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EFFECT OF INFLATION ON ADEQUACY OF PENSION BENEFITS IN RWANDA

BY

Eric RUBYAGIZA

COLLEGE OF BUSINESS AND ECONOMICS

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Effect of Inflation on Adequacy of Pension Benefits in Rwanda

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BY

Eric RUBYAGIZA

213000436

SUPERVISOR:

Charles Mulindabigwi Ruhara, Ph.D.

Kigali, September 2020

DECLARATION

I declare that this dissertation entitled **Effect of Inflation on Adequacy of Pension Benefits in Rwanda** written and submitted by **Eric RUBYAGIZA** is the result of my own work and has not been submitted for any other degree at the University of Rwanda or any other institution.

Names: Eric RUBYAGIZA

Signature:

APPROVAL SHEET

This dissertation entitled **Effect of Inflation on Adequacy of Pension Benefits in Rwanda** written and submitted by **Eric RUBYAGIZA** in partial fulfilment of the requirements for the degree of Master of Science in Data Science majoring in Biostatistics is hereby accepted and approved. The rate of plagiarism tested using Turnitin is 17% which is less than 20% accepted by ACE-DS.

Charles Mulindabigwi Ruhara, Ph.D.

Supervisor

Ignace H. Kabano Ph.D.

Head of Training

DEDICATION

This dissertation is dedicated firstly to God who has given me a chance to pertain this research as a part of master program; to God is the glory for His amazing favor, ingenuity and grace to the point of this submission I owe it all to Him.

To my dearly adored wife, Belyse Mukeshimana, for providing me with trustworthy backing and unceasing inspiration through my years of study and through the process of studying and writing this dissertation, thanks for always being by my side.

To my daughter Eliyanah and my son Todros, for inspiration to achieve greatness.

To my parents, for their love, education and tools for being who I am. Thanks for being such a good example to follow. Thanks for all education to me, for the support and encouragement that has been so fundamental for my life.

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ABSTRACT

The broad objective of this study was to examine the effect of inflation on adequacy of pension benefits in Rwanda and recommend suitable measures that could be taken to improve pension scheme in Rwanda. The study employed the data sourced from Rwanda social security Board (RSSB). Data were for pensioners retired in 2002 and reported to receive pension benefits till 2016/2017. Additional data on inflation covering the period 2002-2016 were sourced from Rwanda National Bank publications. Fixed effect model was used to analyse panel data. Future value was applied to assess the value of pension benefits each year for fifteen years in retirement and the adequacy was measured using replacement rate which is the pension benefits expressed as percentage of income in active period. The results indicate that the inflation declines the value of pension benefits progressively hence affects its adequacy. Consequently, as the period in retirement increases, the value of pension benefits deteriorates and this leads to poverty during retirement. The findings also show that income before retirement is an important and major factor that determines the income in retirement. The pension benefits at the entry point in retirement respond to the international standard as given by ILO, however benefits are insufficient as they are calculated based on low salaries. As per results, the study recommends the indexation of pension benefits based on inflation rate or shortening the period for the ad hoc adjustments to every five years. Moreover, the study recommends the employers to increase the salaries of their employees to guarantee sufficient income in retirement.

Key words: Pension adequacy, Inflation, Previous income, Rwanda

ACRONYMS AND ABBREVIATIONS

EU	European Union
GDP	Gross Domestic Product
ILO	International Labour Organization
IMF	International Monetary Fund
ISSA	International social security association
MINECOFIN	Ministry of Finance for Economic Planning
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Square
RR	Replacement rate
RSSB	Rwanda Social Security Board
SGDs	Sustainable Development Goals
SSA	Sub Saharan Africa
UN	United Nations
UNFPA	United Nations Population Fund

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CHAPTER ONE

GENERAL INTRODUCTION

1.0 Introduction

This chapter presents the background of the study, problem statement, objectives, significance and scope of the study.

1.1 Background

Worldwide, there is a growing consensus by governments and their respective development partners that reduction of the extreme poverty rate among vulnerable groups of people has to be prioritized. This is also reiterated in the recent Sustainable Development Goals (SDGs) released by United Nations (UN, 2017). Though the majority of persons residing in developing nations are exposed to poverty, various scholars argue that the old group from those countries has the highest risk to stay in poverty for a long time (BARRIENTOS, 2003). Though it is apparent that old people need pension schemes to ensure their future income security. Paper by Holzman(2001) and Palacios(2000) argued that only 15% of population over 65 years have retirement benefits. Especially this is lower in Sub-Saharan Africa (SSA) where more than 90% of old people do not have the pension system by which both employee and employer contribute. In addition, among existing pension system, there is serious inadequacy of pension benefits as its value deteriorates as inflation increases (Kobyliński & Balcerowski, 2017).

It is stipulated in human right declaration of 1948 that a person in old age, joblessness, illness, incapacity, widowhood, or other lack of living in situations above person's control has the right to live adequately. Consistent with this declaration, pension funds play an important role to reduce the old-age poverty especially in regions where this issue was historically predominant (Stewart ,2009) and (UN,1948).

There is a general agreement that Pension benefits should be indexed either to price or to wage, to ensure pensioners are protected against poverty in their old age. Most countries index pension benefits in order to at least go at the same speed with the inflation and thus maintain the real value during retirement (Piggott , 2009) and (Szczepański, 2014).

From international perspective, one of the goals of pension scheme in European union countries is to accentuate on adequation of pension benefits for helping their retirees to preserve the living standards after retirement (Hohnerlein, 2019).

while in the Organization for OECD and SSA countries older people are still constrained with inadequacy of public pension benefits throughout their retirement period (European Commission, 2010).

In SSA, among compulsory scheme only a quarter have a clear indexation system (wage or price indexation) while the remaining do not have the explicit indexation rule or they make adjustments on an optional basis (Dorfman, 2009). This is well reiterated in Stewart (2009) report which emphasised that pensioners in SSA countries endure a higher level of inflation risk. Thus, without indexation, old age income and poverty protection can be significantly reduced during retirement by even modest inflation levels.

From national context, it is highlighted that since 1962, the government of Rwanda has embarked on provision of public pension benefits to public and private employees who attain retirement age and contribute to the pension schemes. Nonetheless, Rwandan social services are still modest as the benefits are not sufficient compared to the ever-increasing inflation and financial sustainability of the scheme is not assured. Therefore, this study is purposely carried out to evaluate whether there exists any effect of overtime changing inflation on adequacy of pension benefits among RSSB beneficiaries.

1.2 Problem statement

The value of pension benefits decreases primarily as the result of the progressive inflation. Inflation weakens pension benefits by decaying its purchasing power (Dorfman, 2009) and (Stewart, 2009).

In addition, according to Hohnerlein (2019) insufficient pension benefits may result from different factors like contribution gaps or low salaries, but one major reason for pension inadequacy among grown-up pensioners is deficient pension indexation.

International Labour Organization (ILO) and World Bank propose the replacement rate to be 45% and 40% respectively to keep retirees in their standard of living (Grech, 2013). According to (MINECOFIN, 2009), Rwanda Social Security Board funds up to 60% of the average income before retirement. This should consider as adequate benefits since it is above the minimum standard as required by both ILO and World Bank.

