A PENSION MODEL FOR THE KENYAN YOUTH: USE OF AIRTIME

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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 Research Proposal contains no material previously published or written by another person except where due reference is made in the Research Proposal itself.

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This research proposal has been submitted for examination with my approval as the Supervisor.

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ABSTRACT

The objective of this project is three-fold: first, we develop a model that values a pension fund which uses mobile telephone airtime usage costs to accumulate the funds, with all costs associated with running a pension fund considered. Secondly, we develop two models that explain the difference in the accumulated pension fund value from the actual fund value. These models are: reduction in yield model and reduction in contribution model. Finally, we adjust the pension fund valuation model and the reporting models for lapse rates.

1. INTRODUCTION

Pension funds/schemes are defined as forms of institutional investor, which collect pool and invest funds contributed by sponsors and beneficiaries to provide for the future pensions entitlements of beneficiaries [Davis (2005)]. They provide means for individuals to finance themselves after they have retired and stopped working. This is usually done by means of a lump sum or by periodical payments (annuities) while also supplying funds to the government and other corporation for investment and consumption.

The idea of pension schemes was started way back in the French revolution of 1789-99 although the policy was ignored. The comprehensive old age pension was started in Germany by Otto Von Bismarck (a conservative leader) in 1889.It was originally designed to provide a pension annuity for workers who reached the age of 70 years though this age was reduced to 65years in 1910.Britain then started campaigning for old age pension in 1890's and in 1910 they got their first pension from the liberal government though it was quite meager. After World War Two, most countries and economies started creating their own pension schemes in order to help with old age living.

Pension schemes can be categorized into three. The two main types are defined contribution plan and defined benefit plan. A defined contribution plan is a scheme in which member' and employer' contributions are fixed either as a percentage of pensionable earnings or as a shilling amount. A member's retirement benefit has a value equal to those contributions, net of expenses, including premiums paid for insurance of death or disability risks accumulated in an individual account with investment return and any surpluses or deficits as determined by the trustees of the scheme. A defined benefit plan is where the amount paid to you is set using a formula based on how many years you have worked for your employer and the salary you have earned rather than your investments. The other pension scheme is the hybrid scheme. This scheme entails the blend/combination of the defined contribution plan and the defined benefit plan. Hybrid schemes make the employer and the employee/member to share the risk of paying higher contributions.

In this project, we deliberately choose to look at pension funds established for the youth and unemployed. This is because in many countries, pension funds and its legislation mostly cater for the employed while the unemployed have unstructured methods of savings. In Kenya, for example, we have the National Social Security Fund (NSSF) which until very recently (3 years ago), catered for those who could only make monthly payments from whatever source of income they had. This did not put into consideration those without a consistent stream of income, like the youth and unemployed.

Originally, all pension-related issues were addressed in the NSSF Act. Under the National Social Security Act of 2013, both employed and the self-employed and their dependents qualify as contributing members. The contributing members are expected to make their contributions on monthly basis, with the lowest amount payable being Ksh. 200 per month for the voluntary members (self-employed) and Ksh. 360 per month for the employed. As pointed out earlier, this arrangement gives very little consideration to the unemployed and the youth, who do not have consistent monthly sources of income. In this project, we concentrate on the youth (18-35 years). The model assumes that the earliest contributor to the fund is aged at 18 years, immediately on completion of secondary education.

1.1. Youth Savings Patterns and Performance

The world's population of young people between the ages of 15 and 24 is estimated at 1.2 billion, with the vast majority living in poor countries.[1] Only an estimated 4.2 million youth globally currently have access to financial services, with $186 million outstanding in credit, $48 million in savings, and $1.2 million in insurance [Making Cents International **Invalid source specified.**]. Many youth save informally and may participate in formal banning services if given the opportunity as revealed by United Nations Capital Development Fund report**Invalid source specified.**. Majorities of the youth in developing countries face a double disadvantage – they are young and have low incomes and therefore have limited options in saving for their future. Youth savings products may provide an opportunity to "practice" and cultivate financial capability early

[1] See Brazier and Anthony(2011)

in life.[2] Alongside making financial services available, many policy makers in developing countries are looking for ways to introduce financial capability programs targeted towards the youth.

In Kenya, the youth can open accounts without an initial deposit. However, some of these accounts continue to remain open without ever receiving a deposit. A consumer survey consultancy firm Deloitte published on 21st November 2014 (**www**.allafrica.com/stories/201412082354.html) established that Kenyan youth are the most extravagant in Africa when compared to other wealthier countries such as South Africa, Nigeria and Egypt. According to another study conducted by Deloitte on consumer review, 32% of the Kenyan youth prefer buying well-known brands because it makes them feel good as compared to 25% in South Africa, 23% in Nigeria and 20% in Egypt. Most of their money is spent on luxury products and very little is spent on investment. Most investments in Kenya are regarded as either investing in the real estate or investing in a farm which is not the only way. Most Kenyan youth therefore result to starting businesses which cannot be regarded as investing since they do so to keep themselves busy and regard themselves as self-employed.

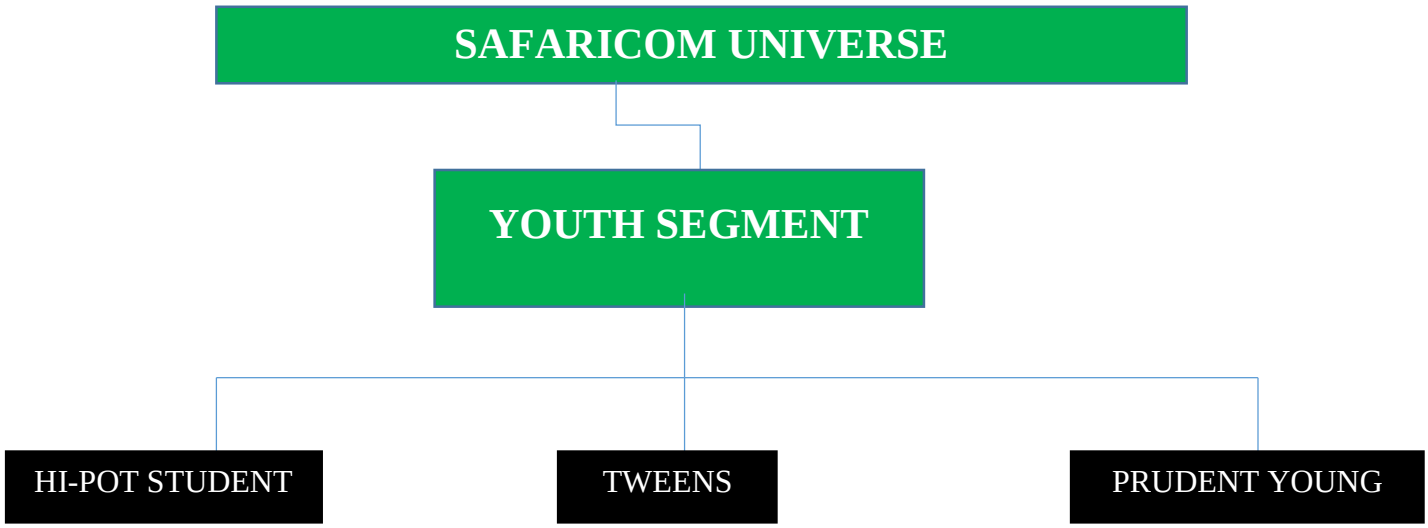
According to more research done by Youth Dynamics, Kenyan youth aged between 16 and 24 spend an average of Ksh 900 per month on their mobile phones. This is mostly spent on social media platforms such as Facebook, Twitter and WhatsApp. The survey polled 900 persons within the 16-24 year age bracket from all over the country. These results are consistent with data from the leading telecommunication company in Kenya, Safaricom, who reported in March 2016 that Kenyans aged 18-24 years spend on average Ksh. 500-1500 per month on mobile phone-related activities.

