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**A PENSION MODEL FOR THE INFORMAL SECTOR IN KENYA**

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## Declaration

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the proposal itself.

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## **ABSTRACT**

The purpose of this research paper is to come up with a pension model for the informal sector in Kenya. We develop a pension model that uses pre-retirement mobile phone airtime expenditures through use of Bonga Points to accumulate the pension fund. We then determine the expenditure patterns experienced pre- and post-retirement and use these patterns to advise on the daily amount required to be saved above the current amount in order to facilitate a comfortable post-retirement life.

The data utilized in this study was retrieved from primary and secondary sources. Inflation and interest rates data were retrieved from Kenya's Central Bank database. The mortality rates were retrieved from the World Health Organization and the life expectancy from World Atlas, Lancet and World Life Expectancy. Pre-retirement and post-retirement data were retrieved from a survey done in the informal markets in Kenya.

The inflation and interest rates were forecasted using the Vasicek Interest Rate Model using MS Excel. The results show that an average individual working in the informal sector spends approximately KShs. 6,130.77 per month for his/her livelihood. Due to inflation trends in the country, their expenses will increase in order to maintain the same standard of living during their retirement. Given the expenditure pre-retirement in that they will need to save KShs.754.30 per month, it will require them to be increase their mobile phone expenditure by KShs. 40 per day in order to raise an amount sufficient to sustain their lifestyle post-retirement.

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## **CHAPTER ONE: INTRODUCTION**

### **1.1 Background Information**

Retirement Benefits Schemes are formed to provide income replacement to members after retirement or provide assistance to beneficiaries of the member upon his/her death. In order for the retirement benefits schemes to meet their objectives, contributions need to be collected from employers and employees and there is need for investments leading to good returns so that benefits are paid on time to the members. Members make these regular contributions during their working life and once a member retires either after attaining the retirement age or earlier due to other factors, such as deteriorated health, these contributions plus accrued returns are utilized to provide retirement income to the member.

In the Kenyan market, Retirement Benefits Schemes can be categorized into two main groups: Pension Funds and Provident Funds.

In Pension schemes, on retirement a member has access to a third of their funds as a cash lumpsum and the balance of two thirds is transferred into an income drawdown or used to buy an annuity. An annuity is an arrangement where an insurance company or life office enters into a contract to pay a certain amount of money in regular intervals, usually monthly, to the annuitant or its beneficiary. An Income Drawdown is a fund that provides members of a retirement benefits scheme an option to access their retirement benefits as a regular income through their investment returns upon retirement rather than taking their benefits as a lumpsum or taking up an annuity. Pension plans in Kenya are classified into: Occupational pension schemes, Public service pension funds, Individual pension plans, which can pay out benefits as pension or provident funds depending on the needs of the individual, and Umbrella schemes, which can pay out benefits as a pension or provident fund depending on the needs of the employer.

A Provident Fund provides only a Lump Sum payment at retirement, so the retiree accesses all their funds at a go. The member can use the funds to either buy an annuity, transfer into an income drawdown fund, or use the money in any way they wish to.

The National Social Security Fund was established in 1965 as a provident fund operating on a defined contribution basis to provide basic financial security benefits to Kenyans upon

retirement. In 2013, however, the National Social Security Fund (NSSF) Act was amended to establish two

funds, namely, a pension fund and provident fund, to which every Kenyan with an income was to contribute a percentage of his/her gross earnings, and receive benefits out of the Funds in case of permanent disability or upon retirement, a monthly life pension; and upon death, a benefit is to be paid to their beneficiaries that is the contributing members are expected to make their contributions on monthly basis, with the lowest amount payable being Kshs. 200 per month for the voluntary members (self-employed) and Kshs. 360 per month for the employed.

## **1.2 Pension Industry in Kenya**

The Retirement Benefits Industry plays a huge role in the economy. According to the Organization for Economic Co-operation and Development (OECD) in 2017, assets in Retirement Benefits Schemes totaled 50.7% of GDP in the OECD countries and 19.7% of total GDP in the non-OECD jurisdictions. It is clear that most non-OECD countries still have a long way to go in the growth of the sector. In Kenya, the Retirement Benefits Assets as a percentage of GDP stood at 13.4%, compared to more developed markets like the USA at 84.1% and the UK at 105.3%. Over the last decades, we have seen reforms and education initiatives by the Retirement Benefits Authority (RBA) to educate people on the importance of saving for retirement.