In addition, Rwanda social Security Board indexes benefits on ad hoc basis regulated by presidential decree but this may take many years while the inflation changes every year (MINECOFIN, 2009).

In fact, over the period starting from 2002 to 2016/2017 (15 years), pension benefits were adjusted only in 2002 to take into consideration the problem of over changing inflation means pension of people who retired in 2002 spent fifteen years without being adjusted.

The main reason related to adjustment made on this matter it is the fact that pensioners were paid the same amount over the last 15 years. While the economy experienced inflation every year, hence pensioners may be losing the purchasing power progressively.

Thus, this study seeks to assess the effect of inflation (one of the utmost clear indexation goal) on pension adequacy to provide insight based on findings to policy makers.

1.3 Objective

The general objective of this study is to assess the effect of inflation on adequacy of pension benefits in Rwanda.

More specifically, this study seeks to:

1. Examine the adequacy of pension benefits at the entry point in retirement.
2. Compare pension adequacy at the entry point in retirement and adequacy during any other retirement periods before indexation
3. Assess relationship between age and pension benefits

1.4 Significance and scope of the study

It is evidenced that the number of elderly living in Rwanda keeps increasing and willingness to be part of pensioners, not only among employees but also among the rest of population, through ejoheza program, is improving day to day. At the same time, as the life expectancy rises, the number of the retired inhabitants increases the same as the period they spent in retirement also increases.

Therefore, there is need to increase awareness of existing benefits of pensions to ensure high embeddedness of people to this scheme in Rwanda. Moreover, this study is stirred up by the apparent need for the government of Rwanda to provide retirees with adequate income in retirement. The study will inform policy making process.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews literature on the effects of inflation on adequacy pension benefits in Rwanda. Apart from the introduction the rest of the chapter is organized as follows: subsection 1 defines the key concepts, subsection 2 discusses different types of indexation, subsection 3 gives empirical review and the subsection 4 summarize the literature.

2.1 Definition of key concepts

This section defines some key concepts of interest.

2.1.1 Pension adequacy

According to World Bank (2019), **pension adequacy** is the extent at which retirement pension benefits encounter the purpose of social security (to reduce the fluctuation of income and to protect against poverty). Other scholars defined **pension adequacy** as the degree to which pensions income permit persons to accomplish their fundamental needs (Redwood et al, 2013) or resist a stated, frequently minimal or modest, normal living standards (Walker, 2005).

Furthermore, Pension system is considered as adequate when it manages to maintain the purchasing power of pension benefits and this can be possible only if pension benefits are significantly indexed otherwise retirees will suffer from poverty (ILO, 2018)

Theoretically, pension benefits adequacy can be explicated by life-cycle income hypothesis. This theory suggests that individuals borrow at early stage and they save for retirement after and finally they reach maximum point beyond which they start to save (ANDO, 1963). From the above definitions, it is well indicated that meagerness of the pension benefits would weaken the social security adequacy principle, which advocates that a stream of income to the retiree be adequate to enable the person to live a decent life in retirement.

2.1.2 Replacement rate

World Bank (2019) report defines **replacement rate** as the indicator that shows how pension benefits is related to average salary (previous income).

2.1.3 Inflation

According to (Grace Ofori-Abebrese R. B., 2017), Inflation is defined as a continued upsurge in general prices of goods and services for a specified time frame.

2.2 Types of indexation

To address the problem of inflation on pension benefits, social security schemes employ different ways of indexation and the approach employs to index pension plays a substantial part for both suitability of pension and the financial health of the scheme (Hohnerlei, 2019)

2.2.1 Price indexation

Price indexation relates to change pension benefits in order to take into consideration the cost of living. It is done by taking the benefits to be regulated then add the inflation ratio expressed in percentage value. In addition, this indexation approach is considered to be the inexpensive method and a valuable influence for terminating the burden of opposing demographic variation on the funding of pension scheme (Disney and Johnson, 2001).

Mathematically, is expressed as:

$$P_t = P_o + P_o \times i$$

Where P_t is the indexed pension benefits, P_o : pension Benefits prior indexation and i represents inflation.

2.2.2 Wage indexations

According to (Hohnerlein, 2019), **wage indexation** is concerned with permitting retirees to partake in growing standards of living of the active and as salaries tend to rise quicker than consumer prices, this approach preserves purchasing power of retirees.

It is frequently the more expensive indexation procedure, excluding in times of a general slowdown in financial activity over a sustained period of time with shrinking wages. It is done by indexing pension benefits on gross domestic product (GDP) growth ration. This can be illustrated like this by the formula

$$B_t = B_o + B_o \times g$$

Where B_t is indexed pension benefits, B_o : pension Benefits prior indexation and g represents gross domestic product growth.

2.2.3 Hybrid indexations

The third method of indexation is the combined method of both price and wage approaches. It combines both inflation ration and gross domestic product (GDP) growth (Kobyliński & Balcerowski, 2017).

2.2.4 Ad hoc indexations

This is not a regular indexation, instead most of time it takes place when decided as necessary or needed. Though many newly established schemes use ad hoc indexation approach, it is criticized to have a limited poverty reduction impact (SOCIAL PROTECTION POLICY PAPERS, 2018)

2.3 Worldwide indexation practice

The table below presents how regions and number of countries practices indexation. It is observed that many countries from Eastern Europe & Central Asia practice more indexation while in East Asia & the Pacific this practice is still critical.

Table 1: Worldwide indexation practice

Region	Number of countries	Prices	Wages	Mixed	Ad hoc/ discretionary
Eastern Asia & Pacific	6	2	2	-	2
East Europe & Central Asia	28	10	5	8	5
Latin America & Caribbean	24	6	2	1	15
Middle East & Northern Africa	12	2	1	-	9
Southern Asia	8	-	-	-	-
Sub-Saharan Africa	18	8	2	0	7
High-income OECD	19	11	2	4	2
World	115	39	10	15	37

Source: (World Bank Group, 2012)

In view of the above, countries from different regions which practiced indexation in 2012 were 115, among which most of them used price index followed by ad hoc indexation. Rwanda uses the ad hoc method through presidential degree to adjust pension benefits for inflation (MINECOFIN, 2009).

Almost all reviewed literatures recommend indexation to safeguard pension against a drop in buying power but there is a cost associated to it hence social security funds need to take into consideration the sustainability issue. Though in practice worldwide, indexation to wage is the most frequent as it delivers higher replacement rates for retirees but it also has a higher burden associated thus more expansive than price indexation approach (John Piggott, 2009)

2.4 Empirical review

Several scholars empirically indicate that inflation weakens pension benefits when it is not indexed because it declines the purchasing power of pension benefits progressively (Dorfman, 2009) and (Stewart, 2009). Though the inflation may be low but still, it depreciates the value of pension benefits hence exposes retirees to poverty (Foster, 2013; Whitehouse, 2009). In addition, Hohner lei (2019) argued that more a retiree become older, more he/she bears an advanced jeopardy of poverty and have lower incomes than newer pensioners.

