



**University of Fort Hare**  
*Together in Excellence*

**AN ANALYSIS OF CAUSALITY BETWEEN SAVINGS AND ECONOMIC GROWTH  
IN SOUTH AFRICA: (1980-2006)**



**TAKINDA MUROMBO**  
**University of Fort Hare**  
*Together in Excellence*

**A DISSERTATION SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS OF  
THE DEGREE OF MASTER OF COMMERCE IN ECONOMICS.**

**DEPARTMENT OF ECONOMICS**

**FACULTY OF MANAGEMENT AND COMMERCE**

**UNIVERSITY OF FORT HARE**

**SOUTH AFRICA**

**NOVEMBER 2008**

**SUPERVISOR: Prof M. NCUBE**

## ABSTRACT

The causal relationship between savings and economic growth has largely remained a debatable subject despite much research into this relationship. A number of recent empirical studies cast doubt on the unidirectional relationship using both time series and cross sectional data and have come up with different results supporting the possibility of bi-directional causal relationships. The literature has also suggested the relationship may differ from country to country. Although the relationship between savings and economic growth was established long ago in development economics, the recent fundamental dispute is centred around whether savings lead to growth of the economy or it is economic growth which leads to more savings or whether there is a bi-directional relation between the two. This study sought to determine empirically the direction of causality, if any, between gross domestic savings and economic growth in South Africa using time series data for the period 1980-2006. Unlike the traditional macroeconomic growth theory, which identifies unidirectional causality, the study sought to examine a two-way causal relationship between domestic savings and economic growth. The study utilised the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) techniques to test for stationarity. It went on to use the Johansen-Juselius technique to test for cointegration. The Granger causality tests performed suggest a uni-directional causality that runs from savings to economic growth in the short-run while bi-directional causality exists in the long-run.

**Key words:** Gross domestic savings, Economic growth, South Africa, Causality, Cointegration, Dickey-Fuller (DF), Augmented Dickey Fuller test (ADF), Investment.

## DECLARATION AND COPYRIGHT

I, the undersigned Takunda Murombo student number 200302027, do hereby declare that this dissertation is my own original work and that it has never been presented to another institution for the award of a degree.

.....

Signature



Date

University of Fort Hare  
*Together in Excellence*

## ACKNOWLEDGEMENTS

Firstly, I would like to deeply thank my supervisor Professor M. Ncube who provided me with useful and helpful assistance. Without his care and consideration, this dissertation would likely not have matured.

Secondly, the financial assistance by the Department of Labour (DST) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the DST or University of Fort Hare.



Finally, I would like to thank my entire family for their love and support during the period of this study. It would not have been easy without them by my side. I would also like to express my gratitude to my colleagues in the department who contributed corrections and good suggestions.

University of Fort Hare  
*Together in Excellence*

## DEDICATION

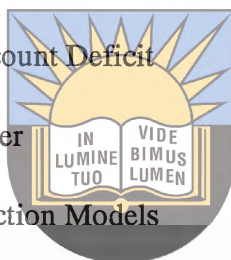
I dedicate this dissertation to my wife Sarah and daughter Charliene.



University of Fort Hare  
*Together in Excellence*

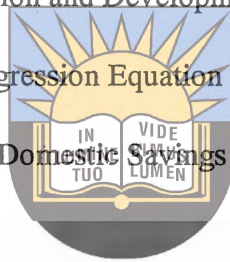
## LIST OF ACRONYMS

ADF	Augmented Dickey-Fuller
ANC	African National Congress
AR	Autocorrelation
ARCH	Autoregressive Conditional Heteroscedasticity
ASGISA	Shared and Accelerated Growth Initiative for South Africa
CAD	Current Account Deficit
DF	Dickey-Fuller
ECM	Error Correction Models
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GDS	Gross Domestic Savings
GEAR	Growth, Employment and Redistribution
GNP	Gross National Product
HIC	Higher-Income Country
IMF	International Monetary Fund
JIPSA	Joint Initiative on Priority Skills Acquisition
LCH	Life Cycle Hypothesis
LIC	Low-Income Country
LMC	Low-Middle Income Country



University of Fort Hare  
*Together in Excellence*

MENA	Middle East and North Africa
MTEF	Medium Term Expenditure Framework
NP	National Party
PFMA	Public Finance Management Act
PIH	Permanent Income Hypothesis
R&D	Research and Development
RDP	Reconstruction and Development Programme
RESET	Ramsey Regression Equation Specification Error Term
RGDS	Real Gross Domestic Savings
S	Savings
SA	South Africa
SARB	South African Reserve Bank
SASI	South African Savings Institute
TFP	Total Factor Productivity
UK	United Kingdom
UMC	Upper-Middle Income Country
US	United States
USA	United States of America
VAR	Vector Auto Regression Model
VECM	Vector Error Correction Models
YP	Permanent income



