UNIVERSITY OF NAIROBI

RETIREMENT INCOME ADEQUACY AND SUSTAINABILITY

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

DECLARATION

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

Betsy Chepkoskei Cheruiyot,

Signed: _____ Date: _____

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

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Signed: _____ Date: _____

ACKNOWLEDGEMENT

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

DEDICATION

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

ABSTRACT

The adequacy of pensions is measured by their ability to prevent poverty, the degree to which they replace income before retirement and how they compare to the average incomes of people below pensionable age. The at-risk-of-poverty or social exclusion measure is directly linked to the poverty reduction target of the Kenya Vision 2030 strategy.

This projects focus is on the adequacy of retirement benefits in light of both expected and unexpected expenses in retirement. The report begins with a conceptual discussion of benefit adequacy and the various ways it has been and can be measured. Adequacy measures examined include replacement ratios, projected expenditures, and minimum societal standards. Both income needs and lump sum equivalents are considered.

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LIST OF ABBREVIATIONS

AME - Average Monthly Earnings

AR - Adjusted Ratio

AVC - Additional Voluntary Contributions

CC - Current Consumption

CRR - Consumption Replacement Rate

DB - Defined Benefit

DC - Defined Contribution

EEPER - Employee Percentage

EPB - Expected Pension Benefit

ERPER - Employer Percentage

HRS - Health and Retirement Study

INF - Inflation Rate

KRA - Kenya Revenue Authority

MESP - Measurement of Economic and Social Performance

NBDS - New Beneficiary Data System

NSSF - National Social Security Fund

PB - Pension Benefit

PRS - Pre- Retirement Salary

PS - Personal Savings

RB - Retirement Benefits

RBA - Retirement benefits Authority

RCE - Retirement Consumption Expenditure

SCF - Survey of Consumer Finances

SSB - Social Security Benefit

TS - Total Savings

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The greatest challenge facing the soon-to-retire employees (i.e., in the age group 49–64) is whether their savings and/or resources (both private and public) will be sufficient to maintain a decent standard of living in retirement. Poverty threshold (standards of living) and replacement rates (pre retirement income) are the main determinants of how adequate the projected retirement income will be. A previous study found that among the households headed by a soon-to-retire employees or workers, the proportion expected to be unable to replace at least half their preretirement income rose from 1989 to 1998.

Key focus of this project will be on measuring retirement benefit adequacy in light of both expected and unexpected expenses in retirement. This project begins with a discussion of challenges in retirement relating to adequacy of benefits and the couple of ways it has and can be measured. A simulation model of the various savings for and expenditure in retirement will be developed, putting into consideration the standard of living as well as replacement rates, investment, inflation, life together with distributional assumptions for each random variable.

This model is slightly different from other stochastic models of the post-retirement period because it considers a wider variety of retirement-related risks and facilitates estimation of the impact of various combinations of factors and decisions on achieving desired retirement outcomes i.e. maintaining a standard of living, minimizing the risk of poverty etc.

1.1.1 Sustainability Challenge

Retirement income costs form a large part of public expenditure and are a major factor in the present and medium- to longer-term public sector budget position. Sustainability relates to the fiscal and financial balance between revenues and liabilities (and the ratio of workers/contributors to pensioners/beneficiaries) in pension schemes. Pension reforms are needed to correct the negative impact of population ageing on this balance. Thanks to reforms planned and/or already enacted (NSSF Act 2013) to improve the medium to long-term

sustainability of public and occupational retirement schemes, in terms expenditure which remains a concern in many cases

1.1.2 Employment Challenge

Late retirements and thus postponed pension purchase leads to longer years of service and hence a bigger bucket of savings which becomes the main route to simultaneous improvements in the sustainability and adequacy of pensions.

The raise of pensionable age and success of pension reforms link the benefit level to gains in life expectancy depending on their underpinning through workplace and labour market measures that enable and encourage both women and men to work longer. Incentive structures such as pensions and medical insurances can influence age management practices at work to some extent. Employment and industrial relation policies need to be put in place to tackle the employment challenge which requires determined efforts to promote longer working lives.

1.1.3 Adequacy Challenge

1.1.3.1 Poverty Protection

The at-risk-of-poverty rate and the share of people living in severe material deprivation are the two main indicators to assess the adequacy at the floor of pension systems, i.e. their ability to prevent or mitigate poverty.

1.1.3.2 Income Replacement

Currently, pensions allow retirees to enjoy living standards that are close to those of the rest of the population depending on their work life savings and for some their retirement incomes are generally higher than for other groups based on their own income transfers.

1.1.3.3 Future Adequacy

Scenarios for the future are modeled as changes in the gross and net theoretical replacement rates. While recent public pension reforms have tended to improve or maintain the poverty protection function, most of the reforms will result in lower replacement rates (pensions relative to previous earnings) in the future. Trends in the future pension adequacy can be assessed not

only with the help of theoretical replacement rates, which look at future income replacement for specific hypothetical individuals, but also with indicators derived from expenditure projections. As the concept of indicators, the coverage of pension schemes and their time horizons are different; results can differ substantially across indicators and are not directly comparable. Still, a combination of the three indicators allow for a broader assessment of the expected evolution of old-age incomes in the future.

The expected reduction in replacement rates is, however, based on the assumption that the retirement age will remain unchanged. Working to a higher age may help maintain or even increase the future level of replacement rates.

1.2 Statement of the Problem

Retirees' greatest challenge is the ability to at least maintain their standards of living by being able to replace their incomes in retirement to sustain their retirement needs and eliminate poverty. This being the case there is need to investigate the measures of retirement income adequacy in terms of its equivalence to pre-retirement's standard of living based on replacement rates relationship between post and pre-retirement income and sustainability to cover all forecasted future living expenses and minimum needs as defined by poverty or other threshold.

1.3 Objectives of the Study

1.3.1 General Objective

To measure retirement income adequacy and sustainability in light of retirement expenditure; expected and unexpected.

1.3.2 Specific Objectives

i. To determine replacement ratios based on preretirement income

ii. To investigate the minimum needs measures in retirement

iii. To determine the target of work life savings (accumulation of Lumpsum)

1.4 Value of the Study

This study will be of benefit to the following groups:

1.4.1 Employer;

Sponsors are interested in understanding the measures that help them compare the benefits produced by their policies for employees with their peers' different demographic characteristics. They may want to know if their employees with certain levels of participation in their retirement benefit plans would be able to afford retirement; and encourage them to save more maybe through additional voluntary contributions (AVC) to ensure they meet their retirement goals.

1.4.2 Policymakers;

These include industry players such as the Retirement benefits Authority (RBA) and the Kenya Revenue Authority (KRA). They are concerned with regulations and tax policies and want to be sure that the limits for tax-preferred employee benefits are appropriate. The RBA is also concerned with the design and affordability of social benefits and the distribution of taxes for social benefits.

The Trustees are charged with the responsibility of day to day running of the scheme. Their decisions and policies may be affected positively or negatively by decision of the Investment managers.

