in the appendix.

#### 4.8 Pension Ratio

Having obtained the projected interest rate at retirement and  ${}_xP_{60}$ , the average annuity factor is calculated as described in the preceding chapter. This from results of the study is found to be 13.57. The pension from the DB plan is then obtained. As mentioned in the earlier chapter (on page 84 under subsection 3.5), pension provision from the DB plan is a fraction of the plan member's average salary for the three best years of members working life. The best three years as earlier mentioned refers to the three years prior to retirement. From computations, this is GHC 14,675.99.

The pension provision from the DB plan managed by SSNIT is calculated as 80% of the plan member's average salary which from calculation is GHC 11,740.79. This amount is added to that from the retirement account (Tier 2) in the case of a plan member in the formal sector as pension from the scheme. In the case of a plan member in the informal sector, pension received will be solely the amount in the retirement account made up of investment returns and contributions to Tier 3 of the pension scheme. To determine if pension provision from the reformed Ghana Pension scheme is adequate in meeting the needs of the Ghanaian pensioner, it is compared to a DB benchmark, that is, pension provision prior to reform. This is calculated as two-thirds of a plan member's average salary, found to be GHC 9,783.99.

Having obtained pension due a plan member from both the formal and informal sectors, the pension ratio is calculated by dividing pension due a plan member from a sector by that prior to reform (as described on page 53 under subsection 3.5). The sub-sections show simulated

pension ratios corresponding to the asset-return model and asset allocation strategy used for the study by generating 10,000 simulations using a specially written code in R. An analysis of the simulated output is also done.

Each point on the curve shows the probability that the pension ratio will fall below a particular level. If at a given probability, the pension ratio is greater than or equal to unity, we conclude that pension provisions from the new scheme considered -the numerator, successfully replicates or adequately provide pension benefits better than the plan used prior to retirement. If otherwise, we conclude that pension provision from the new scheme - numerator does not successfully replicate or provide pension benefits better than the plan used prior to retirement.

It is however also important to observe the dispersion of the results. In the case where a curve rises steeply from zero (0) to unity (1), it can be said that pension provisions are less variable, that is, pension ratio at retirement is more predictable.

#### **4.8.1 DC vs. DB Benchmark**

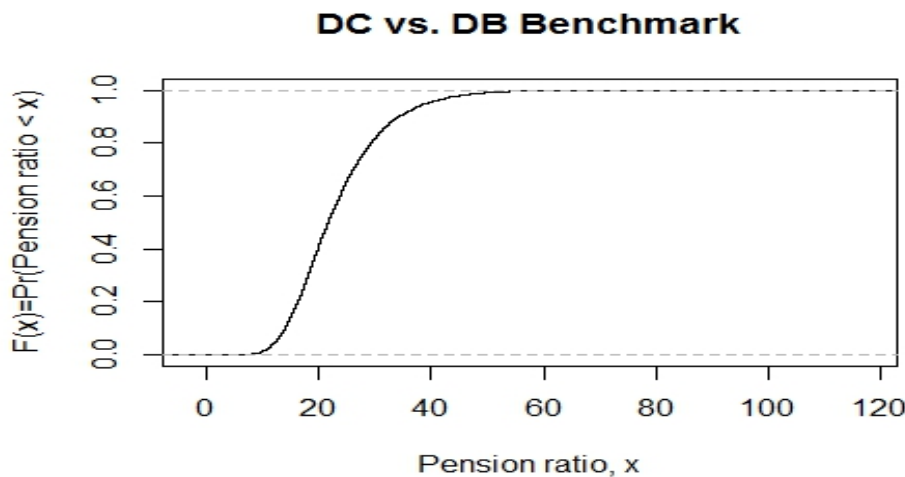
In this section, we assess how adequate a DC plan is in pension provision compared to that under a DB arrangement. This is done by considering a case where a plan member contributes 11 per centum of his monthly earnings towards his pension. As already mentioned, pension from the DB plan is independent of investment returns, it is assumed to be two-thirds of the plan member's annual salary as was the case prior to retirement. Figure 4.4 below shows a plot of pension ratio of a DC plan relative to a DB pension plan as benchmark.

From analysis in R, the minimum pension ratio in comparing pension provision from a DC plan to that under a DB arrangement is 5.50 and the maximum 109.7906. It can therefore be concluded that pensions from a DC plan far supersede provisions as was the case prior to the reform.