The Retirement Benefits Industry in Kenya has registered significant growth, with the total Assets Under Management (AUM) having grown by a Compound Annual Growth Rate (CAGR) of 14.3% to the current AUM of Kshs 1,166.6 bn as of June 2018, from Kshs 287.7 bn in 2008. This growth can be attributed to: (i) actual individual contributions have also increased driven by the growing middle class, (ii) increased returns on the investments, and (iii) growth in contributions as members registered to Retirement Benefits Schemes continue to increase. Despite the immense growth, there is an indication that most Kenyans are yet to join a formal Retirement Benefits Scheme as the penetration rate of the Retirement Benefits Schemes remains low at 15.0% of the adult population.

In the 2018 economic survey report from the Kenya National Bureau of Statistics (KNBS), More than 83 per cent of adults of working age are in the informal sector, and more than 81 per cent of

all employment is in micro-, small- and medium-sized working areas. Informal work brings with it a number of challenges: it is characterized by the absence of formal contracts, which leads to high levels of job insecurity, harsh working conditions, and low pay. Importantly, informal sector

workers lack access to social security and, therefore, have very little to support them in cases of crises, shocks or even retirement. The provision of social security for Kenya's older citizens is very vital as Kenya is a rapidly ageing society but has limited infrastructure in place for its older citizens. Without the ability to save and put aside money for older age, many older persons are left with little income security and must continue to work even when they are hit by illness and disability. Given this, there is need to come up with a pension plan that is suitable for the informal sector in order to meet their retirement needs.

### **1.3 Problem Statement**

On average, the monthly pension received on retirement is equivalent to a third of retirees' last earnings, according to a study that covered 65,000 members from 200 pension schemes by financial services firm Zamara Group. The report established that the individual's current income, health, number of dependents and literacy levels are the leading factors affecting their saving behaviors and how they prepare to secure their life after retirement.

Another survey by Enwealth Financial Services Limited, a social welfare financial services company, puts the rate much higher at 55 percent of last wages. The Enwealth survey worked with a smaller sample involving 515 pension scheme members. But both firms point out that the figures are way below the 75-80 percent replacement rate recommended by pension and personal investment experts to enable individuals to maintain the same living standards even in retirement. This implies that poverty lurks for many people once they decide to retire, unless they have a retirement plan that also includes other sound savings and investments.

The informal sector is largely uncovered by the available pension schemes and hence are unable to meet their retirement needs. One effort made to address this gap was through the introduction of the Mbao Pension Plan in 2009, in which any Kenyan above 18 years could be contributing, via M-PESA, a minimum of Sh20 daily, Sh500 monthly or Sh6,000 yearly, without any penalty

for a lull in contributions. The fund has over 100,000 members, but this is less than one percent of the 14.8 million people engaged in the informal sector.

The model we propose seeks to provide a flexible pension saving plan through what they can afford given their expenditure patterns. This is deducted automatically from their airtime (through their Bonga Points) and saved to their pension fund.

#### **1.4 Objectives**

The objectives of this study are as follows:

- i. Come up with a model that uses pre-retirement mobile phone expenditures through the use of Bonga Points to accumulate the pension fund.
- ii. To establish how much needs to be saved before retirement and to determine post-retirement expenditure patterns.
- iii. To determine if the contribution made through the mobile money systems of transferring Bonga Points into cash will be adequate to meet the post retirement amount and make adjustments if necessary.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Life Cycle Hypothesis**

The life-cycle hypothesis (LCH) is a theory that portray the economic aspects of the spending and saving behaviors of individuals in the course of their lifetime. (Franco Modigliani and Richard,1957). The theory is that people have constant consumption throughout their lives despite their level of income. This happens as people save money when their income level is high and borrow when their income level is low. The life cycle is more effective among people with high income as they are financially literate and are more prone to save unlike people with low income who have high debts may not be capable of saving.

### **2.2 Permanent Income Hypothesis**

The permanent income hypothesis by (Milton Friedman,1957) is a theory stating that the saving habits of individuals is at a level consistent with their permanent income i.e., their expected long-term average income. The consumption behavior of an individual depends on their expectations. For example, an individual is prone to spend more if they are expected to receive an income higher than the expected level such as gaining inheritance, raises in salary or new long-term jobs.

### **2.3 Myopic Prodigality Theory**

The theory assumes that individuals are not looking forward enough when they were young. According to this theory, people make mistakes when they are young, and they save too little. (Diamond, 1977) suggests several possible reasons for this: people may be unable to make effective decisions about long-term issues because they are not willing to confront the fact that one day they will be old, people may lack the information necessary to judge their needs in retirement, people may be unable to make effective decisions about long-term issues because they are not willing to confront the fact that one day they will be old and they may simply fail to give sufficient weight to the future when making decisions so, in essence, they may act myopically. As a result, it may be desirable for the government to act paternalistically and force citizens to save.

