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**THE EFFECT OF DEMOGRAPHIC TRANSITION ON THE EQUITY RISK PREMIUM
IN KENYA**

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ABSTRACT

This study investigates the link between demographic transitions and the equity risk premium in Kenya. The study is hinged on the life cycle hypothesis, which states that the income and consumption profiles of individuals change over their lifecycle. These changes are such that an individual is a net borrower at the beginning of their working life, a net saver at middle age in preparation for retirement and eventually a net dissaver at retirement. The demographic variables used include changes in population, changes in average working population and changes in dependency ratio. Based on the Autoregressive Distributed Lag (ARDL) model the study finds that changes in Average working population have the most impact on the equity risk premium. The 25-39 age cohort of the population negatively affects the equity risk premium. An increase in this cohort leads to a negative shift in the stock market returns. On the other hand, the 40-59 population cohort is found to positively affect the equity risk premium. In line with the life cycle hypothesis, the study concludes that demographic transitions do indeed affect the Equity Risk Premium significantly.

Key words: *Demographic transitions, Equity Risk Premium, Kenya, Life Cycle Hypothesis, Autoregressive Distributed Lag (ARDL) model*

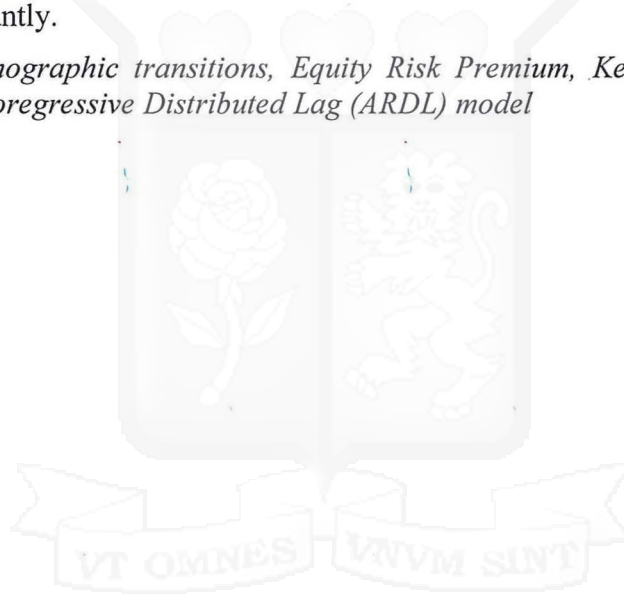
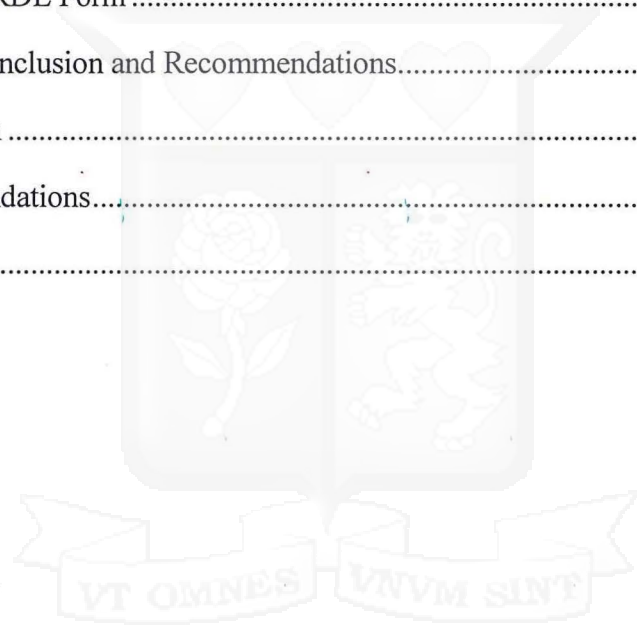


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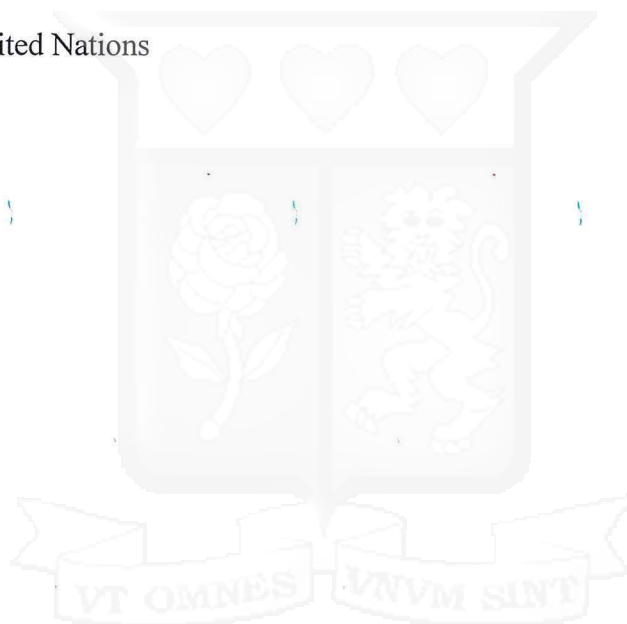
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List of Abbreviations

ERP	Equity Risk Premium
NSE	Nairobi Stock Exchange
ARDL	Autoregressive Distribution Lag
KPHC	Kenya Population and Housing Census
KNBS	Kenya Bureau of Statistics
UN	United Nations



Chapter One: Introduction

1.1 Background

Demographics as described by Hauser & Duncan (1964) involves population composition as well as the changes in the structure of the population compositions. Pertinent variables of demographics which impact social, political and economic aspects include population growth, working age population, average old-age population, and fertility and mortality rates among others.