Each point on the curve shows the probability that the pension ratio will fall below a particular level. From figure 4.4 below, the probability that pension ratio is less than 20 is

approximately 0.9615 or 96.15%. Alternatively, it can be concluded that the probability that the pension ratio will be more than 20 is approximately 0.0385 or 3.85%.

**Figure 4.4: Pension Ratio Plot of DC vs. DB Benchmark**



*Source: Authors*

*calculations*

It is observable that there is considerable dispersion in the pension ratio. An indicator is that simulated pension ratios vary from about 5.50 at one extreme to 109.79 at the other out of 10,000 simulations. Alternatively, the lower 5% quantile is 12 and the upper 5% quantile is 39. That is, there is a 5% chance that the pension ratio will fall below 12, and a 5% chance that it will be greater than 39. This evidently shows a high degree of dispersion which makes it clear how risky DC plans can be to plan members in comparison to a DB benchmark.

#### **4.8.2 Formal Sector: (DB and DC) vs. DB Benchmark**

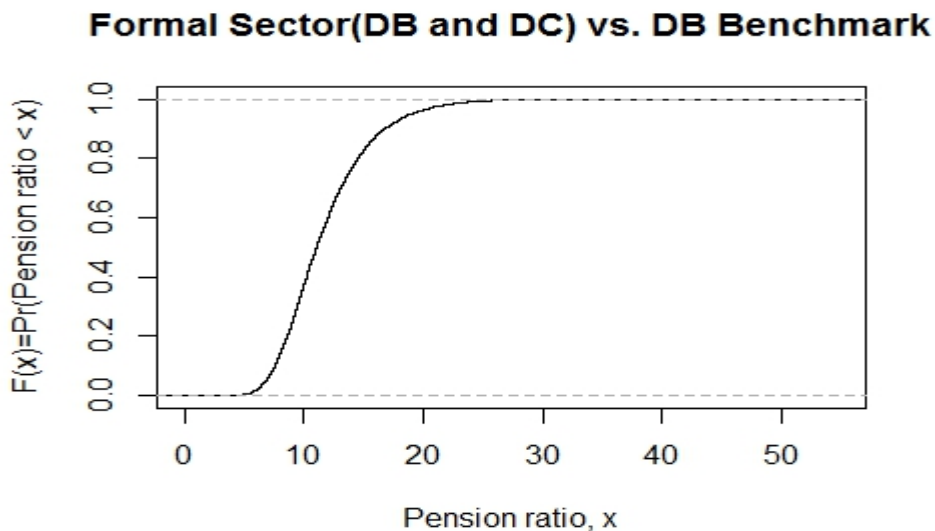
In this section, pension provision to a plan member in the formal sector under the new scheme is compared to provisions prior to the reform, a DB benchmark. As already mentioned in previous chapters, the new pension scheme is a combination of the DB and DC plans under a three-tier structure. For purposes of the study, it is assumed that an employee contributes to only Tiers 1 and 2.

From analysis in R, the minimum pension ratio in comparing pension provision from a plan that's a combination of DB and DC plans to that under a DB arrangement is 3.7 and the

maximum 51.10. It can therefore be concluded that pensions from a DC plan far supersede provisions as was the case prior to the reform.

From figure 4.5 below, the probability that pension ratio is less than 20 is approximately 0.962 or 96.2%. Alternatively, it can be concluded that the probability that the pension ratio will be more than 20 is approximately 0.0385 or 3.85%. Another observation is that, there is approximately a 99.96% chance that the pension ratio will be less than 40.