University of Fort Hare  
*Together in Excellence*

## TABLE OF CONTENTS

<b>ABSTRACT .....</b>	<b>i</b>
<b>DECLARATION AND COPYRIGHT .....</b>	<b>ii</b>
<b>ACKNOWLEDGEMENTS.....</b>	<b>iii</b>
<b>DEDICATION.....</b>	<b>iv</b>
<b>LIST OF ACRONYMS .....</b>	<b>v</b>
<b>TABLE OF CONTENTS.....</b>	<b>vii</b>
<b>CHAPTER 1 .....</b>	<b>1</b>
<b>INTRODUCTION.....</b>	<b>1</b>
1.1: BACKGROUND OF THE STUDY.....	1
1.2: STATEMENT OF THE PROBLEM.....	4
1.3: AIM AND OBJECTIVES OF THE STUDY.....	5
1.4: HYPOTHESIS .....	6
1.5: SIGNIFICANCE OF THE STUDY.....	6
1.6: ORGANISATION OF THE STUDY .....	7
<b>CHAPTER 2 .....</b>	<b>8</b>
<b>LITERATURE REVIEW.....</b>	<b>8</b>
2.1: INTRODUCTION .....	8
2.2: THEORIES ON THE ROLE OF SAVINGS IN ECONOMIC GROWTH.....	8
2.3: THEORIES ON THE ROLE OF ECONOMIC GROWTH IN SAVINGS.....	20
2.4: EMPIRICAL LITERATURE .....	27
<b>CHAPTER 3 .....</b>	<b>51</b>
<b>OVERVIEW OF SAVINGS AND ECONOMIC GROWTH IN SOUTH AFRICA .....</b>	<b>51</b>
3.1: INTRODUCTION .....	51
3.2: TRENDS IN ECONOMIC GROWTH: 1980-1992 .....	57



**University of Fort Hare**  
*Together in Excellence*

3.3: TRENDS IN ECONOMIC GROWTH: 1993-2006 .....	62
3.4: GROSS DOMESTIC SAVINGS IN SOUTH AFRICA.....	65
3.4.2: ANALYSIS OF THE COMPONENTS OF GROSS SAVINGS .....	67
3.4.3: TRENDS IN SAVINGS BY THE PRIVATE SECTOR (HOUSEHOLD AND CORPORATE SAVINGS) .....	70
3.5: COMPARING SOUTH AFRICA’S SAVINGS WITH OTHER COUNTRIES .....	80
3.6: RELATIONSHIP BETWEEN REAL GROWTH RATE IN GROSS DOMESTIC SAVINGS (GDS) AND REAL GROSS DOMESTIC PRODUCT (GDP).....	81
3.7: CONCLUSION.....	82
<b>CHAPTER 4 .....</b>	<b>83</b>
<b>METHODOLOGY AND DATA ANALYSIS .....</b>	<b>83</b>
4.1: INTRODUCTION .....	83
4.2: MODEL SPECIFICATION.....	83
4.3: DEFINITION OF VARIABLES AND SOURCES.....	87
4.4: REVIEW OF ESTIMATION TECHNIQUES .....	88
4.4.1: TESTING FOR STATIONARITY .....	89
4.4.2: DICKEY-FULLER (DF) AND AUGMENTED DICKEY-FULLER (ADF) TESTS ...	89
4.4.3: COINTEGRATION AND ERROR CORRECTION MODELLING (ECM) .....	93
4.5: PRESENTATION OF RESULTS .....	102
4.5.1: ANALYSIS OF RESULTS .....	105
4.6: CAUSALITY TESTS .....	111
4.6.1: GRANGER CAUSALITY RESULTS .....	114
4.7: CONCLUSION.....	116
<b>CHAPTER 5 .....</b>	<b>117</b>
<b>CONCLUSIONS AND POLICY RECOMMENDATIONS .....</b>	<b>117</b>
5.1: CONCLUSIONS.....	117
5.2: POLICY RECOMMENDATIONS .....	120
5.3: LIMITATIONS OF THE STUDY.....	121