Diamond (1977) suggests that the solution to the prodigal father problem is a fully funded program, and one that need not be administered by the government. We believe that the solution

may involve a pay-as-you-go program since, when the program is first created, it is too late to force the first old generation to save and (presuming society still wants to help the poor old) revenue is immediately needed to pay them. However, this reasoning cannot explain why even the richer members of the initial old generation would receive subsidies. As a forced savings program, it may explain why benefits are not means-tested - the program is not designed to redistribute, just to ensure people leave some of their resources for their old age. (Feldstein, 1985) states that, as opposed to the social security programs used in practice, the optimal solution to the prodigal father problem involves means-testing and a low level of retirement benefits.

## **2.4 Empirical Review**

A study has been done by (Amos Gitau,2012) to determine the success factors that are vital for the working of a micro pension plan. The study established features of a micro pension scheme to cover the informal sector workers and provided recommendations on the steps that could be taken to address the challenges to the implementation of such a system in Kenya. The data was collected from informal sector participants, micro financial institutions and saccos through interviews and questionnaires and the data analysis was done by visual binding and exploratory factor analysis. The study findings led to the implementation of three models for the micro-pension plan. The models are public private partnerships, multi-employer models and the centralized nation-wide scheme.

The study stated that the challenges faced by members that contribute to the low intake of micro pension plans include low levels of income, complexity in the plans, difficulties in claiming the benefits on retirement, inadequacy of pension schemes to join, mismanagement by the institutions, low return rates and inaccessibility of funds till retirement. The study showed that an ideal pension scheme has effective measures such as maintaining an effective risk management system, allowed for flexibility in contributions, allowed members to access their account details on their phone, allowed the members to have a personal retirement account and allowed withdrawal before retirement.

A study was done by (Doyo Philip,2013) to establish the relationship between financial literacy and pension preparedness among the informal sector in Kenya. The study was carried out

through 150 small-scale Traders and the primary data was collected using questionnaires. Regression analysis was done on the financial literacy and their retirement preparedness. The study indicated that 76% of the participants were aware of their pension products but active participation was visible by only half of them in the scheme. This was due to the low levels of financial literacy in matters of saving, asset accumulation and cash flow management. The study found out that financial literacy had a significant positive relationship on pension preparedness and other factors that were studied such as age and income levels also have an effect on the same. The study recommended that the government designs programs for awareness and come up with incentives for pension savings in order to increase the uptake for pension schemes.

(Philip Ngare,2014) studied the effect that financial literacy had on planning for retirement among the informal sector in Kenya. Group interviews and questionnaires were used to collect the primary data and descriptive statistics on factors such as marital status, age, income level, level of education and gender were analyzed. The results on these factors except gender indicated that they strongly relate to retirement planning. The study established that it is not likely for a financially illiterate person to plan for the future upon retirement and hence there is need for education and awareness through financial literacy programs to help with the challenges. The study recommends community pension awareness programs as well as the development of a curriculum on financial education and pension education in middle level and higher learning institutions in order to increase the level of retirement planning.

A study has been done by (Cynthia Onyango,2014) on the attitudes of informal sector workers towards saving for retirement pensions. The study focused on workers in Kamkunji where group discussions were conducted to collect the data on their gender, saving statuses, gender, and work status. The study found out that life experiences such as responsibilities of children, peer and media advice and future unpredictability influenced the saving attitudes of the people. The study also found out that the participants could not save for pension because of their income levels. It was stated that they are more concerned with their immediate needs as opposed to those of their future. Although saving was thought to be desirable, it was also thought that it should not be to the detriment of their current lifestyle. In order to save, participants believed they would require a higher income rather than making any cutbacks to current spending. The study established that in as much as the workers would like to save for retirement, they had a negative attitude towards

the existing pension schemes, and this was brought about by lack of trust and awareness. This in result affected the uptake of pensions.

## **2.5 Research Gap**

To address the issue of uptake of pension schemes among the informal sector, the Inua-Jamii Senior Citizens' Grant was launched in 2018 whereby the scheme provides income protection to all the citizens above the age of 70. The scheme provides 2000 shillings to the members in order to reduce dependency of those in old age. Due to the fact that the scheme is financed by tax, it discourages inclusivity of the people of working age who want to save for their retirement.

In a bid to address that issue, Mbao Pension Plan was developed whereby it is a saving plan for low-income workers that enable them to easily make small contributions towards their retirement. It works more as like a provident fund than a pension since the members can withdraw their savings as lumpsum in the event they exit the scheme. The pension plan enables members to save a minimum of 20 shillings a day, 500 shillings a month or 6,000 shillings a year. These payments towards the scheme are made through mobile money transfers and is effective as majority of the citizens have access to mobile phones. The scheme is flexible and ensures inclusivity as there are no penalties if a member fails to contribute. The retirement savings of the members are not affected by changes in employment or sources of income since the members are in charge of their personal accounts.