**Figure 4.5: Pension Ratio Plot of Formal Sector Pension (DB and DC) vs. DB Benchmark**



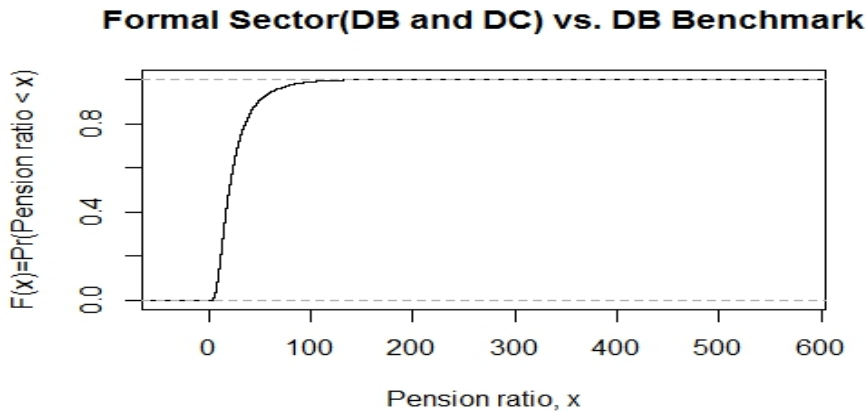
*Source: Authors calculations*

It is observable that there is considerable dispersion in the pension ratio. An indicator is that simulated pension ratios vary from about 3.7 at one extreme to 51.10 at the other end out of 10,000 simulations. Taking a closer look at the dispersion, considering the contribution of pension from Tier 1 relative to the DB benchmark, the pension ratio is 1.2 (i.e.  $11,740/9,783.99 = 1.2$ ). Now looking at the pension ratio range holistically, it is clear that the variation or dispersion stems from pension provisions from the DC component of the scheme, that is, pension provisions from Tier 2.

Alternatively, the lower 5% quantile is 6.8 and the upper 5% quantile is 19. That is, there is a 5% chance that the pension ratio will fall below 6.8, and a 5% chance that it will be greater than 19. This evidently shows a high degree of dispersion which makes it clear how risky the new Ghanaian pension scheme is to a plan member in the formal sector relative to a DB benchmark, attributed to pension provisions from the DC component of the scheme.

Figure 4.6 below shows the pension plot for a plan member where a 60/40 asset allocation strategy (60% invested in equities and 40% in bonds) is used during investment of funds in retirement account of plan member. It is clear that pension provisions from this strategy may far exceed that for a case of a 30/70 asset allocation strategy. Results from analysis in R reveal that the minimum pension ratio is 2.42 and the maximum 537.14. Just as in the case of a 30/70 asset allocation strategy, the pension ratio of the DB component to the benchmark is 1.2, the dispersion can therefore be attributed to the DC component of the scheme. A possible contributory factor to the dispersion in pension ratios is the risky nature of equities. It can therefore be concluded that though a DC scheme may promise higher benefits at a high degree of risk, an asset allocation strategy such as the 60/40 strategy may jeopardise the predictability of pension ratio due to high investments in a risky assets such as equity.

**Figure 4.6: Pension Ratio Plot of Formal Sector Pension (DB and DC) vs. DB Benchmark (60/40 asset allocation strategy)**



*Source: Authors calculations*

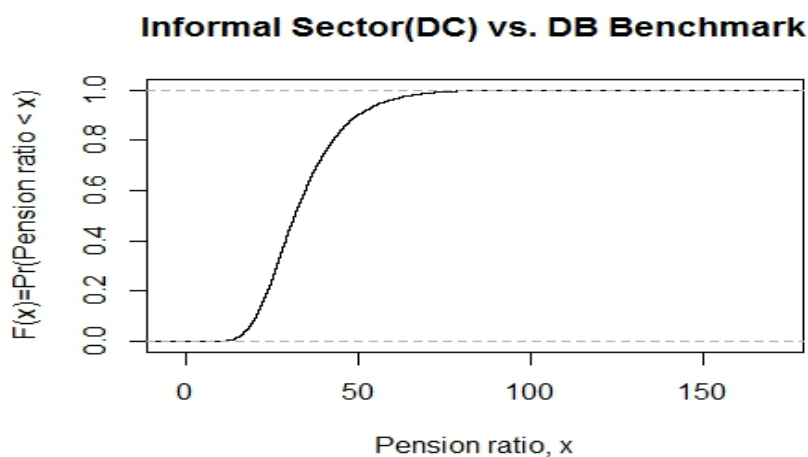
### 4.8.3 Informal Sector vs. DB Benchmark

In this section, pension provision to a plan member in the informal sector under the new scheme is compared to provisions prior to the new pension scheme, a DB benchmark. As already mentioned in previous chapters, pension provisions of plan members under the new scheme is a combination of the DB and DC under a three-tier structure. The informal sector refers to the sector of the economy that is not taxed, monitored by any form of government or included in Gross National Product (GNP), however for purposes of the study, this is taken to include the self-employed, street hawkers, artists and the like who are not employed into the formal sector of the economy. As already mentioned as an objective of the pension reform is increasing coverage to the informal sector that accounts for 80% of the country's workforce, they are for purposes of the study considered to contribute 16% of their monthly earnings -set at par with a worker in the formal sector into Tier 3 of the new Pension scheme to provide a personal pension.

From analysis in R, the minimum pension ratio, comparing pension provision from a DC plan to that under a DB arrangement is 8.01 and the maximum 159.70. It can therefore be concluded that pensions from a DC plan far supersede provisions as was the case prior to the reform.

