UNIVERSITY OF NAIROBI

THE SHIFT FROM COMPLIANCE BASED SUPERVISION TO RISK BASED SUPERVISION OF THE DEFINED CONTRIBUTION SCHEMES IN KENYA

JOSEPHINE NJOKI WAWERU

156/80826/2012

NOVEMBER, 2014

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN ACTUARIAL SCIENCE, SCHOOL OF MATHEMATICS, UNIVERSITY OF NAIROBI.
DECLARATION

I, the undersigned, declare that this is my original work and has not been presented to any institution or university other than The University of Nairobi for academic credit. I further declare that I followed all the applicable ethical guidelines in the conduct of the research proposal.

Josephine Njoki Waweru,
Signed: _____________________________ Date: ____________________________

This project has been submitted for examination with my approval as the University supervisor.

Supervisor,
Prof. Patrick Weke,
Lecturer,
School of Mathematics,
University of Nairobi,
Signed: _____________________________ Date: ____________________________
ACKNOWLEDGEMENT

First and foremost, I acknowledge God for giving me this opportunity to live to see the completion of my project. I also acknowledge the effort and support of my supervisor Prof. Patrick Weke who instructed and directed me throughout the project. Last but not least, my workmates, my family and friends who gave me moral support.
DEDICATION

This project is dedicated to my family for all the support and encouragement they accorded me towards making this research project a success.
ABSTRACT

Risk-based supervision of pension funds grew out of a project that was jointly conducted by the World Bank and the International Organization of Pension Supervisors (IOPS). The project was initiated in response to the increasing interest in the development of innovative approaches to pension supervision from the member countries of both institutions.

The project provides an initial assessment of the development of risk-based supervision of pension funds in Kenya that has been pioneering the development of risk-based supervision methods in various forms.

A risk-based approach encourages supervised entities to place a greater focus on risk management in their daily operations, which promotes a stronger pension system and more effective outcomes for the members of the system. It is also expected that moving to a risk-based approach to supervision will enhance the ability of supervisors to focus resources on areas of highest risk, which will, over time, result in a more efficient use of supervisory resources.
TABLE OF CONTENTS

DECLARATION ........................................................................................................................... II

ACKNOWLEDGEMENT ........................................................................................................... III

DEDICATION .......................................................................................................................... IV

ABSTRACT ................................................................................................................................ V

TABLE OF CONTENTS ........................................................................................................... VI

ABBREVIATIONS .................................................................................................................... IX

CHAPTER ONE ........................................................................................................................... 1

INTRODUCTION ....................................................................................................................... 1

1.1 Background of the Study ..................................................................................................... 1

1.1.1 RBA Supervision Framework ....................................................................................... 1

1.1.2 Steps to risk Based Supervision ................................................................................... 2

1.1.2.1 Risk Focus ............................................................................................................. 2

1.1.2.2 Risk Factors .......................................................................................................... 2

1.1.2.3 Risk Indicators ...................................................................................................... 2

1.1.2.4 Risk Mitigations ..................................................................................................... 3

1.1.2.5 Risk weighting probability and impact ................................................................. 3

1.1.3 Supervisory approach and risk levels .......................................................................... 3

1.1.4 Challenges of implementing the RBS ......................................................................... 4

1.2 Research Problem ............................................................................................................. 5

1.3 Objective of the Study ....................................................................................................... 7

1.3.1 General Objective ........................................................................................................ 7

1.3.2 Specific Objective ....................................................................................................... 7
CHAPTER TWO .......................................................................................................................... 8
LITERATURE REVIEW .............................................................................................................. 8
  2.1 Introduction ......................................................................................................................... 8
CHAPTER THREE .................................................................................................................... 15
RESEARCH METHODOLOGY .............................................................................................. 15
  3.1 Introduction ....................................................................................................................... 15
  3.2 Population .......................................................................................................................... 15
  3.3 Pension Salary .................................................................................................................... 15
  3.4 Pensionable Service .......................................................................................................... 15
  3.5 Employers contribution .................................................................................................... 15
  3.6 Employees contribution .................................................................................................... 16
  3.7 Accumulated benefits ....................................................................................................... 17
  3.8 Normal retirement age ...................................................................................................... 17
  3.9 Risk scoring card .............................................................................................................. 17
  3.10 Investment and asset allocation ...................................................................................... 20
    3.10.1 Value at Risk .............................................................................................................. 20
    3.10.1.1 Calculation of VaR using Variance Covariance Method ...................................... 21
    3.10.1.2 Calculation of historical VaR ................................................................................ 22
  3.11 Data collection ................................................................................................................ 24
CHAPTER FOUR ....................................................................................................................... 25
DATA ANALYSIS, RESULTS AND DISCUSSION ................................................................. 25
  4.1 Introduction ....................................................................................................................... 25
  4.2 Descriptive Analysis ......................................................................................................... 25
    4.2.1 Using the risk scoring card .......................................................................................... 25
4.2.2 Calculation of historical VaR................................................................. 29

4.3 Conclusion ............................................................................................. 31

CHAPTER FIVE .......................................................................................... 32

SUMMARY, CONCLUSION AND RECOMMENDATIONS ............................. 32

5.1 Introduction ............................................................................................ 32

5.2 Summary ............................................................................................... 32

5.3 Conclusions ........................................................................................... 33

5.4 Limitation of the Study ........................................................................... 34

5.5 Recommendations .................................................................................. 34

5.6 Suggestions for Further Research .......................................................... 35

REFERENCES ......................................................................................... 36
ABREVEATIONS

IOPS - International Organization of Pension Supervisors

CBS – Compliance Bases Supervision

CI – Confidence Interval

CONSAR -

EF – Efficient Frontier

DC – Defined Contribution

RBA – Retirement Benefits Authority

RBS – Risk Based Supervision

VaR – Value at Risk
CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

1.1.1 Retirement Benefits Authority Supervision Framework

The Retirement Benefits Authority has since commencement utilized Compliance Based Supervisory model to oversee the pension industry. This resulted in an unwarranted amount of time being spent on pension schemes and provident funds which are largely in compliance with the requirements under the legislation and the regulations. To improve the regulatory process and make more effective use of resources, the Authority sought to develop a risk-based approach to its pension scheme monitoring and review practices.