1.4.3 Financial Services Industry;

The industry players support the employers, plan sponsors, individuals, and financial advisors by developing products, services and software that meet the needs of each group. The industry is particularly interested in understanding needs and purchase behavior with regard to annuities and medical insurance for older persons.

1.4.4 Individuals;

An income needs forecast and a draw down plan adjusted with changing circumstances will be of great help to individuals. Planners also need to be able to explain the plan in order to justify monthly savings goals and lump sum targets for younger clients.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses literature reviewed on post retirement financial status. As well, empirical studies and general literature relating adequacy of retirement income are discussed. Post retirement financial status has been discussed in several studies that have focused on the importance of preparation and satisfaction in retirement. While some studies measured the financial status of the elderly, financial planning for retirement requires evaluating the positions of pre retirees relative to retirement needs. Many methods can be used and one of them is the life cycle hypothesis.

2.1.1 Life Cycle Hypothesis

The life-cycle economic approach implies that people try to vigorously save before retirement because they think they will not be saving much after retirement. However, economists have shown that retired persons are less likely to dissave than was originally posited (Ando & Modigliani, 1963; Kotlikoff, Spivak & Summers, 1982; Hogarth, 1991). Mirer (1979) implied that the life cycle theory of saving, in which wealth is accumulated during working years in order to finance consumption during retirement, is a simplistic form and suggested that precautionary, bequest, and other motives must be taken into consideration.

Retirees have diverse differences in terms of logistics involved in economic planning. It has also been assumed that the public and private retirement benefits plans are distributed more equally than the private earnings, and hence that economic inequality declines during the retirement years as the elderly tend to depend on public and private benefits (Hurd & Shoven, 1985).

2.1.2 Cumulative advantage/disadvantage model

The model is an alternative interpretation of the inequalities of income distribution among the elderly or retired. Those who are advantaged during their work life are more likely to receive a good education, leading to good jobs, leading to better health and better pension coverage, leading to higher savings and better postretirement benefit income (pensions). The cumulative

advantage/disadvantage perspective focuses attention on the much skewed postretirement distribution of such resources as private pensions and savings (Shea & Crystal, 1990).

Leon (1985) identified a recursive model of economic status in retirement that pointed to a sequence of factors where previous conditions influenced later ones. He found that the family's socioeconomic and demographic characteristics determine to a large extent the educational attainment, which then influences occupational achievement. At the same time family background and demographic characteristics influence the possession and level of personal economic and business assets.

Several studies suggest that retirement preparation typically increases with age and financial preparation for retirement is greater among older age groups (Evans, Ekerdt & Bosse, 1985; Kilty & Behling, 1986). In anticipation of retirement, planning may be initiated as early as fifteen years prior to retirement but actual retirement preparation is which was not very common is getting popularity even among professionals (Kilty & Behling, 1986; Block, 1984). Furthermore, job mobility, occupational employments characterized by low rates of pension coverage, and/or low wages can all undermine the retirement-income prospects of even those workers who spend most of their adult lives in the labor force (Rix, 1993).

Richardson and Kilty (1989) found that income was one of the important predictors of financial planning as well as age. The closer people were to retirement, the more likely they were to invest or save. The family life cycle also affects the ability to plan and invest. After children are raised and home mortgages are paid, resources are finally freed up for retirement saving. Attitudes towards retirement may be less important for pre-retirement planning than socioeconomic indices.

Beck's (1984) findings of retirement preparation programs revealed that it was the socially and economically advantaged worker who was most likely to have an opportunity to participate in these programs. Older workers who would benefit most from retirement preparation programs are those with less education, lower occupational status, no pension coverage, and consequently lower retirement income are the least likely to have access to such programs and services. Retirement preparation consists of activity that some suggest is least pursued by those who need it the most, namely women, single head of households, and the economically disadvantaged

(Hayes & Parker, 1993). Fillenbaum, George, and Palmore (1985) reported that the perceived adequacy of their incomes motivate those of upper economic levels to take action to preserve their current standard of living as much as possible during retirement. The less fortunate, on the other hand, may foresee little change in their living standards and those in the middle often feel strapped to do significant financial planning.

This study was limited by data for comparisons between years or longitudinal data which could provide a more thorough understanding of preretirees' awareness of the problem and if this awareness had resulted in actually saving for retirement also pre retirees perceptions were examined for this analysis, instead on focusing on actual saving behavior.

A number of other previous papers have presented estimates of Social Security and/or pension wealth. Martin Feldstein (1974), introduced the concept of Social Security wealth and developed its methodology. His main interest was the social security wealth aggregate level together with its effect on aggregate savings and retirement patterns. In a follow-up paper, Feldstein (1976), using the Federal Reserve Board's 1962 Survey of Financial Characteristics of Consumers (SFCC), considered the effects of Social Security wealth on the overall distribution of wealth. He found that the inclusion of Social Security wealth had a major effect on lowering the overall inequality of (total) household wealth.

Edward Wolff followed up Feldstein (1976) by examining the distributional implications of both Social Security and private pension wealth. These studies include Wolff (1987), which used the 1969 Measurement of Economic and Social Performance (MESP) database and was the first paper to add estimates of private pension wealth and examine their effects on the overall distribution of wealth. The paper showed that, while Social Security wealth had a pronounced equalizing effect on the distribution of "augmented wealth" (defined as the sum of marketable wealth and retirement wealth), pension wealth had a disequalizing effect. The sum of Social Security and pension wealth has, on net, an equalizing effect on the distribution of augmented wealth. Wolff (1988) examined the implications of including both Social Security and pension wealth for estimating the life-cycle model of savings; Wolff (1992) addressed the methodological issues in estimating both Social Security and pension wealth. Wolff (1993a, 1993b) extended the estimates of Social Security and pension wealth to the 1962 SFCC and the

1983 SCF; and Chernick and Wolff (1996) examined the levels of Social Security benefits and Social Security wealth on the basis of the 1989 SCF by age group, lifetime earnings quintile, and family structure. Wolff (2002a) re-examined the distributional effects of retirement wealth based on the SCF from 1983 to 1998 and found that Social Security continued to have a mitigating distributional effect. With respect to defined contribution wealth, though, Wolff (2003) found that the rise in defined contribution wealth has led to greater wealth inequality.

Work on the effects of Social Security and pension wealth on the overall distribution of wealth was also conducted by Arthur Kennickell and Annika Sunden (1999), who based their study on the 1989 and 1992 SCF. They found a net equalizing effect from the inclusion of these two forms of retirement wealth in calculating total household wealth. Interestingly, they found that there is a negative effect of both defined benefit plan coverage and Social Security wealth on non-pension net worth, but that the effects of defined contribution plans, such as 401(k) plans, are insignificant.