From figure 4.7 below, the probability that pension ratio is less than 50 is approximately 0.902 or 90.18%. Another observation is that there is approximately a 99.9% chance that the pension ratio will be less than 100 or a 0.01% chance that the pension ratio will be more than 100.

**Figure 4.7: Pension Ratio Plot of Informal Sector (DC) vs. DB Benchmark**

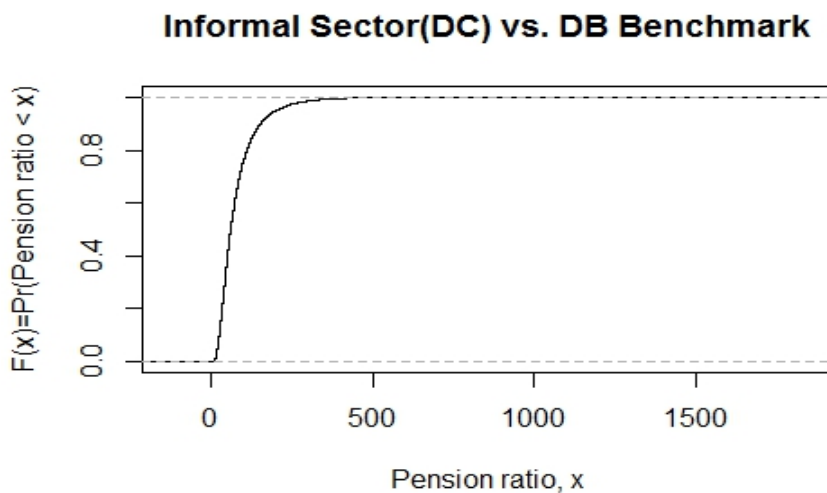


*Source: Authors calculations*

Looking at the dispersion in the pension ratio, an indicator is that simulated pension ratios vary from about 8.01 at one extreme to 159.70 at the other end out of 10,000 simulations. Alternatively, the lower 5% quantile is 6.7 and the upper 5% quantile is 57. That is, there is a 5% chance that the pension ratio will fall below 6.7, and a 5% chance that it will be greater than 57. This goes to show how wide the dispersion of pension ratios is, re-emphasizing how risky DC plans are compared to a DB benchmark.

Figure 4.8 below shows the plot of the empirical cumulative distribution of pension ratios where a 60/40 asset allocation strategy is used by pension fund managers when investing funds (contributions) of plan members. Results from R show high dispersion in pension ratios with a minimum ratio of 3.92 and a maximum ratio of 1,715.02. Again, though this is attributed to the risky nature of DC schemes, the higher pension benefit receivable is a result of high investment in equities which also though risky, promise high returns.

**Figure 4.8: Pension Ratio Plot: Informal Sector (DC) vs. DB Benchmark (60/40 asset allocation strategy)**



*Source: Authors calculations*

### 4.8.3 Formal Sector vs. Informal Sector

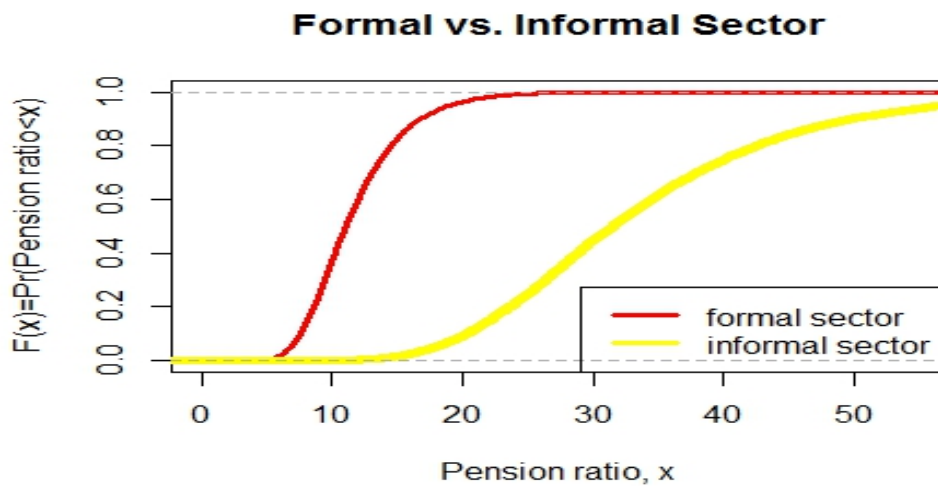
In this section, pension provision to a plan member in the formal sector under the new scheme is compared to that of a plan member in the informal sector all relative to a DB benchmark. As already mentioned in previous subsections, the new pension scheme is a combination of the DB and DC plans under a three-tier structure. For purposes of the study, it is assumed that a worker in the formal sector contributes to only Tiers 1 and 2; an informal sector worker contributes to Tier 3 of the Pension scheme.