From another point of view, some scholars declared that salaries, retirement pension and social benefits respond less to inflation compared to nonwage income, and the real value of cash savings, being unremunerated, is worn by inflation (Kahn, 1997). Also, Leicester (2008) found the similar result that mean inflation for retirees has been almost the same as that for non-pensioners, but that ranking variations from year to year and changes within a particular year may be large. They say that the way that families of pensioner experiences inflation may differ based on the age and revenue of pensioners. In addition, it is claimed that poverty jeopardies among older retirees can be credited to several influences. In earnings-related pension schemes based on social insurance contributions, deficient pension income can result from different factors like: contribution discontinuities or mostly incomplete and insufficient employment history (because of part-time work, low salaries, reduced earnings capacity, etc.). But one main factor for lower pension adequacy among elder retirees is unsatisfactory pension indexation (Hohnerlein, 2019).

The factors that determine pension benefits depend on the type of the system (defined benefits or defined contribution). For defined contribution system benefits are mainly defined by how much someone contributed before retiring and how the social security fund invests the contributions of members while for the defined benefits system, Benefits are determined by how old does someone enters in retirement, contributed period and the average salary (FOSTER, 1998).

Dorfman (2015) stated that almost all pensions who contributed their full career in defined benefits, they receive adequate benefits. But contribution densities in some countries suggest that workers on average have gaps in contribution hence they receive lower benefits. Universally, there is an inequality of men and women in labour market and this inequality persists in their retirement. The researches indicate that the inequality of men and women in benefits is determined by lower coverage of women in the scheme, their income is lower compared to the income of men and as women have a habit of taking a big portion of household's tasks, they frequently shorten their employment careers (UNFPA (United Nations Population Fund) ; 2012. Ageing in, 2012; Razavi, Arza, Braunstein, Cook, & Goulding, 2012)

2.5 Summary of the literature

The reviewed literature in the area of pension adequacy indicates that inflation reduces replacement rate as inflation is increasing and as the years in retirement increases too and several studies concluded that economic value of established benefits decreases primarily as the result of the progressive inflation. However, other scholars argue that, pensions, and social benefits have a tendency to respond less to inflation and they claim that insufficient pension benefits can result from other factors like part time jobs, low salaries or contribution gaps.

In addition, the literature argues that pension benefits are determined by amount contributed and the investment earnings when the scheme is a contributed system and benefit formula, retirement age, length of service and pre-retirement earnings when the scheme is a defined benefits system. Furthermore, the reviewed literature indicates that there is a gap in gender as women receives lower benefits compared to men. After conducting literature review in the area, it was found that few literatures were done to assess the adequacy of pension scheme especially in Sub-Saharan Africa. In addition to that, most of the reviewed study are qualitative and descriptive hence they are at a high risk of subjectivity. Moreover, they used replacement rate to assess the adequacy but this indicator is not enough as it is taken at one point in time thus cannot reveal the inadequacy that can appear in retirement. Therefore, panel data, future value and fixed effect model were added to replacement rate in order to assess the pension adequacy not only at one point in time but also throughout the retirement period.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter provides methodology followed to achieve the study's objectives.

Apart from the introduction the rest of the chapter is organized as follows: subsection 1 indicates the source of data and describes the variables used for the analysis, subsection 2 explains the population of the study, subsection 3 gives a detailed analytical framework for assessing the effects of inflation on adequacy of pension benefits by presenting appropriate analytical methods used for each objective.

3.1. Data source and variables description

This study mainly used the administrative data sourced from RSSB and the data on inflation that were collected from publications made by National Bank of Rwanda.

This study considers the following main variables:

- ✓ **Inflation:** annual inflation rate (Variation of prices measured on year-to-year basis and expressed as percentage)
- ✓ **Pension benefits:** income that social security fund pays a retiree on monthly basis,
- ✓ **Age:** number of years of a pensioner

The dependent variable is:

- ✓ pension benefits

The independent variables are:

- ✓ inflation,
- ✓ age,

3.2. The population of interest

More focus was given to 248 employees who retired in 2002 and reported to receive pension benefits till 2016/2017.

This cohort is selected because they are between two pension benefits adjustments, their benefits remain the same for fifteen years. However, after data cleaning, records for one person were ignored as his benefits was recorded as negative and it is not possible hence the population used in this study was 247 retirees.

3.3 Analysis

Prior to any descriptive and empirical analysis, data were cleaned using R programming language. The variables are descriptively presented to explain their central tendency and their measure of association.

In addition, Future value is applied to assess the value of pension benefits each year for fifteen years. Furthermore, fixed effect model was used in the analysis in line with the objectives of the study.

To measure the adequacy, replacement rate is employed, it is the pension benefits expressed as percentage of income in active period then compare it with the international standard as provided by world bank and ILO, then if this is greater or equal to international standard of 45% and 40% by ILO and world bank respectively is considered to be adequate.

To measure the effect of inflation and age, fixed effect approach was employed to estimate the regression model. The fixed effects model is considered as it is the appropriate model as we have panel data. It explores the relationship between independent and dependent variables within an entity (Torres-Reyna, 2007).

The fixed effect (FE) model is used in similar researches in social security industry in different years by different researches as Lingguo Cheng (2016), Alfonso Arpaia (2009) and David Amaglobei H.C(2019).

R programming language was used to deal with statistical calculation in this study.

3.4. Model Specification

For achieving the objectives of the study, the following function model was used:

$$y = f(x, z) \dots\dots\dots (1)$$

This can be written as

$$y = \alpha + \beta_1 x + \beta_2 z + \epsilon_t$$

Where y represents pension benefits, x signifies inflation rate, z stands for Age, β_1 and β_2 are coefficients of inflation and age respectively and ϵ_t is an error term

The following are expected outcomes:

The study was expected to give the measurement of how inflation affects pension benefits and to indicate at which extent pension adequacy differs from entry point in retirement and during any other retirement periods before indexation.

3.5. Analytical framework

The analytical framework for assessing the effect of inflation on adequacy of pension benefits, objectives, data requirements and respective analytical methods are presented in the below table. Future value, paired t test and Fixed effect model were employed.

Table 2: Analytical framework

Objectives	Data requirements	Analytical methods
To assess the effect of inflation and age on pension benefits	Dependent variables: pension benefits. Independent variables: inflation and age	Fixed effect model is used to assess how inflation affect pension benefits and how age is correlated with pension benefits
To Compare the pension adequacy at the entry point in retirement and the adequacy during any other retirement periods before indexation	Average salary, Pension benefits and inflation for each year	Express pension benefits at the entry point in retirement as percentage of average salary, calculate the average replacement rate to be benchmarked against the standards as provided by ILO and Work Bank. Compute Future value of pension benefits, then estimate the average replacement rate and benchmark the average replacement rates against the standards after every five years in retirement. Test the significance of the difference between replacement rates. Paired t test was used to test if there is a significant difference between replacement rate at the entry point in retirement and after every five years.