**University of Fort Hare**  
*Together in Excellence*

5.4: AREAS FOR FURTHER RESEARCH.....	121
REFERENCES.....	122
APPENDIX.....	131

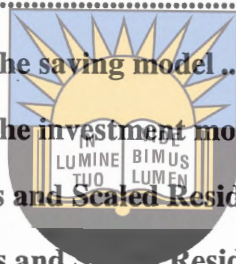
### LIST OF TABLES

Table 2.1: Summary of key results on causality between savings and economic growth.....	49
Table 3.1: Gross Capital Formation as a ratio of GDP (Percentage).....	61
Table 3.2: Ratio of gross fixed capital formation to GDP .....	65
Table 3.3: Components of gross saving as percentage of gross product (1980 -2005).....	69
Table 3.4: South Africa's gross saving as percentage of gross domestic product compared to middle-income economies .....	81
Table 4.1: The Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) results .....	91
Table 4.2: Cointegration analysis for the saving model period 1980 to 2006.....	97
Table 4.3: Cointegration results for the Investment Model period 1980 to 2006.....	99
Table 4.4: Results of saving as a function of growth, interest rate, political instability, income per capita, inflation, financial sector development plus the error term. ....	103
Table 4.5: Results of Investment as a function of interest rate, credit, political instability, financial sector development, growth, savings, dummy variables and the error term .....	104
Table 4.6: Granger causality results based on the Wald F-test.....	114

### LIST OF FIGURES

Figure 1: Effects of saving rate on income and growth.....	13
Figure 2: Income stream of an individual from Youth to Retirement years.....	22
Figure 3.1: GDP Growth, GDP per Capita and Population Growth.....	58
Figure 3.2: Ratio of Balance of current account to GDP .....	60

<b>Figure 3.3: GDP Growth in the Post-Apartheid era.....</b>	<b>62</b>
<b>Figure 3.4: Gross saving as percentage of GDP .....</b>	<b>67</b>
<b>Figure 3.5: Trends in the Corporate sector’s savings.....</b>	<b>71</b>
<b>Figure 3.6: Trends in Household savings.....</b>	<b>75</b>
<b>Figure 3.7: Private savings and bank deposit rate.....</b>	<b>79</b>
<b>Figure 3.8: Trends in Government saving as a ratio of GDP .....</b>	<b>80</b>
<b>Figure 3.9: Relationship between real rate of GDS and real GDP growth.....</b>	<b>82</b>
<b>Figure 4.1: Stationarity graphs.....</b>	<b>93</b>
<b>Figure 4.2: Cointegration vectors for the saving model .....</b>	<b>98</b>
<b>Figure 4.3: Cointegration vectors for the investment model .....</b>	<b>100</b>
<b>Figure 4.4: Actual versus Fitted values and Scaled Residuals for the Saving model .....</b>	<b>106</b>
<b>Figure 4.5: Actual versus Fitted values and Scaled Residuals for the Investment model..</b>	<b>107</b>



**University of Fort Hare**  
*Together in Excellence*

## CHAPTER 1

### INTRODUCTION

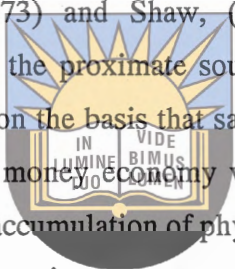
#### 1.1: BACKGROUND OF THE STUDY

The relationship between savings and economic growth has received widespread attention across the globe in recent years. This is attributed to the fact that ranking countries according to their savings rates has been found to be very useful in explaining their growth. However, empirical evidence has cast doubt on the traditional theoretical explanations which assume a unidirectional causal relationship between savings and growth i.e. high growth must be financed by high savings. The experiences of certain countries show that despite their high savings rate, they recorded large current-account deficits, although the traditional theory states that in the long run, economic growth and development of a country is dependent on the level of its savings rate. Such a relationship dates back to the 1950s when economists hypothesised that savings and economic growth are positively correlated. For example, Eisner, (1995) clearly indicates that saving and growth are inextricably intertwined, and more particularly, that you cannot have one without the other. This assertion has necessitated the question of which is the cause and which is the effect? Is it savings that generate growth or is it growth that generates savings? There has been no categorical answer to this question. The answers to this question have varied and are dependent on the economy in question.

Despite the fact that the strong correlation between these variables is firmly established, researchers have found it difficult to identify the precise link between them. The direction of causality between domestic savings and economic growth is still far from clear with different theories supporting either direction (Agrawal, 2001). This relationship can be traced back to the traditional classical models (neoclassical growth models) of economic growth of Ramsey (1928), Harrod (1939), Domar (1946) and Solow (1956). The fundamental ideas of these growth models suggest that savings or capital accumulation causes or leads to economic growth. This comes from the fact that increases in savings will translate into higher capital investment which in-turn will stimulate economic growth (Dawit, 2003). In a closed economy, saving is the accumulation

of assets or investment. In other words, savings and investment are identical. Therefore the effect of increasing savings is to increase the availability of a supply of loanable funds to capital investments. The more capital goods a nation has at its disposal, the more goods and services it can produce and the resultant increases in demand created by the availability of goods and services will lead to economic growth. This entails that the causality runs from savings to growth and may explain variations in economic performances of the country.