As already mentioned, pension ratio for plan members in the formal sector vary from 3.70 at one extreme to 51.10 at the other extreme, this dispersion largely attributed to the DC provision associated to pension provisions. On the other hand, pension ratio for a plan member in the informal sector ranges from 8.005 at one extreme to 159.70 at the other extreme. The range of values for pension ratio associated with the various sectors seem to suggest that an individual is better off with a DC plan as compared to combined plan with DB

and DC arrangements. This can be observed from figure 4.10 showing a plot of formal sector pension ratio to that of an informal sector plan member. An empirical cumulative distribution curve that extends further to the right promises higher benefits as the further to the right the curve extends, the higher the pension ratio. The cumulative distribution curve of a plan member in the informal sector extends further to the right hence provides much higher pension benefits relative to the formal sector plan member, all relative to a DB benchmark.

The reader is reminded that unlike contributions of a plan member in the Informal sector whose contribution is 16% of his/her monthly earnings, that of a plan member in the Formal sector is 5% of his/her monthly earnings which is invested towards retirement in the retirement account opened upon entry into the scheme. The larger chunk of 11% contributed is managed by SSNT who provide benefits under a DB arrangement with contributions spooled towards pension provision of all plan members enrolled. As already mentioned, the pension ratio of the DB component of the new pension scheme relative to the DB benchmark is 1.2, hence the variability in pension ratios stems from the DC component. Comparison between the two sectors can therefore be viewed as a comparison between two DC schemes, one with contributions of 5% of monthly earnings (a minor fraction accounted for by the DB component in the formal sector) and the other with contributions of 16% of monthly earnings. An increase in contributions to the DC component of the Pension scheme by a plan member in the formal sector as suggested by the NPRA for workers to open a personal pension account with further contributions could result in even higher pension benefits.

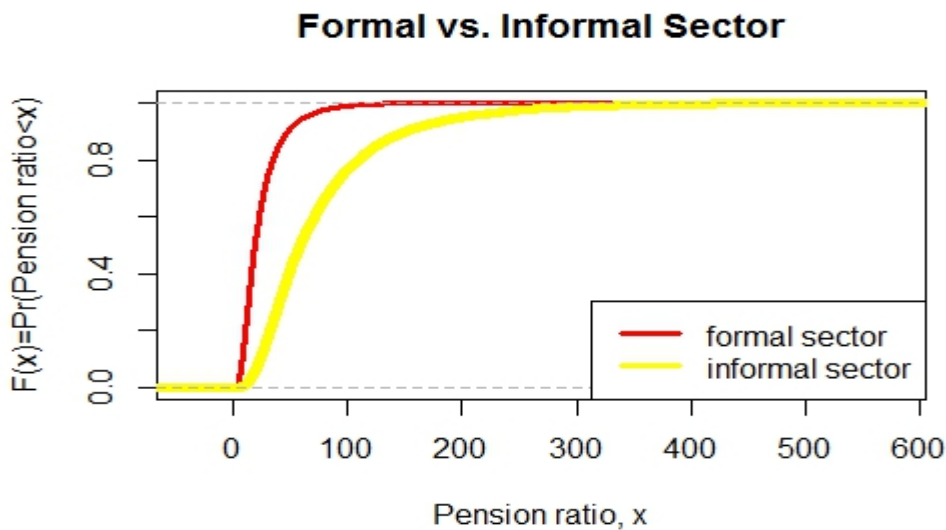
Finally, considering the dispersion of the simulated pension ratios for plan members under the two sectors under study, there is a wider dispersion associated with that of the Informal sector being solely a DC plan to that under the Formal sector (DB and DC), it can therefore be concluded that though a plan that is solely under a DC arrangement may provide higher pension benefits in comparison to the combined plan, it is more risky. Also, should plan members, especially those in the formal sector contribute to Tier 3 of the pension scheme as a personal pension account or employers open provident fund accounts for their employees, their pension benefits may see some further increase hence meet retirement needs of plan members. Figure 4.9 below shows a plot of the empirical cumulative distribution of pension ratios of plan members in the formal and informal sectors.