In developing this new supervisory approach, RBA received technical assistance from the World Bank as well as input from a consultant funded by the Government of Kenya and the World Bank. The Authority launched its risk-based supervision model on June 17, 2010.

The risk-based approach to supervision is an approach which promotes the moving away from an approach based on strict compliance, specific rules and quantitative controls towards an approach that puts more emphasis on the identification and management of relevance.

The approach is borne out of the recognition of the need to have a more proactive approach to the regulation of the pension sector.

From the RBA’s point of view, the main objectives for the risk-based pension supervision model are:

a. Better understanding of Retirement Benefits Schemes financial position and the possible development in the short and medium term by both the regulator and the regulated entity;

b. Varying the scope and intensity of supervision in relation to the level of the risk schemes are exposed to;

c. Integrating supervisory regimes and efficient use of resources and time;
d. Effective allocation of scarce resources;
e. Measuring the investment risk; and,
f. Promoting confidence in the system as a whole.

1.1.2 Steps to risk based supervision process

1.1.2.1 Risk Focus:

Assessing risk per sector and focusing the resources on those sectors with high vulnerability. The objectives include protecting the interest of Members and Sponsors (Employers) of retirement benefits schemes and promote the development of the retirement benefits industry. In terms of risk measurement the following risks are identified; Counterparty default risk, market risk, operational risk, liquidity risk, legal and regulatory risk, strategic risk and most of all Investment risk.

1.1.2.2 Risk Factors:

The risk categories adopted include the Investment risk where the management and control is in the hands of the Trustees for example satisfactory investment policy statement and investment return above average, Insurance risk for example uninsured/insured life or disability benefits and non financial risk based on independent reviews for example large number of investment options.

1.1.2.3 Risk indicators:

Qualitative indicators may be used where the rules based assessments of the asset limits in compliance based into its risk based analysis. The diversification of a fund’s investment portfolio and compliance with the investment guidelines count for about 5% of the overall risk score, marks are awarded if the scheme has complied with investment guidelines and if invested in guaranteed funds.

Quantitative indicators may be used where the RBA uses a database of complaints as a further risk indicator which is managed by the Authority’s compliance department. The database captured for each complaint the interpretation of the law, administration and record keeping and benefits calculations.
1.1.2.4 Risk Mitigation

Risk mitigants considered in the pension Schemes include quality of the board of Trustees, effectiveness of operational management – outsources operations by the board, a funds information systems and financial controls, adequacy of risk management systems, compliance culture and procedures and adequacy of independent reviews.

1.1.2.5 Risk weighting, probability and impact

This helps to measure the investment risk especially for the DC schemes. This depends on the size and the total assets of the institution. The overall risk score is obtained by taking 50% (inherent risk) + 25% (Management and control)+ 25% (Capital support).

The risk score is taken as indicating the probability of a risk occurring and the funds are divided into three categories – large, medium and small according to the asset value.

Supervisory approach

Generally according to the RBA the risk level is as follows:

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Indicators</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green – 0</td>
<td>Schemes well run, financial and non financial indicators within acceptable range.</td>
<td>No action required</td>
</tr>
<tr>
<td>Light amber – 1</td>
<td>Reasonably well run, most financial and non financial indicators within acceptable range</td>
<td>Regular fillings continue, but more intensive monitoring until scheme returns to risk level 0</td>
</tr>
<tr>
<td>Dark amber -level 2</td>
<td>Scheme generally in acceptable status, but a number of indicators outside range, or have been deteriorating</td>
<td>Supervisor questions scheme administrator regarding the issues raised by analysis. Monitoring continues until scheme returns to risk level 0</td>
</tr>
<tr>
<td>Red – Level 3</td>
<td>Significant number of</td>
<td>Supervisor requests recovery</td>
</tr>
</tbody>
</table>
indicators outside acceptable range, or have shown significant deterioration, plan from Trustees. Recovery plan is examined and monitored until scheme can be returned to at least risk level 1

| Ultra-red – Level 4 | Scheme is in significant difficulty – scheme member interests significantly threatened | Intervention needs to be considered, including requirement for additional funding, reduced benefits, placing scheme in trusteeship, or eventually closing scheme, if all else fails |

### 1.1.3 Challenges of the Implementation of the risk based approach

Adaption of Models – One structure or Model cannot be taken from another country and applied unaltered to another country’s pension system. Most countries are unique with models requiring adaptation to each situation of each county. Operational and legal risks for example are more challenging for developing countries which means they need to be built into their systems more robustly.

Supervisory authority reorganization - The key to monitoring of risk based approach lies with the regulatory authorities (RBA) who need to communicate in every step of the process. This however requires that investment managers have more powers to carry out their mandate. After the rule was passed on the shift from compliance based the RBA changed the Compliance department to the Supervisory department. With this change the staff were only taken for a five days training on the same while with countries like South Africa having several departments which include Licensing and registration, prudent, enforcement and research and policy department.

Unavailability of data – With the shift from compliance based to risk based with developed countries like the UK and Mexico data was often not available and this was a major challenge. By this historical challenge, retirement benefits schemes shifting from
compliance based to risk based would need to think hard about the data they have and the data they need to use in advance of launching the transition to risk based approach. This is vital for ensuring the efficient working of the risk-based system. One solution is to build data collection into the risk-based analysis, explaining that if the data collected is insufficient or late this would be taken into account when forming any risk-score or deciding the supervisory response towards the fund.

Stakeholders (Industry) - Another challenge is communicating the new supervisory approach with the pension industry and with the funds and entities being supervised. The pension industry to understand the philosophy of the risk-based approach is key, as the ultimate goal is to imbue a risk culture into the pension funds themselves, with the pension funds performing their own risk controls and monitoring, so that the supervisory authority only has to step in where necessary. Explaining the new system to a wide range of stakeholders is therefore key. The RBA noted a resistance to change by stakeholders as a major hurdle to overcome when rolling out their new risk-based supervisory approach - including some doubting the independence of the whole exercise, and members and beneficiaries being concerned that they will have to bear the costs of the new supervisory system.