With the same theoretical underpinnings of savings running to growth, are the advocates of financial liberalisation McKinnon (1973) and Shaw, (1973). They indicated that capital accumulation or physical investment is the proximate source of economic growth. They have long argued for financial liberalisation, on the basis that saving is complementary to investment in the development process, even in a money economy where savings can go either into the accumulation of money balances or the accumulation of physical capital. However, the advocates of financial repression have argued that savings are not necessarily channelled into investment. (Tobin, 1965), has argued that what is important for growth is not prior savings, but rather the prospect of profit and the elastic supply of credit to the private sector.



University of Fort Hare  
*Together in Excellence*

The proposition that an increase in the private propensity to save implies an increase in household and corporate savings as a result of an increase in income will enhance accumulation of capital which has a favourable effect on economic growth is very popular with institutions such as the International Monetary Fund (IMF) and the World Bank. These institutions have encouraged both developed and developing countries to take policy measures that promote the private propensity to save and to do as much as possible to check public deficits which are seen as a major threat to growth (Palumbo, 1996). South Africa is also following this proposition. This is evidenced by the Government's Growth, Employment and Redistribution Strategy (GEAR) which has indicated that the aggregate saving rate needs to be raised to 23% of the gross domestic product in order to support an average economic growth rate of more than 4% per year in real income (Prinsloo, 2000). In addition to this, there has been increased recognition by the South African government and financial sector in general that the absence of basic financial

services, particularly in rural areas, is a major obstacle to growth and poverty reduction. As a result of this, the South African financial sector committed itself to the Financial Sector Charter which acknowledged that “access to first-order retail financial services is fundamental to black economic empowerment and to the development of the economy as a whole” (Banking Council of South Africa, 2003:9). The parties to the Financial Sector charter thus committed to increase substantially effective access to retail financial services for the lower income groups by 2008.

In contrast to the above proposition, the life-cycle model of Modigliani theorizes that the relationship between savings and growth works in the other direction. This implies that higher growth rates of savings may result from higher rates of growth of real income (real GDP), taking into account the fact that, if income rises rapidly, consumers can increase both their consumption and savings more rapidly. This assumption is consistent with the finding that higher rates of savings are correlated with higher income per capita. As a result of this, it can be stated that the more quickly a country increases its income per capita, the more rapidly it should expect the savings rates to rise. This view entails the country pursuing policies that are aimed at improving growth. The causality in this case runs from growth to savings. The Keynesian view states that change in the country’s rate of economic growth will affect its aggregate saving rate.

Thus the existing growth theories predict the causal link to run both-ways from savings to economic growth and vice versa. Given the two different views, this study aims to explore empirically the actual direction of causality and test whether the economic growth in recent years in South Africa has been conducive for higher domestic savings and vice versa using causal and co-integration test procedures. In particular the study will use the causality testing framework first introduced by Granger (1969) and later modified by Engle and Granger (1987). The finding of the study will help to gain further insight into this highly debatable issue of the direction and association between saving and growth.

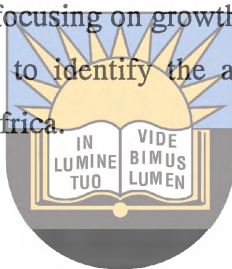
## 1.2: STATEMENT OF THE PROBLEM

Despite the adaptation and implementation of a new economic policy since 1995, that targets an increase in savings and economic growth, South Africa has failed to achieve the targeted goals and maintain sustainable economic growth. The country has been affected by a slow growth rate in domestic savings and economic growth for the past several years dating back to the early 1980s. This is evident from the various strategic policies to promote growth that were introduced by the government, particularly soon after attaining its independence in 1994. In 1995 when the African National Congress (ANC) took power from the apartheid regime, it implemented a macroeconomic policy which emphasized fiscal deficit reduction, a tight monetary policy combined with rapid trade liberalisation. The general objective of this macroeconomic policy was to achieve a strong economic growth that would lay the basis for a reduction in unemployment and a more equitable distribution of income and wealth. This objective gave rise to the Growth, Employment and Redistribution programme (GEAR) whose aim was to grow the economy, generate jobs and promote an equitable distribution of income with a target of 6% growth by the year 2000 (Treasury, 1996). Given that the central goal of GEAR was growth of the GDP, the outcomes in the "mid term" review of 1998 showed that the actual performance fell short of the target, 1% compared to 3.4%. The review also showed that growth rate had declined continuously below one percent for each quarter from 1997 to 1998. In fact the growth of output was less than a third of its target (Weeks, 1998). Recognising that the objectives of growth were never met the South African government again continuously introduced other programmes such as Shared and Accelerated Growth Initiative for South Africa (ASGISA) and Joint Initiative on Priority Skills Acquisition (JIPSA) but still growth has not improved to the expected level.