**Figure 4.9: Pension Ratio: Formal Sector vs. Informal Sector**

*Source: Authors calculations*

Figure 4.10 below shows the empirical cumulative distribution plots for a plan member in the formal and informal sector for a 60/40 asset allocation strategy. From the plot, the curve for a plan member in the informal sector extends further to the right than for the formal sector just as observed in figure 4.9 representing the case with a 30/70 asset allocation strategy. It is also evident that the plot for a formal sector plan member rises more steeply from zero to one than for an informal sector meaning pension ratio is more predictable for a pension scheme combining both plans than that of a total DC plan.

**Figure 4.10: Pension Ratio: Formal Sector vs. Informal Sector (60/40 asset allocation strategy)**



*Source: Authors calculations*

#### 4.9 Chapter Summary

The adequacy of pension receivable under the new Ghanaian pension scheme was demonstrated by running a simulation of 10,000 risk scenarios faced by a plan member over a 40 year contributory period with investments in Equities and Bonds. The returns on the economic variables (equity, bond, interest rate and inflation) were modelled as following a multivariate log-normal distribution and projected over the investment period.

Results showed that investments in equities promise higher benefits than one in bonds however more risky considering its standard deviation. Log changes in interest rates had a negative and positive relationship with equities and bonds respectively which shows them to be diversifying assets.

Further analysis reveals that DC plans though promises higher benefits, are more risky than DB plans. This was evident by DC plans (demonstrated by an informal plan member) having wider dispersion of pension ratios and how gentle the curves rose from zero (0) to unity(1).

In the case of a formal sector plan member with contributions to tiers 1 and 2 of the scheme which are under DB and DC plan arrangements respectively, it was realised that the variation in pension provision could be attributed to the DC component of the scheme as the DB pension provision from Tier 1 accounted for a small portion of the pension ratio.

Comparison of pension provision for plan member in the formal sector (under DB and DC arrangement) and that for an informal sector plan member (under DC arrangement) confirmed the assertion that DC plans promised higher benefits but also subject to higher risks. It was also realised that further contribution to tier 3 of the pension scheme by a formal sector plan member could significantly increase benefits received.

Lastly, results from the simulation output showed that a high risk 60/40 asset strategy with 60% of funds invested in equities and 40% in bonds promise much higher benefits than a low risk 30/70 strategy as prescribed by the NPRA. It was however subject to more risk due to the risky nature of equities hence made pension ratios less predictable.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.0 Introduction

This chapter presents a summary of the research and limitations to the study in addressing the objectives initially set. It also draws some conclusions on the structural and parametric changes affecting pension provisions from the Ghana Pension Scheme as result of the reform. Lastly, recommendations are made to improve pension provisions in Ghana by addressing key areas for effective and efficient operation.

#### 5.1 Summary

Pension provision has been a major issue for governments, corporations and the public worldwide in light of various economic and demographic factors such as declining mortality and falling interest rates. These factors which have an effect on the economic growth amidst other concerns has instigated a worldwide reform of pension schemes from the DB plan to DC pension plan provisions. Africa and therefore Ghana has seen such reform following rising concerns of the inadequacy of pension provisions of the SSNIT scheme under the DB in light of the growing needs of the Ghanaian after retirement, also in comparison to the fading out 1950 British Colonial Ordinance popularly known as CAP 30.

To address this, a committee was set up which recommended the introduction of a combination of a DB and DC pension plan in a three-tier structure regulated by the NPRA. Under the new pension scheme, Tier 1, a mandatory basic national social security scheme, is a partially-funded DB scheme managed by SSNIT; Tiers 2 and 3 however operating under a DC arrangement are managed by privately managed trustees licensed by the NPRA. They are mandatory fully-funded Occupational pension scheme and a voluntary scheme which may serve as a provident fund or personal pension scheme respectively.

In light of varying risks a plan member and/or sponsor are exposed to under the various pension plans such as political and regulatory risk, investment risk, inflation risk among others, the paper sought to assess the adequacy of pension provisions of the new pension

scheme in comparison to the DB scheme managed by SSNIT prior to the reform following the structural and parametric changes due to the reform. This is demonstrated by simulating 10,000 risk scenarios of the life of a plan member who joins the scheme at age 20 and retires at age 60.

