Micro Pension Scheme Model
for Kenya Commercial Motorbike Companies

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Abstract

Micro- pension schemes are meant to insulate low income earners from old age poverty. The formulation of such a model requires a delicate balance between economic viability and adequate generation of income returns to the participants. The commercial motorbike operators (popularly known as boda-boda) do not have a specific pension scheme. Using data from the records of Maseno university boda-boda operators, an interview guide and central bank of Kenya (CBK); we designed a defined contribution pension scheme model that inculcated the different modes of exit from the study and their probabilities. These were vital in coming up with the different benefits accrued as per the mode of exit of the boda-boda operator. There are two main types of pension scheme: defined benefit scheme and defined contribution scheme. Define contribution is a pension scheme where the contributions of both the employer and employee are usually fixed, often as percentage of the salary, and the benefits are the returns of these combined contributions on retirement usually after investment. On the other hand defined benefits are pension schemes in which the pension and other benefits are set out in the rules of the scheme. A micro pension scheme is an arrangement that enables small and middle-income earners to contribute
regularly some amount as savings so that they can be able to receive an annuity after retirement. Most micro pension schemes have adopted the defined contribution schemes because of the risk of investment involved.

**Keywords:** Micro- pension scheme, Economic viability, Central Bank of Kenya Rates, Defined contribution scheme.

1 Introduction

1.1 Background of the Study

Pension is a contract for a fixed sum of money to be paid regularly to a person on retirement from services either due to attainment of the mandatory age for retirement or due to ill-health that warrants retirement. Pension is also paid to employees who withdraw from the pension scheme or from the work place. There are two main types of pension schemes: defined benefit scheme and defined contribution scheme. Defined contribution is a pension scheme where the contributions of both the employer and employee are usually fixed, often as a percentage of the salary, and the benefits are the returns of these combined contributions on retirement usually after investment. On the other hand defined benefits are pension schemes in which the pension and other benefits are set out in the rules of the scheme.

A micro pension scheme is an arrangement that enables small and middle income earners to contribute regularly some amount as savings so that they can be able to receive an annuity after retirement. Most micro pension schemes have adopted the defined contribution schemes because of the risk of investment involved.

In both developing and developed countries, most governments and private entities are shunning away from defined, benefits which used to be the popular scheme amongst these institutions. They are now adopting defined contribution because the risk is borne by the employees instead of the employer as is the case with the former.

In Africa 80% of non-agricultural workers, work in the informal sector. Recent research by the United Nations estimates that by 2050 there will be almost 2 billion people over 60 (in age) worldwide with close to 80% leaving in developing countries. According to Help Age International the over sixties and over eighties represent the fastest growing population group on the African continent with the numbers of elderly people increasing by 50% between 2000 and 2015 and nearly fivefold by 2050 with majority of the population working in the informal sector, appropriate pension arrangements are needed to ensure that informal sector participants do not fall into the poverty trap after retirement.
The main reason for the existence of pension schemes is the provision of basic income security and poverty alleviation especially to the elderly (Honzman and Hinz 2001). Most retirees are insulated against old age poverty by pension schemes since a large proportion of the income of retirees is derived from their previous pension arrangements. For instance, where there is no pension out of 146000 children orphaned by HIV and AIDS only 1000, secondary school in 2007 because their grandparents could not afford school fees (Stewart and Yermo, 2009).

There are a number of things that need to be considered when coming up with a feasible micro-pension scheme model. The main factors being: investment, expected benefits. In line with the RBA act, pension schemes are mandated to follow the stipulated rules and regulations when it comes to investment. A pension scheme has to be bound by the trust deed and rules as per the provisions of the RBA act and whereby individuals that are key for the success of a pension scheme are mentioned in their various capacities. The individuals are: fund manager, custodian, actuary, sponsor board (board of trustees) and administrator. These individuals work in unison as mandated by the trust deed rules.

1.2 Statement of the Problem

Commercial motorcyclists in Kenya do not have pension benefit schemes that can cater for their financial security after retirement. By retirement we mean, either the mandatory exit of an employee from work after attainment of the retirement age (or attaining the maximum number of years of service), early retirement voluntarily or due to ill-health.