An aspect that is often overlooked is the effect of demographics on frontier financial markets variables such as asset prices. A proposed channel through which demographics affect asset prices is through demand and supply dynamics in the market as investigated by Goyal (2004) and Bergantino (1998). An increase in the middle-aged cohort of a population, increases consumers of financial assets as they seek to save more, and this demand exerts an upward pressure on asset prices.

A second channel through which demographics affects asset prices is through a consumer characteristic: risk aversion. Cohn, Lewellen, Lease, & Gary (1975) and Ameriks & Zeldes (2004) found that an increase in the age of a person, the more risk averse they become and hence tend to prefer less risky assets thus affecting asset allocation. Older people then let go of their stock holding much faster than their fixed income securities.

While the working age population in the rest of the world is decreasing significantly, that of Kenya is projected to increase and exceed that of the rest of the world by 2035 (IMF, 2015). Despite a considerable reduction in fertility rates, the population is said to continue to rise for two reasons. One reason is that the high fertility rates in the preceding years has produced a relatively large number of families who will continue bearing more children. The second reason lies in the fact that the life expectancy of the country has increased and is projected to keep increasing over the coming few decades (World Bank, 2010). These expected changes in demographics then have an implication on asset returns.

Particularly if the life cycle hypothesis of saving Modigliani & Ando, Life Cycle Hypothesis of Saving, (1963) holds, then the projected population structure for Kenya poses an interesting phenomenon for its frontier financial market. The hypothesis holds that young people, when they enter the labor market, have to sustain their income and therefore are net borrowers. At this point,

they make investment decisions that pertain to starting a life such as purchasing mortgages and cars for which their income is not enough.

As they approach middle age their income increases, they are in their prime working ages and therefore they accumulate assets. These workers save by investing in financial market assets such as bonds and equities in anticipation of an uncertain retirement period. Finally, in old age, people dissave their income since they are net consumers with no income.

Demographics is a cumulation of individual consumers. This therefore means that the life cycle hypothesis can be dissected at a population level by looking at demographic variables such as middle/old ratio, the ratio of middle aged people to old aged people in the assumption that middle aged people are in their prime working years and the old aged are retirees who are dissaving.

It is against this background that this paper aims to shine a light on how the current and expected demographic transitions will affect the asset prices as well as returns in the equity market. More specifically, the paper will investigate the effects of demographics on the equity risk premium. The equity risk premium shows the returns on equity after considering the effects of other variables such as inflation and interest rates of equity returns.

1.2 Motivation of the Study

Fundamentally, everything is affected by demographics or transitions of demographics. For example, the economy is affected by the interaction of both labor and capital. Labor is provided by individuals in the working class and any shift in demographics affect this cohort and therefore subsequently affects the economy. A practical example of the significance of demographics is how the Baby Boomers¹ in the US placed pressure on basic necessities such as food and proper education at a young age and an upward pressure on asset prices such as equities, fixed income and real estate when they were in the saving and working ages. The fact that demographics affect social, political as well as economic aspects is the motivation for this study.

In Kenya, the population in all the three age sets defined by Modigliani & Ando, Life Cycle Hypothesis of Saving, (1963) has been consistently growing as shown by the figure below.

¹ Baby Boomers are the individuals born in the two decades that followed World War 2 in the United States, between 1946-1964.

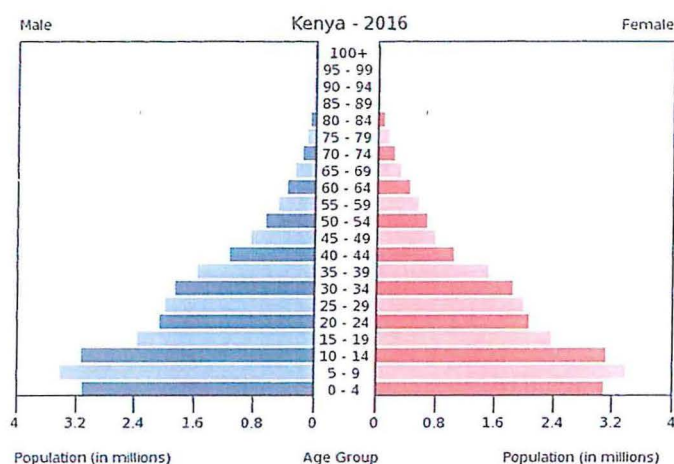


Figure 1: Sourced from the 2017 CIA world fact book

Between 1988 and 2000, the average proportion of the saving population, 40-59, was around 0.09 Of the total proportion. At the time, the average returns of the NSE 20 share index was -0.0211. In the next decade, the proportion of the savers increased to an average 0.19 of the total population and with it came an increase in the NSE 20 returns to a positive average of 0.002. While on the surface, this phenomenon seems to support the life cycle hypothesis, an increase in the savings population increases the returns of equity assets, this empirical analysis aims to investigate whether there is a relationship between the population structure seen above and equity returns and the nature of this relationship.