To test the appropriateness of the model, Hausman test was used. According to (Greene, 2008) Hausman test is used to assess the appropriate model to be used for panel data analysis. It helps to decide whether fixed is appropriate or random is the one to be used. the null hypothesis for Hausman test states that the preferred model is random effects whereas the alternative hypothesis states that the preferred model is the fixed effect.

After running Hausman test, the results are presented here below:

Hausman Test results

data: Benefit ~ Inflation + Age

chisq = 25.852, df = 2, p-value = 2.434e-06

alternative hypothesis: one model is inconsistent

The results show that p-value is significant hence the null hypothesis (the preferred model is random effects) was rejected then the fixed effect model was chosen.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presents descriptive and empirical analysis that are likely to respond study's objectives. It also provides interpretation and discussion of results necessary to make the reader understand the effects of inflation on adequacy of pension benefits in Rwanda.

4.1 Descriptive statistics

4.1.1 Inflation

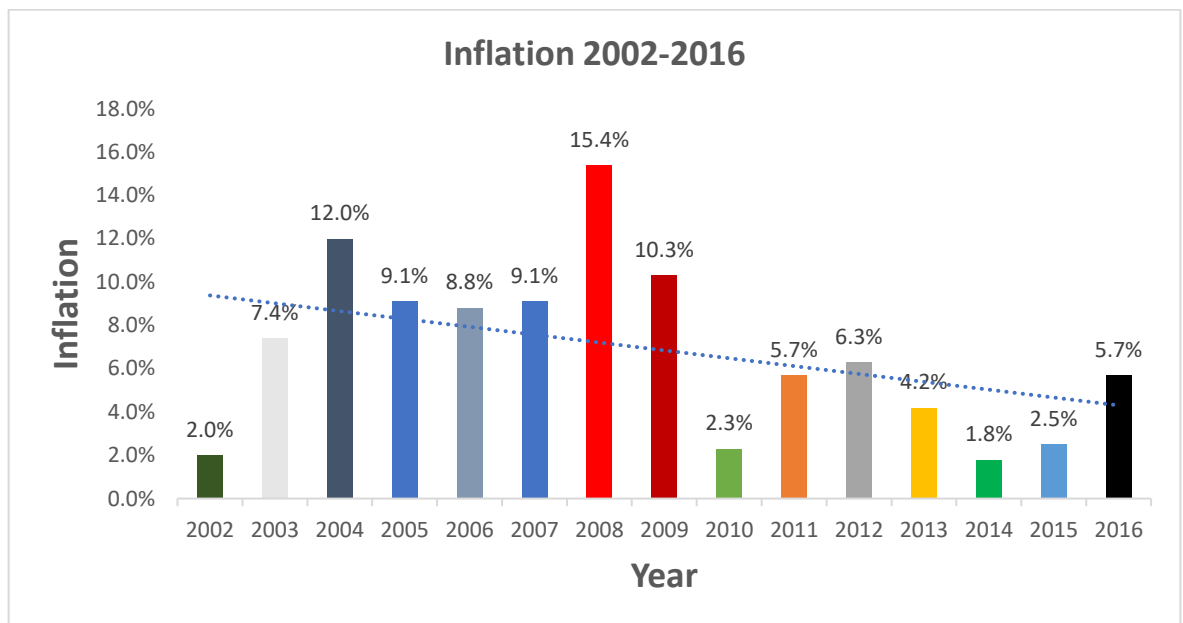


Figure 1: Inflation Trend

Figure 1 above depicts inflation trend over the period of fifteen years from 2002 to 2016. It is indicated that the mean of inflation rate in Rwanda is 6% and it has a decreasing trend which is good for value pension benefits as inflation correlates negatively with the value of pension benefits.

It is also noticed that there is an overtime variation of inflation which is a problem for both pensioners and social security funds. This could be partly implied that pensioners are challenged by the overtime fluctuation of inflation. As the inflation fluctuates with the value of their benefits while social security funds get challenged as inflation affect their returns on investment.

4.1.2 Age of beneficiaries

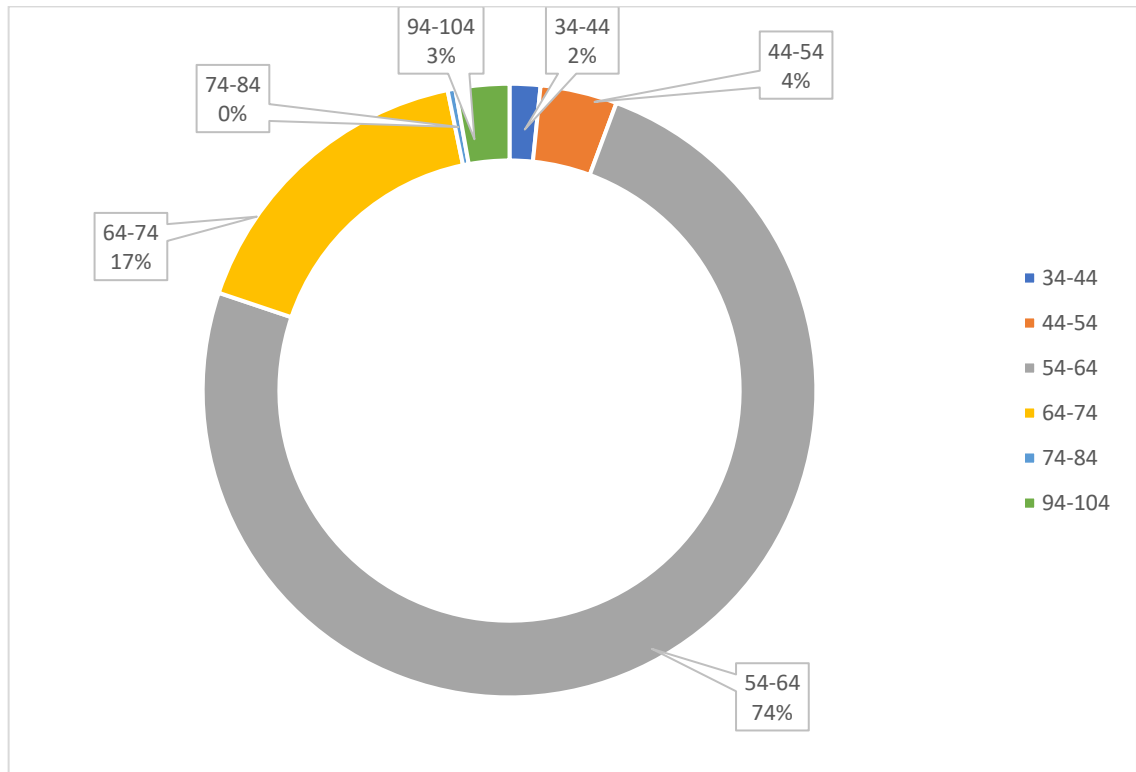


Figure 2: Distribution by Age

The figure 2 shows that 74% of people who retired in 2002 were aged 54-64, and about 17% of them were aged between 64-74. This implies that 91% of retirees were aged between 54-74. Though the eligibility of having pension in 2002 was at least 55 years old, there is 6% of people who retired in 2002 and they were younger (less than 55years). This is explained by the fact that the law gives the opportunity for pension scheme members who incurs disability before attaining the eligible age for retirement.