Economic literature indicates that savings provide the means for capital formation, which is in turn critical for economic growth. However, in the case of South Africa, while there has been some improvement in the growth of the economy for the last two or three years, gross domestic savings have been decreasing since 1980. This decrease has been accompanied by a fall in domestic investment. The national savings rate which is defined as the ratio of national savings to gross national disposable income has remained well above 20 % in the 1980s. But, this rate has subsequently fallen to less than 20% in the first years of the new millennium (Prinsloo,

2000). Having established organisations such as the South African Savings Institute (SASI) which promotes savings within the South African population has produced little improvement in the growth of savings.

Despite the fact that the South African government has tried to devise policies that stimulate both growth and savings, this has not resulted in any significant improvement. In view of the fact growth, which is necessary for saving, is very low while savings which are critical for growth are continuously decreasing, the important question to ask is how the South African economy can grow and savings increase. Is it through focusing on growth or is it through focusing on savings? The purpose of this study is therefore, to identify the actual direction of causality between savings and economic growth in South Africa.



### 1.3: AIM AND OBJECTIVES

University of Fort Hare

*Together in Excellence*

The overall aim of this study is to examine the actual direction of causality between savings and economic growth for South Africa using investment as an intermediate link between savings and economic growth, in order to better inform the policy debate on how economic growth can be enhanced.

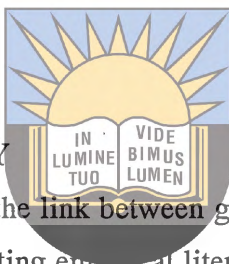
The objectives of the study are:

- To establish empirically whether a causality relationship exists between savings and economic growth.
- To determine empirically the direction of causality between savings and economic growth in South Africa using econometrics techniques.

#### 1.4: HYPOTHESIS

This study hypothesised that there is a positive and bi-directional causality relationship between savings and economic growth. Thus we assume that savings enhance investment, which in turn further boost savings in the economy. Therefore, the following are the null hypotheses of this study:

- There is a positive relationship between savings and economic growth.
- There is a two-way causal relationship between savings and economic growth i.e. savings cause economic growth and an increase in economic growth causes an increase in savings.



#### 1.5: SIGNIFICANCE OF THE STUDY

There is little published information on the link between growth and savings in South Africa so this study seeks to contribute to the existing empirical literature. This study will give an insight into the relationship between savings and growth in the South African community using panel data on the proxy variables. Identifying the link between these variables will provide more information for policy makers and economic agents in South Africa. This is very important in the sense that it can influence their investment decisions particularly if they realise that whatever they do, which is related to the growth of income and savings, will boost the economy. This will effect an improvement in the standard of living in the country through the creation of new employment.

Another unique feature of this study is that it will attempt to overcome the problems encountered in previous studies. Thus, the study will employ a longer time-series for one country (South Africa, 1980-2006). It will also test the presence of unit roots before proceeding to estimations. The rigorous employment of econometric issues of cointegration and causality, will offer the advantage of testing the existence of a positive long run relationship between savings and growth from which some policy conclusions can be drawn as explained below.

The identification of the causal linkage between savings and growth is important not only for understanding the process but for the design of policy. If, for instance, savings are found to drive growth through the automatic translation of savings into capital formation, then policy makers would direct their policy at encouraging savings. If on the other hand growth is found to drive savings then policy would be directed to encourage growth in the economy.

## **1.6: ORGANISATION OF THE STUDY**

The study is organized into five chapters as follows. Chapter 1 provides an introduction to the study. Chapter 2 gives an overview of both theoretical and empirical literature on the relationship between savings and economic growth. The overview of savings and economic growth is covered in Chapter 3. Chapter 4 explores the methodology and data analysis employed in the study. Finally, conclusions, policy recommendations, limitations and areas for further research are covered in chapter 5.



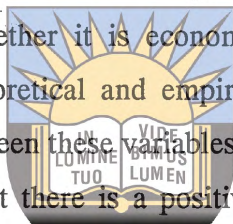
**University of Fort Hare**  
*Together in Excellence*

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1: INTRODUCTION

A lot has been published on the relationship between growth and domestic savings in many different contexts. While there is a general consensus on the broad theoretical literature on the importance of savings for a country's long-term growth, the empirical literature varies greatly and there is a debate on the direction of the relationship; that is, whether the domestic savings rate enhances economic growth or whether it is economic growth which drives growth in savings. This chapter reviews both theoretical and empirical literature which shows there is positive and significant relationship between these variables. The first part of the chapter reviews some of the theories which indicate that there is a positive relationship between savings and growth. These include the financial liberalisation hypothesis, neoclassical growth model, endogenous growth model and the life-cycle hypothesis and permanent income hypothesis. The role of growth in savings will be explained in the life-cycle hypothesis and permanent income hypothesis. The second part of the chapter reviews the empirical literature.