1.1.1. Who Do We Define As The Youth Segment?

The youth segment is defined by dividing it into three: Tweens (<18 years old), Hi-Pot Student (18-24 years old) and Prudent Young Consumers (25-35 years old).They form 60% of the Kenyan population. The diagram below shows the characteristics of the different categories of

[2] Financial capability as defined by the U.S. Treasury Department, FINRA Investor Education Foundation (2009),is the combination of knowledge, skills, attitudes, and especially behaviors that people need to make sound personal finance decisions, suited to their social and financial circumstances.

youth as well as their airtime usage on a monthly basis. The graph below it shows how the youth are distributed in different regions.



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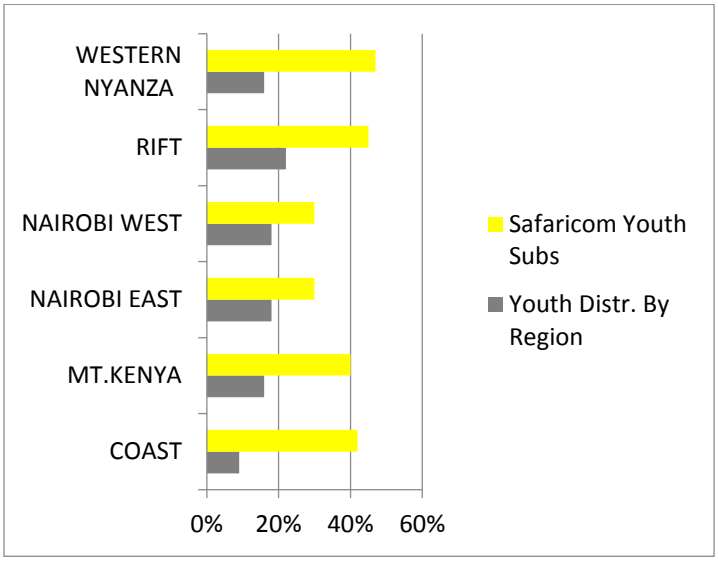
Urban Age 18-25 ARPU *≤1500 50% of usage is on data ARPU*- Average Revenue Per user	School and guardian mobile restrictions. Urban Age < 18 ARPU≤250	Non-college attending youth. Age 18-25 ARPU ≤ 1500 Non-voice usage at 50%

Distribution by Regions



1.2. Pension Plan for the Self-employed: Kenyan MBAO Pension Plan

The MBAO Pension Plan was established on 28th June 2011. It was started for the Medium and Small Micro Enterprises (MSMEs) sector and to help members of different JUA Kali (self-employed) Associations to save regularly to provide a long-term and reliable income when they retire from their jobs or business. The name "MBAO" refers to the amount – Ksh 20– which is the minimum daily contribution that members can make. Members can join and pay Ksh 100 as a registration fee and then commit to saving at least Ksh 20 a day or Ksh 100 a week or Ksh 500 a month.

The main objectives of setting up the scheme were to extend coverage of retirement benefits to JUA Kali workers; create a National Retirement Benefits Scheme for JUA Kali workers, educate, train and sensitize members of the scheme on matters regarding retirement benefits, promote the JUA Kali National Scheme amongst JUA Kali workers and research and compile statistics regarding the scheme.

MBAO Pension is regulated by the Retirement Benefits Authority of Kenya (RBA) and is embracing the Risk Based Supervision Model. The take up of the MBAO Pension plan is tremendous with many workers registering for it; as at 31 July 2015 the scheme had 42,000

members. Of the members, 35% of them (more than 14,000 members) are not saving consistently, according to www.easst.collaborative.org.

1.3. Problem Statement

Traditionally in Kenya, pension schemes were regarded as a preserve for the employed. This was not effective since 75% of the labor force in Kenya is in the informal sector, which was only covered by 0.5%-1% in the pension schemes. The formal sector covers 15% in the pension schemes. This changed in 2010 when MBAO Pension Plan was launched to cater for the self-employed. On the other hand, the unemployed and the youth have hardly been catered for when it comes to financial products. This is most interesting given that the youth make up 60% of Kenya's population. If this population group was targeted, then there would be increased savings which would lead to increased investment.

We also note that of those registered under the MBAO pension scheme, more than 30% of those registered in the self-employed scheme are not saving consistently. This could point towards inconsistent income sources and 'forced' saving culture.

In this study, we suggest ways in which the youth can be catered for by introducing a scheme in which they can save towards their retirement using their mobile phones. To enforce the saving discipline, we suggest that the contributions be deducted automatically from their costs of using their mobiles, for example, as they make calls, send text messages, using data for browsing and even transferring money from one user to another. This can be done by incorporating a 10% increase in cost of transaction, the increase being the contribution towards retirement.

1.4. Research objectives

The objective of this project is three-fold:

To develop a model that values a pension fund which uses mobile telephone airtime costs to accumulate the funds, with all costs associated with running a pension fund considered.

1.5. Significance of the study

1.5.1. The findings in this study should be useful to the general public in helping them save for their retirement and have finances to use even when they have stopped working. It will help them feel financially secure for the future.

1.5.2. The study will be useful to telecommunication companies as more people will be encouraged to use mobile money and own phones. This will boost their profits and help in contributing revenue to the government.

1.5.3. The study will form a basis for further research on how to improve pension schemes which lead to new ideas of improving the Kenyan economy.

1.5.4. Another important aspect of pension plans is that they help in the efficient use of taxpayer funds. By pooling and efficiently managing assets pensions are able to achieve "economies of scale". The pension that one gets helps to boost the economy as one will spend the money in the local economy to purchase products which will then lead to a rise in profits for the businesses manufacturing and processing the products.

1.5.5. The broader economy is also boosted which provides a win-win for employers, employees, taxpayers and local government.

1.5.6. Alongside those primary objectives, other objectives of pension are to promote economic growth as long as pension models have been formulated correctly.

1.5.7. Pension also helps in reducing risks since the pension risks are shared on a wider audience such as the social fund.

2. LITERATURE REVIEW

This section aims to explain the views of different authors on youth spending and savings. The first section explains how the youth perceive savings as well as their saving habits. The second section aims to explain the obstacles that the youth face when trying to save and that hinder their development in their saving culture. The third section explains opportunities that are available for financial institutions to tap into the youth network. The last section explains the factors that will help facilitate youth savings and promote their saving culture.