1.3 Problem Statement

While a multitude of research has focused on the effects of demographics on asset prices and returns in developed countries, the same lacks in frontier and emerging countries. The findings and conclusions of such results however cannot be replicated across developing countries since their demographic characteristics are different. In developed countries, the fertility rates are lower than in their counterparts leading therefore to a lower middle-old ratio. Such demographic characteristics affect asset prices and returns differently. Where researchers have considered demographics in developing countries, only output and the impact of macroeconomic variables is considered (see for instance Thuku, Gachanja, & Obere , 2013).

Additionally, over time the only demographic variable under consideration, on its effect on the economy, has been population growth. While population growth is a key variable in analyzing the effect of demographics, there are other variables pertaining to demographics that are occasionally

overlooked. Such variables include life expectancy, age structure, dependency ratios and fertility rates.

There therefore exists a gap in that, the investigation of the effect of demographics on financial markets in emerging and frontier markets is scarce. This study is an attempt to fill this gap by particularly looking at the effect of demographic variables on the equity risk premium in an emerging market.

1.4 Research Objectives

This study aims to achieve the following:

1. To establish whether there is an effect of demographic transitions on the equity risk premium in the Kenyan equity market.
2. To test the magnitude and direction of the effect of demographic transitions on the equity risk premium in the Kenyan equity market.

1.5 Research hypotheses

The research question that this study aims to investigate is whether demographic transitions affect the equity returns in the hypothesis is as stated below.

H_0 : Demographic transitions do not significantly affect equity returns in Kenya.

H_1 : Demographic transitions significantly affect equity returns in Kenya.

Chapter Two: Literature Review

2.0 Introduction

Most research on demographics and asset prices is anchored on the life cycle hypothesis. The life cycle hypothesis by Modigliani & Ando (1963) states that the income and consumption profiles of individuals change over their lifecycle. This change, as well as the expectation of future increase or reduction in income levels influences the choice to invest in assets. An individual will therefore be a net borrower in his/her young ages (25-39) in order to supplement income received and to invest in assets that relate to starting of a life.

At middle age (40-59), an individual will seek to save in preparation for the future. This is because of the impending retirement when the human capital levels and consequently income levels of the individual will decrease. At this age, the individual is a net saver and the savings is released as capital investments. Between the ages of 60-69, an individual is a net dissaver since he tries to maintain the same level of consumption before retirement. These fundamental changes in the holding of assets affect demand and supply of assets which is then reflected on the prices of assets.

Given that demographics map characteristics of investors, then it is logical to conclude that a cross-section of the demographics of a country at any one point, should be a snapshot of the specific age group. Therefore, a decision of one individual is likely to be replicated across the entire age group of investors.

2.1 Life Cycle Hypothesis

The Life Cycle Hypothesis can be inferred to as an extension of the permanent income hypothesis. Permanent Income Hypothesis of Friedman (1957) posits that consumption is modelled in such a way as to spread out income over the life period of investors. This distribution of income over the lifetime caters for any changes in income levels in order to get rid of uncertainty. Friedman (1957), goes further and concludes that the only time that an individual will save from his current income is when he expects future income to be less than permanent income in the future. This statement stated otherwise could be taken to be what the life cycle hypothesis proposes.

The life cycle hypothesis by Modigliani & Ando (1963) proposes that the consumption and saving of an individual, changes over his/her life time. At young age, between 25-39, individuals are net borrowers. At this stage in life, they are looking to start a life and therefore each decision they

make is wired around purchasing assets that enable them to achieve their objectives such as purchasing a mortgages and cars. The middle age cohort, which is usually taken to be between 40-59 years of age, are net savers. This is because they expect a decline in income when they retire as their human capital capabilities decline as well.

In line with the permanent income hypothesis, an investor under the Life Cycle Hypothesis theory, saves at middle age because they expect the future permanent income to reduce. Finally, at old age, which is assumed to be the ages of 60-69, individuals are net dissavers. They sell off their assets to the younger generations and shift positions in their assets to reflect their change in financial needs and risk attitudes.

Empirical evidence from Amlan, Punhani, & Shi (2012) support the life cycle hypothesis. An analysis of the relationship between the middle/old ratio in US and the real S&P500 P/E finds a strong correlation of 0.73 in the period between 1950 and 2011. Liu & Spiegel (2011) also present the same evidence in their model. The paper investigates the relationship between these two variables between roughly the same time frame, 1954-2010, with Amlan, Punhani, & Shi (2012) and finds a correlation of about 0.61%. I attribute the difference between the two correlation results, to the 3-year difference in the time frame. Goyal (2004) finds that both stock market inflows and outflows are influenced by demographic variable. Stock outflows for example, are heavily influenced by the size of the cohort aged above 65. Inflows, on the other hand, are heavily influenced by the size of the middle-aged cohort.