University of Fort Hare

#### 2.2: THEORIES ON THE ROLE OF SAVINGS IN ECONOMIC GROWTH

##### *i. McKinnon-Shaw model: Financial liberalisation hypothesis*

McKinnon (1973) and Shaw (1973) put forward an argument for financial liberalisation in financially repressed developing countries by arguing that the various forms of financial repression such as interest ceilings, high reserve ratios and implicit credit programs impede the development of financial markets. They argued that the consequences of this are a reduction in the flow of funds to the formal financial sector and the distortion of the allocation of resources, especially on lower financial savings, credit supply, investment and hence economic growth and development. Regulation does have a negative impact on the amount of domestic savings and

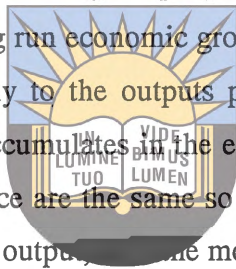
thus capital formation. It is against this backdrop that they argued for maximum financial liberalisation because of its impact on saving, investment and growth.

In his argument for financial liberalisation McKinnon (1973) indicated that money holdings and capital accumulation are complementary in the development process. Because of the lumpiness of investment expenditure and the reliance on self-financing, agents need to accumulate money balances before investment takes place. Positive (and high) real interest is necessary to encourage agents to accumulate money balances, and investment will take place as long as the real rate of return on investment exceeds the real rate of interest. On the other hand, Shaw's argument stresses the importance of financial liberalisation for financial deepening, and the beneficial effect of high interest rates on encouragement to save and discouragement to invest in low-yielding projects. The increased liabilities of the banking system, resulting from higher real interest rates, enable the banking system to lead more resources for productive investment in a more efficient way (Thirwall, 2003: 424). Contrary to the above views are the advocates of financial repression for example Tobin, (1965), who argue that saving is not necessarily channelled into investment. He argued that what is important for growth is not prior saving, but rather the prospect of profit and the elastic supply of credit to the private sector.

McKinnon and Shaw in this model therefore assume that financial liberalisation will be associated with higher real interest rates, as financial restrictions in the financial system are reduced (artificial ceilings) and would finally stimulate savings. The prime assumption in this model is that saving is responsive to interest rates, and higher savings rates in this case will finance a higher level of investment which will lead to a higher economic growth rate. Thus, the policy implication of this model is that an increase in interest rate towards its level of equilibrium through its impact on better resource allocation should eventually lead to higher savings, investment and economic growth.

**ii. The neoclassical growth model (Solow 1956 and Swan 1956)**

The neoclassical model of economic growth (closed economy) is famously known as Solow (1956) and Swan (1956) model. The model claims that the steady-state or proportional growth in a manner that there are no induced changes in relative prices over time, long-run level of per capital income is determined by the rates of saving and population growth. In particular the model proposes that an increase in the stock of capital leads to a higher level output and faster growth at least in the short to medium term (In the strategies of economic development, unlike the Harrod-Domar model, that assumes capital accumulation is the engine of growth, the Solow-Swan model identified that continued technological progress is critical for sustained per capita growth). The Solow-Swan model of long run economic growth consists of a production function which relates the inputs in the economy to the outputs produced and a capital accumulation equation which describes how capital accumulates in the economy. The assumption in this case is that the population and the labour force are the same so that output per capita and output per worker are equal. The share of saving in output, in the model is fixed. The production function equation is expressed as:



University of Fort Hare  
*Together in Excellence*

$$y = f(k), \dots\dots\dots 1$$

This equation shows that output per head  $y$  is a function of capital per head  $k$ .

With the macroeconomic equilibrium condition, where aggregate demand equal aggregate supply, the Solow-Swan model investment (I) is equal to savings (S) (closed economy)

$$I = S \dots\dots\dots 2$$

The change in the capital stock is equal to the investment net of depreciation. With a capital stock  $K$ , we assume that depreciation is a fixed proportion of  $K$  equal to  $dK$ . Then the change in capital stock is equal to investment minus depreciation:

$$\Delta K = I - dK \dots\dots\dots 3$$

Assuming that saving is a fixed proportion of national output, then

$I = S = sQ$ . Therefore,

$$\Delta K = sQ - dK \dots\dots\dots 4$$



### University of Fort Hare

Dividing both sides of this equation by the size of labour force, we have

$$\Delta K/L = sq - dk \dots\dots\dots 5$$

The population is assumed to grow at a constant proportional rate  $n$ , and is the same as the labour force growth rate. Thus  $\Delta L/L = n$ . Technological progress is also assumed to be zero initially.  $k = K/L$ , the proportional growth rate is given by

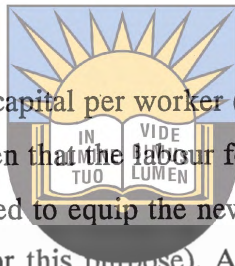
$$\Delta k/k = \Delta K/K - \Delta L/L = \Delta K/K - n \dots\dots\dots 6$$