1.2 Research problem

The main goal of the retirement system is to ensure that members receive an adequate retirement benefit income when they retire. The growing number of defined retirement benefit schemes accumulates a sum of assets which can then be turned into a pension income on retirement.

However, the amount of this retirement income is not set in advance. In the absence of a proper regulatory framework, this feature leads to a focus by not only pension providers, but also regulators and retirement scheme members themselves on the short-term accumulation of assets rather than the longer-term goal of securing an adequate retirement income.
Risk-based supervision (RBS) for retirement schemes is currently defined as an approach by which the supervisory authority (RBA) directs its scarce resources towards the main risks posed to pension fund members - as opposed to rules or compliance-based supervision which involves rigorously checking compliance with a set of rules, irrespective of their relative importance to meeting the contributor’s objective.

In order for retirement scheme reforms to be successful to run effectively, policy makers need to first focus on maximizing return and minimizing risks by generally developing a model that will not only focus on the administration, management, control and capital and support but will also include focusing on the investment risk of the fund and asset allocation that will give the maximum return with the present risk.

Retirement Schemes are managed by licensed asset management companies, which are allowed to manage other funds as well. The investment regulation requires only a minimum level of diversification of the instruments under management. There are no restrictions on the number of portfolios that each of the asset management companies that manage retirement schemes are required to offer. The number of funds and the investment strategy of these funds have been mostly guided by the capacity of the sales force to bring a minimum number of contributors to these funds. Each fund is guided by its own investment guidelines, which can change without much notice.

The paper goes on to assert that, RBS for retirement benefits schemes has been defined as a much less specific way compared with banks and insurers- as a process for the allocation of supervisory resources towards the greatest potential risk.
1.3 Objectives

1.3.1 General Objective

The main objective of this study is to maximize return by providing adequate and secure pensions for Members in a Scheme at the point of retirement by developing the current model to include the investment risk and asset allocation.

1.3.2 Specific Objectives

i. To ensure that the available Member Benefits are effectively allocated when invested to give the maximum return.

ii. To vary the scope and intensity of supervision in relation to the level of risk the Scheme is exposed to.

iii. Better understanding of the Scheme as a whole and its possible developments by the regulator and the regulated Scheme.

iv. Promote confidence in the system as a whole
CHAPTER 2

LITERATURE REVIEW

According to IOPS, “risk-based supervision is a structured approach that focuses on the identification of potential risks faced by pension plans or funds and the assessment of the financial and operational factors in place to manage and mitigate those risks. This process then allows the supervisory authority to direct its resources towards the issues and the institutions that pose the greatest threat”. 14 IOPS Principles of Private Pension Supervision No. 5 states that: ‘Pension supervisory authorities should adopt risk-based supervision’

According to IOPS, RBS is a method of rationing scarce supervisory resources and focusing supervisory attention towards the entities that, in the supervisor’s assessment, pose the greatest risk.

IOPS also suggests that resources should be allocated on the basis of the schemes risk profiles in a formal way and risk assessment of the supervisors should also involve the assessment of emerging and possible future risks as well as current and past risks.

IOPS’ work had focused on a forward-looking approach and the allocation of supervisory resources as the benefits of RBS.

Pension Risk is the major risk faced by retirees where it measures whether the retiree will have enough pensions at the point of retirement. It may be measured by:

a. Pension targeted at the point of retirement
b. Investment Plans to hit the targets over time
c. Deviations that could come up as the Investment plans are being undertaken

Processes and operational risks could also be focused on especially in emerging markets where corruption and fraud within the financial sector are still major challenges.
Minimizing pension risk in a scheme is based on three main factors:

a) the level of contributions throughout the accumulation phase;
b) the security of the funds contributed; and
c) the earnings on those contributions net of fees.

Contribution risk is not in the control of the supervisor. This has led to supervisors focusing on more on operational risks than on investment risk - i.e. the security of those funds rather than the earnings on them.

The focus on process with respect to investment management places undue emphasis on operational risk to the detriment of emphasizing pension risk, which is the main concern of contributors.

This focus on processes rather than outcomes can mean that regulators and supervisors actually introduce misaligned incentives into the management of pension funds and can actually increase rather than mitigate the key pension risk which is what should be the main focus and objective because they tend to focus on short term rather than long term returns.

Investment risk is generally controlled via limits on the amount of a portfolio which can be invested in certain (risky) assets. This asset class restrictions is that they focus on short-term volatility without considering the ultimate risk to pension fund members. Blake et al (2008) describes this as the equivalent of worrying about air turbulence on a flight without considering whether the plane is actually going to reach its destination. Benartzi and Thaler (2007) also state that it often leads to an overly conservative investment approach - which is initially supported by the members of the pension plan due to financial literacy and behavior economic biases reinforcing the focus on the short-term and the avoidance of risk. Thus these investment approaches will not be sufficient to deliver an adequate retirement income over the long-term.
Supervisory authorities have tried use Value at Risk (VaR) as an alternative measure for controlling investment risk when asset class restrictions have been removed in some countries like Mexico. Yet these also control short-term volatility rather than pension risk.

Mexico introduced an investment regulatory framework based on quantitative measures traditionally used to measure short-term investment risks. Mexico introduced a maximum limit on the VaR of the pension portfolio. VaR is a risk measure that is easy to quantify and can provide high frequency data to traders and investors, its relevance for risk management of long-term investors.

The regulation should have created the conditions for asset managers to invest pension fund assets strategically in order to optimize the future value of pensions, Mexico’s VaR an approach on portfolio allocation and focused on maintaining volatility within a predefined range. . However, short-term volatility is a poor predictor of the value of the benefits at retirement age. Using an inappropriate tool to try to measure performance against some short-term objective (VaR) increases pension risk even further.