2.1.Young people and savings

Young people today face a very uncertain future. Young people face many challenges. In particular those with those low incomes, in insecure employment or not in work are highly vulnerable to financial shocks and lack the safety net that would help them deal with emergencies. A research carried out by the Institute of Public Policy Research showed aimed to explain this challenges and how they impact the youth. The financial resilience of young people is a challenging outlook for young people. To make matters worse, they are not facing it from a position of financial security. If the youth were to become suddenly unemployed, most say that they would make ends meet using their savings. However, most of the youth have savings that are below the recommended level in case of financial emergencies by financial advisers. Solutions that support young people to become financially secure adults are solely needed. A particular focus should be on improving the resilience on young people, especially those on low incomes, to financial shocks such as becoming unemployed. Savings have an important role to play in enabling the youth to better weather periods of difficulty. Most young people do not feel financially secure. Young people currently have a negative view of their financial situation which includes the belief that they will be worse off than their parents. When young people cannot rely on their savings in times of financial emergencies, they mostly rely on their family and friends. However, the parents of young people from poorer backgrounds are less able to support for their children, leaving them more vulnerable to financial shocks. There is therefore an important argument for encouraging young people, particularly those on low incomes to save so that they increase their resilience to financial shocks. This will not be easy, but the potential benefits are large. Savings can enhance the security and resilience of young people as they negotiate the difficult times especially those from low income backgrounds.

Young people tend to be perceived as having a higher propensity to spend than older groups. The 'Wealth in Great Britain' survey, ONS found the proportion of people with a 'strong or moderate inclination to spend [3] decreased with age. One reason that makes young people spend more than they save is that younger people think little about the future and instead prefer to enjoy their

[3] This was calculated by synthesizing participants' responses to three questions: They were asked how much they agreed with the following statements: 'I tend to buy things when I can't really afford them' ,'I am more of a spende than a saver', 'I tend to buy things on credit and pay it off later'.

‘carefree youth’, Kempson and Finney. The youth believe about it being all about here and now since it’s ‘more fun’.

Several stakeholders have emphasized the importance of designing initiatives to encourage young people to save in ways that work with their existing saving and spending habits. This will help improve their financial resilience and stability.

2.2.Foreseen Obstacles for policy makers

2.2.1. Legal age to enter into contracts

Regulations that prohibit youth from owning and operating their own accounts pose major obstacles for youth savings. In almost all countries’ regulations, minors are not considered sufficiently competent to enter into legally binding contracts, including opening and operating a bank account on their own. In Kenya, youth must be 18 years of age in order to open an account independently. However, in Kenya flexibility in banking policy allowed “trusted adults” to be cosignatories on minors’ accounts. This alternate cosignatory frees the youth from having to rely solely on parents who might not be living in the same town or are otherwise unavailable.

2.2.2. Documentation required to open an account

Some form of identification is required for individuals to participate in most formal financial transactions. According to the Global Findex, 18% of adults cite their lack of requisite documentation as the reason for not accessing formal financial services like saving for retirement. Cumbersome identification requirements, including address proof, are challenging for many low-income people seeking access to formal financial services. A point to note is that in Kenya, the amount of taxes and fees is higher than interest accrued.

2.3.Opportunities for Financial Services Providers

To reach the large number of youth that could use pension funds as an avenue to save for their retirement, there must be a clear business case for providers. Subsidized programs, especially in low income countries, will unlikely reach significant scale because public resources are limited and often unreliable over time. Specific opportunities include:

2.3.1. Tapping into young people's network

Financial service providers have the opportunity to tap into youth's social network, particularly their family, friends and other members of their communities to acquire new clients at low cost. The premise is that once a service relationship has been established by the youth, other members would become more open to establishing a formal financial relationship. The youth will save towards their retirement if provided with an opportunity that encourages saving, is easy to access, and is relevant to their needs.

2.3.2. Transaction activity and patterns (Youth)

Transaction activity is usually on the decline since most youth have a lower bank deposit frequency, which can be attributed to a lull in motivation as time passes, or simply no money to deposit. This is directly linked to their likelihood to save towards their retirement.

Deposit and withdrawal rules play a critical role in transaction patterns and savings performance. This can be illustrated by findings that reflect treatment of initial deposits, presence of monthly deposit goals, and withdrawal restrictions. Facilitating account uptake is important, but ensuring that the initial deposit can be made even if the account has to be opened at a later time, may be more beneficial. Otherwise, accounts may continue to lay dormant, potentially incurring costs that benefit neither the account holder nor the FI (Financial institutions)

A savings goal may boost savings behavior, but for some may also have the opposite effect of limiting the potential to save more for a longer period of time. Youth who are of majority age may be more self-sufficient, require funds for daily needs, and therefore need greater flexibility to deposit and withdraw funds.

2.3.3. Savings performance

Younger youth tend to save more than older youth. A key reason is that younger youth are less likely to withdraw. In addition, most of the youth report that savings will come from parents or gifts, so younger youth may be receiving greater financial support from parents and other adults than older youth. As youth gets older, their expenses rise, as do expectations for them to make money and pay for their expenses, whether for their education or daily needs. Beginning to build

savings early in life may enhance education, or other opportunities that increase well-being, as well as ensure that they have secure income throughout their inactive years after retirement.

Parents not only provide funds, but they also provide other forms of support such as encouraging their children to save, facilitating access to make deposits and helping to build trust in formalized savings. Consistently across Kenya, youth who said that they learned about pensions through friends, family, or mass media save more than those who learned through other means, such as information at school, a bank campaign or a financial education workshop.

2.4. Implications of Savings Demand Assessment Findings

Here we point out product design and outreach features that may increase youth financial inclusion in developing countries.

i. Access

When the opportunity is offered, many youth will open savings accounts and save in them. If offered earlier in their lives, they may save more. Expanding services in parallel with youth development stages can benefit the youth in a big way, according to Kilara, Magnoni & Zimmerman. Technology is a viable channel of reaching the youth and they have always been known to be early adaptors of technology [Pickens, Porteous and Rotman. This offers a viable opportunity to dramatically cut costs for reaching youth and encouraging them to save for retirement using mobile phones.

ii. Facilitation

Data indicates that more youth will participate if FIs partner with schools to offer financial education and services. Partnerships between FIs between youth-serving organizations or apprenticeship programs may also facilitate saving-for-retirement uptake with out of school youth. Establishing a national set of standards or program to integrate financial services and financial education by “taking pension schemes to the youth” could be one way to reach the greatest number of youth in building youth financial capability. With any model, engaging parents in the savings process is a key component to facilitate savings.

iii. Information

Government campaigns or regulatory bodies' initiatives may be positioned for maximum reach in ensuring that the youth know about saving opportunities. Informally, financial institutions can contribute to educate the youth by providing information and guidance on which product features may facilitate or hinder savings performance when the youth is ready to start saving in a pension fund.

iv. Incentives

To encourage youth financial inclusion, incentives may be necessary as a strategy to remind both staff and youth that a youth's saving product is a viable financial product. In developing business strategies that serve the youth, financial institutions that offer incentives for selling other products should also consider offering incentives for selling youth retirement-savings accounts, thus equalizing emphasis on any particular product and more fairly representing each product's features to help youth decide what product best meets his or her needs.

v. Restrictions

Determining the appropriate balance of control of the pension savings account between the account holder and financial institutions may be difficult. One alternative for the financial institutions restricting control may be setting expectations and goals.

vi. Expectations

Setting savings targets with youth may increase savings performance. Establishing monetary savings goals that reflect resources needed at different life stages (e.g. business development, education, land) may encourage both short -term and long- term savings.