Thus,  $\Delta K = (\Delta k/k) K + nK$ . Dividing both sides of the equation by  $L$ , will give us

$$\frac{\Delta K}{L} = \Delta k + nk$$

Replacing this expression for  $\Delta K/L$  in equation 5, we arrive at the fundamental equation of capital accumulation:

$$\Delta k = sq - (n + d)k \dots\dots\dots 7$$



This key equation states that growth in capital per worker ( $\Delta k$ ) is equal to the rate of savings per capita  $sq$  minus the term  $(n + d) k$ . Given that the labour force is growing at the rate  $n$ , a certain amount of per capita saving must be used to equip the new entrants into the labour force with  $k$  capital per worker ( $nk$  must be used for this purpose). Also a certain amount of per capita of saving must be used to replace depreciating capital ( $dk$  must be used). Thus, in total  $(n+d)k$  in per capita savings must be used to keep the capital-labour ratio constant at the level  $k$ . Any saving above the amount  $(n + d) k$  leads to a rise in the capital-labour ratio ( $\Delta k > 0$ ), (Sachs and Larrain, 1993).

Equations 1 and 2 have a unique (stable) equilibrium solution for output per head and capital per head (Given that there is no technical change). The steady state growth rate of total output is given by the assumption that, at the rate of population growth  $n$ , and the capital-output ratio,  $v$  adjusts to equal the ratio  $s/(n + d)$ . Thus, in the steady state, both  $k$  and  $q$  reach a permanent level. In order for the steady state to be reached per capita saving must exactly equal capital widening, so that  $\Delta k = 0$ . Mathematically expressed

$$sq = (n+d)k$$

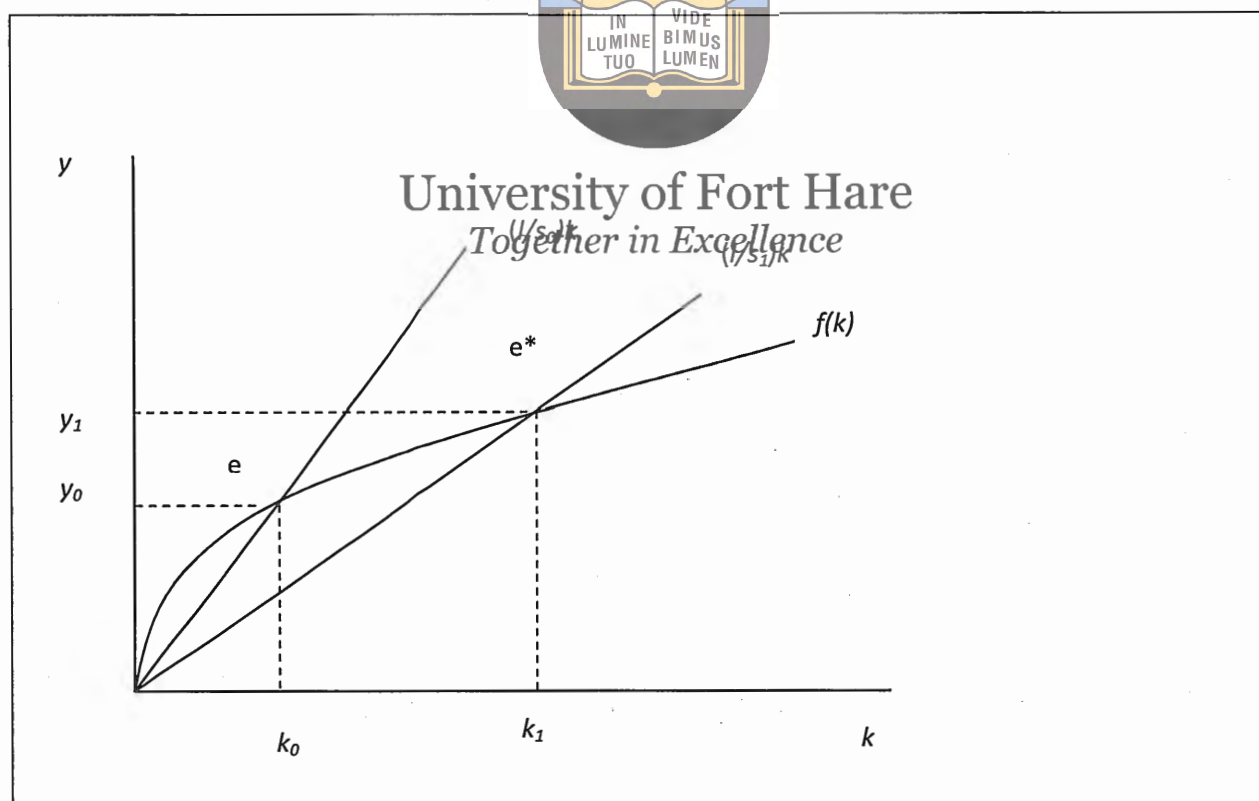
Although the steady state means a constant value of  $q$  and  $k$  it does not mean that growth is zero. There is positive growth of output at the rate of  $n$ . Therefore increases in the saving rate increase the capital output ratio, raise output and capital per head.