Regulators have moved more towards controlling the outcomes which retirement scheme funds to deliver through the introduction of guarantees. Introduction of guarantees not only increases the cost of the system and lowers returns to contributors, but also creates distortions in the asset allocation of the retirement funds. These factors translate into lower pensions or benefits in the future.

In this context, trustees have taken a conservative approach and have assumed that these guarantees can be executed at any point in time. This has resulted in conservative retirement portfolios, with low volatility and potentially low pension benefits in the future. As a result, the guarantees on the nominal value of the pension fund result in increases in pension risk, as managers invest the pension fund in inefficient portfolios that will be unable to deliver adequate benefits at the retirement age.
Rudolph and others (2010) point out that while most of the literature highlights the herding effects of minimum guarantees, the problem is not one of herding but in the portfolio allocation resulting from the interactions in the market. Herding is in the nature of the fund management industry, and having common portfolio benchmarks helps to ensure comparability among portfolios.

With the existence of guarantees or the requirement for the investment of reserves to mirror the investments of the pension fund, there is an argument to suggest that more schemes are concerned with measuring their capital at risk than they are measuring the investment risk in the fund.

The introduction of guarantees creates additional distortions in the duration of the fixed income portfolio of the pension funds. Since the liabilities are largely long term, the fixed income part of the portfolio should consist of investments in long-term inflation linked bonds. These instruments protect individuals from interest rate risk, associated with reinvestment risk, and also to the risk of unexpected changes in the rate of inflation.

Many countries require that the reserves be invested in the same way as the assets of the fund; the requirement appears to have a distortive effect on the asset allocation of pension funds.

The performance of retirement schemes is typically measured by rates of return, which are not only misleading, but they are also poor indicators of pension risk. While rates of return are useful tools for measuring short term performance, their relevance in mitigating pension risk is limited. For instance, when a Member receives a report that indicates that previous year his or her pension fund had a rate of return of 5 percent, the scheme Member does not have enough information to differentiate between a good and a bad performance.

It also could be said that even if performance were measured accurately (against long term benchmarks rather than short-term volatility) individuals would not be able to assess this
properly due to low levels of financial literacy.

Due to the limited ability of members of schemes to understand investment decisions and the complexity of the question, a large majority of individuals are unable to understand the risks of the investment alternatives, and information provided to the market is focused on misleading indicators of pension risk. Members of schemes are provided with information that relates to the short-term performance of their pension asset but is irrelevant to the question of pension risk.

The failure to measure pension risk is a function of a lack of benchmarks, against which it can be measured, which, in turn, is due to the failure to quantify the pension objective. In other words, it is not possible to answer the question of “will I have enough?” unless there is a quantification of “enough”. Can the attention of pension supervisors be focused back towards to core goal of delivering an adequate pension income and mitigating pension risk?

Tony and Heinz (2014) argued that that benchmarking portfolios of pension funds is the most strategic way of applying the pillar three concept to RBS of retirement funds that is, in order to be meaningful, rates of returns need to be compared against something. Consequently, it is important to measure performance against benchmarks built with the objective of optimizing the members’ pensions at retirement age.

Tony and Heinz (2014) also state that the absence of explicit targets related to the expected value of pensions at retirement age, the introduction of RBS does not guarantee that the expected value of pensions at retirement age will adequate. If RBS is to be more meaningful, it needs also to supervise investment risks, and assess those risks against benchmarks derived from quantifiable targets. They also emphasize that the proper approach to pension design is to start calculating back from a desired/required pension level and setting a long term investment strategy adequate to reach this goal.

For example a 50 percent replacement rate target at the age of 65 and a contribution rate of
10 percent employer and employee, one needs to calculate expected annuity prices based on mortality data and estimates about improvements, and then use asset return and wage curve modeling to see what sort of investment performance and portfolio may be necessary to reach the pension capital required. It may turn out that the set of replacement rate – retirement age – contribution rate does not allow for an investment performance which is realistic in which case one or more of those parameters may have to be adjusted or the expectations of a future replacement rate lowered.

If the portfolio allocation of pension funds is driven by the investment regulation, the case for introducing RBS is limited. The justification for introducing RBS would be stronger in cases where the supervisory agency is mandated to take a proactive role in supervising investment risk, with the aim of mitigating pension risk.

The case for introducing RBS is even more relevant in cases where pension funds are allowed to leverage or invest in derivative instruments or structured products that are heavily exposed to counterparty risks or default risk.

According to Pablo Antolin et al (2009), measuring the level of investment risk in DC schemes is critical since it takes into account both positive and negative outcomes. Approaches to regulating investment risk include quantitative portfolio restrictions, minimum investment returns, and targets over the accumulation period, a maximum VaR over a short investment period and a maximum replacement rate expected shortfall.

Minimum investment return has been used in Switzerland, Belgium and Germany while VaR has been used in Mexico. Investment limits are the most popular form in quantitative investment regulations in most countries. Two other types are used by policy makers and this consists of requiring pension funds to meet a minimum investment return set in absolute terms and setting quantitative risk limits on the overall fund portfolio.
The VaR coexists with quantitative approach and restrictions. According to CONSAR (Mexico) for VaR purposes, it takes a one day horizon for the total portfolio and estimates the VaR using the historic returns over the past 500 days (95% CI). Stress testing may also be done on individual assets and this helps examine the effect of simulated large movements in key risk factors upon the value of the portfolio through traditional probability model which takes account of risk factors correlations.

Only a few countries with mandatory DC systems require Schemes to meet minimum investment returns where the minimum returns are the pension funds’ industry return average. For example Chile’s minimum guarantee is based on the average real return for all pension funds over the last 36 months.
CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION:

This Chapter describes how the systematic plan to study the conversion, expounding on steps and procedures involved in Research Design, Study Population and Sample, Sampling Method, Data Collection, Analysis. This chapter as well expounds on the data size and the data collection methods applied.

3.2 POPULATION

The population of this study consisted of employees of the researched on company. The Scheme was sampled from a Retirement Industry service provider within the Kenyan Retirement Industry whose population was evenly distributed.