3. METHODOLOGY

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

3.1. Research Design

Research design provides guidelines that direct the researcher towards solving the problem and may vary depending on the nature of the problem being studied. The study adopted the inferential research design. Inferential statistics makes inferences about populations using data drawn from the population, i.e. a sample from an entire population.

3.2. Population Sampling

The population comprised of secondary data from Safaricom youth subscribers between the age of 18-35 years of age.

3.3. Data Collection

This research purely used secondary sources of data. The data was from the World Bank report on the Kenyan economic update, Safaricom and economic journals.

3.4. Data analysis methods

The research used computer packages such as Excel and Eviews to cle analyze the data. Graphs were used in the presentation of the data.

3.5. The Model

This appendix analyses the charging elements of typical personal pension plans. To illustrate the effects of charges, we define the following terms:

V_T Maturity value of the fund at the end of the period T.

V_t Value of the fund at the end of period t; t will have the value 0 at the start of the scheme and T at the end of the last period of contribution (if the scheme goes to maturity).

g_t Growth rate in the fund's value in period t.

C_t Contribution made in period t. We assume that contributions are made at the beginning of each period and that contributions grow at an annual rate of $e\%$ (for

example, the rate of growth might reflect the growth rate in national average earnings). Thus:

$C_t = C_{t-1} \times (1 + e_{t-1})$, where $e_0 = 0$ and $C_0 = C$.

M_t Policy fee in period t. This is assumed to be uprated at the rate of i% per annum (for example, i might be related to the rate of change in the retail price index). Thus:

$M_t = M_{t-1} \times (1 + i_{t-1})$, where $i_0 = 0$ and $M_0 = M$.

f Fund management fee (expressed as a proportion). This is assumed to be paid annually on the fee date and to be proportional to the value of the fund at that date.

x_t Redemption fee payable at maturity (when $t = T$), transfer fee payable when the policy is transferred (where $t < T$) or fee associated with conversion of the policy to paid-up status (also where $t < T$, but may continue to be paid up to T; prior to any of these events, $x_t = 0$.

F_0 Policy set-up fee (e.g. the independent financial adviser's (IFA's) fee), paid at the start of the policy.

The value of the fund in period t is then given by the following iterative equation:

$$V_t = \{V_{t-1} + C_{t-1}(1 + e_{t-1}) - M_{t-1}(1 + i_{t-1})\}(1 - f)(1 + g_t)(1 - x_t) \quad (1)$$

where in the case of $t = 1$, V_0 is replaced by $-F_o$. This can also be expressed as:

$$V_t = -F_0(1 - f)^t \prod_{k=1}^{t}[(1 + g_k)(1 - x_k)] + \sum_{m=1}^{t}\{C \prod_{k=0}^{m-1}(1 + e_k) - M \prod_{k=0}^{m-1}(1 + i_k)\}(1 + f)^{t+1-m} \prod_{k=m}^{t}[(1 + g_k)(1 - x_k)] \quad (2)$$

In equation (2), C represents the amount contributed by the policyholder (which is uprated annually by e_t), while the g_t terms measure the returns on the fund. All other terms are related to charges.

3.5.1. Reduction in yield

The complexity of equation (2) means that there is no simple summary measure for the impact of charges. The convectional approach is to calculate the reduction in yield (RiY) resulting from the charges.

Suppose that g is the constant growth rate for the fund assumed by the regulator. Equation (2) can be used to project the value of the fund in period t based on this assumed growth rate:

$$V_t = -F_0[(1-f)(1+g)]^t \prod_{k=1}^{t}(1-x_k) + \sum_{m=1}^{t}\left\{C\prod_{k=0}^{m-1}(1+e_k) - M\prod_{k=0}^{m-1}(1+i_k)\right\}[(1+f)(1+g)]^{t+1-m}\prod_{k=m}^{t}(1-x_k) \quad (3)$$

The RiY is defined as the difference between the assumed return (g) on the fund and the fund's internal rate of return or *effective yield* (g'), which is equal to the yield on a hypothetical zero-load or charge-free scheme[4] with the same gross contributions and having the same terminal value as the scheme in question. Hence, g' is the solution to the following equation:

$$V_t = \sum_{m=1}^{t}\{C\prod_{k=0}^{m-1}(1+e_k)\}(1+g')^{t+1-m} \quad (4)$$

where V_t is defined in (3). The reduction in yield is defined as:

$$RiY = g - g' \quad (5)$$

The higher the charges, the lower will be the net contributions invested; hence, the lower will be g' and the larger will be the reduction in yield.

3.5.2. Reduction in contributions

Reduction in yield is not the only method for reporting charges. There is an alternative method based on contributions: the *reduction in contributions (RiC).* This is defined as the difference between the gross contributions (C) into a scheme and the scheme's *effective contributions (C'),*

[4] That is, a scheme which $a = 1$, $s = 0$, $M = 0$, $f = 0$, $x = 0$, $F_0 = 0$ in equations (1) to (3)

as a proportion of gross contributions. Effective contributions are equal to the contributions into a hypothetical zero-load scheme with the same assumed return and having the same terminal value as the scheme in question. The effective contribution is therefore the value of C' which solves the following equation:

$$V_t = \sum_{m=1}^{t}\{C' \prod_{k=0}^{m-1}(1+e_k)\}(1+g)^{t+1-m} \quad (6)$$

where V_t is defined in (3). The reduction in yield is defined as:[5]

$$RiY = (C - C')/C \quad (7)$$

Since the left-hand sides of equations (4) and (6) are identical, the right hand sides must equal each other, which implies that the RiC is related to the gross and effective yields as follows:

$$RiC = 1 - [\sum_{m=1}^{t}\{\prod_{k=0}^{m-1}(1+e_k)\}(1+g')^{t+1-m}]/[\sum_{m=1}^{t}\{\prod_{k=0}^{m-1}(1+e_k)\}(1+g)^{t+1-m}] \quad (8)$$

3.5.3. Adjusting for lapse rates

Suppose a lapse rate occurs in period L (where$0 < L < T$). The value of the fund when the policy is converted to a PUP is:

$$V_L = -F_0(1-f)^L \prod_{k=1}^{L}[(1+g_k)(1-x_k)]$$

$$+ \sum_{m=1}^{L}\left\{C\prod_{k=0}^{m-1}(1+e_k) - M\prod_{k=0}^{m-1}(1+i_k)\right\}(1-f)^{L+1-m}\prod_{k=m}^{L}[(1+g_k)(1-x_k)] \quad (9)$$

The value of the PUP in any subsequent period t (where $L < t < T$) is:

[5] It is easy to show that the reduction in contributions is equal to the total compounded charges as a proportion of gross terminal fund value:

$$\frac{\text{Total compounded charges}}{\text{Gross terminal fund value}} = \frac{\sum_{m=1}^{t}\{(C-C')\prod_{k=0}^{m-1}(1+e_k)\}(1+g)^{t+1-m}}{\sum_{m=1}^{t}\{C\prod_{k=0}^{m-1}(1+e_k)\}(1+g)^{t+1-m}}$$

$$= \frac{(C-C')}{C}$$

$$= RiC$$

$$V_{Lt} = V_L(1-f)^{t-L}\prod_{k=L+1}^{t}[(1+g_k)(1-x_k)] - \sum_{m=L+1}^{t}\{M\prod_{k=0}^{m-1}(1+i_k)\}(1-f)^{t+1-m}\prod_{k=m}^{t}[(1+g_k)(1-x_k)] \quad (10)$$

where, depending on the policy, M and x_k may be positive for each period between L and t.[6]