4.1.3 Contribution period

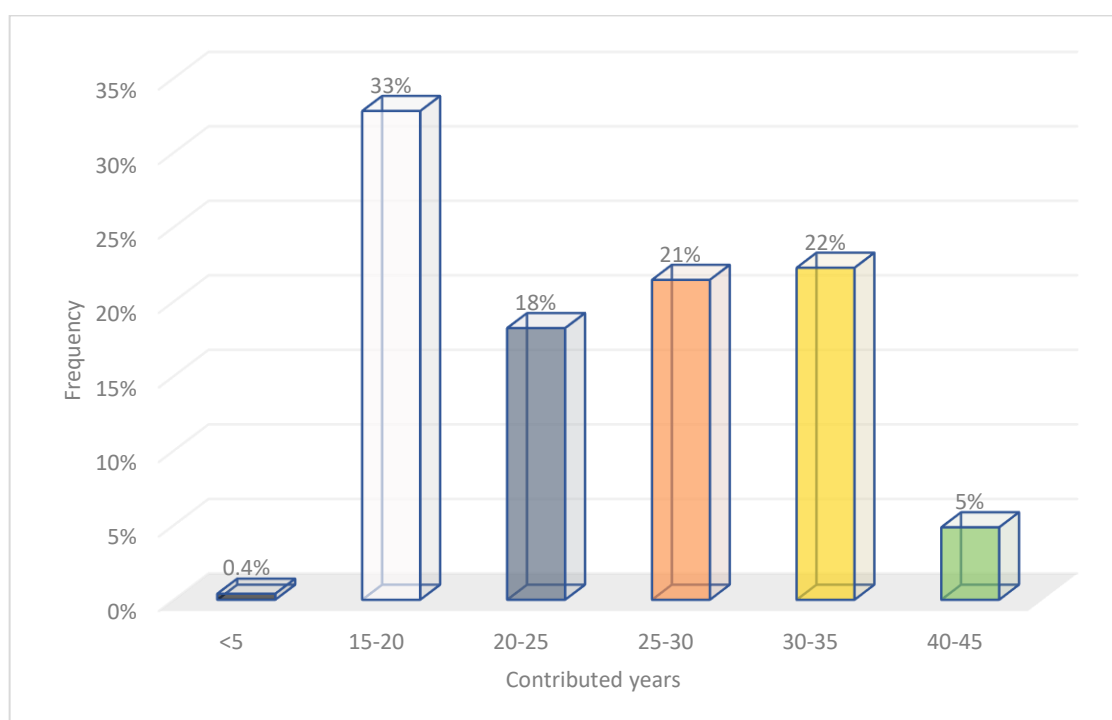


Figure 3: Contributed Period

A large proportion of pensioners who retired in 2002 contributed between 15-20 years (about 33%), followed by those who contributed between 30-35 years (22%), between 25-30 (21%) and 18% contributed for 20-25 years. However, 0.4% contributed less than 5 years. That proportion of pensioners who contributed lesser than 5 years should be covered by pension scheme funds in accordance with the article 21 of law of organization of social security of 2003 if they experiences incapacity before reaching the eligible age for retirement to receive invalidity pension if they fulfill the requirements of being a member for at least 5 years; having paid contribution towards the Trust for six months in the last twelve months preceding the damage which led him/her to disability.

According to (ILO, 1952; ILO, 1967). Minimum of 30 years of contribution or employment are required to be able to receive benefits of 40% and 45% respectively however the findings show that the average of contributed period is 25 this means that the pensioners contributed below the standard as requested by the ILO hence their benefits will be insufficient. On the other hand, if the scheme tries to give the adequate benefits, the sustainability of the scheme will be harmed.

4.1.4. Average Salary

Table 3: Average Salary

Av-Salary	Frequency	percentage
10000-109999	182	0.74
<10000	42	0.17
110000-209999	11	0.04
210000-309999	6	0.02
410000-509999	2	0.01
610000-709999	2	0.01
510000-609999	1	0.00
810000-909999	1	0.00
Total	247	1.00

The above table shows that 74% of people who retired in 2002 were receiving the average salary between 100,000-109,999 Frw. Moreover, the median and the mean of average salary are 22,329 Frw and 51,824 Frw respectively. This shows that majority of retirees in 2002 had a low income before retiring. This implies that they will receive insufficient amount in their retirement period because benefits are calculated based on the income in active period.

4.1.5 Benefit distribution

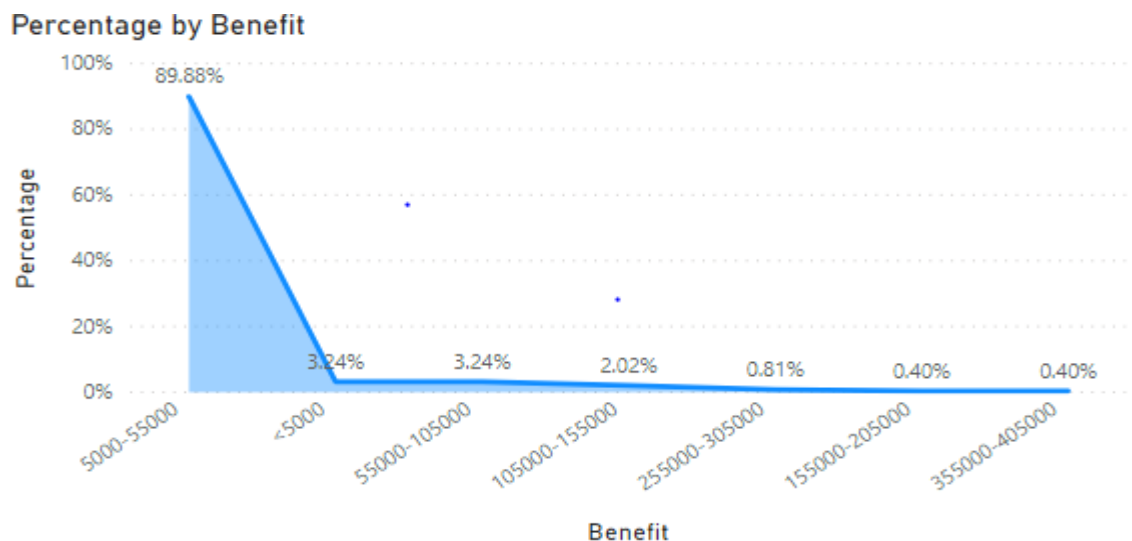


Figure 4: Pension Benefits in 2002

The obvious result here on the above diagram is that approximately 90% of pensioners received pension benefits between 5000-55000 Frw in 2002. According to MINECOFIN (2009),

The mean and the median of pension benefits are 21,440Frw and 9,850 Frw respectively. This means that on average retirees receives a low amount hence suffer from poverty however pension benefits are supposed to prevent retirees from poverty.