3.3 PENSIONABLE SALARY

This is the basic yearly salary being received by an employee excluding bonuses, commissions, overtime, housing allowance, leave allowance, directors’ fees and any other fluctuating emoluments or other allowances.

3.4 PENSIONABLE SERVICE

The period of continuous service with the employer following the entry date on which the employee joined the Scheme or first contributed to the Scheme.
3.5 EMPLOYERS CONTRIBUTION

At time t, the employer of the active population contributes a rate $\pi$ of their salaries to the scheme:

$$DC_{er} = \int_{t}^{LR} ERPER \ast E_t^* (1 - m_t) e^{-\delta t} dt$$

3.6 EMPLOYEE’S CONTRIBUTION

At time t, all members of the active population contribute a rate $\pi$ of their salaries to the scheme:

$$DC_{ee} = \int_{ee}^{LR} EEPER \ast E_t^* (1 - m_t) e^{-\delta t} dt$$

Where:

$m_t$ is the mortality rate

$t$ is time conditional on age, gender

$\delta$ is the discount rate

$E_t^*$ is the predicted earnings of the worker at time $(t)$ in constant Kshs.

The integration runs from the current year to LR, where RA is the expected age of retirement and LR= A-AR is the number of years to retirement.
3.7 ACCUMULATED BENEFITS

This is the aggregate of all contributions made by a employee and by the employer under the Rules adjusted for increase or decrease in the value of any investments representing the same and of all interest accrued and accumulated thereon less any deduction in respect of tax or management expenses as at any particular date.

3.8 NORMAL RETIREMENT AGE

This is the age at which an individual ceases to work for his employer and is legible to receive his/her accumulated benefits that he had saved at the time of employment. The Normal retirement age for most Schemes in Kenya is 55 while the early retirement age is 50 years.

3.9 RISK SCORING MODEL

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Satisfactory Results</th>
<th>Unsatisfactory Results</th>
<th>Risk Score</th>
</tr>
</thead>
</table>
| 1.1 Inherent risk - investment | • Satisfactory investment policy | • Lack of satisfactory investment policy statement  
| | • Recent review of statement | • Lack of evidence of updating of statement  
| Statement | • Investment return above average | • Asset class(es) outside range 80 – 120% of average  
| | • Risk measures (e.g. diversification) |  
| | below average | • Individual holdings above threshold (e.g. 2% of portfolio)  
| | | • Non-compliance with asset limits  
| | | • Liquidity concerns  
| | | |  
| 1.2 Inherent risk - insurance | • insurance risk not present | • uninsured life or disability benefits beyond capacity of scheme to absorb  
| | • insurance risk insured | | 0.5  
| | | |  

17
<table>
<thead>
<tr>
<th>1.3 Inherent risk – non-financial</th>
<th>2.1 Management and control – Trustee oversight</th>
<th>2.2 Management and control – Operations and Interrogatories</th>
</tr>
</thead>
<tbody>
<tr>
<td>• relatively simple plan provisions and procedures</td>
<td>• satisfactory Trustee oversight</td>
<td>• satisfactory completion of interrogatories</td>
</tr>
<tr>
<td>• transparent outsourcing Procedures</td>
<td>• Lack of proper oversight process</td>
<td>• unsatisfactory completion of interrogatories</td>
</tr>
<tr>
<td>• complex provisions beyond capacity of scheme</td>
<td>• non-transparent outsourcing of functions</td>
<td>• unsatisfactory filing record</td>
</tr>
<tr>
<td>• large number of investment options in DC schemes where capacity not present to handle this</td>
<td>• non-transparent declaration of interest in DC schemes</td>
<td>0.25 to 0.5</td>
</tr>
<tr>
<td>• capacity to handle greater Complexity</td>
<td>• 0.5 – 1</td>
<td>• 0.5</td>
</tr>
</tbody>
</table>

- • capacity to handle non-insured risk
- • uninsured pensions at retirement in small DB scheme
- • uninsured pensions at retirement in DC scheme – actuarial valuations
- • uninsured pensions at retirement in DC scheme – no or unsatisfactory actuarial valuations

- • defined benefit scheme with complex provisions beyond capacity of scheme
- • non-transparent outsourcing of functions
- • large number of investment options in DC schemes where capacity not present to handle this
- • non-transparent declaration of interest in DC schemes

- • satisfactory Trustee oversight
- • No or unsatisfactory completion of governance self assessment questionnaire
- • Concerns about Trustees meeting fit and proper criteria
- • Lack of proper documentation
- • Concerns about document filing and cooperation with RBA
<table>
<thead>
<tr>
<th>2.3 Management and control – Independent Review</th>
<th>2.3 Management and control – Independent Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>• independent professionals used in review process</td>
<td>• concerns about independence (e.g. professional is employee of organization)</td>
</tr>
<tr>
<td>• professionals in good standing</td>
<td>• concerns about professional standing</td>
</tr>
<tr>
<td>• easily understandable reports without qualifications</td>
<td>• unclear reports and/or qualifications</td>
</tr>
<tr>
<td>3.1 Capital support – Employer sponsor</td>
<td>3.1 Capital support – Employer sponsor</td>
</tr>
<tr>
<td>• timely remittance of employee and employer contributions</td>
<td>• Contribution delinquency¹</td>
</tr>
<tr>
<td>• DB schemes – satisfactory actuarial assumptions for current service Cost</td>
<td>• If contributions are occasionally 7 days or more in arrears, but less than 30 days score 0.5</td>
</tr>
<tr>
<td>• Schemes with unfunded liabilities/solvency deficits – satisfactory recovery plan</td>
<td>• If contributions are persistently more than 7 days in arrears score 1</td>
</tr>
<tr>
<td>• Contribution holidays well Monitored</td>
<td>• If contributions are in arrears for 30 days or more score 2</td>
</tr>
<tr>
<td>• DC schemes – objectives and target of schemes well communicated</td>
<td>• If there is a pattern of late payment score 3</td>
</tr>
<tr>
<td>• Industry and scheme sponsor in good shape financially</td>
<td>• Contributions below those recommended in actuarial report</td>
</tr>
<tr>
<td></td>
<td>• If contributions are less than 90% of the recommended current service cost and amortization payments score a</td>
</tr>
</tbody>
</table>
• Poor or no monitoring of contribution holidays
• DC schemes – poor communication of targets
• Industry and/or scheme sponsor in poor financial shape

3.10 INVESTMENT AND ASSET ALLOCATION

Contributions from the DC are invested in various portfolios containing four asset classes and this includes; Treasury bonds/bill, equity, cash and property. The mean standard deviation and correlation matrix is as shown.