If we define q_t as the lapse rate in the period t by policyholders from a particular provider, the expected value of a fund from that provider in period t is:

$$V_t^* = \sum_{L=1}^{t} \Pr(lapse\ in\ period\ L | \text{ no lapses before } L) \times \text{Value of fund at } t \text{ if lapsed at } L + \Pr(\text{no lapses before } t) \times \text{Value of unlapsed fund at } t$$

$$= \sum_{L=1}^{t}\prod_{k=0}^{L-1}(1-q_k)q_L V_{Lt} + \prod_{k=0}^{t}(1-q_k)V_t \quad (11)$$

where $q_0 = 0$ and the product of the $L-1$ terms $(1-q_k)$ measures the persistency rate over $L-1$ periods.

The *lapse-adjusted reduction in yield (LARiY)* experienced by the provider's policyholders will depend on the effective yield g^* that solves:

$$V_t^* = \sum_{m=1}^{t}\{C\prod_{k=0}^{m-1}(1+e_k)\}(1+g^*)^{t+1-m} \quad (12)$$

Where V_t^* is defined in (11). The lapse-adjusted reduction in yield is given by:

$$LARiY = g - g^* \quad (13)$$

An alternative method of accounting for lapse rates has recently been proposed by Chapman (1998). He defined the *annual charge equivalent (ACE)* as the single annual charge (as a proportion of fund value) that gives the same average annual take as a company's current range of charges when the company's lapse rates are taken into account.

The ACE, denoted h below, is calculated as the solution to:

[6] Estimates by Shuttleworth (1997) indicate that pension providers extract similar charges on PUPs as for active accounts. They are required to apply the same growth rate on PUPs as on active accounts.

$$V_t^* = \sum_{m=1}^{t}\{C\prod_{k=0}^{m-1}(1+e_k)\}[(1+\mathrm{g})(1-\mathrm{h})]^{\,t+1-m} \quad (14)$$

However, the *ACE* always takes the same value as the *LARiY*, as can be seen by comparing equations (12) and (14). Since the left-hand sides of these equations are identical (and defined by equations (11)), the right-hand sides must equal each other, which implies that:

$$(1-h)(1+g) = (1+g^*) \quad (15)$$

and, hence, that:

$$LARiY = g - g^* = h - hg \approx h \quad (16)$$

since hg is negligible. Thus the *ACE* and *LARiY* are equivalent measures.

Finally, the *lapse-adjusted reduction in contributions (LARiC)* is found by substituting the effective yield (g^*) from equation (12) for (g') in equation (8).

4. DATA ANALYSIS

This section aims to investigate how reduction in yield works and the revenue collected after all costs associated with the pension fund have been deducted. It looks at the different contributions made annually from when one is 18 years of age to when one turns 59 years of age. The period therefore covers 41 years of contributing to the pension fund. The data explains the different values of the fund earned at the end of the contribution period. We conducted investigation on the different costs on the clients and the relationship it has on monthly contribution, reduction in yield and the movement of the client cost per month as they age. Thereafter, we conducted tests on how the monthly loss (without considerations on growth and interest rates) relates with monthly contribution and how monthly loss with considerations relates with monthly contributions. We assumed that 15% of the Safaricom youth population will take up the pension scheme and compared the revenues earned from them with the monthly contributions. All this was done using eviews 8.From the analysis, this were regression estimates.

4.1. Regression Analysis

4.1.1. Regression coefficients

4.1.1.1. R-squared

R-squared is used to explain how the variability of one factor can be caused by its relationship with another factor. R-squared usually ranges between 0 and 1.The higher the value tends to 1, the better the fit and explanatory power. R-squared is calculated using the formula: Explained variation/Total Variation which can also be written as $1 - \frac{SSE}{TSS}$, where SSE is the Sum of squared errors and TSS is the Total sum of squares.

4.1.1.2. Adjusted r-squared

The adjusted R-squared is more or less like the R-squared but has been adjusted to accommodate the changes in degrees of freedom that result due to addition or removal of one or more independent variables in a model. The formula is as follows:$R_{2adj} = 1 - \left[\frac{(1-R^2)(n-1)}{n-k-1}\right]$ where n is the number of points in your sample and k is the number of independent regressors.

4.1.1.3. Durbin Watson Statistic

Durbin Watson Statistic is usually used to test for autocorrelation. The values are usually from 0-4 and a value of 2 explains that there is no autocorrelation. Values that tend to zero show positive autocorrelation and values that tend to 4 show negative autocorrelation.

4.1.1.4. Standard Error of regression

The standard error of regression is used to measure accuracy of how well a population sample represents a population. The smaller the SE shows the higher the accuracy of the sample mean.

4.1.1.5. F-Statistic and probability F-Statistic

The F-Statistic aims to find out if the relationships between two populations are significantly different or if a group of variables are jointly significant. The probability F-Statistic shows the probability that your results could have happened by chance.

4.1.1.6. Akaike information Criterion

This is a measure of how well a model fits a dataset, while adjusting for the ability of that model to fit any dataset whether or not it is related. A model with a minimum AIC value is the one that will be most preferable.

4.1.1.7. Schwarz criterion

This is also known as the Bayesian information criterion. It is also used as a criterion for model selection. The smaller the Schwarz criterion, the better the fit of the model.

4.1.1.8. Hannan Quinn

This is a criterion for model selection. It is used as an alternative to the Schwarz Criterion and the Akaike information Criterion.

4.1.2. Regression estimates Results

4.1.2.1. Relationship between client cost per month and reduction in yield.

As shown in the regression analysis below, the R^2 has a value of 0.78 or 78%.That means that it can explain 78% of the data. The standard error of regression is st 1.3 which is a small value. This shows a high degree of accuracy of the sample mean. The Durbin Watson Statistic is at 0.48.It tends to zero hence showing positive autocorrelation.

Dependent Variable: CLIENT_COST_PER_MONTH
Method: Least Squares
Date: 11/04/16 Time: 14:22
Sample: 1 42
Included observations: 42

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.755857	0.341991	10.98234	0.0000
RIY___REDUCTION_IN_YIELD	242.1481	20.04033	12.08304	0.0000

R-squared	0.784946	Mean dependent var	7.081136
Adjusted R-squared	0.779570	S.D. dependent var	2.802526
S.E. of regression	1.315786	Akaike info criterion	3.433194
Sum squared resid	69.25173	Schwarz criterion	3.515940
Log likelihood	-70.09707	Hannan-Quinn criter.	3.463523
F-statistic	145.9998	Durbin-Watson stat	0.486359
Prob(F-statistic)	0.000000		

4.1.2.2. Relationship between monthly loss to client (without considering growth rate of funds) and monthly contributions.