Given the overwhelming evidence supporting Life Cycle Hypothesis, it is therefore possible to conclude that the prices of financial assets will be affected by different demographic transitions. If the assumption of rational investor holds, then the decisions of an individual investor is replicated across the market and the cross section of a particular age set should be consistent. If, for example, there is a transition from a small to a large cohort of middle aged people, there will be an inflationary pressure on asset prices because the savers will subsequently demand more saving channels. This excess demand pushes the prices of financial assets higher. The boom of the US asset market in the 80's and 90's is sometimes attributed to the entry of the baby boomers into their middle age (Bakshi & Chen, 1994).

2.2 Risk Avoidance and Portfolio Allocation in the Life Cycle

Goyal (2004), Amlan, Punhani, & Shi (2012) and Ang & Maddaloni (2003) among others analyze the effects of demographic variables such as age structure on different fundamentals of stocks such as stock prices and stock returns. A constant finding in the research papers is the change in individual portfolios with a shift in the age structure of individuals.

Cohn, Wilbur, & Ronald (1975) mention risk aversion of investors is positively correlated with demographic variables such as age, marital status and gender. This proposition significantly strengthens the shift in asset classes with movement from one risk profile to another. With increasing old age, individuals let go of positions in risky assets and invest in relatively secure assets such as bonds.

Another proponent of the shift in risky assets to less risky ones with increase in age is Kocherlakota & Jagannathan (1996) who argue that people with labor income are relatively uncorrelated with stock returns since they have more years of earning ahead of them and can recover the potential losses associated with stock ownership.

Holding fixed income securities is a low risk-low return investment relative to holding equity positions. Given the low risk and return profile of fixed income securities, Cohn, Wilbur, & Ronald (1975) argument can be justified with the fact that the investments made by an individual during working years are in speculation of the income needed to support the individual without a constant income.

There is therefore no significant need to invest in a high-income security, after retirement, all other factors held constant. Drawing again from the concept investigated by Cohn, Wilbur, & Ronald (1975), and again all other factors held constant, then logically a rational investor should be compensated for any additional risk taken up which should be a risk premium.

In line with this thought, Ang & Maddaloni (2003) in their research find that there are different demographic variables that are able to predict the risk premia of stocks in the future, indicating that investors are compensated for holding risky assets. The three demographic variables used are; the average age of population, the fraction of adults over the retirement age of 65 years and the proportion of population in the working age.

The change in the risk profile in an investor's life cycle directly feeds into portfolio allocation as investors shift allocations in different assets. The investor in the old age cohort will seek to sell their risky assets, in this case equity and purchase safer securities. The changes in demand and supply of traded assets as brought about by change in age structure, subsequently affect the prices of traded securities. An analysis of the effect of these changes by Goyal (2004) show that indeed there is an inflationary pressure on real equity prices in the event that there is an increase in the fraction of middle age population and a deflationary pressure on these prices with an increase in the old age population.

2.3 Demographics and Stock Prices

Given that a large cohort was born in the US immediately after the second world war, Liu & Spiegel (2011), it follows that the change in demographics placed immediate pressure on different sectors of the US economy such as health, education and employment among others. It therefore followed that a lot of researchers were motivated to research on the effects of the baby boom on the financial markets.

Bakshi & Chen (1994) investigated and concluded that baby boomers were the reason to the increase in the real S&P stock index and housing prices between 1966 and 1980 because they were just entering the job market and were in their 20s. While the increase in housing prices is consistent with Modigliani & Ando, (1963) Life Cycle Hypothesis, an increase in the index is not. As earlier pointed out, the Life Cycle Hypothesis states that a young individual will invest in assets that are pertinent to the starting of a new life. However, individuals do not start saving until they reach middle age, about 40-59 of age, and this is when, ideally, the effects of this demographics begin being relevant.

It is widely believed that when the baby boom cohort enters into retirement they will dissave by selling their assets, only to a smaller cohort. Informed by knowledge of forces of demand and supply mechanisms, the high supply of assets sold by a large cohort and the low demand by a relatively smaller cohort influences the price of financial assets downwards since supply is greater than demand. Poterba (2001) illustrates this phenomenon in a simple model:

$$p * K = N_y * s$$

Assume that an individual's life is distinctively divided into two, when he is young (y) and when he is old (o). Assume further that the individual works when he is young and retires when old. If (K) is the fixed supply of a durable assets and (s) a fixed saving rate from the labor income, then the price of one unit of good (p) has a linear and positive relationship with the number of young workers N_y . In the event that there is a demographic transition such that the number of young people reduce, the asset price is expected to reduce as well.

The model is however too simplistic an approach to summarize the effect of a demographic change on asset prices as there are other channels through which demographics affect asset prices. The assumption that an individual's life is distinctively divided into two ignores the role played by young individuals (20-39) through credit given to them and how this potentially affects the prices of assets. The final assumption that prices are directly and linearly correlated with the increase and decrease of number of young people is insufficient since it does not show the interaction of other factors in change of age structure.