<table>
<thead>
<tr>
<th>Return</th>
<th>Volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>4.0</td>
</tr>
<tr>
<td>Bonds</td>
<td>5.5</td>
</tr>
<tr>
<td>Equity</td>
<td>7.5</td>
</tr>
<tr>
<td>Property</td>
<td>6.0</td>
</tr>
</tbody>
</table>

3.10.1 Value at Risk approach

VaR measures the potential loss on a portfolio where the loss is linked to the probability of large adverse movements in the market typically at 5% confidence interval. It assumes all assets are normally distributed and the portfolio return is a linear combination of normal variable. VaR can provide the Fund Manager and the supervisor with a summary measure of the market risk to which each pension portfolio is exposed as well as the probability of an adverse move. The attraction of VaR is that it a common measure of risk factors across different positions and risk factors. However it does not consider loss or gains when the bad state does not occur nor does it state the expected loss when the bad state occurs. This is particularly problematic when returns distributed have fat tails. VaR
in Pension schemes is concerned with non zero means to the return distribution.

### 3.10.1.1 Calculation of VaR using Variance Covariance Method

Asset distribution of the various assets should sum to 1.

<table>
<thead>
<tr>
<th>Asset</th>
<th>Weight</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The weighting represents the amount of the portfolio invested in each asset. It is also possible to represent the weighting as a value of the fund, rather than as a percentage.

Correlation is calculated by looking at how the price of the asset moves in relation to each other. A correlation coefficient can have a value of between 1 and -1.

A correlation of 1 means that the two assets have a perfect positive correlation. In other words, if one asset changes value, the other changes value by the same proportion - i.e. if Asset A increases in value by 5%, then Asset B will increase in value by 5%.

A correlation of -1 means that the two assets have a perfect negative correlation. In other words, if one asset changes value, the other changes value by the same proportion but in the opposite direction - i.e. if Asset A increases in value by 5%, then Asset B will decrease in value by 5%. A correlation of 0 means that the two assets have no relation at all. In other words, if one asset changes value, the other will not be affected at all (it might increase, decrease or not change value).
<table>
<thead>
<tr>
<th></th>
<th>Interest Rates</th>
<th>Equity</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Rates</td>
<td>100</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Equity</td>
<td>50</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>Property</td>
<td>50</td>
<td>75</td>
<td>100</td>
</tr>
</tbody>
</table>

This are according to the South African SAM Q1S1, however the correlation matrix will need to be derived for the Kenyan Market.

**VaR of a Portfolio of n assets.**

\[
\sigma_p^2 = \begin{bmatrix} w_1 & \cdots & w_n \end{bmatrix} \begin{bmatrix} \sigma_{11} & \cdots & \sigma_{1n} \\
\vdots & \ddots & \vdots \\
\sigma_{n1} & \cdots & \sigma_{nn} \end{bmatrix} \begin{bmatrix} w_1 \\
\vdots \\
w_n \end{bmatrix} = w^T \Sigma w
\]

Where:

- \( w \) is the vector of the weights of the n assets.
- \( w' \) is the transpose vector of \( w \)
- \( \Sigma \) is the covariance matrix of the n assets

### 3.10.1.2 Calculation of Historical VaR

There is a set of basic parameters to be determined and in turn define the historical VaR. The parameters include:

- Confidence interval at 95% the standard levels,
- Number of scenarios considered 500 which is large enough to cover transitory volatility and
- Evaluation frequency (daily) mainly 500 days.
The process of calculating Historical VaR;

First the actual price of the asset is calculated. For Treasury bills and bonds the following is used;

\[ AP = \frac{NV}{1 + \left(\frac{MR}{360}\right) \times TM} \]

Where;

- AP - Actual Price
- NV – Net Value
- MR – Market Rate
- TM – Time to Maturity

Secondly, list the rates of return or the interest rates for the past 500 days which affect the valuation of the asset.

Calculate the percentage change of consecutive dates of the rates or returns observed.

\[ \% \text{ Change} = \frac{\text{Today’s rate}}{\text{yesterday’s rate}} \]

The new historical rate is created by applying the rate variations from the previous step to the current level of rate;

\[ \% \text{ change} \times \text{current day rate} \]

Using the rates computed from the 500 values, calculate the new price and value of the asset;
NP = \frac{NV}{1 + (\frac{MR}{360}) TM}

Where;

NP - New Price
NV – Net Value
MR – Market Rate
TM – Time to Maturity

Then we calculate the profit or losses of the asset relative to the current value calculated in the first step. The profit or loss should also be a percentage of the current value of the portfolio.

Finally we sort in descending order the changes in percentage of the value of portfolio. The regulatory VaR is the 13th worst scenario. Which is given by (0.05/2)*500.

3.10 DATA COLLECTION

For the purpose of this study, raw data was used. The data was obtained from the retirement benefits scheme, the data being from a Retirement Scheme Administrator and an Investment (Fund) Manager.
CHAPTER FOUR

DATA ANALYSIS AND RESULTS

4.1 INTRODUCTION

This chapter shows findings of the study and discusses them in length. The study targeted to measure of Investment risk using the VaR. Section 4.2 gives the descriptive analysis, Section 4.3 provides the risk scoring card and value, Section 4.4 covers the comparison of VaR and Risk scoring value and Section 4.5 is the interpretation of the findings.