4.1.6 Distribution by Gender

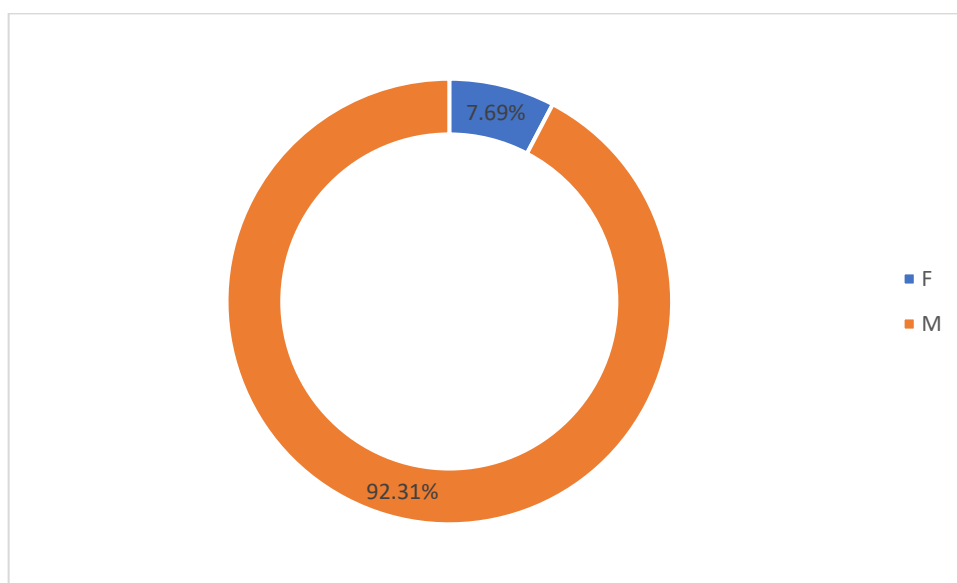


Figure 5: Distribution by Gender

In 2002, among 247 people who retired only 7.69%% were female while males were 92.31%. This shows that at that time and the previous years there were inequality of gender in labour market hence in retirement.

4.1.7 Replacement rate in 2002

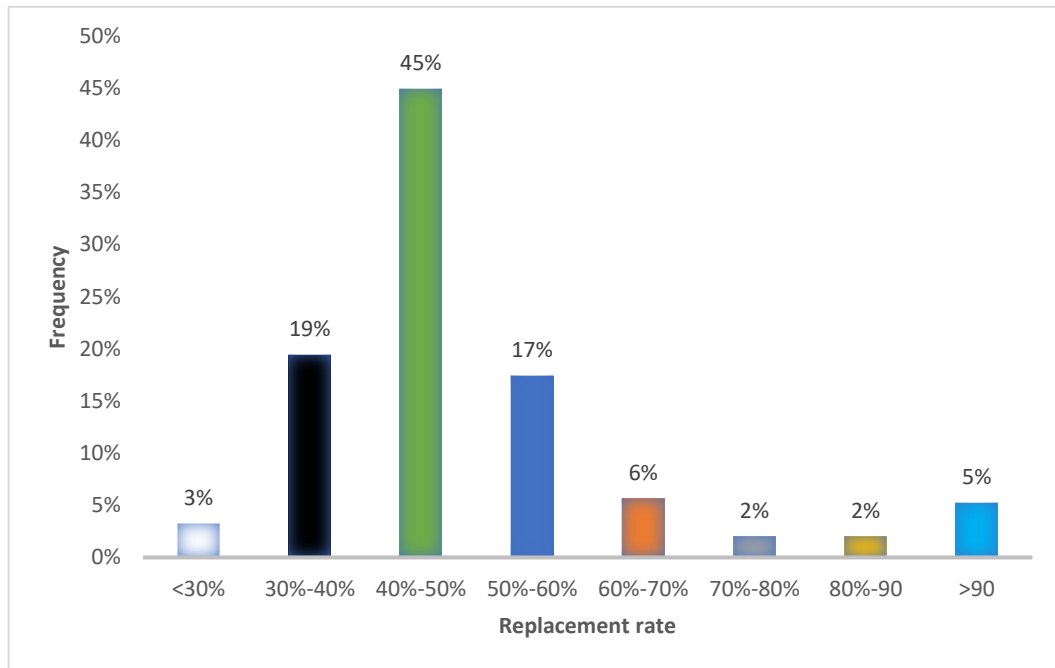


Figure 6: Replacement rate in 2002

In 2002, 77% of pensioners received the benefits which cover between above 40% of their previous income while 23% of them received benefits lower than 40%. This means that 77% of people who retired in 2002 received adequate pension (replacement greater or equal 40%) and only 23% received inadequate pension benefits,

It means that at the entry point in retirement the pensioners are secured, the problems come with the period as they stay in retirement for a long period and their benefits are not indexed. Here also we need to clarify that those people who received replacement rate greater than 100%, it is because the minimum benefit was 5200 Frw means those people should receive benefits lower than that due to their previous income and number of years in service. Though this finding shows that at the entry point, pensioners received adequate benefits as indicated by replacement rate, but it is not enough to consider replacement rate only as we realised that on the average retirees received lower benefits, this results from the fact that before retiring pensioners received low salaries.