The Asset Price Meltdown Hypothesis is a theoretical visualization of the simple model by (Poterba, 2001). It states that as the baby boomers move into retirement they will be net sellers of their assets, which is consistent with the life cycle hypothesis. The theory goes further to hypothesize that the baby boomers will not have enough people to sell their assets to as the next cohort will be smaller in size. This phenomenon will then cause a surplus in assets and the demand will be too low hence the prices of assets will decrease causing an asset price melt down. (Poterba, 2001) however, dismisses this claim and uses data from US to show that assets holding fall slowly after retirement despite rising rapidly before.

The argument posed by the Asset Price Meltdown Hypothesis is also invalid given that individuals have a choice as to whether to hold the assets or not and an individual may choose to hold the assets for the incoming generations to inherit as opposed to selling the assets.

Another reason as to why this hypothesis may not hold, is the fact that financial markets are open to foreign investors as well, who will create a demand for the surplus supply. Given that the stock prices will shift in the direction of the equilibrium between demand and supply, the prices will be low. All else held constant, these low prices will actually be attractive to other foreign investors. The fact that the market will correct itself, under the assumption that markets are efficient, then the prospects of an increase in value of the share in the future will be incentive enough to foreign

investors. Finally, that rational investors are forward looking and will particularly adjust prices according to the expectation of the movement of these stocks, invalidates the asset melt down hypothesis.

Brooks (2002) also disagrees with the asset meltdown hypothesis and bases his disagreement on the fact that investors will hold their asset and live off the returns from their investments thereafter. He also argues that companies will incentivize the asset holders to hold their stocks by boosting dividends. This, he says is particularly because holders of stocks are relatively wealthy who own large quantities of shares and will not see the need to sell the shares if the dividends are boosted.

Despite the wide range of papers written on the area, researchers still have differing opinions on whether demographics affect the stock market or changing demographics is indifferent to the stock market. Researchers like Amlan, Punhani, & Shi (2012), Bakshi & Chen (1994), Cohn, Wilbur, & Ronald (1975), Ang & Maddaloni (2003), Goyal, (2004) and Liu & Spiegel, (2011) who agree that demographics indeed have an effect on financial assets proposes different channels through which different demographic variables affect the prices of financial assets.

Amlan, Punhani, & Shi (2012) emphasize on people characteristics such as consumer and worker characteristics, in a bid to move away from the conventional emphasis on aging. This is a cautionary act from using demographics purely as a human count. The paper goes further ahead to describe asset accumulation and portfolio allocation as channels through which demographics affect asset pricing. While there is a widely-held assumption that investors are rational, most of the time investing is done with bias. Hence the need for fields like behavioral finance². In such a case then, it is important to look at individual behavioral characteristics that influence choice in portfolio allocation. The limitation of using this, is the data used is not uniform and is hard to compare across age sets.

Bakshi & Chen (1994) proposes the channel through which demographics affect asset pricing is through the life cycle hypothesis as well as risk aversion. However, unlike Amlan, Punhani, & Shi (2012), Bakshi & Chen (1994) use population structure as the demographic variable to investigate their hypothesis. They find that the increase in asset pricing in the 80's was due to the fact that the baby boomers had entered their saving ages. With regard to the second channel, the paper

² Behavioral finance is a branch of finance that deals with cognitive psychology theory with conventional economic and finance to find out why people make irrational financial decisions.

concludes that risk aversion increases with age and as individuals become older, they prefer less risky assets.

Cohn, Wilbur, & Ronald (1975) like the previous two researchers look at risk aversion as a channel through which demographics affect stock variables. The demographic variables that the paper focuses on are divided into two, one aspect looks at age, gender and marital status while the socio-economic aspect looks at variables such as education, income and wealth. Such variables influence the choice to invest in assets and even then, the weights of the different assets in the portfolio's.

Ang & Maddaloni (2003) use three demographic variables; average age of the population, fraction of adults over 65 and proportion of working age population to investigate the equity risk premium changes and whether they are affected by changes in demographic variables. Goyal, (2004) does a thorough job in investigating the effects of demographics on stocks. Unlike his predecessors, he analyzes stock outflows as well and finds that this out flows are correlated to the increase in size of the age cohort that is between 60-65.

This study will focus on life cycle hypothesis as well as asset accumulation as channels through which demographic variables affect asset returns. At the different stages of the life cycle of an individual, the individuals invest in assets that are in line with their objectives. This accumulation of assets directly affects the demand and supply mechanisms which in turn then influence asset prices.

This study seeks to improve empirical works by presenting the equity risk premium as a proxy for equity returns. The Equity Risk Premium (ERP) is the return above the risk-free rate and is influenced by an investor's view towards risk. Using the ERP eliminates the need to consider the effects of other variables such as interest rates and inflation on equity returns.

Chapter Three: Methodology

The model that used to investigate the effect of demographic transition on equity returns is the Autoregressive Distributed Lag (ARDL) model. As Arnott & Chaves (2012) observe, demographic variables are slow moving and therefore any variable that affects demographic variable are lagged and the effects on demographic variables are seen over.

In an efficient market, the returns of an asset do not compensate idiosyncratic risk. The equity risk premium however compensates all investors for systematic risks which are not diversifiable such as inflation rate changes and interest rates changes. The return over and above the risk-free rate offered by the market is what is known as the Equity Risk Premium (ERP).

$$ERP = r_m - r_f \quad (1.1)$$

This study therefore uses this equity risk premium as the equity variable. In so doing, there is an assumption stemming from efficient market hypothesis that aspect of equity return brought about by macroeconomic variables affecting the market equally are accounted for.