4.2 DESCRIPTIVE ANALYSIS

4.2.1 Using the Risk Scoring card - Questionnaire

Using the various areas involved in Investments risks, the following should be regarded:

<table>
<thead>
<tr>
<th>Investment risk</th>
<th>Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you prepared an investment policy statement?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Has this statement been reviewed within the previous year?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Have the investments been monitored regularly based on this statement?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Are all the investment made in accordance with the regulations?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Are any of the assets invested by an outside investment manager or other financial Institution?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Have you conducted an asset liability management review?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Have you prepared an estimate of liquidity requirements and how these will be met over the short and medium term?</td>
<td>Y/N</td>
</tr>
</tbody>
</table>
Areas of Insurance risk to be regarded include;

<table>
<thead>
<tr>
<th>Insurance risk</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the scheme provide insurance or disability benefits, other than</td>
<td>Y/N</td>
</tr>
<tr>
<td>survivor benefits (e.g. lump sum death benefits)</td>
<td></td>
</tr>
<tr>
<td>If such benefits are provided, are they insured by an insurance company?</td>
<td>Y/N</td>
</tr>
<tr>
<td>If such benefits are provided and are not reinsured, has a risk analysis</td>
<td>Y/N</td>
</tr>
<tr>
<td>been performed</td>
<td></td>
</tr>
<tr>
<td>Are pensions paid from the fund or are they reinsured with an Insurance</td>
<td>Paid</td>
</tr>
<tr>
<td>company?</td>
<td>Insurance</td>
</tr>
</tbody>
</table>

Areas of Non financial risk to be reviewed include;

<table>
<thead>
<tr>
<th>Non-financial risk</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the scheme administered internally?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Is any part of the administration outsourced?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Has there been any change to the arrangements in the previous year?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Is an electronic data processing system used for administration?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Are there any outsourcing arrangements?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Were such arrangements selected at arm’s length in a transparent manner?</td>
<td>Y/N</td>
</tr>
<tr>
<td>If the answer to the previous question is yes, do you have written delegations, service standards and documentation related to the appointment of the outsourcing</td>
<td>Y/N</td>
</tr>
</tbody>
</table>
Areas of Non financial risk to be reviewed include;

<table>
<thead>
<tr>
<th><strong>Trustees Board Oversight</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there a written governance document outlining the roles and responsibilities of the Trustees Board?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Have you completed the governance self-assessment questionnaire?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Have all members of the Board of Trustees passed fit and proper tests or been trained?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Have all Board members passed the tests required?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Do you have a code of conduct for Board members?</td>
<td>Y/N</td>
</tr>
</tbody>
</table>

Areas of operations and control to be reviewed include;

<table>
<thead>
<tr>
<th><strong>Operations and control</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have a written procedure manual for the operation of the pension Scheme?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Do you have written risk control mechanism?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Do you have specific quality and timeliness standards, which are monitored?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Do you have a formal complaints resolution mechanism?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Do you have conflict of interest guidelines and a code of conduct for all Members of the management?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Are any of your activities outsourced?</td>
<td>Y/N</td>
</tr>
</tbody>
</table>
Areas of independent review include;

<table>
<thead>
<tr>
<th><strong>Independent Review</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Are independent professionals engaged to review the accounts and Actuarial statements?</td>
</tr>
<tr>
<td>Is the appointment of these professionals reviewed regularly by the Board?</td>
</tr>
<tr>
<td>Have you changed any of these professionals in the past three years? If so, why?</td>
</tr>
</tbody>
</table>

Areas of contribution remittance to be reviewed include;

<table>
<thead>
<tr>
<th><strong>Contributions Remittance</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Are any assets invested in securities of the plan sponsor, other than through a recognized securities exchange?</td>
</tr>
<tr>
<td>Do you perform dynamic solvency testing?</td>
</tr>
<tr>
<td>Have all employer and employee contributions been made to the fund within the time limits prescribed?</td>
</tr>
<tr>
<td>If the answer to the previous question is no, do you have mechanisms in place to monitor and ensure that contributions are paid on time?</td>
</tr>
</tbody>
</table>

**From the Methodology in section 3.9 the overall risk score is given by**

50% (inherent risk) + 25% (Management and control) + 25% (Capital support).
4.2.2 Calculation of Historical VaR

Using the method described in section 3.9.1.2 the following is noted.

i. The estimation of the historical percentage variations of risk factors is performed (500 days).

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Date</th>
<th>Mrkt rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base date</td>
<td>30th June, 2014</td>
<td>10.04</td>
</tr>
<tr>
<td></td>
<td>27th June, 2014</td>
<td>10.06</td>
</tr>
<tr>
<td></td>
<td>26th JUNE, 2014</td>
<td>9.53</td>
</tr>
<tr>
<td></td>
<td>25th June, 2014</td>
<td>8.48</td>
</tr>
<tr>
<td></td>
<td>24th June, 2014</td>
<td>7.52</td>
</tr>
<tr>
<td></td>
<td>23th June, 2014</td>
<td>6.65</td>
</tr>
<tr>
<td></td>
<td>20th June, 2014</td>
<td>5.99</td>
</tr>
<tr>
<td></td>
<td>19th June, 2014</td>
<td>5.71</td>
</tr>
<tr>
<td></td>
<td>18th June, 2014</td>
<td>5.82</td>
</tr>
<tr>
<td></td>
<td>17th June</td>
<td>5.66</td>
</tr>
<tr>
<td></td>
<td>16th June</td>
<td>4.41</td>
</tr>
<tr>
<td></td>
<td>13th June</td>
<td>3.18</td>
</tr>
</tbody>
</table>