Several papers have used the Health and Retirement Survey (HRS). Alan Gustman, Olivia Mitchell, Andrew Samwick, and Thomas Steinmeier (1997) found that, in 1992 among households in the HRS, pensions, Social Security, and health insurance accounted for half of the wealth for those age 51-61; for 60 percent of total wealth for those in wealth percentiles 45- 55; and for 48 percent of wealth for those in wealth percentiles 90-95. In a follow-up study focusing on the role of pensions in forming retirement wealth, Gustman and Steinmeier (1998) used data from the HRS to examine the composition and distribution of total wealth for a group of 51- to 61-year-olds. They found that pension coverage was widespread, covering two-thirds of households and accounting for one-quarter of accumulated wealth on average. Social Security benefits accounted for another quarter of total wealth. They also found that the ratio of wealth (excluding pensions) to lifetime earnings was the same for those individuals with pensions and for those without, which they interpreted as evidence that pensions cause very limited displacement of other forms of wealth.

2.1.3 Retirement Income Adequacy

Calculations of retirement income adequacy typically relate retirement consumption to preretirement consumption in three possible ways;

First, a household may be considered adequately prepared for retirement if it can maintain a similar real level of consumption as during its working years. Usually, 80 percent of preretirement income is thus considered adequate since the income needs of retirees are likely to be lower than those of workers (Aon 2001). Households no longer need to save for retirement, taxes are lower, work related expenses disappear, the family size of retirees is smaller than that of workers, and households eventually pay off their debt (McGill et al. 1996).

Second, retirement income adequacy may be defined as a constant nominal level of consumption during retirement as during working years. This means that consumption needs are expected to decline during retirement over time, but in a somewhat arbitrary fashion.

Third, real consumption may decline if the marginal utility of consumption is held constant and uncertainty about income and life expectancy are introduced (Engen, Gale, and Uccello 1999). As households must consider an uncertain future, their marginal utility of certain consumption today is higher than the marginal utility of uncertain consumption in the future.

A number of studies have analyzed retirement savings adequacy with differing results. For instance, Gustman and Steinmeier (1998) found, using the HRS, that the average household could replace 60 percent of preretirement income in real terms and 86 percent of preretirement income in nominal terms. The finding for the nominal replacement ratio led the authors to conclude that households, on average, were adequately prepared for retirement.

Engen, Gale, and Uccello (1999), using the Survey of Income and Program Participation (SIPP) and the SCF, estimated that 40–50 percent of households fell short of what they needed for adequate retirement income. But as their calculations are based on a stochastic model, only 50 percent of households should be expected to meet the target retirement savings. The average replacement ratio for the median income quintile household, calculated by Engen, Gale, and Uccello (1999), is still 72 percent, leading the authors to conclude that households are close to being adequately prepared for retirement.

In an updated study, Engen, Gale, and Uccello (2002) found that the upswing in stock prices from 1995 to 1998 did not substantially alter their earlier findings on retirement income. This suggests that much of the increase in retirement wealth was concentrated among households who were already adequately prepared for retirement. Further, Haveman et al. (2003), using Social Security's New Beneficiary Data System (NBDS), found that retired beneficiaries had a median replacement ratio of about 80 percent, and that only 30 percent of households had a replacement ratio of less than 70 percent in 1982.

By contrast, several studies concluded that households were inadequately prepared for retirement. For instance, Moore and Mitchell (2000) found, using the 1992 HRS, that the median wealth household would have to save an additional 16 percent of earnings annually if it were to retire at age 62 and an additional 7 percent annually for retirement at age 65 to finance an adequate real replacement ratio. Their estimate of a savings rate of 7.3 percent for households wishing to retire at age 65 was three times as much as what households actually saved (Mitchell and Moore 1998). This meant that households had, on average, between 75 percent and 88 percent depending on marital status of what they needed when retiring at 65 in 1992 (Mitchell and Moore 1998). Also, Gustman and Steinmeier's (1999) show that, based on real replacement ratios, the average household had 28 percent less than adequate retirement savings. Lastly, Wolff (2002b) concluded that 61 percent of households could not replace 75 percent of their preretirement income in retirement based on data from 1998, up from 56 percent of households in 1989.

One issue to consider, though, is what a shortfall relative to adequate savings means. In some cases, a shortfall will still allow households to finance most of their expected consumption. Engen, Gale, and Uccello (1999) point out that the households used in Mitchell and Moore (1998) could still finance more than 90 percent of the consumption prescribed by their model with no additional savings.

Similarly, Haveman et al.'s (2003) study shows that about 20 percent of households have a replacement ratio between 70 percent and 80 percent. That is, one fifth of households have more than 90 percent, but less than 100 percent, of what is generally assumed for retirement income adequacy; 80 percent of preretirement earnings.

As wealth is unequally distributed, there may be a large share of households for which the shortfalls are larger. Engen, Gale, and Uccello (1999) calculated that households in the 75th percentile the closest income percentile for average (not median) income had 121 percent to 172 percent of what they needed for retirement. For the median household, the same ratios ranged from 47 percent to 124 percent. Thus, the median household reached only 62 percent of the preparedness of the average household in 1992. Moreover, Wolff (2002a) documented that the gap between average wealth and median wealth to income ratios increased further by 1998.

Following the unequal distribution of wealth, large shares of households are likely to experience retirement consumption shortfalls. Gustman and Steinmeier (1999) found that households in the bottom quartile had nominal replacement ratios of 50 percent and real replacement rates of 33 percent, compared to nominal replacements of 121 percent and real replacement rates of 81 percent for the top quartile. Also, Wolff (2002b) found that 16 percent of households could replace less than 25 percent of their preretirement income and that 43 percent of households could replace less than half of their preretirement income during retirement in 1998.

Lastly, Haveman et al. (2003) found Shortfalls in retirement savings vary with household demographics. Mitchell et al. (2000) and Engen, Gale, and Uccello (1999) found that black and Hispanic married households experienced a larger shortfall in retirement income adequacy than whites, and that less education resulted in a worsening of retirement income adequacy. Mitchell and Moore (1998) also found that single households were less adequately prepared than married ones.

In comparing these figures with findings of other studies, e.g., Haveman et al. (2003) only considered Social Security earnings for their replacement ratio calculations, thus understating the level of household income. Also, Wolff (2002b) considered the wealth of households nearing single men were more likely be inadequately prepared than single women, who were in turn less likely than married couples to be adequately prepared for retirement.

To make ends meet in retirement, when facing an income shortfall, households will have to curtail their retirement consumption. In fact, one of the distinguishing features between studies that conclude that households are adequately prepared for retirement and those that do not is the consumption pattern in retirement. For instance, Engen, Gale, and Uccello (1999) and Gustman

and Steinmeier (1999) conclude that households are adequately prepared for retirement based on the fact that real retirement consumption declines with age in their models. Similarly, Haveman et al. (2003) base their conclusions on the assumption of declining consumption in retirement, albeit at a slower pace than Gustman and Steinmeier (1999).