The implication of this assumption in the ARDL model is such that macroeconomic variables will not be considered in the regression.

3.1 Research Design

The study is correlational since it shows the relationship of more than one variable to another variable. The study considers the correlation between demographic variables and equity returns. In particular, the study analyzes how movement and transitions in demographic variables lead to a movement in equity returns. In this research, the demographic variables whose effect on equity returns being investigated are changes in population growth, changes in average working population and changes in the dependency ratio.

The study is also quantitative as it uses statistical tools and econometric models to analyze the effect of demographic variables on demographic variables.

3.2 Population and Sampling of the Study

The population from which the demographics data is sourced is the Kenyan Population and that from which the equity returns are sourced from is the Nairobi Stock Exchange (NSE). The Official

Kenyan population data is updated every ten years after a nationwide census while the NSE data is updated at the end of each trading day.

Population data is acquired from the KPHC database which is available in the KNBS database. Census in Kenya is usually undertaken in the country every once in ten years. Population estimates are acquired from 1988 to 2014. The data is divided into 17 sub-groups of four years each. This study however considers the ages that are specified in the life cycle hypothesis such that young age will be 20-29, middle age 30-39 and old age 60-69 with a focus on 65 as the retirement age.

The NSE 20 index represents the dependent variable in the study. As opposed to the NASI, as investigated by Osoro & Ambrose (2013), the NSE 20 index gives an accurate snapshot of movements in the market. For this reason, this study uses the NSE 20 index as opposed to the all share index.

Other macroeconomic variables that affect an investors attitude towards equity returns are considered in the equity risk premium.

3.3 Method Specification

An Autoregressive Distribution Lag (ARDL) model is used because of the lags of the regressor on the explained variable. The key inputs in the model are equity premiums for the period 1989-2014 and changes in population growth, changes in the average working age population and changes in the dependency ratios. Other variables that affect the regressor are accounted for in the ERP.

3.4 Selection of Variables

Changes in population growth: In the asset meltdown hypothesis, population growth is a pertinent factor identified to have an effect on the stock prices. The population growth variables have a direct effect on the different sizes of age cohorts.

Changes in the average working population: This is a variable identified in the life cycle hypothesis as the fundamental driver of asset prices. During the working age, individuals save money for an uncertain future by investing in financial markets assets which then changes the demand and supply dynamics.

Changes in the dependency ratio: This ratio shows the change in proportion of old age relative to middle age. At old age, individuals are dissavers hence their decisions of selling assets to fund

Chapter Four: Data Analysis

This chapter presents the results and findings of the study whose main objective was to find out whether there is an effect of demographic transitions on the equity risk premium in the Kenyan equity market. In the event that demographic transitions are found to affect the equity risk premium, the other objective was to find out the magnitude and direction of these effects on the equity risk premium.

Before going in depth into the analysis, the study tested the statistical characteristics of the variables. These tests, particularly the unit root test, were to assist in choosing the demographic variables that are most suitable for the model. The study also employed the cointegration method to test for the presence of a long run relationship between demographic variables and the equity risk premium in Kenya.

If the variables are cointegrated i.e. related in the long run, then an error term is added to the model. This error term assists in deducing the nature in both the short run and in the long run and therefore helps in making a conclusive summary.

4.1 Unit Root Test

The study tests for stationarity in order to gain insight on how to treat the data henceforth. The table below shows the results of a unit root test performed. The null hypothesis is that the data contains a unit root therefore the data series is non-stationary while the alternative hypothesis that the series does not contain a unit root therefore is stationary.

UNIT ROOT TEST RESULTS

Variables	T-Statistic	Level	
		Critical Values 1%	P-Values
Population Change	-0.937135	-3.752946	0.7574
Dependency Ratio	-2.207852	-3.769597	0.2091
Average Working Population			
L25-39	-1.095942	-3.72407	0.701
L40-59	-0.117842	-3.72407	0.937
Average Retirement Population			
L60-69	-1.984888	-3.72407	0.2911

	1st Difference		
	T-Statistic	Critical Values 1%	P-Values
Population Change	-3.362288	-3.78803	0.0247
Dependency Ratio	-3.833686	-3.769597	0.0087
Average Working Population			
L25-39	-4.648463	-3.72407	0.0011
L40-59	-3.933011	-3.72407	0.0062
Average Retirement Population			
L60-69	-3.082434	-3.72407	0.041
	2nd Difference		
	T-Statistic	Critical Values 1%	P-Values
Population Change	-1.281615	-3.752946	0.62
Dependency Ratio	-1.587151	-3.78803	0.4713
Average Working Population			
L25-39	-3.191913	-3.737853	0.0331
L40-59	-3.435208	-3.737853	0.0196
Average Retirement Population			
L60-69	-3.926589	-3.737853	0.0065

Table 1 Unit Root Test Results

All the explanatory variables except the change in total population, are found to be stationary after taking performing the unit root test at 1st level. The purpose of the stationarity test is to ensure that we do not use I (2) in the model as specified in the ARDL (Pesaran, Shin, & Smith, 2001). In this case all the explanatory variables except the change in population will be considered in the model since they are found to be stationary at the 1st differences, making them I (1).