Most of the bodaboda operators do not have business acumen (that they can rely on after exiting their commercial transport system) that can sufficiently support their families and thus are obliged to join pension schemes so as to overcome this shortcoming. Note that they earn roughly five hundred Kenya shillings daily.

The prevailing financial insecurity of those operators is what prompted us to come up with a model that can be used to develop sustainable micro-pension schemes.

1.3 Significance of the Study

In line with the main objective of vision 2030 of helping transform Kenya into a middle income country by providing high quality life to all its citizens by the year 2030, we herein came up with a plan to secure the uncertain future of commercial motorbike operators by coming up with a pension scheme that insulates them from old age poverty which will ensure that they are able to
adequately afford the various basic social services and do not have to live on a shoe string budget. With a pension scheme in place, the commercial motorbike operators are able to inculcate the time value of money in their daily lives taking into consideration the importance of saving the little they earn and not to squander it.

1.4 Objectives of the Study

1. To have a model that aligns to the RBA act.

2. To ensure that the model can value benefits under the defined contribution pension scheme.

2 Main Results

2.1 Benefit valuation

We are focusing on defined contribution pension plan where the future benefit is unknown (uncertain). The benefits are based on the contributions made by the members in the pension scheme and the accrued future interest. This implies that we have discrete cash flows which incorporate the following factors:

(a) The amount of payment made as contribution to the scheme.

(b) The accumulation factor.

(c) The survival factor.

Therefore we are going to calculate the accumulation value of the contributions made taking into consideration the three factors listed above. The normal retirement age was found to be 53 years (from data analysis). Define:

$$i_t$$ is the effective interest rate at time $$t$$.

Therefore the accumulated value of contributions.

$$\sum_{t=0}^{53-x} [(0)^*(\Gamma(1 + i_t)^*E(tP_x^t))]$$

0 = contribution amount  
$$x$$ = entry age to scheme  
$$E(1 + i_t) =$$ accumulation factor  
$$tP_x^t =$$ survival factor
2.2 Accumulation factor

We observed that interest rates are not fixed but change with time. We also made an assumption that growth/accumulation rates have a log-normal distribution. That is, \((1 + i_t)(\log N(\mu, \sigma^2))\). This implies \(\log(1 + i_t) - N(\mu, \sigma^2)\)

\[
E(1 + i_t) = \exp[\mu + (1/2)\sigma^2] \quad \text{and} \quad \text{var}(1 + i_t) = \exp(2\mu + \sigma^2)\exp(\sigma^2 - 1)
\]

\[
E[\log(1 + i_t)] = \mu \quad \text{and} \quad \text{var}[\log(1 + i_t)] = \sigma^2
\]

We can estimate \(\mu\) and \(\sigma^2\) by method of moments. Central bank of Kenya interest rates were used.

\[
E[1 + i_t] = \mu = (1/n) \sum_{t=0}^{n} \log(1 + i_t) \quad \text{where} \quad n = 42
\]

\[
= (1/42) \sum_{t=0}^{4} 2 \log(1 + i_t) = 0.008697523
\]

\[
\hat{\mu} = 0.008697523
\]

\[
\hat{\sigma^2} = [1/(n - 1)] \sum_{t=0}^{n}[\log(1 + i_t)]^2 + n[1/42 \sum_{t=0}^{4} 2 \log(1 + i_t)]^2
\]

\[
= [1/42] \sum_{t=0}^{4} 2[\log(1 + i_t)]^2 + 42 \times 0.008697523^2
\]

\[
= 0.003262837
\]

Therefore \(E(l + i_t) = \exp[\mu + (1/2)\sigma^2] = \exp(0.008697523 + 0.5 \times 0.003262837) = 1.010382469\)

And \(\text{var}(1 + i_t) = \exp(2\mu + \sigma^2)\exp(\sigma^2 - 1)\).

\[
= \exp(2\times0.008697523 + 0.003262837)\exp(0.003262837 - 1) = 0.003336381
\]

Therefore we are going to use the \(E(1 + i_t) = 1.010382469\) as the monthly accumulation factor.