In the past few years, a number of studies have looked at the changes of retirement income adequacy over time. Wolff (2002b) found that the share of households between the ages of 47 and 64 that could replace less than 75 percent of their current income in retirement rose from 56.1 percent in 1989 to 61.2 percent in 1998. In comparison, Engen, Gale, and Uccello (2002) found that retirement income adequacy, by their stochastic definition, had changed little from 1995 to 1998. Lastly, Smith (2003) found, using data from the Panel Study of Income Dynamics (PSID) and the CPS, that median after-tax income replacement ratios in retirement showed an increasing trend, particularly since the early 1990s.

The studies most closely related to the current work are those that examine the replacement rates of current and/or future retirees and those that explore factors that impact retirement adequacy. Studies examining the issue of retirement adequacy generally focus on one of two measures: the income replacement rate or the consumption replacement rate. The income replacement rate measures retirement adequacy as the ratio of post-retirement income to pre-retirement income. Studies that utilize the consumption replacement rate consider the ratio of retirement wealth to estimated consumption needs during retirement.

One study that utilizes income replacement rates in measuring retirement adequacy is that of Gustman and Steinmeier (1998). This study considers the annuitized value of all available wealth relative to pre-retirement income using HRS data and finds a replacement rate of 60 percent. Munnell and Soto (2005) also calculate income replacement rates using HRS data. This study finds a replacement rate of 73.8 percent for couples and 86.3 percent for single individuals if lifetime earnings are used and replacement rates of 60.1 percent for couples and 66.9 percent for single individuals if the top five earnings years are used.

These studies involve the estimation of the various sources of retirement income to generate the income replacement rate. A recent study by Smith (2003) uses data from the Current Population Surveys and the Panel Study of Income Dynamics to calculate income replacement rates for

actual retirees between the ages of 68 and 72. The author using actual retirement income and projected earnings before retirement and finds that income replacement rates increased during the 1980s and 1990s, reaching a high of 74 percent in 1999. The results of projected income replacement rates by Munnell and Soto.Replacement rates are calculated as wealth accumulated by the date in which the study was conducted, not projected wealth at retirement age. In addition, pre-retirement income is based on the most recent earnings, not lifetime earnings.

While this study also considers the annuitized value of all available wealth relative to pre-retirement income, unlike Gustman and Steinmeier (1998), replacement rates are calculated based on projected values for the first year in which both spouses are retired. However, those of Gustman and Steinmeier (1998) are much lower.

Two studies that utilize consumption in generating a measure of retirement adequacy are Montalto (2001) and Butrica, Goldwyn, and Johnson (2005). Montalto (2001) uses SCF data and measures retirement adequacy as the ratio of retirement wealth relative to consumption needs. She finds consumption replacement rates ranging from 110 percent to 315 percent, depending on the planned retirement age. Butrica et al. (2005) utilize the HRS dataset and examine the expenditure-to-income ratio (the inverse of the consumption replacement ratio utilized in the current study) for respondents and find median ratios of 81 percent for married couples and 90 percent for single individuals. Considering the inverse of these ratios (a measure similar to the consumption replacement rate), the results are comparable to those of Montalto (2001). The expenditure-to-income ratios estimated by Butrica et al. (2005) are lower (or the consumption replacement rates are higher) when the annuitized value of financial assets is included: 59 percent and 68 percent respectively.

The use of the consumption replacement rate to measure retirement adequacy is rooted in the life cycle literature. Here, researchers have found that consumption changes over a person's lifetime. The changes in consumption during retirement are hypothesized to primarily result from a drop in expenses resulting from a variety of factors including the elimination of work-related, dependent-related, and/or household expenses; the elimination of retirement savings expenses; and the possible reduction in taxes paid (e.g. Munnell and Soto, 2005; Hurd and Rohwedder, 2006). This is substantiated by several life cycle studies (e.g. Bernheim, Skinner, and Weinberg,

2001; Gourinchas and Parker, 2002). For example, using data from the Consumption Expenditure Survey and controlling for family size and cohorts, Gourinchas and Parker (2002) find that consumption rises with age, until around 45 when it begins to drop. In addition, empirical studies in the area find that consumption falls between 14 to 16 percent during retirement. These findings have important implications for the current article because they provide some support for the use of the consumption replacement rate approach as a viable method for determining whether a household is adequately prepared for retirement.

More specifically, when considering the consumption replacement rate (rather than the income replacement rate) as a measure of retirement adequacy, research suggests that since consumption falls during retirement, a consumption replacement rate of greater than 85 to 90 percent would likely be sufficient for the household to maintain a comparable standard of living during retirement.

In examining just a few of the studies in this area, it is evident that significant variation exists in the results. This variation is likely due to several differences in the way in which the studies have approached measuring retirement adequacy which include; differences in the sources of income and/or investments that are used in the calculation of retirement wealth, whether retirement adequacy is measured by examining retirement wealth relative to consumption needs or pre-retirement income, the choice of the retirement age and the data source used.

It is noted that the measure of consumption has varied in empirical research .Some focus only on food expenditures while others include broader measures such as the studies discussed. By considering a number of factors that could lead to differences in the retirement wealth measures, a more complete picture of retirement adequacy is created while providing some insight into the possible sources of variation in the results obtained from prior studies.

Finally, while some studies have considered the effect of individual characteristics on components of retirement income (e.g. Moore and Mitchell, 1997; Even and Macpherson, 2006), few studies have actually discussed or considered the effect of individual characteristics on total retirement adequacy (e.g. Gustman and Steinmeier, 1998; Engen, Gale, and Uccello, 1999; Yuh, Montalto, and Hanna, 1998a; Yao, Hanna, and Montalto, 2003; Engen, Gale, and Uccello, 2004).

Two studies, Yuh et al. (1998a) and Yao et al. (2003), model the likelihood that a household is adequately prepared for retirement and find that financial variables are the driving forces, not the demographic variables. Alternatively, Engen et al. (2004) consider the effects of a variety of earnings and household demographic factors on whether a household is a high saver. The results showed that a variety of these factors, including age, household income, the presence of pension coverage, and retirement age, influence whether the household is considered a high saver.

Note that while the 1998 Gustman and Steinmeier study does examine the effect of various individual characteristics on retirement wealth, including lifetime earnings, age, and some employment-related variables, only the results for the variable of interest, the presence of pension coverage, were reported.

Yuh et al. (1998a) considers a household to be adequately prepared for retirement if the "household could retire at the planned retirement age and maintain the level of preretirement consumption from the accumulated retirement resources, including accumulated assets and pension income." Yao et al. (2003) define adequately prepared as meeting the guideline of a capital accumulation ratio of at least 25 percent. The capital accumulation ratio is a measure of investment assets relative to net worth. The paper defines a high saver as a household in which the actual wealth-lifetime earnings ratio exceeds the simulated wealth-earnings ratio adequacy.

As such, we then model various income and consumption replacement rates as functions of common set of adequacy factors; pooling retirement wealth from all saving towards retirement, calculating both income and consumption replacement rates, retirement age rates and using the data availed.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction:

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

3.2 Population

The population of this study consisted soon-to-retire employees and pensioners. They were obtained from a Retirement Industry service provider within the Kenyan Retirement Industry.