This was done by first generating returns on four economic variables: Equities, Inflation, Interest rates and Bonds. 10,000 40-year scenarios were simulated as described in Chapter 3 considering investment risk, the risk that plans assets may fall short of what is needed to meet its obligations. The income of a plan member was then modelled with contributions to the scheme as defined by National Pensions Act 766 which were invested in equities and bonds. This determines the fund size which represents the amount in the retirement account of a plan member from the Tier 2 or 3 as pension provision from Tier 1, a DB pension plan, is independent investment performance. For a simplified study, the case of a plan member in formal employment was considered with contributions only to Tiers 1 and 2, that is 11% and 5% of monthly salary respectively. Also, that of a plan member in the informal sector where contributions are made only to Tier 3 of the pension scheme, a total of 16% of monthly earnings was considered. As per the pension provision defined by the NPRA under the DB of the SSNIT scheme, a plan member in the formal sector receives 80% of the average salary in addition to pension annuity from Tier 2.

Having obtained the fund size at retirement as described in previous chapters with contributions and real return on investment over the period, the annuity factor was calculated hence the pension annuity which was used in the calculation of pension ratio. The pension ratio was then calculated by comparing pensions received under the new scheme to that under the DB scheme as was managed by SSNIT prior to the reform promising two-thirds of average salary.

## **5.2 Conclusion**

The pension reform addresses a number of problems which affect pension provision from the Ghana pension scheme such as regulation and governance, solvency and investment strategy of pension schemes in the country needs further reform. Some positives from the reform is the setting up of the National Pensions Regulatory Authority which regulates all pension

schemes operating in the country, also the unification of pension schemes in operation. Another positive to the reform is its increase in coverage to workers in the informal sector.

Despite the positives, there is the need for further reform on the National Pensions Act. One such is the independence of the regulatory body from influence of government. Currently, the Chairman and Director of the SSNIT scheme is appointed by the President of Ghana based on a selection process which is unknown to plan members. This raises concern as the institution and its decisions may therefore be influenced by the government and for political or ideological reasons and not for adequacy and sustainability in pension provision as purported. Periodical new sheets and reports published by SSNIT also reveals that employers continually fail to comply with guidelines and directives set by the National Pensions Act 766 in either enrolling their staff or paying contributions to the scheme as required. There is therefore the need for the strengthening of the legal framework and enforcement machinery in ensuring that plan sponsors and members comply to directives of the pension bill. Lastly, the adequacy, solvency and sustainability of the scheme managed by SSNIT which though now promises higher benefits has not being meted with an associated increase in contribution to that tier. This coupled with restrictions on the investment and asset allocation strategy used the fund managers may actuarially render the scheme unsustainable.

Analysis of simulated output, plots of empirical cumulative distribution of pension ratios show that for a formal sector worker with contributions made to Tiers 1 and 2, the dispersion in pension ratio was largely attributed to the DC component of the Pension scheme. This was evident by the pension ratio of the DB component of the new Pension scheme relative to the benchmark which from calculation is 1.2, a fixed value despite all possible risk scenarios considerable. It can therefore be concluded that the variation observed in pension ratios which show provision from the new scheme to be risky can be attributed to the DC component of the scheme.

This is further demonstrated from the case of an informal sector plan member making a total contribution of 16% of monthly earnings to Tier 3 (a DC plan) of the Pension scheme equalling that from a formal sector plan member as described in the study. Simulated output

show the highest degree of dispersion observed which confirms and reiterates findings of earlier studies that though DC schemes may provide higher benefits, they are also riskier.

Comparison of pension provision from a combination of DB and DC plans (demonstrated as a formal sector plan member) to a total DC plan (demonstrated as an informal sector plan member) displayed in figure 4.5 reveals that a plan member is likely to receive higher pension benefits under a total DC plan than a combined pension plan. However, further analysis show that this comes at a greater risk as there was a higher degree of dispersion of pension ratios making it less predictable.

As explained in Chapter 4, a comparison between a combined plan and that under a total DC is virtually a comparison between two DC schemes; one with a total contribution of 16% of monthly earnings and another with contribution of 5% of monthly earnings with a guaranteed benefit from a DB plan as dispersion in pension ratios is resultant on DC plans and the DB component accounts for a small fraction of pension ratio. In light of this, pension provision for a formal sector plan member, with benefits from a combination of DB and DC plans, can be increased by making further contributions to the DC scheme (Tier 3) as encouraged by the NPRA as a personal pension. Employers could on the other hand make this contribution to the tier as a provident fund for employees to encourage loyalty or early retirement depending on the organisations objectives and strategy.