The challenge of the pension plan is that members find it difficult to be consistent with contributing to the scheme and they often withdraw funds before their retirement age hence does not satisfy its intended purpose. Also, due to marketing strategies and awareness of the scheme, the low uptake of the pension scheme is evident. There is need to make changes to encourage members to keep investing in the scheme in order to better provide income security in old age.

Octagon Pension Scheme launched a digital pension scheme to give workers in the informal sector a platform to save for their retirement. The product, MOBIKEZA, allows contributors to make unlimited deposits and periodic withdrawals via USSD or an app. It caters to the youth, JuaKali artisans, and workers in Micro-Small and medium-sized Enterprises (MSMEs) that lack a means of saving for their old age. The scheme uses Mpesa which has facilitated the development of innovative mobile products due to the ease of depositing and withdrawing and

integrating products with the Mpesa ecosystem. Despite launching the scheme, there is low uptake of the plans and Octagon recommends tax incentives for savings and inclusivity of other services such as life cover, funeral cover, medical cover, credit facilities, and insurance aspects.

(Wangari and Muthoni,2019) attempted to come up with a pension plan where contributions are made relative to airtime consumption which implies the rates the member can afford. In this model, the members' contributions will be deducted automatically such that they are put into saving and discouraged from withdrawing before maturity. The challenge faced was that the charging rates on calls were too high and this may cause individuals to opt out of this option.

## **CHAPTER THREE: METHODOLOGY**

This chapter outlines the research methodology of the study. It covers the research design, population of the study, sampling methods used, data collection methods and data analysis techniques.

### **3.1 Research Design**

The study investigates whether the rates used to convert Bonga Points into retirement savings are practical and hence the savings can therefore be used by the informal sector workers to meet their retirement needs.

### **3.2 Population Sampling**

The target population consists of the small-scale traders of the informal sector workers in Kenya. The sample was from the informal sector markets in Mwiki, Komarock and Kayole.

### **3.3 Data Collection and Analysis**

The study comprised of primary data as it was relevant to the study. The collection of the data was done through the use of questionnaires. It included both open and close ended questions on their expenditure. Initial expenditure items included: The individuals' tuition and that of their children, their nutrition, their children's nutrition, rent, their health expenditure, travel expenses and miscellaneous expenses.

The study also used secondary data on the rates used. The data on the inflation rates and interest rates were obtained from the website of the Central Bank of Kenya and the life expectancy data was retrieved from the Global Health Observatory repository. The analysis of the data was done through computer packages such as MS Excel.

### **3.4. The model**

#### **3.4.1. Assumptions**

- i. The individuals will begin saving for pension from the age of 21 and will retire at 55 years.
- ii. The model assumes no late entrants or early withdrawals unless withdrawal by death.
- iii. Expenditure patterns are similar pre- and post-retirement.

### 3.4.2. Estimation of model parameters

#### Interest Rates

The data used for the interest rates are the monthly weighted aggregate savings rates on commercial banks. The data was obtained from the Central Bank database and was used to construct the forecast model.

The forecast model used is the Vasicek Model as the interest rates exhibit stochastic properties and mean reverting behavior. The model predicts future interest rates movements as a result of the current market volatility, market risk factor and the long-run mean interest rate value. The model satisfies the stochastic differential equation:

*Equation 1 Vasicek Interest forecast model*

$$dr_t = \alpha(\beta - r_t)dt + \sigma dW_t$$

We use this to forecast future interest rates. To estimate the pullback rate  $\alpha$  and the long-term average rate  $\beta$ , we run a regression of  $r_{t+1}$  against  $r_t$ , obtaining the standard error, the gradient and intercept which then are used to solve for  $\sigma$ ,  $\alpha$  and  $\beta$ .

#### Inflation Rates

The data on the inflation rates was also obtained from the Central Bank database and similar to the interest rates, we use the Vasicek model to forecast future rates. According to the World Health Organization data in 2018, the life expectancy in Kenya was 66.7. Given the living standards of the individuals, we opted to use 66 years and therefore forecast future inflation rates for 45 years, these being the number of years the individual is expected to live after joining the scheme.