3.3 Data Collection

For the purpose of this study, Raw data was used. The data was obtained from the several retirement benefits scheme service providers; the data being from a Retirement Scheme Administrator.

3.4 Data Analysis

3.4.1 Social Security Benefits

All participants are assumed to be eligible for Social Security retirement benefits. Social Security retirement benefits used in this project are the rates calculated by the Social Security Administration and reported in the Board of Trustees' annual report. The rates represent estimates of average benefits amounts to be received by workers as a cumulative of total benefits saved during work life.

For current Social Security retirees (r) , their gross Social Security Benefit (SSB_r) is given by:

$$SSB_r = \int_0 SSB\left(1-m_t\right)e^{-\delta t}dt \tag{3.1}$$

Where; m_t is the mortality rate

t is time conditional on age and gender,

δ , discount rate

and the integration runs from the person's current age to age 100

where it is assumed that the current Social Security rules remain in effect indefinitely.

Social Security benefit among current workers (w) is based on the worker's projected earnings history estimated by regression equation. The coverage is assigned based on whether the individual expects to receive Social Security benefits and on whether the individual was salaried or self-employed and on the basis of the person's earnings history, the person's Average Monthly Earnings (AME) is computed. Then,

$$SSB_w = \int_{LR} AME\left(1 - m_t\right)e^{-\delta t}dt \tag{3.2}$$

Where; m_t is the mortality rate

t is time conditional on age and gender,

∂ , discount rate

$LR = A - RA$ is the number of years to retirement, the integration runs from the expected age of retirement to age 100.

3.4.2 Employer Sponsored Retirement Income

Employer-sponsored pension income is calculated using member balances pension information from the plan Administrator. This includes information on the balances and yearly contributions for DC plans as well as estimated retirement benefits for DB pension plans.

3.4.2.1 Defined Benefits Plans and Benefits

For retirees (r) their pension benefits remain fixed in nominal terms over time for a particular beneficiary or is indexed for inflation. In this case the gross Defined Benefit pension wealth is given by:

$$DB_r = \int_0 PB(1-m_t)e^{-\delta t}dt \tag{3.3}$$

Where; m_t is the mortality rate

t is time conditional on age and gender,

δ , discount rate

and the integration runs from the person's current age to age 100

For soon-to-retire workers (w) the computation is slightly different. The considered information is on coverage among current workers, including the type of plan, the expected benefit at retirement or the formula used to determine the benefit amount (for example, a fixed percentage of the average of the last five year's earnings), the expected retirement age when the benefits are effective, the likely retirement age of the worker, and vesting requirements. The information covers current and past employments depending on the plans the employers had in place. On the basis of the information provided and on projected future earnings, future expected pension benefits (EPB_w) are then projected to the year of retirement or the first year of eligibility for the pension. Then the present value of pension wealth for current workers (w) is given by:

$$DB_w = \int_{LR} EPB(1-m_t)e^{-\delta t}dt \tag{3.4}$$

Where; m_t is the mortality rate

t is time conditional on age and gender,

δ , discount rate

RA is the expected age of retirement and $LR = A - RA$ is the number of years to retirement, the integration runs from the expected age of retirement to age 100.

3.4.2.2 Defined Contribution Plans and Benefits

Assumption: that workers remain at their company until retirement and that the terms of their DC contract with their employer stays the same.

In most cases, the employer contribution is a fixed percentage of the employee's salary. On the basis of the estimated human capital earnings functions for each worker, it is possible to calculate the annual stream of future employer contributions to the DC plan until retirement.

Information on the contribution to DC pensions plans is recorded in two ways. First, the employees contribution given as a percent of earnings.

Let EEPER be the amount contributed by the employee to the DC plan. Then, the present value of the stream of future employee contributions, DCee, is given by:

$$DC_{ee} = \int_{0}^{LR} EEPER * E_t^* \left(1 - m_t\right) e^{-\delta t} dt \tag{3.5}$$

Where: m_t is the mortality rate

t is time conditional on age, gender

∂ is the discount rate

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

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

Secondly, the employer contribution is also given as a percent of earnings. If we assume that the employers proportion, $ERPER$, is fixed over time, then DC_{er}, is given by:

$$DC_{er} = \int_0^{LR} ERPER * E_t^* \left(1 - m_t\right) e^{-\delta t} dt \tag{3.6}$$

Estimates are provided for the following components of wealth:

$$DC = DC_{ee} + DC_{er} \tag{3.7}$$

where DC is the current market value in Defined Contribution accounts.

$$PB = DB + DC \tag{3.8}$$

Retirement benefits RB are then given as the sum of pension benefits and Social Security benefits.

$$RB = PB + SSB \tag{3.9}$$

3.4.3 Probit model of Retirement Income Adequacy

We now examine the characteristics of those who save by estimating a multivariate probit model. The model is estimated separately using the various modes of saving, with the dependent variable taking on the value of 1 if the worker saves, and 0 otherwise. We model the adequacy issue as;

$$TS_i = B_{0i} + B_{?i} X + \varepsilon_i \tag{3.10}$$

Where TS_i is the Total savings for the household depending on whether or not the household saves or had savings B0j is a constant, and ε_i is an error term. X is a vector of demographic and

financial variables thought to affect the adequacy of retirement income and includes age, gender, savings amount from DB, DC and SSB together with personal savings if available.

If TS >0, the individual had savings; hence TS =1 for those observed, 0 otherwise. The sub-script i represent each household represented in the data. Thus, the probability that a worker was saving for their retirement can be written as;

$$p\left(TS_{i=1} / X\right) = \Phi\left(B_{0i} + B_{?i}X\right) \tag{3.11}$$

where $\Phi(.)$ denotes the cumulative normal distribution. We estimate equation (3.11) for both each household. Because macroeconomic conditions and tax laws have varied over the years, we also include dummy variables.

3.4.4 Replacement Rates Estimation.

This section of methodology calculates various measures of retirement adequacy using the two approaches;

i. the income replacement approach and

ii. the consumption replacement approach

In order to obtain future household income, defined contribution plan balances, asset values, and consumption, several assumptions are made regarding the accumulation period (number of years to retirement), the retirement period, and growth rates. The accumulation period is determined by considering the current ages of the household members and their retirement ages.

The reported real wage growth and interest rates used are those reported by the Administration Trustees. With both the consumption replacement rate and the income replacement rate, the numerator is the annuitized projected retirement benefit (RB) for or:

$$RB_i = SSB_i + PB_i + PS_i \tag{3.12}$$

Where: RB_i is Retirement Benefit

SSB_i is Social Security retirement benefits

PB_i is projected value of employer-sponsored retirement income $(DB + DC)$

PS_i is the projected value of personal savings at retirement.

i is the household

3.4.4.1 Income Replacement Rate

In the calculation of the income replacement rates, the denominator represents pre-retirement income. Specifically, the income replacement rate (RR) is;

$$IRR_i = \frac{RB_i}{PRS_i} \tag{3.13}$$

Where: IRR_i is the income replacement rate

RB_i is Retirement Benefit

PRS_i is the pre-retirement salary

i is the household

RR represents the percentage of the pre-retirement income the household will be able to replace during retirement and pre retirement salary (PRS) is the annual salary the year prior to retirement. Income replacement rates are computed for the various households at the early retirement age, normal retirement age, late retirement age, and for workers near retirement.