4.2 Testing for Long Run Relationships

In this section, the variables that are estimated using the ARDL model are dependency ratio and the average working population which is divided into two working classes as per the Life cycle hypothesis; young age and middle age workers. The model then runs a regression with the equity

risk premium as the dependent variable and the dependency ratio (middle to old) and the average working age as the independent variables.

The results from the regression are as follows:

Variables	Coefficient	Std. Error	Prob.
Equity Risk Premium (2)	-0.64246	0.177848	0.0112
Average Working Population			
L25-39 (4)	-1.68907	0.3529	0.0001
L40-59 (4)	1.3224	0.5686	0.0001
Dependency Ratio (3)	2.5679	0.0092	0.0002
C	0.7142	0.8535	0.0086

Table 2 ARDL Regression Results

The number of lags selected using the Schwarz criterion are (2,4,4,3) for the variables. The Schwarz criterion of lag selection is preferred to the Akaike criterion because it penalizes for using too many lags in the model. The use of many lags increases the degree of freedom and increases the chance of accepting the null hypothesis.

The 25-39 population cohort is significant at interpreting the dependent variable. It has a large negative effect on the equity risk premium which posits that it negatively influences excess market returns. The 40-59 population cohort is also significant in interpreting the equity risk premium. The coefficient is positive which means a movement in this cohort is directly proportional to excess market returns. This cohort positively influences the dependent variable. The dependency ratio is significant in affecting the dependent variable as well. A positive movement in the dependency ratio means an increase in the middle age population supporting the dependent population and thus affects the independent variable.

4.3 Bounds Test

In the ARDL model, a bounds test is usually carried out to determine whether there exists a cointegrating relationship between the independent variables and the dependent variable.

Test Statistic	Value	K
F Statistic	15.96300	3

Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Table 3 Bounds Test Results

In the bound test, the hypothesis being tested is:

H_0 : No long run relationship exists

H_1 : Long run relationship exists

The value of our F-statistic is greater than all |1 bound critical values. Therefore, we can reject the null hypothesis and accept the alternative that the explanatory variables are cointegrated with the dependent variable. This would go further to imply that changes in the population cohort aged 25-39 years and 40-59 years covary with changes in ERP over time. It would then be important to estimate the long-run and short-run relationship within the model. This will be carried out by estimating the Error Correction Model (ECM) of the ARDL model.

4.4 ECM in ARDL Form

Given that the independent variables and the dependent variables are related in the long run, the ECM in ARDL form to be estimated is as follows:

$$ERP = \alpha_0 + \sum_{i=0}^T ERP_{T-1} + \sum_{i=0}^T \beta LN25 - 39_{T-i} + \sum_{i=0}^T \psi LN40 - 59_{T-i} + \sum_{i=0}^T \phi \Delta DR_{T-i} + Z_t + \varepsilon \quad (1.6)$$

Where Z_t is an error correction term in the form;

$$Z_t = \theta_1 LN25 - 39_{t-1} + \theta_2 LN40 - 59_{t-1} + \theta_3 DR_{t-1}$$

Such that the ECM in ARDL form equation to be estimated is as follows;

$$ERP = \alpha_0 + \sum_{i=0}^T ERP_{T-1} + \sum_{i=0}^T \beta LN25 - 39_{T-i} + \sum_{i=0}^T \psi LN40 - 59_{T-i} + \sum_{i=0}^T \phi \Delta DR_{T-i} + \theta_1 LN25 - 39_{t-1} + \theta_2 LN40 - 59_{t-1} + \theta_3 DR_{t-1} + \varepsilon \quad (1.7)$$

The results from the regression are as follows;

Short-Run Coefficients			
Variables	Coefficient	Std. Error	Prob.
Equity Risk Premium (2)	-0.64246	0.177848	0.0112
Average Working Population			
L25-39 (4)	-1.68907	0.3529	0.0001
L40-59 (4)	1.3224	0.5686	0.0001
Dependency Ratio (3)	2.5679	0.0092	0.0002
C	0.7142	0.8535	0.0086
Long-Run Coefficients			
Variables	Coefficient	Std. Error	Prob.
Equity Risk Premium	0.473094	0.230549	0.1094
Average Working Population			
L25-39	0.44515	3.269934	0.0308
L40-59	0.0781	1.942798	0.1240
Dependency Ratio	0.0652	1.369283	0.2428
C	0.0761	0.8535	0.7550
R-squared	0.92746		

Table 4 ARDL Long Run and Short Run Results

The effect of the younger working age population on the excess market return is significant enough to explain changes in the Equity Risk Premium. However, the rest of the independent variables i.e. the 40-59 cohort and the dependency ratio are not significant enough to explain the changes in the equity risk premium in the long run. According to Brooks (1998), the positive correlated relationship between asset prices and the size of the cohorts as seen in the above results is known as the 'aggregate saving hypothesis'.