This implies that the \(E(i_t) = 0.010382469\).

The annual accumulation factor is given by: \([E(l + i_t)]^{12} \sim \log N(l2\mu, 12\sigma^2)\). Therefore \([E(1 + i_t)]^{12} = \exp[12\mu + (l/2)12\sigma^2]\)

\[
= \exp(l2\times0.008697523 + 0.5\times12\times0.003262837) = 1.131956213
\]

2.3 Contribution amount

From the analysis of data, the average amount the bodaboda operators could be willing to pay to the pension plan per day is Kshs.37.25 which is approximately Kshs.40.00 per day in arrears. This amount is payable daily including weekends. Since interest rates are assumed to accrue on monthly or annual basis. The expected accumulation value at the end of the year is

\[
40 \times 30 S_{12\delta i} = 1200\times[(1 + i)^{12} - 1]/i
\]
\[ S_{12@1} = 1200 \times (1 - 0.010382469^{12}) + 1)/0.010382469 = 15251.42557 \]

Where \( S_{12@1} \) is an accumulation value of 12 monthly payments.

### 2.4 Survival factor

We have four decrements: withdrawals, deaths, ill-health and normal age retirement. Define:

- \( X \) is the age of an active member of the pension scheme.
- \( \pi P_{x}^{t} \) is the probability that a life aged \( x \) last birthday survives all decrements before age \( x + t \).
- \( \gamma(t)^{w} \) the hazard function for withdrawals.
- \( \gamma(t)^{d} \) the hazard function for deaths.
- \( \gamma(t)^{I} \) the hazard function for ill-health retirements.
- \( \gamma(t)^{r} \) the hazard function for normal age retirements.

We calculate the Maximum Likelihood Estimators of the Hazard functions of various decrements.

\[
\gamma(t)^{w} = \text{total number of withdrawals} / \text{the time unit(month)} = \frac{13}{48}.
\]

\[
\gamma(t)^{d} = \frac{1}{48}, \quad \gamma(t)^{I} = \frac{1}{48}, \quad \gamma(t)^{r} = \frac{3}{48}.
\]

\[
\pi P_{x}^{t} = \exp[- \int (\gamma(u)^{w} + \gamma(u)^{d} + \gamma(u)^{I} + \gamma(u)^{r}) du]
\]

\[
= \exp[- \int (13/48 + 1/48 + 1/48 + 3/48) du]
\]

\[
= \exp(-0.375t)
\]

Where \( t \) is the number of decrements which is 4.

Therefore the probability of an operator surviving all decrements is \( \exp(-1.5) \) The expected accumulated value of contributions.

\[
= \sum_{t=1}^{53-x} [(15251.42557) \times (1.131956213)^{t} \times (\exp(-1.5))]
\]

The above formula will give the value of contribution a given operator expects once he or she retires. Once he or she reaches the retirement age he or she will be given an option to accept the lump sum or receive an annuity payable monthly in advance. The terms of the annuity maybe 5,10,15,25,30 or 35 years. Payments will be paid to said beneficiaries once operator dies before full amount is paid.

The level monthly payments will be determined by the following formula.

\[
S\bar{a}_{n \times 12} = C \text{ Where :}
\]

\( S \) =expected value of contribution

\( c \) =monthly level payment to be made

\( n \) =annuity term in years

\( \bar{a} n \times 12 = \text{present value of an annuity due given by} \ (1 - v^{n \times 12})/d \)

\( v = 1/(1.010382469) \)

\( d \) =effective monthly discount rate given by \( 0.010382469/1.010382469 \)
3 Conclusion

We therefore, conclude that a micro pension plan based on defined contribution model is possible. The valuations as well as the expected benefits can be calculated approximately and projections can be made when the right accumulation/growth factor is determined.

4 Recommendation

We recommend that the project be put into use by associations of informal workers in developing their pension schemes. We also recommend that further research be done on the project so that a universally acceptable improved model of this type can be made and put into use.

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References


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