3.4.4.2 Consumption Replacement Rate

Consumption as used throughout refers to household consumption less expenditure on pensions, Social Security, savings, and insurance (life). As has been noted in other studies, these expenditures are significant during the accumulation period but not during the retirement period.

Consumption expenditure models estimation would produce prediction equations for the years under survey. These prediction equations would apply to the corresponding survey years to obtain predicted values of current (latest) survey year consumption (CC_i) . Predicted current/latest consumption is then projected to the year immediately preceding retirement using the number of years to retirement age (YRS_i) and the assumed inflation rate (INF) . In order to incorporate the change in spending that occurs during retirement, as discussed in the life cycle literature, projected consumption is adjusted by the ratio (AR_x) of median consumption expenditure for retirees to that of similar near-retirees. Therefore, projected annual retirement consumption expenditure (RCE_i) may be expressed as:

$$RCE_i = (CC_i)\left[(1+INF)^{YRS_i}\right](AR_x) \tag{3.14}$$

Where; RCE_i is the projected annual retirement consumption expenditure

CC_i is the current consumption

INF is the Assumed inflation rate

YRS_i is the remaining years to retirement

AR_x is the adjustment ratio of median consumption expenditure for retirees to that of similar near-retirees.

The consumption replacement rate (CRR_i) is defined as the ratio of annuitized projected retirement benefit (RB_i) to projected retirement consumption expenditure (RCE_i) .

$$CRR_i = \frac{RB_i}{RCE_i} \tag{3.15}$$

Where; CRR_i is the consumption replacement rate

RB_i is the projected retirement benefit

RCE_i is the projected retirement consumption expenditure

As with the income replacement rates, consumption replacement rates are calculated using all measures of retirement wealth for retirement ages.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter shows findings of the study and discusses them in length. The study targeted measure of Retirement Income Adequacy using the Probit model, Income and Consumption Replacement Rates. Section 4.2 gives the descriptive analysis, Section 4.3 provides the regression analysis, Section 4.4 covers replacement rate estimation and Section 4.5 is the interpretation of the findings.

4.2 Descriptive Analysis

Table 4.1 gives a summary of all the demographic and financial variables under study;

Table 4.1 Summary of Independent Variables

	Total Savings	Sex	Age	Employment Status	DB Balance	DC Balance	SSB Balance	Personal Savings
Min	21,335.00	1	22	1	-	-	3,600.00	-
1st Qu	143,653.00	1	30	3	-	13,753.00	19,200.00	-
Median	243,782.00	2	39	4	71,658.00	103,345.00	40,800.00	-
Mean	440,972.00	1.654	41.73	3.327	225,030.00	148,633.00	47,515.00	19,793.00
3rd Qu	389,465.00	2	53	4	152,461.00	179,412.00	74,400.00	35,721.00
Max	3,838,752.00	2	66	4	2,694,474.00	1,199,179.00	105,600.00	98,134.00

KEY

Sex	Female	1
	Male	2

Employment Status	Normal Retirement	2	Working	4
	Early Retirement	3	Late retirement	1

4.3 Regression Model

The household savings were regressed against demographic and financial variables.

$$TS_i = \beta_{0i} + \beta_{?i} X + \varepsilon_i$$

$$TS_i = \beta_{0i} + \beta_{1i} S + \beta_{2i} A + \beta_{3i} ES + \beta_{4i} DB + \beta_{5i} DC + \beta_{6i} SSB + \beta_{7i} PS + \varepsilon_i$$

Variable Definition

TS_i = Households (i) Total Savings.

β_{0j} = Mean of Household savings (given by the model intercept),

$\beta_{?i}$ = The difference between the mean of Household i and Mean household savings

X= is a vector of demographic and financial variables.

ε_i = An independent and identical distribution error term

4.3.1 Regression Coefficients

Table 4.2 Summary of Regression Equation Coefficients

Coefficients:	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**
(Intercept)	1.88E-10	3.40E-09	5.50E-02	0.956
XSex	1.49E-11	1.12E-10	1.33E-01	0.895
XAge	-1.49E-11	1.58E-10	-9.40E-02	0.925
XEmploymentstatus	3.91E-11	6.39E-11	6.12E-01	0.544
XDBBalance	1.00E+00	1.55E-16	6.46E+15	<2e-16 ***
XDCBalance	1.00E+00	3.97E-16	2.52E+15	<2e-16 ***
XSSBBalance	1.00E+00	6.63E-14	1.51E+13	<2e-16 ***
XPersonalsavings	1.00E+00	2.04E-15	4.91E+14	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1]

In Table 4.2 are reported results of saving tests on the data. It is clear that almost all variables are characterized by a positive difference from the intercept. This is an evidence positive relationship between the variables and amount of savings.

From the table the established savings regression equation is:

$$Y_i = \mathbf{1.88E-10} + \mathbf{1.49E-11}S - \mathbf{1.49E-11}A + \mathbf{3.91E-11}ES + \mathbf{1.00E+00}DB + \mathbf{1.00E+00}DC + \mathbf{1.00E+00}SSB + \mathbf{1.00E+00}PS + \varepsilon_i$$

From the model, it can be seen that taking the independent variables' value at zero, the savings would be 1.88E-10. Holding all other factors constant, a unit increase in gender representation, Age, Employment Status, Defined Benefits, Defined Contributions, Social Security Benefits and personal savings would lead to a savings increase or decrease of 1.49E-11, 3.91E-11, 1.00E+00, 1.00E+00, 1.00E+00, 1.00E+00 respectively. A unit decrease in age distribution would lead to a decrease in savings of -1.49E-11.

4.4 Replacement Rates Estimation.

Household total savings are projected on the basis of the regression coefficients. Substituting values to vector X of the demographic and financial variables into the regression equation above, 52 individual household total savings are obtained.

Results on the Income and Consumption Replacement Rates are covered in Section 44.4.1 and 4.4.2 below using the following three assumptions;

i. Inflation Rate at 7.3%

ii. Constant consumption Rate of 80%

iii. Replacement Rate benchmark of 75%

iv. Average Wage growth Rate of 20.9%

4.4.1 Income Replacement Rate

Using the wage growth rate and household salaries we compute the future household income to be able to calculate the Income Replacement Rate using equation (3.12)

52 individual house hold Replacement Rates are obtained but for the whole population we compute the Average Replacement Rate.