ii. With these variations of risk factors a set of price scenarios for individual securities are computed (500 days.)
### iii. Price scenarios are used to determine 500 scenarios for the current portfolio valuation.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Date</th>
<th>Market rate</th>
<th>% change</th>
<th>New Historical Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27th June, 2014</td>
<td>10.06</td>
<td>1.055614</td>
<td>10.59836306</td>
</tr>
<tr>
<td>2</td>
<td>26th JUNE, 2014</td>
<td>9.53</td>
<td>1.123821</td>
<td>11.28316038</td>
</tr>
<tr>
<td>3</td>
<td>25th June, 2014</td>
<td>8.48</td>
<td>1.12766</td>
<td>11.32170213</td>
</tr>
<tr>
<td>4</td>
<td>24th June, 2014</td>
<td>7.52</td>
<td>1.130827</td>
<td>11.35350376</td>
</tr>
<tr>
<td>5</td>
<td>23th June, 2014</td>
<td>6.65</td>
<td>1.110184</td>
<td>11.14624374</td>
</tr>
<tr>
<td>6</td>
<td>20th June, 2014</td>
<td>5.99</td>
<td>1.049037</td>
<td>10.53232925</td>
</tr>
<tr>
<td>7</td>
<td>19th June, 2014</td>
<td>5.71</td>
<td>0.9811</td>
<td>9.85024055</td>
</tr>
<tr>
<td>8</td>
<td>18th June, 2014</td>
<td>5.82</td>
<td>1.028269</td>
<td>10.32381625</td>
</tr>
<tr>
<td>9</td>
<td>17th June</td>
<td>5.66</td>
<td>1.283447</td>
<td>12.88580499</td>
</tr>
<tr>
<td>10</td>
<td>16th June</td>
<td>4.41</td>
<td>1.386792</td>
<td>13.92339623</td>
</tr>
</tbody>
</table>
iv. Gains and losses of the portfolio’s value are computed and sorted in descending order.

v. The regulatory VaR is the 13th worse scenario (corresponding to the 95% confidence level).

4.3 Conclusion

Results from the scoring card and the VaR show that the asset mix of schemes is distributed in a very conservative environment. The regulation of the investment choice should also be considered in risk based supervision to ensure that the assets are distributed according to the risk value of a particular Scheme.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter gives a conclusion of the study, limitations and recommendations for further research.

5.2 SUMMARY

This objective of this study was to develop the current risk based supervision model which focuses on the management and control, capital support, and inherent risk to also include measure the investment risk level for Schemes using the VaR. As was noted retirement schemes are built to ensure that the Members or employees of a Scheme have sufficient accumulated benefits at the point of retirement. The investment and asset allocation should be one of the major subjects regarded in order to maximize returns to Members benefits though the risk of counterparty is predominant especially with the younger generation workforce.

With the 95% CI in VaR there is a 95% probability that the actual returns of the portfolio will be worse than the VaR. A VaR of 0.6% of total funds of 1billion means the value at risk is 600,000.00.

The objective of the investment strategies in schemes should be to maximize the returns of retirement benefits subject to a given risk level calculated from VaR. The analysis shows that an investment portfolio may be mean variance efficient in the short term but inefficient when looked at through the lens of the scheme member.

Very low allocation of equities and very high allocations in government securities is unattractive in terms of tradeoff of return and risk thus the regulator (RBA) and the
investment managers need to consider the wide range available assets.

Changes in the investment strategy using the risk scoring card and VaR aims at high returns and better retirement benefits by increasing investment opportunities and regulating the credit risk. The challenge involved would be that the Fund managers would need to improve their skills, experience and develop an adequate risk management infrastructure.

The risk scoring card measures both the magnitude of the potential impact and the probability of the occurrence of financial failure which employs logical approach to selecting, rating and weighting the factors which determine the overall probability of failure.

The model encourages greater risk awareness in schemes thus providing analytical consistency and discipline in measuring the risks. The movement towards risk management and outcomes rather than a focus on structure and compliance leads to the efficient frontier. The asset allocation using the efficient frontier enables better allocation of scheme resources (benefits) and can lead to efficient gains and higher benefits.

5.3 CONCLUSIONS

In this project, it is noted that risk based supervision is not designed to solve the problem of schemes with low or average returns but the principle advantage is the ability to help supervisors and Trustees identify ahead of time risks that may cause serious problems in the future, and assess the ability of Trustees management to deal with risks identified.
5.4 LIMITATIONS OF THE STUDY

The limitations of this study include;

i. Risk based supervision is still very young in Kenya and the world at large and few countries have managed to come up with a method or model to be adopted. These countries include Australia, Germany, Chile, Mexico, India etc.

ii. VaR is usually uninformative about the extreme tail, it only tells us what we would lose in normal states, where the tail event does not occur but nothing about what we could lose in bad states where a tail event occurs.

iii. VaR addresses the retirement benefits schemes as financial intermediaries there is no explicit treatment of retirement income adequacy

iv. Historical VaR relies on historical relationships of asset classes and risk management methods that may not hold in the future.

v. Interaction of various elements of regulatory framework are not considered

5.5 RECOMMENDATIONS

The recommendation for this study is that the RBA and Trustees should also include the Investment risk as they work towards converting or moving from compliance based supervision to risk based supervision since returns of investments also play a big role in ensuring that Members of schemes have enough or better benefits at the point of retirement.
5.6 SUGGESTIONS FOR FURTHER RESEARCH

The study has served as a development for further research on the shift from compliance based supervision to the risk based supervision for retirement benefits schemes.

A further study can be conducted using various sets of data to compare the different environments and achievements of peer companies, employers and service providers.

Many other factors not considered in this project also need to be reviewed since they also affect how retirement benefits or funds are invested. These factors include the ages of members, expenses incurred within the scheme subject to the market limits, level of employee turnover, occupation etc.
REFERENCES

Pablo Antolin, Sandra Blome, David Karim, Stephanie Payet, Jordy Peek, Gerhard Scheuenstuhl and Juan Yermo. Investment Regulations and Defined Contributions, July 2009 OECD working paper on Insurance and Private Pensions No. 37

IOPS Tool kit for Risk Pensions Supervision Module 2 – Kenya www.iopstoolkit.org

IOPS Working Paper No.4 Experiences and challenges with the Introduction of Risk based supervision for Pensions Funds, August 2007

RBA supervisory guideline No. 2 –www.rba.go.uk


CONSAR – Mexican pension Funds VaR and Risk Management April, 2008

Augustino N. Hotay – Guidebook on the Implementation of Risk based Supervision, January 2009