4.2: Measures of Association

4.2.1 Pension benefits and Average salary

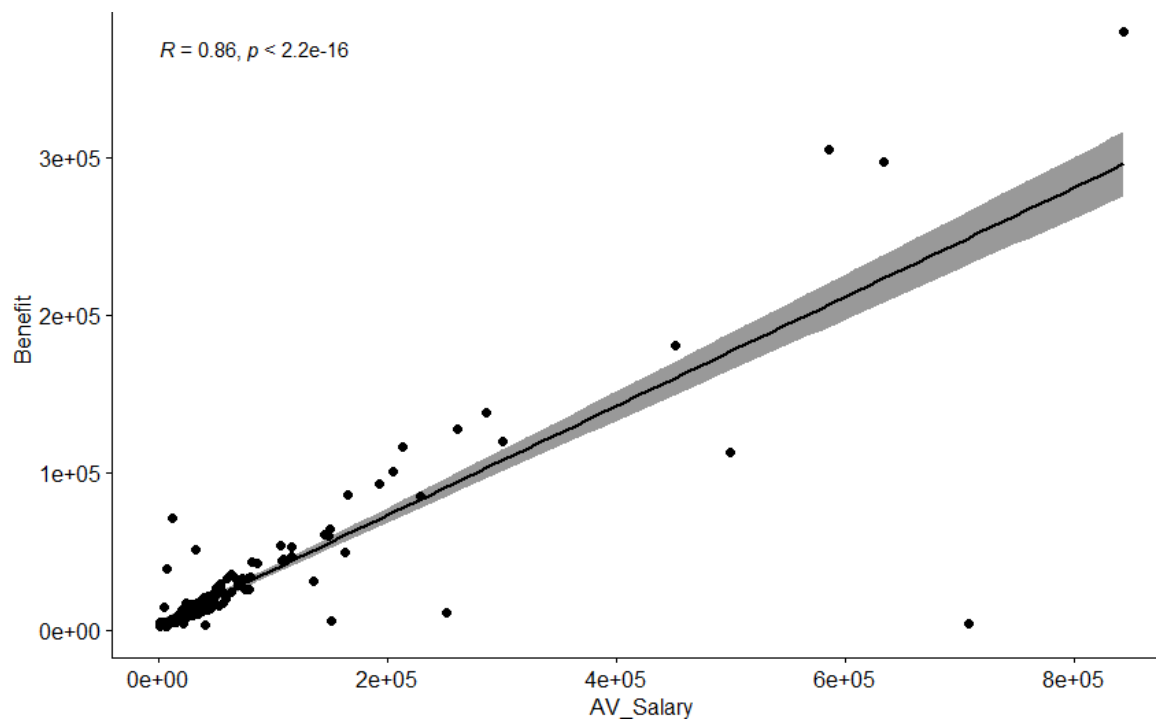


Figure 7: Pension Benefits and Average salary

There is a strong and important association between pension benefits and previous income. fig 8 shows that there is a positive correlation between retiree's pension and his/her income before retiring, therefore people must be aware that whatever they receive while contributing will determine how much they will gain in retirement because they are strongly related.

4.2.2 Age vs BENEFIT

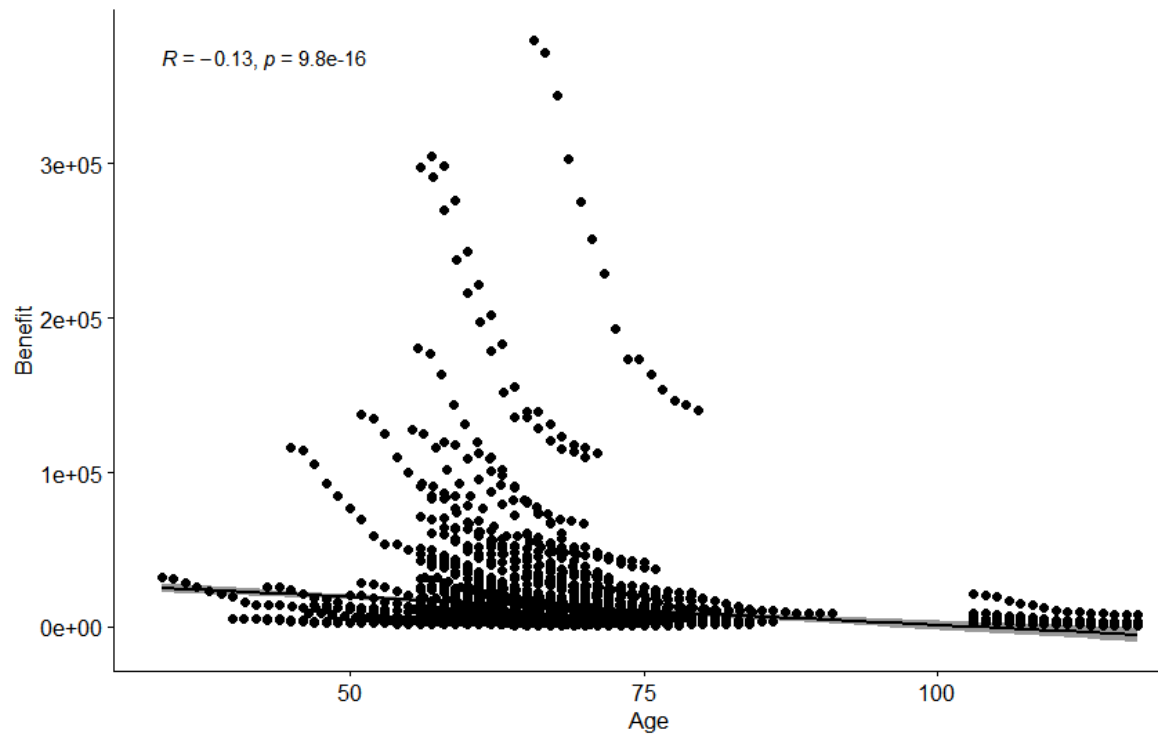


Figure 8: Age and Benefits

The above figure shows that the older people are at high risk of poverty as the value of their benefits get worsened progressively means as retirees become older as they become poorer. Therefore the period in retirement has to be taken into consideration to ensure that beneficiaries are protected from poverty due to the inflation as they get older.