RR (Retired + Near Retirement) = 0.357015 $\cong$ 36%

RR (Retired)= 0.483928 $\cong$ 48%

4.4.2 Consumption Replacement Rate

Consumption is defined as Income less savings.

$$C = Y - S \tag{4.1}$$

Where C ~Consumption

Y ~Income

S ~Savings

Consumption replacement Rate is obtained using the projected annual retirement consumption expenditure and the total retirement savings. Using the data, we obtain the projected Annual Retirement Consumption Expenditure.

The adjustment ratio AR_x of median consumption expenditure for retirees to that of similar near-retirees

$$AR_x = 0.94289 \cong 94\%$$

Thus each household Retirement Consumption Expenditure and Consumption Replacement Rates are calculated. The average consumption Replacement Rate for both retired and near retirement workers is 30% and for retirees is 68%

CRR (Retired+ Near retirement)$= 0.27979275 \cong 30\%$

CRR (Retired)$= 0.68011992 \cong 68\%$

4.5 Interpretation of the Findings

The following were the findings of the research study clearly established according to the set objectives. The study focused on Retirement Income Adequacy and Sustainability. The most common approach of measuring Retirement Income adequacy is the calculation of replacement rates using total savings amount to fund retirement and pre retirement income. We use the

generic replacement rate of about 70%-80% on average (75%) as a bench mark to measure Retirement Income Adequacy.

4.5.1 Income Replacement Rate

From the analysis we obtained an Income Replacement Rate of 48% and for the already retired and 36% for both retired and near retirement respectively.

It is quite clear that the range is 36%-48% for Income Replacement. For the retired their income replacement rates are slightly higher than for the two populations combined due to the as workers approach retirement age they tend to save more to maximize their saving as opposed to the younger group of workers whose priorities are different.

The younger population's consumption is on the other hand higher than that of the retired The younger tier tends to maximize on investments and maintaining a certain standard of living as their peers.

4.5.2 Consumption Replacement Rate

Consumption Replacement Rates of 30% and 68% were obtained for both populations and for the retired respectively. The rate for the retired population is much higher than the near retirement since they maximized saving during their final working years to ensure that their retirement life would be comfortable.

This is also justified by the fact that at retirement consumption levels tend to decrease because at retirement it is assumed that there is not much responsibility for retirees; children are all grown and done with school, mortgage has been cleared and probably returns are streaming from small investments made before retirement from other vehicles.

It is also noted that retiree expenditures do not, on average, increase each year by inflation the actual spending curve of a retiree household varies by total consumption and funding level from retirement incomes.

4.6 Conclusion

Results from both Replacement Rates show that income and consumption rates post retirement are below the benchmark of 75% at 48% and 68% respectively. This implies that standard of living will likely, not be maintained but shift downward slightly post retirement and especially in terms of income.

On the other hand, Households with lower levels of consumption and higher funding from retirement Income and other vehicles tend to have real increases in spending through retirement, while households with higher levels of consumption and lower

Funding tend to see significant decreases. The implication is that households that are not consuming retirement income optimally will tend to adjust them during the retirement period, i.e. spending is not constant in real terms.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

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

5.2 Summary

This objective of this study was to measure retirement income adequacy and sustainability in light of retirement expenditure. To achieve this objective, work life saving were calculated putting into consideration coefficients obtained from regressing the demographic and financial variables with different household savings using the probit model. The demographic and financial variances were; Sex, Age, Employment Status, DB balances, DC balances, SSB balances and personal savings if any. The regression coefficients obtained after regression showed that each and every variable was significant to the amount being saved for retirement. Using the obtained retirement savings we estimate each households replacement rates. The bench mark replacement rate used was 75%, as used by many other researches. The income and consumption replacement rates obtained from the data were 48% and 68% for retirees and 36% and 30% for both populations. These rates were lower than 75% the bench mark rate. The results indicated that as yet population's retirement income was not adequate to sustain retirees in their post retirement life. This result is an indicator of most Kenyans poor culture of saving and deterioration of living standards post retirement. Therefore the results concluded that retirement income is not adequate and sustainable in post retirement life.

5.3 Conclusions

In this project, it is noted that while a replacement rate between 70% and 80% is likely a reasonable starting place for most households, the actual replacement goal can vary considerably based on the expected differences between pre- and post-retirement expenses. When combined, these findings have important implications for retirees, especially when estimating the amount that must be saved to fund retirement. The results of the study show that in Kenya Retirement

income is not adequate to sustain post retirement life. This implies that standards of living will change due to decrease in income received by retirees in retirement as compared to pre retirement. The results are evidence that more need to be done by Policy makers, the Government, regulators, Industry Players and Individuals as we. The inadequacy and non sustainability of Retirement Income tends to motivate the parties involved and especially members to try and save more during their work life (Additional Voluntary Contributions) to be able to maintain, better or improve their retirement income, standard of living and eliminate poverty.

5.4 Limitations of the Study

Though this project investigated the adequacy and sustainability of Retirement Income the kind and size of data considered had the following limitations; First, there was limited data available for retirees to be used in the analysis and the record of workers past employment history, balances and record are not well filled, hence dwelling on long serving employees of firms. Secondly, benefits access before retirement age was another challenge since using the most current employment income saved for retirement would give a lower figure as opposed to working with savings accumulated through a workers entire work life. Third, different employers have different policies and thus different data set. This would not give a whole or broader perspective and/ or implication to many and might not be relevant to others.

5.5 Recommendations

The recommendation for this study is that individuals/employees/workers should plan for their retirement, socially, psychologically and financially. Financial planning would imply saving more during productive life stage (work) right from employment, so that they can earn higher incomes in retirement to sustain them for their lifetime.

For policy makers, they should put in place policies that bar employees from accessing their benefits upon exit because it reduces the retirement basket and beats the logic of “Saving for Retirement”

Employers/ Sponsors should give incentives to encourage their workers to participate in saving to better their post retirement life, since being employers they have the best interest of their workers at heart.

5.6 Suggestions for Further Research

The study has served as a foundation for further research on the Adequacy and Sustainability of Retirement Income, considered the various demographic and financial variables affecting Retirement planning.

A further study can be conducted using various sets of data to compare the different environments and achievements of peer companies, employers and service providers. This will give the researcher adequate data to investigate the Retirement income adequacy issue. Many other factors not considered in this project also need to be reviewed since they also affect rate and amounts saved for retirement. These factors include marital status, household compositions, level of education, occupation and many more.

Researchers all over the world have put forward numerous hypotheses and theories why planning and saving for retirement is key. Theses should be tested as well. At the same time this opens the door for further research on retirement planning and well being in general.