Lastly, results from analysis for a 60/40 asset allocation strategy are similar to that of a 30/70 asset allocation strategy. The differing feature however stems from the fact that part of dispersion observed in pension ratios is a result of the risky nature of equities. There is however the likelihood of pension benefits far exceeding that where a 30/70 asset allocation strategy is used. The risky nature of equities might therefore have informed the decision by the NPRA in adopting a low risk strategy.

It can therefore be concluded that the new Ghanaian Pension scheme provides adequate benefits to meet the needs of the Ghanaian retiree considering the results from the simulated pension ratios for both an employee who makes contributions to all three tiers (most possible

case of a formal sector worker) or one who makes contributions to just Tier 3 of the pension scheme.

### **5.3 Recommendations**

As earlier mentioned in the preceding section of the chapter, there is the need for further reform of SSNIT, especially the board structure and composition to ameliorate political risk. This coupled with good corporate governance practices will demonstrate to the general public the transparency and accountability of the scheme in their operations thereby change the notion of clients that the scheme was mismanaged. Also, there is need for stronger legal framework and enforcement machinery to ensure employers adhere to directives of the NPRA as stated by law. Another effective way of achieving this is by sensitizing the general public on the need to be concerned about their retirement, that is, check their pension contribution statements for non-payment or reduced contributions remitted to the scheme.

There is also the need for an actuarial check on the adequacy, solvency and sustainability of SSNIT following the reform as though remittances to the tier has reduced, pension benefits have increased. As opined by Blake et. al (2001), unlike other industries, effects of structural and parametric changes to pension schemes may not be evident till about 20-30 years into the future; the sustainability of the scheme in providing the benefits promised some years into the future should be actuarially investigated.

From results, an asset allocation strategy with heavy investment in equities promise much higher benefits than a low risk strategy, however is much riskier, an observation which might have informed the decision by NPRA to adopt the current strategy. Despite it being an objective of the regulatory body to ensure fund managers invest in assets using a strategy that ensures the retirement income security of plan members, fund managers should be allowed to creatively determine the best optimal asset allocation strategy to be used in the interest of plan members.

Lastly, employees in the formal sector should make contributions to Tier 3 of the Pension scheme towards their personal pension or employers set up provident fund to increase benefits to be received upon retirement. There is the need for mass education of the general

public, especially those in the informal sector to make some contributions towards a personal pension scheme. as it not only improves the welfare of the retired after active service but also aids in poverty alleviation. Though informal sector workers are not always assured of a steady stream of income, they should be encouraged to make some contribution, payable over a long contributory period towards the scheme for benefits in the event of retirement, invalidity or ill health.

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## APPENDIX

**Table 4.8: Probability That a Life Aged 60 survives to age (60+x),  ${}_xP_{60}$** 

x	${}_xP_{60}$
0	1.000000000
1	0.970930000
2	0.940515618
3	0.908768513
4	0.875716602
5	0.841406026
6	0.805890277
7	0.769258535
8	0.731607176
9	0.693058794
10	0.653758895
11	0.613869796
12	0.573587660
13	0.533118183
14	0.492691831
15	0.452554691
16	0.412965206
17	0.374185709
18	0.336492111
19	0.300145916

20	0.265404026
21	0.232504543
22	0.201658165
23	0.173044888
24	0.146803496
25	0.123030138
26	0.101771760
27	0.083024384
28	0.066735000
29	0.052802067
30	0.041082912
31	0.031400286
32	0.023550058
33	0.017311765
34	0.012458498
35	0.008766734
36	0.006024280
37	0.004037382
38	0.002635361
39	0.001673125

**Table 4.9: Probability that a life aged  $x$  lives to age  $(x+1)$ ,  $P_x$** 

Age	$P_x$
60	0.97093
61	0.968675
62	0.966245
63	0.96363
64	0.96082
65	0.95779
66	0.954545
67	0.951055
68	0.94731
69	0.943295
70	0.938985
71	0.93438
72	0.929445
73	0.92417
74	0.918535
75	0.91252
76	0.906095
77	0.899265
78	0.891985

79	0.88425
80	0.87604
81	0.86733
82	0.85811
83	0.848355
84	0.83806
85	0.82721
86	0.81579
87	0.8038
88	0.79122
89	0.778055
90	0.764315
91	0.749995
92	0.735105
93	0.719655
94	0.703675
95	0.687175
96	0.670185
97	0.65274
98	0.634875
99	0