4.3 Empirical findings and discussion

4.3.1 Comparison of replacement rates

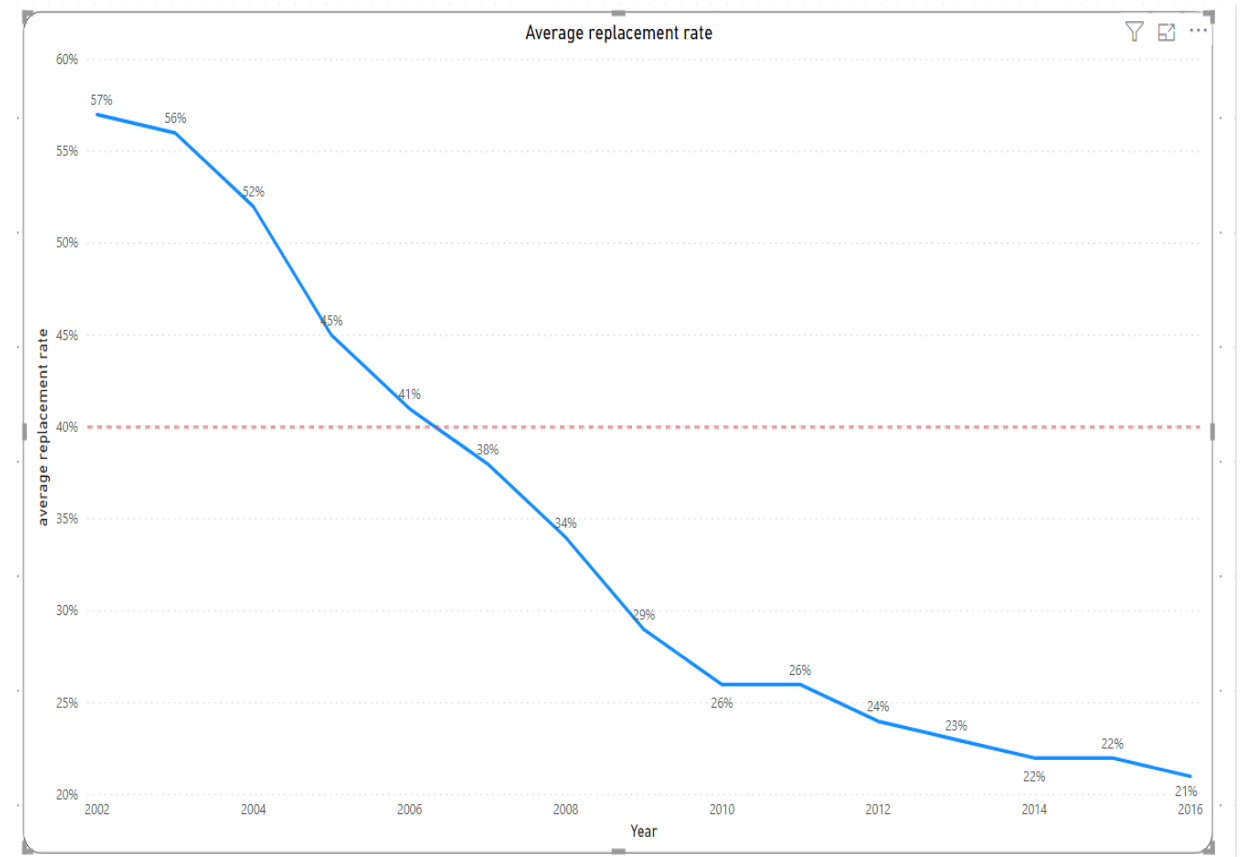


Figure 9: Average Replacement rate

The figure 9 shows the average replacement rate within 15 years from the year of entry in retirement. It indicates that average replacement rate in 2002 was 57% which is considered as very good as it is above 40% and 45% required by both world bank and ILO respectively. Replacement rates in 2003, 2004, 2005 and 2006, were 57%, 56%, 52%, 45% and 41% respectively. This means that till 2006 the Rwanda social security board were achieving the standard as required by World bank hence according to world bank standard people who retired in 2002, they received adequate pension benefits till 2006. However, from 2007 to 2016 retirees received benefits that are lower to the minimum standard of adequate pension benefits and this was being worse progressively. Furthermore, Paired t-test was employed to check the significance of difference between replacement rate of retirees in 2002 and the replacement rate after every five years.

Table 4: T-test for replacement rate after 5 years in retirement

Paired -t test					
Variables	Observation	t	Significance level	P - value	Mean (diff)
RR 2002	246	5.4987	5%	0.000	0.1885379
RR 2006	246				

The statistic (t) is 5.4987, and p-value (Sig. (2-tailed)) is 0.000. As p-value is < significance level we can conclude that there is enough evidence to reject null the null hypothesis (there is no difference in mean for replacement rate in 2002 and 2006) with 95% confidence.

Table 5: T test for replacement rate after 10 years in retirement

Paired -t test					
Variables	Observation	t	Significance level	P - value	Mean (diff)
RR 2002	246	5.4987	5%	0.000	0.3737397
RR 2011	246				

Similar to the paired t test for replacement rate of 2002 and 2006, the output shows that there is a significant difference between replacement rate of 2002 and replacement rate of 2011(after 10 years) and more to that the mean difference is increasing as it was 0.18 and now it 0.37.

Table 6: T test for replacement rate after 15 years in retirement

Paired -t test					
Variables	Observation	t	Significance level	P - value	Mean (diff)
RR 2002	246	5.4987	5%	0.000	0.4332796
RR 2016	246				

Finally, paired t test was employed to test how difference the replacement rate of retirees at the entry point and after fifteen years and the results show that there is a significant difference between replacement rate at the entry point in retirement and replacement rate after 15 years. Moreover, the paired t test shows that the mean difference is increasing as follow after five years the mean difference was 18%, after 10 years the mean difference was 37% and after 15 years the mean difference reached 43%. This means that the value of pension benefits worsens progressively therefore social security fund is recommended to index pensioners' benefits.

4.3.3 Effect of Inflation and Age on pension benefits

The fixed effect model is applied to measure the effect of inflation on pension benefits and how pension benefits correlate with age. Here below is the regression output in the table.

Table 7: Fixed Effect model result

Fixed effect Model				
Dependant Variable (DV)	Independent variable (IV)	coefficients	P – value per each IV	The overall P-value for the model
Pension Benefits				0.000
	Age	-1078.46	0.03427	
	Inflation	-9432.02	0.000	

The coefficient of inflation is -9432. As this coefficient is negative represents the decrease of value of pension benefits for every additional one-unit in inflation. It shows that if inflation increases by 1, the value of pension Benefits decreases by 9432 Frw. Similarly, the coefficient of Age is negative means that as a retiree get older as the value of its benefits decreases. the increase of one age causes the mean decrease of 1078frw of value of pension benefits.

As it was found by other researchers like Dorfman, Stewart and Whitehouse (2009), our results also indicate that inflation deteriorates pension benefits. Moreover, Consistent with what was found by Hohner in 2019, our results claimed that as retirees get older as they become poorer.

The regression output shows that there is sufficient indication to reject null hypothesis which states that there is no significant relationship between value of pension benefits and inflation means that inflation affects significantly the value pension benefits hence the study recommends to index pension benefits on inflation. The same applies to age, the output indicates that as a retiree get older as his/her value of benefits reduced hence social security fund has to index benefits to protects its beneficiaries from poverty.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter is divided into 3 sub-sections, subsection 1 summarizes the findings, subsection 2 presents the conclusions and subsection 3 provides recommendations.

5.1 Summary of findings

The main objective of this study was to assess the effect of inflation on adequacy of pension benefits in Rwanda, with the specific objectives of evaluating the adequacy of pension benefits at the entry point in retirement, comparing pension adequacy at the entry point in retirement and adequacy during any other retirement periods before indexation and examining the relationship between age and pension benefits

The results are summarized as follow:

The findings indicated that inflation reduces the value of pension benefits hence its adequacy. In addition to that it was found that the difference between replacement at the entry point and after every 5years is significant and the mean difference increases which means the value of benefits worsens progressively.

The results also highlight that income before retirement is an important and major factor that determines the income in retirement and pension benefits at the entry point in retirement respond to the international standard by World Bank and ILO, however benefits are insufficient as they are calculated based on low salaries.

Although the primary role of pension systems is to provide adequate income in old age, prevent poverty and ensure long lives among retirees, the study findings show that the poverty risk increases with age and this is confirmed by other researches namely (Hohnerlein, 2019).

5 2 Conclusion

This study aimed to assess the effect of inflation on pension benefits. In this study we analysed how the inflation affects pension benefits and how age correlates with pension benefits.

The study concludes that inflation depreciates the value of pension benefits hence it reduces its adequacy and exposes retirees to poverty.

At the entry point in retirement the study concludes that pensioners receive adequate benefits but this adequacy reduces with time due to lack of indexation consequently, more a retiree become older, more he/she is at higher risk of poverty compared to younger retirees. Moreover, the study infers that the key major determinant of pension benefits is the income before retirement.

5.3 RECOMMENDATIONS

➤ To Government of Rwanda

Grounded on the results of this study, the government is recommended to take into consideration the issue of inflation to ensure the protection against poverty, either by making indexation on inflation (price indexation) or shortening the period of ad hoc indexation to least five years as in five years the average replacement rate is in the range of minimum standard accepted by international standards as adequate pension benefits.

Moreover, the study recommends the employers to increase the salaries of their employees to guarantee sufficient income in retirement.

➤ To other researchers:

Researchers are recommended to perform further researches in the area of indexation and pension adequacy and ensure that their recommendations can be applied without threatening the pension scheme's sustainability.

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