#### Pre-retirement expenditures

Let  $Z$  be the amount needed to sustain similar consumption levels once the individual retires.  $Z$  is determined by computing the average monthly consumption and then adjusting it for inflation as depicted in the equation below:

*Equation 2 Inflated Expenses value*

$$Z = G \prod_{r=1}^{45} (1 + e_r)$$

Where  $Z$  is the inflated expenses up to the age of 66,  $G$  is the expenditure value at the start of the period and  $e_r$  is the forecasted inflation rate for each subsequent period.

### Post-retirement expenditures

Assuming that the individual receives their pension income monthly, we determine the total amount required to have been saved by the time the individual retires by discounting the value of the annuity  $Z$  from equation above for 11 years from the age of 66 to 55 such that:

*Equation 3 Present Value of Post Retirement Expenditure*

$$Y = Z \alpha_{N=11}^{(12)} \times P_t$$

Where  $Y$  is the total discounted amount needed at age 55 to facilitate post retirement expenditure,  $Z$  as indicated above,  $N$  is the number of years between retirement and death and  $P_t$  is the probability of survival. We assume  $N = 11$  as the life expectancy of Kenyans remains 66 years;  $r_t$ s are the forecasted interest rates.

For each of these years we multiply the accumulated amount by the probability of survival of the individual. Kenya's life tables were sourced from the Global Health Observatory data repository of the WHO (World Health Organization, 2018).

Age	Probability of Dying			Probability of Survival
	Male	Female	Average	
20-24	0.016	0.01	0.013	0.987
25-29	0.018	0.013	0.0155	0.9845
30-34	0.021	0.015	0.018	0.982
35-39	0.028	0.02	0.024	0.976
40-44	0.034	0.025	0.0295	0.9705
45-49	0.041	0.028	0.0345	0.9655
50-54	0.054	0.036	0.045	0.955

<b>55-59</b>	0.065	0.045	0.055	0.945
<b>60-64</b>	0.094	0.068	0.081	0.919
<b>65-69</b>	0.139	0.108	0.1235	0.8765

### **Contributions accumulation**

Let  $K$  be the amount that needs to be saved monthly;

#### **Equation 4 Feasibility equation**

$$Za_{N=11r_t}^{(12)} * P_t = Ks_{34i_r}^{(12)} * P_t$$

Where  $Y = Za_{N=11r_t}^{(12)} * P_t$

The amount  $K$  is got using the forecasted interest rates to accumulate an annuity  $X$  monthly for 34 years (this is the period between when the individual makes their first contribution and when they retire).

### **Conversion Rate**

Using the amount of annuity  $X$ , we determine the conversion rate to be used to redeem Bonga Points into cash. The Bonga Points are got from mobile phone expenditure at a rate of one Bonga Point for every 10 shillings spent on airtime.

## CHAPTER 4: RESULTS AND ESTIMATIONS

### 4.1 Interest Rates

The following is a graph of the historical interest rates on savings obtained from the CBK website:

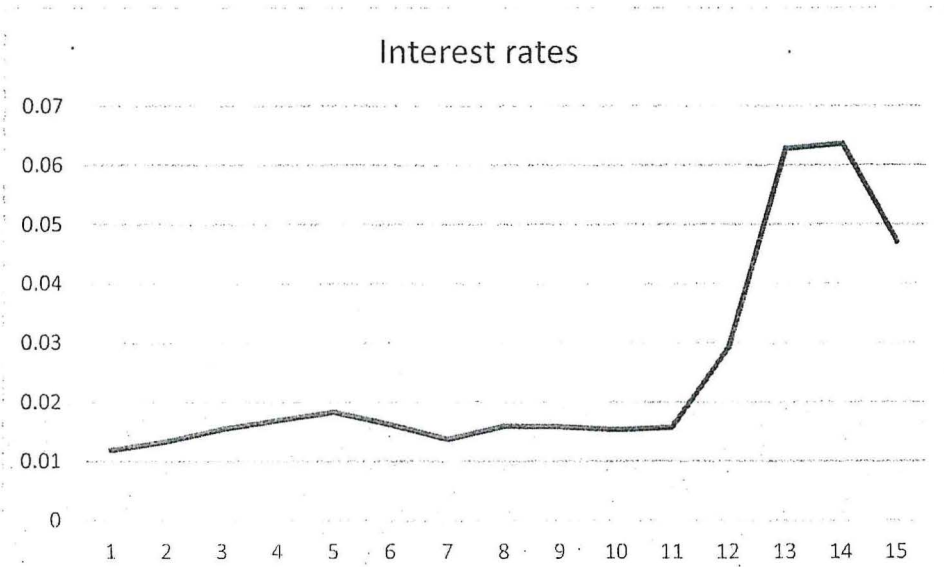


Figure 1 Graph of Historical Interest Rates

The rates depicted a stochastic nature and portrayed mean reverting tendencies when graphed. As a result, the Vasicek Model is used to forecast the future interest rates. We carry out a regression of  $R_{t+1}$  against  $R_t$  to obtain these results:

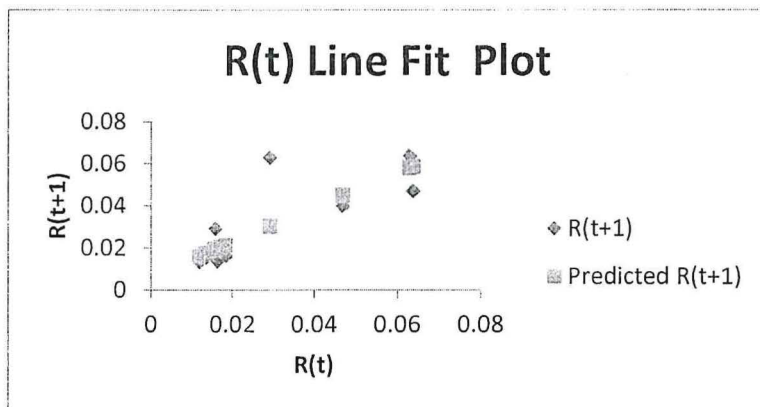


Figure 2 Plot of Line of Fit of Interest Rates

The plot of line of fit indicates the relationship between  $R(t+1)$  and  $R(t)$  and includes the regression line which is useful in obtaining the regression equation.

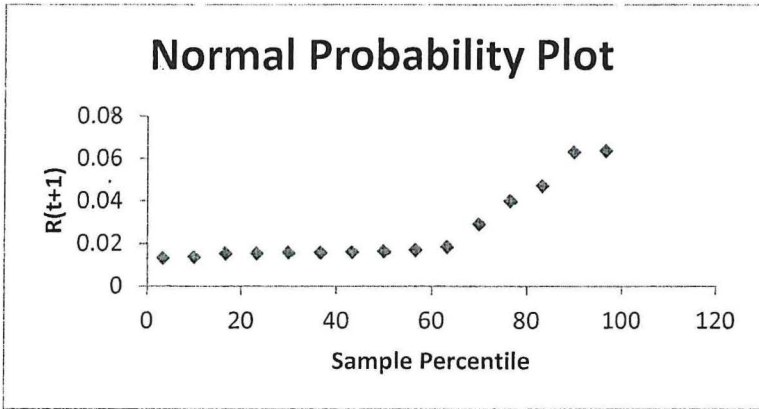


Figure 1 Plot of Normal Probability Distribution of Interest Rates

The normal probability plot indicates if the data fits a normal probability distribution. The plot is an S shaped curve indicating shorter than normal tails. This means that the interest rates exhibit less variance.

Table 1 Interest rate Regression Estimates

**REGRESSION ESTIMATES**

Intercept	0.006327499
Gradient	0.82022437
Standard Error	0.010651445

The gradient of the regression gives  $e^{-at}$  and the intercept  $C$  gives  $b(1 - e^{-at})$  and the standard error gives  $S^2/2(1 - e^{-at})$ . We then solve for pullback rate  $\alpha$ , the long-term average rate  $\beta$  and volatility  $\sigma$  as shown:

Table 2 Interest rate Parameter Estimates

## INTEREST RATES PARAMETERS

Initial value, $r$	0.0399
Pull-back rate, $a$	0.198177355
Long term average, $b$	0.035196646
Volatility; $\sigma$	0.011722566
Change in time, $\Delta t$	1

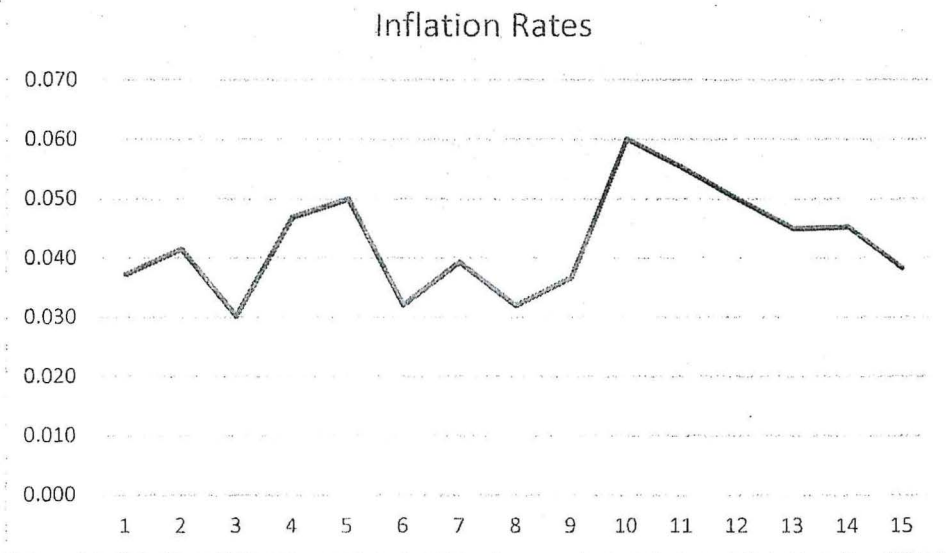
The initial value of  $R_t$  is above the long-term average  $b$  indicating that the drift i.e., the expected rate of change is negative. The values above allow us to calculate the change in interest rate  $dr_t$  by combining the stochastic and deterministic component for each period as in the equation:

*Equation 5 Vasicek Model equation*

$$dr_t = \alpha(\beta - r_t)dt + \sigma dW_t$$

### 4.2 Inflation Rates

The following is a graph of the historical inflation rates obtained from the CBK website:



*Figure 4 Graph of Historical Inflation Rates*

As for the interest rates, the inflation rates depicted a stochastic nature and portrayed mean reverting tendencies when graphed. As a result, the Vasicek Model is also used to forecast the future inflation rates. We carry out a regression of  $R_{t+1}$  against  $R_t$  to obtain these results:

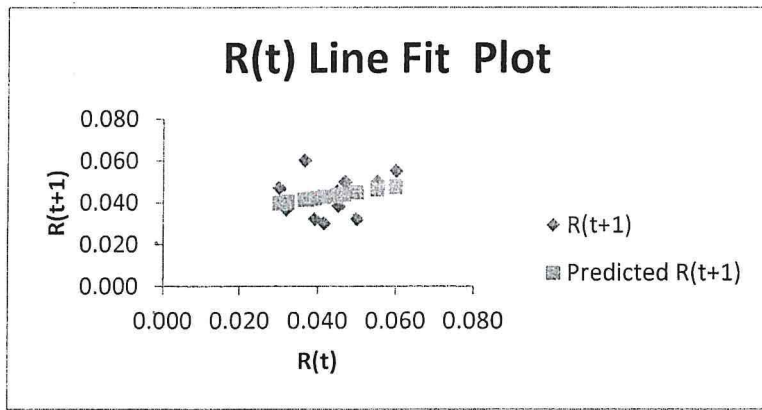


Figure 5 Plot of Line of Fit of Inflation Rates

The line of fit plot demonstrates the regression line and it compares how well the fitted values follow the observed values.

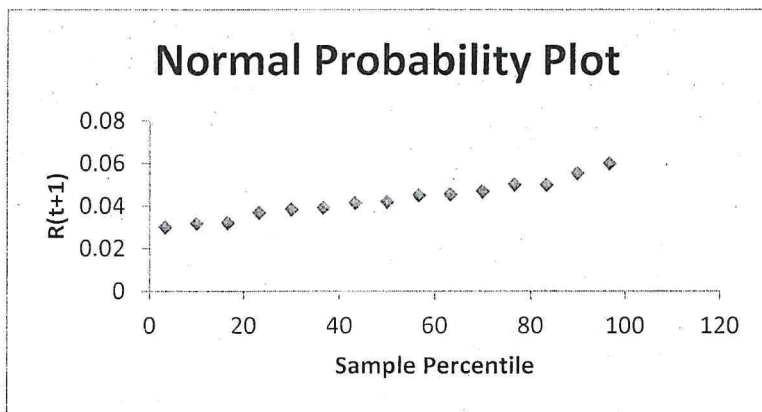


Figure 6 Plot of Normal Probability Distribution of Inflation Rates

The line of the normal probability plot is close to a straight line indicating that the data are approximately normally distributed.

Table 3 Inflation rate Regression Estimates

**REGRESSION ESTIMATES**

Intercept	0.031973686
Gradient	0.258116723

Standard Error	0.008666349
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The gradient represents the rate of change of one variable to another. The gradient shown illustrates a positive slope meaning the y variable increases as the x variable increases. The intercept is a constant in the model and it makes the residuals have a zero mean ensuring that the residuals do not have an overall bias. The standard error is relatively low indicating that the observed values do not fall far from the regression line.