Chapter Five: Conclusion and Recommendations

5.1 Conclusion

The questions that this study was attempting to shed light on were whether demographic transitions in the country affect the equity risk premium and in the event that they do, whether the effect is positive or negative. Based on the results acquired in chapter 4, demographics explain to an extent the movements in the equity risk premium. Age 25-39 is the strongest cohort in terms of the effect it has on the equity risk premium. An increase in this cohort sees a decrease in the excess returns of the market. This finding is consistent with Modigliani & Ando's, (1963) Life Cycle Hypothesis.

At this age, individuals are net borrowers and they use the money borrowed to consume and to make investments in assets pertaining to the beginning of a life. The cohort between 40-59 on the other hand however are net savers. Given that they have worked for a few years, it is assumed that they begin saving in preparation for retirement. Saving at this age composes of investments in securities traded in the stock exchange among many other assets. An increase in the investment then increases the return. The findings in section four are consistent with this hypothesis. The coefficient on the 40-59 cohort is positive both in the short run and in the long run.

The dependency ratio is the middle to old ratio. This shows the number of working individuals supporting the non-working individuals. A high ratio means more individuals are working relative to those who are supported and a lower ratio depicts a lower number of working individuals. The positive coefficients in the results in section two show a positive relationship between dependency ratio and equity risk premium. These findings are also an extension of the life cycle hypothesis; an increase in the middle age cohort increases the investment in securities and therefore increases the returns over and above the risk premium.

In the long run however, the effect of demographic variables on the equity risk premium weakens and the only variable with a significant effect is the 25-39 cohort. One reason for this could be the fact that over time, emerging factors that are neither demographic factors nor macroeconomic factors begin affecting the Equity Risk Premium.

Poterba (2001), posits that on a macro level there is little evidence of a 'robust' historical relationship between demographic structure and financial asset returns. He critically reviewed the above studies and found many faults with the empirical model specifications, attributed to the limitation of

statistical tests, poor data construction, lack of testing for unit roots, overfitting with too many demographic variables, and few effective degrees of freedom. This study however attempts to correct the faults done by other studies as mentioned by Poterba (2001) by for example testing for unit roots and using only the demographic variables that are in line with the ARDL model.

5.2 Recommendations

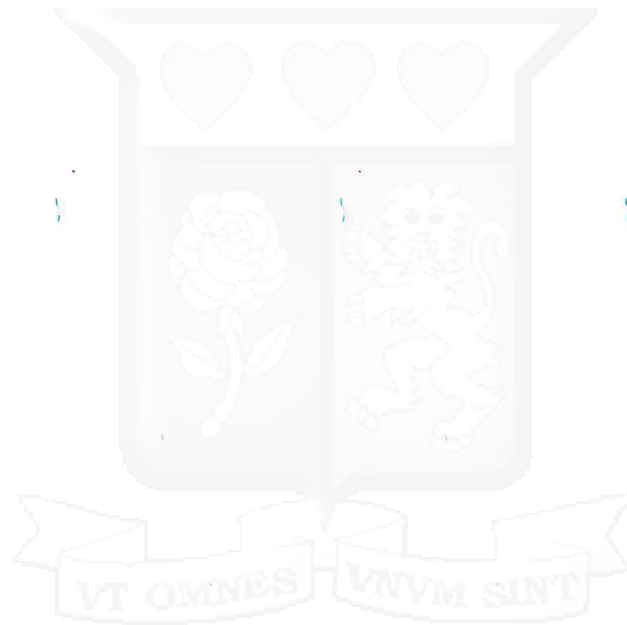
70% of the population in Kenya is estimated to comprise of the youth meaning there is a youth bulge in the country. The median age in Kenya as estimated by the UN is 19 years old. This means that the population is expected to be youthful for a long period of time. If the results of this study hold, then the expectation is that there will continue to be little participation in the stock market for a longer period of time. This withstanding, there is need to incentivize the youth in Kenya to invest in the stock market. Some key recommendations to encourage youth participation in the Kenyan stock Market include:

Free educational enlightenment programs to educate the youth on benefits of trading in the stock market. Kenya has seen the rise of such programs as curated by companies such as Valuraha and Abacus. Valuraha focuses on educating secondary school students using a mentor approach on the benefits of investments. This is to ensure that their interest is piqued at an earlier age. Despite this being a step in the right direction, more players need to come on board with the initiative to ensure a wider reach and more impact.

Enabling the youth to have easier access to the stock market. This serves the purpose of eliminating as much as possible all the barriers to trading. Equity Bank is an example of a commercial bank in the country that champions this cause. In the event of opening a bank account with equity, they give you an option of opening a trading (CDS) account as well. This reduces the chain of involvement that an individual goes through in order to start trading. It also serves as an incentive because the work is made easier for traders.

Finally, in order for the incentives to work, there needs to be direct involvement of the market authorities in pushing for youth participation. In recent times there has been an increase in the involvement of the Nairobi Stock Exchange with regard to encouraging youth participation. An innovation around this field is the NSE challenge which brings together several young people to compete in a virtual simulated stock competition. There are different kinds of rewards, ranging

from cash rewards to internship opportunities. This sort of incentives done on a larger scale are a step in the right direction in involving the youth in various investment activities.



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