As shown below, the R^2 is at 0.95 or 95%.This shows that there it has a high explanatory power in the variables. The Durbin Watson is at 0.04 which shows that the data has positive autocorrelation. The standard error of regression is at 67.73 which is quite high hence showing low accuracy of the sample mean.

Dependent Variable: MONTHLY_LOSS_TO_CLIENT_G
Method: Least Squares
Date: 11/04/16 Time: 16:42
Sample (adjusted): 2 42
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-514.6978	32.38556	-15.89282	0.0000
MONTHLY_CONTRIBUTION	1.397430	0.050923	27.44176	0.0000

R-squared	0.950761	Mean dependent var	325.2790
Adjusted R-squared	0.949498	S.D. dependent var	301.3891
S.E. of regression	67.73003	Akaike info criterion	11.31649
Sum squared resid	178906.9	Schwarz criterion	11.40008
Log likelihood	-229.9880	Hannan-Quinn criter.	11.34693
F-statistic	753.0501	Durbin-Watson stat	0.049268
Prob(F-statistic)	0.000000		

4.1.2.3. Relationship between monthly loss (considering growth rate of funds) and monthly contributions

The data below shows that R-squared is 1% which is very low. This shows that it has a low explanatory power and therefore not the best fit for the model. This is because 99% of the relationship will be unexplained. The Durbin-Watson has a value of 1.123667.This shows that it has positive autocorrelation. The standard error of regression has a value of 168.9 which is quite high. This shows a high degree of inaccuracy.

Dependent Variable: MONTHLY_LOSS_CONSIDERING
Method: Least Squares
Date: 11/04/16 Time: 16:55
Sample: 1 42
Included observations: 42

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-119.7424	78.14202	-1.532369	0.1333
MONTHLY_CONTRIBUTION	0.269118	0.124016	2.170035	0.0360

R-squared	0.105327	Mean dependent var	40.11830
Adjusted R-squared	0.082960	S.D. dependent var	176.3844
S.E. of regression	168.9097	Akaike info criterion	13.14305
Sum squared resid	1141219.	Schwarz criterion	13.22580
Log likelihood	-274.0041	Hannan-Quinn criter.	13.17338
F-statistic	4.709052	Durbin-Watson stat	1.123667
Prob(F-statistic)	0.036001		

4.1.2.4. Relationship between client cost per month and monthly contributions

The data below shows that it has positive autocorrelation with reference to the Durbin Watson value of 1.72.The R^2 value of 2.9% is quite low proving it has low explanatory power since 98.1% is unexplained. The standard error of regression has a value of 2.83.This shows a high degree of accuracy in the sample mean.

Dependent Variable: CLIENT_COST_PER_MONTH
Method: Least Squares
Date: 11/04/16 Time: 17:01
Sample: 1 42
Included observations: 42

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.508737	1.310668	5.728940	0.0000
MONTHLY_CONTRIBUTION	-0.000720	0.002080	-0.346063	0.7311

R-squared	0.002985	Mean dependent var	7.081136
Adjusted R-squared	-0.021940	S.D. dependent var	2.802526
S.E. of regression	2.833103	Akaike info criterion	4.967070
Sum squared resid	321.0590	Schwarz criterion	5.049817
Log likelihood	-102.3085	Hannan-Quinn criter.	4.997400
F-statistic	0.119760	Durbin-Watson stat	1.717901
Prob(F-statistic)	0.731109		

4.1.2.5. Relationship between revenue earned (assuming 15% of the youth take up the pension) and monthly contributions

The data below indicates that there was positive serial correlation/autocorrelation given the value of 1.12 of the DW. The r^2 value of 0.1 or 1% shows that the variables could only be explained by 1% and hence is not of best fit to the model. The standard error of regression has a very high value of 5278342 which shows a high degree of inaccuracy in the sample mean.

Dependent Variable: REVENUE_PER_MONTH_WITH_A
Method: Least Squares
Date: 11/04/16 Time: 17:12
Sample: 1 42
Included observations: 42

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3741891.	2441899.	-1.532369	0.1333
MONTHLY_CONTRIBUTION	8409.804	3875.423	2.170035	0.0360

R-squared	0.105327	Mean dependent var	1253677.
Adjusted R-squared	0.082960	S.D. dependent var	5511926.
S.E. of regression	5278342.	Akaike info criterion	33.84257
Sum squared resid	1.11E+15	Schwarz criterion	33.92532
Log likelihood	-708.6940	Hannan-Quinn criter.	33.87290
F-statistic	4.709052	Durbin-Watson stat	1.123667
Prob(F-statistic)	0.036001		

4.1.2.6. Relationship between pension gains to the administrator/Monthly loss to client and the revenue earned per month

The data shows that the explanatory power of the R^2 is quite low given its low value of 17%.It also shows that there is positive autocorrelation between the two variables given the 1.18 value of the DW. The standard error of regression has a very high value of 34258056 which shows a very high degree of inaccuracy in the sample mean.

Dependent Variable: REVENUE_PER_MONTH
Method: Least Squares
Date: 11/04/16 Time: 17:24
Sample (adjusted): 2 42
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8087538.	7924697.	-1.020549	0.3138
MONTHLY_LOSS_TO_CLIENT_G	51184.48	17972.36	2.847955	0.0070

R-squared	0.172165	Mean dependent var	8561696.
Adjusted R-squared	0.150939	S.D. dependent var	37178612
S.E. of regression	34258056	Akaike info criterion	37.58429
Sum squared resid	4.58E+16	Schwarz criterion	37.66788
Log likelihood	-768.4780	Hannan-Quinn criter.	37.61473
F-statistic	8.110848	Durbin-Watson stat	1.189102
Prob(F-statistic)	0.006987		

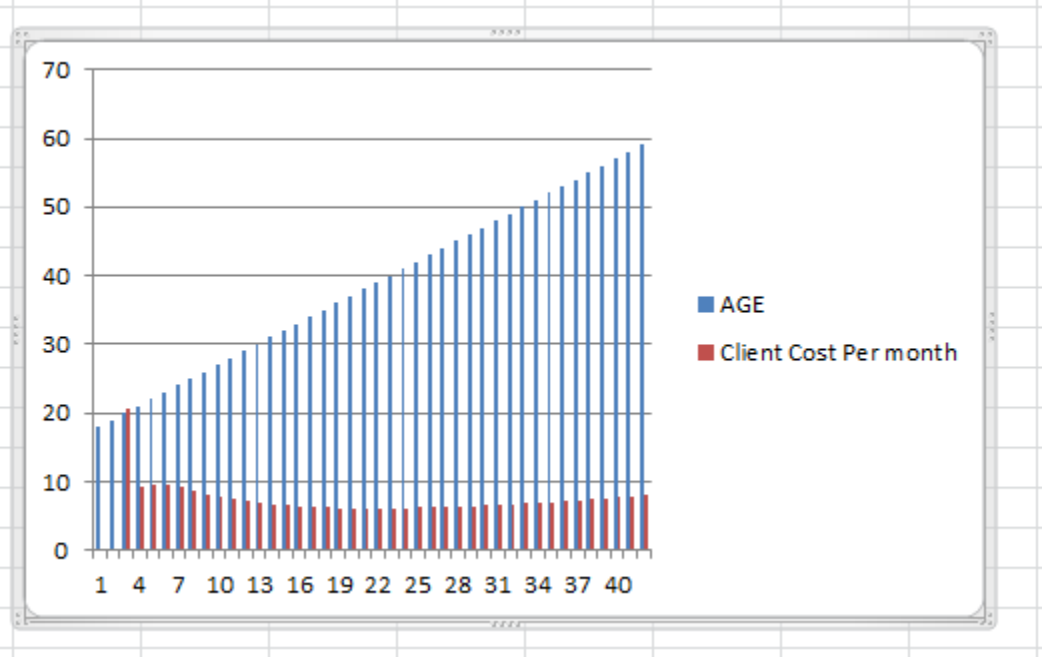
From the data above, we see that R^2 is 78% which means that it has a high explanatory power and therefore this shows that the relationship between client cost per month and reduction in yield is significant in our data. The Durbin Watson Statistic shows that there is positive

autocorrelation as the value 0.48 tends towards zero. The Standard error in the above data shows that the sample mean is accurate as the value of 1.31% is quite small. This shows that the variables used are significant in our data.