We then solve for pullback rate  $\alpha$ , the long-term average rate  $\beta$  and volatility  $\sigma$  as shown:

*Table 4 Inflation rate Parameter Estimates*

#### INFLATION RATES PARAMETERS

<b>Initial value, r</b>	0.042
<b>Pull-back rate, a</b>	1.354343383
<b>Long term average, b</b>	0.043098001
<b>Volatility, <math>\sigma</math></b>	0.014763432
<b>Change in time, <math>\Delta t</math></b>	1

The initial value of  $R_t$  is below the long-term average  $b$  indicating that the drift i.e., the expected rate of change is positive. The coefficient  $a$  indicates that there is a high rate at which the interest rates  $R_t$  are pulled back towards the long-term average.

We then calculate the change in inflation rates  $dr_t$  for each period as done for the interest rates.

#### 4.3 Monthly Expenses

Assuming that the individual receives their pension income monthly, we determine the total amount required to have been saved by the time the individual retires by accumulating the expenses from the period of joining the scheme to when they retire, multiplying it with the

probability of survival. We then discount the annuity for the periods after retirement. We subject the monthly expenses to inflation in order to accumulate the expenses.

According to the expenditure data, the average individual living in Mwiki, Komarock and Kayole spends approximately KShs. 6130.77 per month. From the inflation forecast model results, we estimate that to receive a monthly figure that allows the individual to sustain their current consumption for the 11 years post retirement, the individual will require their contributions to have accumulated to KShs. 2,223,357.60 by the time they turn 55 years old.

#### **4.4 Monthly Savings**

The accumulated amount is computed by accumulating the monthly amount needed to be saved and multiplying it by the probability of survival. The monthly savings need to equal to the amount required at age 55 to sustain a similar level of consumption throughout the remaining life span of the individual.

As time increases, the monthly savings increase due to the impact on interest rates. From the data collected, the study finds that on average, individuals' daily mobile expenditure is at an average of KShs. 754.30 per month.

#### **4.5 Conversion Rate**

The Bonga Points are calculated at a rate of one Bonga Point for every 10 shillings spent on airtime. Then the Bonga Points are redeemed into cash at a rate of 1 KShs for every 3.33 Bonga Points which then can be saved for retirement. In order for the monthly savings to be equal to the amount required at age 55, an individual is required to save KShs. 798 per month from age 21 to age 55.

## CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

The objective of the study was to establish whether mobile phone airtime (through use of Bonga Points) could be a feasible tool for saving for pension. The study involved a model that recalculates the amount required to be saved monthly considering the discounting assumptions and find out the spending patterns for those in retirement. This modeling task required:

- Mobile phone expenditure data.
- Probabilities of survival which were derived from Kenya's Life Table.
- Life expectancy data.
- Inflation and interest rates extracted from Kenya's Central Bank database.

We first forecasted the inflation and interest rates using the Vasicek Model. To estimate the pullback rate  $\alpha$  and the long-term average rate  $\beta$ , we run a regression of  $r_{t+1}$  against  $r_t$ , obtaining the standard error, the gradient and intercept which then are used to solve for  $\sigma$ ,  $\alpha$  and  $\beta$ . This allows us to calculate change in interest rate for each period.

The probabilities of survival were computed by finding the average probability of the males and females. With these six parameters, we computed the monthly consumption and the monthly savings. The monthly consumption is a function of the inflated expenditure discounted and multiplied by the probability of survival. The monthly savings is a function of the average amount that needs to be saved accumulated in the future then multiplied by the probabilities of survival, the exit and entry rates accumulated.

Due to the conversions caused by Bonga Points, the results show that individuals require to spend KShs. 798 per month which translates to at least KShs. 30 per day above their normal mobile phone expenditure. The amount may be too high due to the strict conversion rates by the network providers and due to that, majority of individuals may fail to want to take part in this scheme as the expenditure then become unaffordable. Should the conversion rates be altered and feasible for the network providers, then the amount may become affordable.

The results show that if cash accumulated through conversion of Bonga Points from airtime usage is the source of contributions then the model fails to be feasible.

## **5.2 Limitations of the study**

- i. The study assumes that the airtime expenditure habits of the individual persist throughout their lifetime.
- ii. Data on the expenditure was limiting due to the sample size.
- iii. The study focuses solely on airtime through Bonga Points in which the conversion rates may not be applicable to other network providers such as Telkom.

## **5.3 Recommendations**

1. We recommend that further research looks at the feasibility of this model if the conversion rates by the network providers can be altered.
2. We recommend incorporation of conversion rates by other network providers.

**List of Abbreviations**

**CBK: Central Bank of Kenya**

**GDP: Gross Domestic Product**

**KSHS: Kenyan Shilling**

**NSSF: National Social Security Fund**

**OECD: Organization for Economic Cooperation and Development**

**RBA: Retirement benefit Authority**

**WHO: World Health Organization**

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