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APPENDICES

R Code and Output

> mydata<-read.csv("C:/Users/Diana/Desktop/mydata.csv")

> attach(mydata)

> mydata

	Totalsavings	Sex	Age	Employmentstatus	DCBalance	DBBalance	SSBBalance	Personalsavings
1	340924.00	Male	52	Early Retirement	134462.00	134462.00	72000	0.00
2	359110.36	Male	30	Working	190116.75	109419.00	19200	40374.61
3	68998.00	Male	26	Working	29699.00	29699.00	9600	0.00
4	617377.92	Female	25	Working	316684.00	270302.00	7200	23191.92
5	424302.39	Male	27	Working	236168.40	115736.00	12000	60397.99
6	149310.78	Female	30	Working	69645.85	51284.00	19200	9180.93
7	790294.03	Male	60	Normal Retirement	365386.50	302030.00	91200	31677.53
8	247218.00	Male	33	Working	110409.00	110409.00	26400	0.00
9	331296.00	Male	37	Working	147648.00	147648.00	36000	0.00
10	126680.85	Female	32	Working	58614.95	29514.00	24000	14551.90
11	238092.40	Male	35	Working	113374.15	73663.00	31200	19855.25
12	101704.00	Female	60	Normal Retirement	10504.00	0.00	91200	0.00

	Totalsavings	Sex	Age	Employmentstatus	DCBalance	DBBalance	SSBBalance	Personalsavings
13	282925.75	Male	53	Early Retirement	208525.75	0.00	74400	0.00
14	299390.00	Male	50	Early Retirement	232190.00	0.00	67200	0.00
15	840567.48	Male	48	Working	417794.15	324857.00	62400	35516.33
16	516458.00	Male	54	Early Retirement	439658.00	0.00	76800	0.00
17	267043.25	Male	60	Normal Retirement	175843.25	0.00	91200	0.00
18	25838.95	Male	25	Working	18638.95	0.00	7200	0.00
19	21335.20	Male	24	Working	16535.20	0.00	4800	0.00
20	120935.22	Male	30	Working	65401.25	0.00	19200	36333.97
21	157723.60	Female	33	Working	84421.85	0.00	26400	46901.75
22	284159.39	Male	40	Working	127636.59	98160.00	43200	15162.80
23	351930.43	Male	42	Working	173436.45	85824.00	48000	44669.98
24	87162.00	Male	30	Working	33981.00	33981.00	19200	0.00
25	476518.87	Male	60	Normal Retirement	111849.65	236186.00	91200	37283.22
26	480652.73	Male	42	Working	194819.15	140424.00	48000	97409.58
27	365729.15	Male	38	Working	152888.25	92834.00	38400	81606.90
28	384474.54	Male	60	Normal Retirement	80592.95	185817.00	91200	26864.59
29	54492.85	Female	22	Working	14102.85	28539.00	4800	7051.00

	Totalsavings	Sex	Age	Employmentstatus	DCBalance	DBBalance	SSBBalance	Personalsavings
30	88844.75	Female	24	Working	17534.15	57743.00	4800	8767.60
31	236468.63	Male	36	Working	135244.10	0.00	33600	67624.53
32	483737.48	Male	60	Normal Retirement	294403.00	0.00	91200	98134.48
33	50258.73	Female	35	Working	12705.35	0.00	31200	6353.38
34	68557.45	Male	37	Working	21705.00	0.00	36000	10852.45
35	3838751.69	Male	54	Early Retirement	1199178.58	2562773.11	76800	0.00
36	184628.25	Female	50	Early Retirement	0.00	117428.25	67200	0.00
37	238099.43	Female	27	Working	150733.00	0.00	12000	75366.43
38	269911.35	Male	27	Working	171941.00	0.00	12000	85970.35
39	154183.25	Male	50	Early Retirement	0.00	86983.25	67200	0.00
40	205298.30	Female	38	Working	0.00	166898.30	38400	0.00
41	404435.55	Female	60	Normal Retirement	0.00	313235.55	91200	0.00
42	58920.00	Male	30	Working	3972.00	35748.00	19200	0.00
43	236490.00	Male	49	Working	0.00	171690.00	64800	0.00
44	193144.00	Female	49	Working	0.00	128344.00	64800	0.00
45	160853.65	Male	60	Normal Retirement	0.00	69653.65	91200	0.00
46	45080.80	Female	22	Working	0.00	41480.80	3600	0.00

	Totalsavings	Sex	Age	Employmentstatus	DCBalance	DBBalance	SSBBalance	Personalsavings
47	786957.00	Female	53	Early Retirement	596.00	711961.00	74400	0.00
48	240345.06	Male	48	Working	0.00	177945.06	62400	0.00
49	2003146.00	Male	60	Normal Retirement	147537.00	1764409.00	91200	0.00
50	3668416.20	Female	66	Late Retirement	868342.20	2694474.00	105600	0.00
51	170821.30	Female	33	Working	96281.00	0.00	26400	48140.30
52	330526.30	Female	44	Working	277726.30	0.00	52800	0.00

> Y<-cbind(Totalsavings)

> X<-cbind(Sex,Age,Employmentstatus,DBBalance,DCBalance,SSBBalance,Personalsavings)

> Xvar<-c("Sex","Age","Employmentstatus","DBBalance","DCBalance","SSBBalance","Personalsavings")

> summary(Y)

Totalsavings

Min. : 21335

1st Qu.: 143653

Median : 243782

Mean : 440972

3rd Qu.: 389465

Max. :3838752

> summary(X)

	Sex	Age	Employmentstatus	DBBalance	DCBalance	SSBBalance	Personalsavings
Min. :	1.000	22.00	1.000	0	0	3600	0
1st Qu.:	1.000	30.00	3.000	0	13753	19200	0
Median :	2.000	39.00	4.000	71658	103345	40800	0
Mean :	1.654	41.73	3.327	225030	148633	47515	19793
3rd Qu.:	2.000	53.00	4.000	152461	179412	74400	35721
Max. :	2.000	66.00	4.000	2694474	1199179	105600	98134

> table(Y)

> #PROBIT REGRESSION MODEL

> myprobit <- glm(Y ~ X,data=mydata)

> summary(myprobit)

Call:

glm(formula = Y ~ X, data = mydata)

Deviance Residuals:

Min	1Q	Median	3Q	Max
-1.397e-09	-7.276e-11	-1.819e-11	5.821e-11	3.056e-10

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.879e-10	3.397e-09	5.500e-02	0.956
XSex	1.490e-11	1.123e-10	1.330e-01	0.895
XAge	-1.490e-11	1.577e-10	-9.400e-02	0.925
XEmploymentstatus	3.914e-11	6.394e-11	6.120e-01	0.544
XDBBalance	1.000e+00	1.548e-16	6.459e+15	<2e-16 ***
XDCBalance	1.000e+00	3.970e-16	2.519e+15	<2e-16 ***
XSSBBalance	1.000e+00	6.626e-14	1.509e+13	<2e-16 ***
XPersonalsavings	1.000e+00	2.038e-15	4.907e+14	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for gaussian family taken to be 1.275621e-19)

Null deviance: 2.7654e+13 on 51 degrees of freedom

Residual deviance: 5.6127e-18 on 44 degrees of freedom

AIC: -2105.4

Number of Fisher Scoring iterations: 1