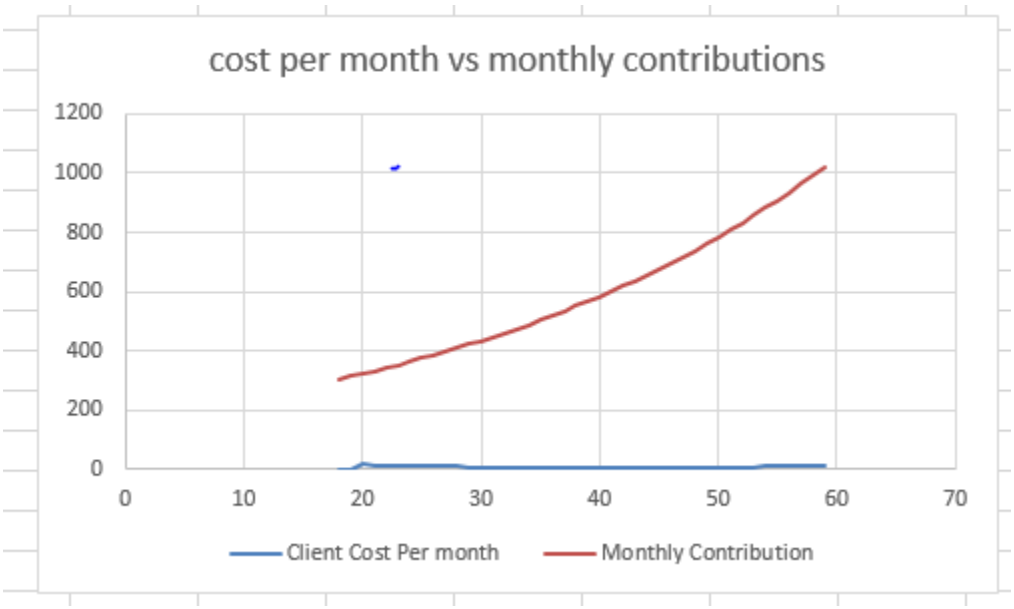
4.2. Graphs

4.2.1. Movement of client cost per month as the client ages.

The graph below shows that as the client ages, the client cost per month starts with a sharp increase in price and gradually decreases as the client becomes older. It then starts to increase towards the end of the pension contribution age though at an almost constant rate.

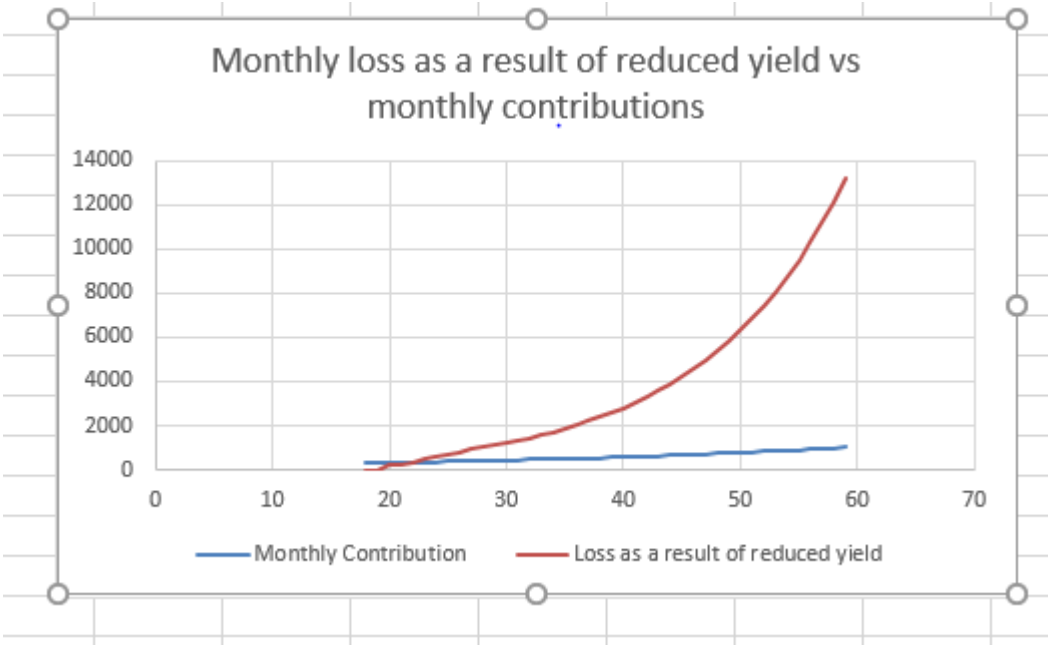


4.2.2. Relationship between client cost per month and monthly contribution



The graph above shows that the client cost per month is quite negligible when compared with monthly contributions. As the client ages, we see that their cost is not as high and this shows that the client does not incur losses when contributing to the pension fund.

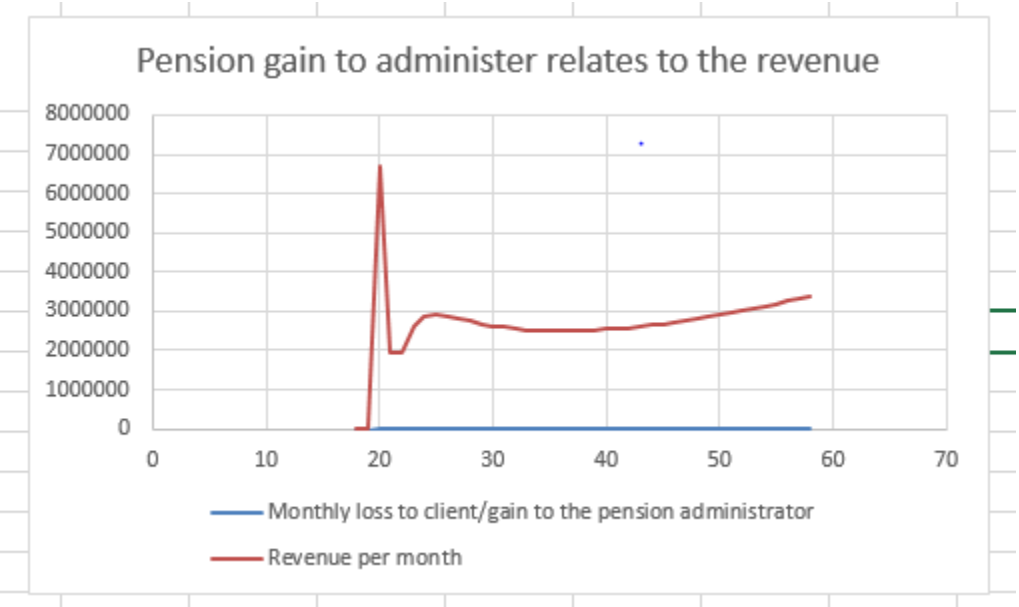
4.2.3. Relationship between monthly losses as a result of reduced yield and monthly contributions



The graph above shows that the monthly loss as a result of reduced yield increases as the client ages. The monthly contribution is seen to be at an almost constant level as the client ages.

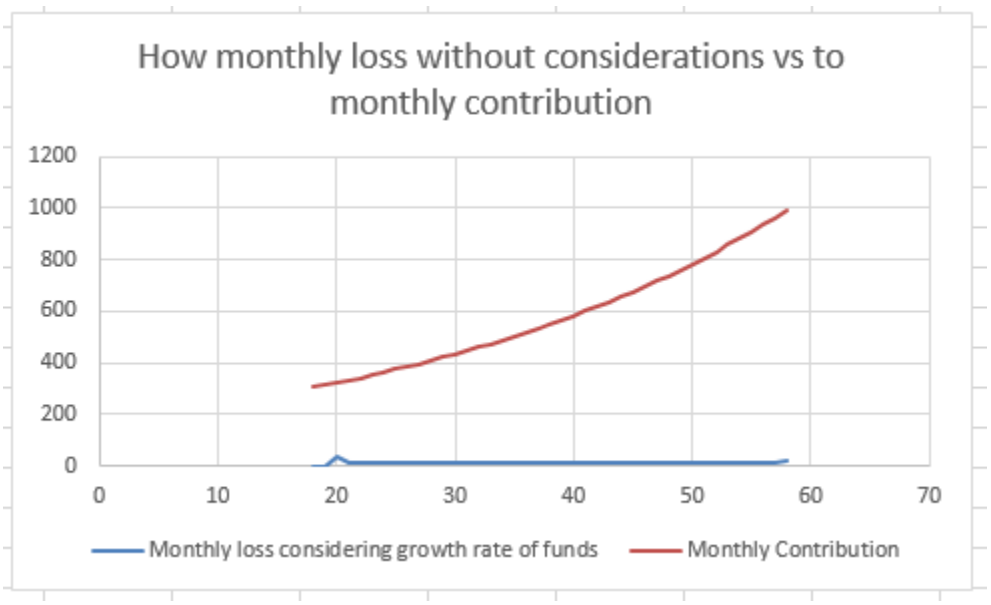
4.2.4. Relationship between pension gains to the administrator and revenue earned

Monthly loss to the client/pension gain to the administrator is seen to be at a constant rate as the client ages. The revenue per month is seen to start out very highly during the first few years. It is then seen to reduce sharply due to the steep decrease seen. Thereafter, the revenue per month is seen to follow a constant gradual increase until the end of the pension contribution age.



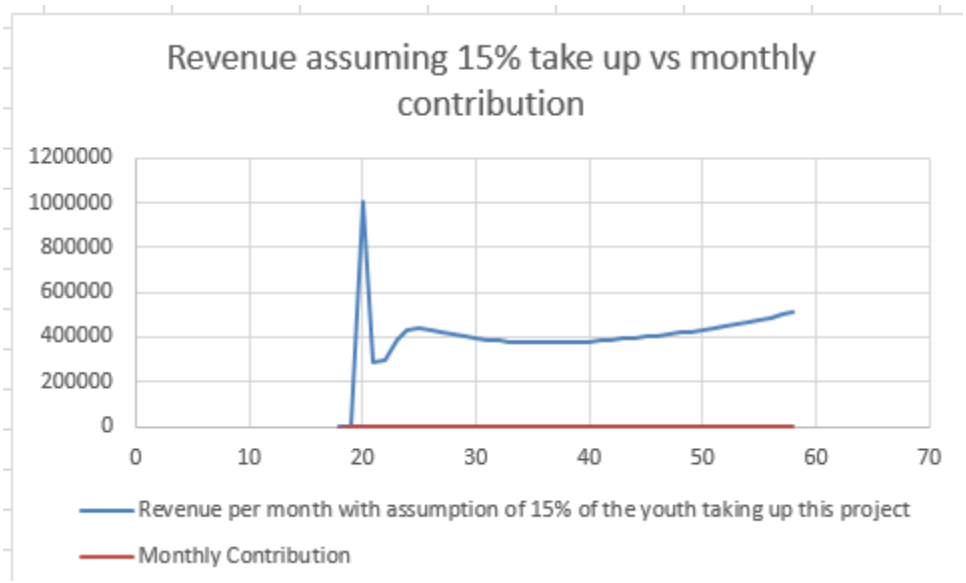
4.2.5. Relationship between monthly loss considering growth rate of funds and monthly contribution

The monthly loss considering growth rate of funds rises in the third year of contribution and eventually reduces following a constant rate as the monthly contribution increases.



4.2.6. Relationship between revenue earned (assuming 15% of the youth take up the pension) and the monthly contributions

The revenue per month is seen to be very high in the first years of contribution. It then decreases sharply in the next few years of contribution. Eventually it alternates between an increase and a decrease and increases gradually as the client ages.



5. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Previous studies that have tried to promote savings but have not succeeded since most youth lose motivation in savings. This study promotes savings since from the findings; the loss on the client is quite low in relation with the contributions hence giving motivation to a youth to save for their retirement.

5.1. Conclusions

From the data analysis, we have seen that the relationship between monthly loss to the client (considering growth rate of funds) and the monthly contributions have a very low r-squared of 1% as compared to the relationship between monthly loss to the client (without considering growth rate of funds) and the monthly contribution, which has an r-squared of 95%. This is because the growth rate of the contributions is only applied on the same, and has no relationship with the loss experienced by clients.

We also see that the relationship between pension gains to the administrator and the revenue earned has a sharp increase in the first years of contribution to the fund. This can be attributed to the fact that at the beginning of the fund, the client incurs a high penalty of transfer at the beginning of the pension fund which raises cost to client thus gains to the administrator. In addition to this observation, we see that as the client ages, their cost per month decreases throughout the tenure, as compared to the contributions value. This is because we introduced an escalation term for the contributions, in that they increase per year at a pre-specified rate.

In conclusion, we observe that both the client and the fund administrator gain in that the former's costs decrease over time while the fund value increases, while for the former, the profits increase over time.

5.2. Recommendations for Further Research

In this study, we have calculated the reduction in yield as well as the reduction in contributions and how they affect the profitability of the fund. However, we have not considered any adjustments in lapse rates from the clients' side. We therefore suggest further research into this where the funds value should be adjusted for lapse rates. Another area that stimulates further studies is that there is no consideration given for late entrants and early leavers. We recommend

the application of the survival rate models to study the effect of those who leave the fund before their retirement age on their savings, and also on the profitability of the pension scheme.

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