### Effects of the saving rate on Income and Growth

A question that can be posed is whether it is true that a higher rate of saving leads to faster economic growth. This question can be answered if we consider the following diagram. Suppose there is an increase in the saving rate.



**Figure 1: Effects of saving rate on income and growth**



With a saving rate of  $s_0$ , the equilibrium is at  $e$ . Given that there is an increase in the saving rate to  $s_1$ , this will shift the equilibrium to  $e^*$ . The shift in the saving rate will in this case increase per capita output and per capita stock in the steady state. This implies that the higher rate of savings

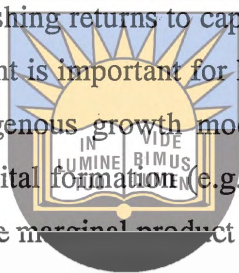
will generate more investment per unit of output as compared to the lower saving rate which will lead to an expansion of capital per worker. This process however does not have an effect on the long run equilibrium growth rate because this saving-investment ratio is offset by a higher capital-output ratio as a result of diminishing returns to capital. The savings rate in this case will thus only influence the level of per capita capital stock and thus per capita output towards which the economy gravitates in equilibrium, rather than the rate at which either magnitude changes (Romm, 2005).

Briefly the Solow-Swan model is a model which is designed to show how growth in capital stock, growth in the labour force and advances in technology interact and how they affect the total output of a nation. In this model the capital stock is a key determinant of the economy's output and any changes in the capital stock can lead to economic growth. The model further shows that the level of the economy is a key determinant of the steady-state capital stock. It indicates that if the savings rate is high the economy will have a large capital stock and a high level of output. Likewise it also indicates that if the savings rate is low the economy will have a small capital stock and a low level of output. Higher savings in the Solow-Swan model therefore leads to faster growth –but only temporarily (in the short to medium term). This means that an increase in the rate of savings raises growth until the economy reaches the new equilibrium or new steady state.

Although the Solow-Swan model has managed to explain the role of savings in economic growth, it has been criticized, in the sense that it performs poorly when it is applied to empirical evidence. Although the model was the first to incorporate technical progress which influences labour productivity as a variable that explains economic growth, they did not clarify how technical progress (assumed exogenous) comes into existence. This view attracted considerable criticism from a number of authors (e.g. Kaldor 1957, Robinson 1962) on the grounds that the separation between investment and innovation (or technical change) was artificial, as most technical innovation tends to be embodied in new machinery and equipment. Moreover the

model did not consider other things such as the role of institutions, history, social and political systems.

The fact that an increase in the savings rate will not have an effect on the long run equilibrium growth rate is however resolved with the introduction of technological change which is exogenous in the Harrod-Domer model in the endogenous growth model of Romer (1986). In the Romer model where technology is endogenous, an increase in the savings rate not only increases per capita output in a steady state but it also increases the growth rate of per capita output. The model relaxes the assumption of diminishing returns to capital and it assumes that if there are no diminishing returns to capital, investment is important for long run growth, and growth becomes endogenous in this case. In this endogenous growth model there are assumed to be positive externalities associated with human capital formation (e.g. education and training) and research and development (R&D) that prevent the marginal product of capital from falling and the capital-output ratio from rising. Also learning by doing and embodied technical progress as well as technological spillovers from trade are additional possibilities of education and development.



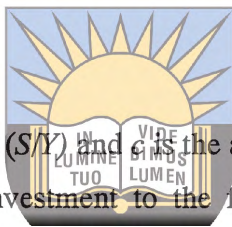
University of Fort Hare  
*Together in Excellence*

In conclusion, it could be stated that both the Solow-Swan model and the Romer model in this case show that an increase in the savings rate will lead to growth. A surprising implication of Solow's view was that savings will not sustain growth because savings divert money from consumption today toward buying machinery for the production tomorrow, but this does not raise the long-term rate of growth due to the unavoidable diminishing returns to increasing machines that set in. But the high saving economy would have higher income than the low-saving economy. Although the Solow-Swan model indicates that savings rates have a short to medium effect on the growth rate, the Romer growth model indicates that when technology is seen as endogenous, the increase in the growth rate will be permanent.

### iii. Harrod-Domar Growth Model

The Harrod-Domar model is a growth model which was developed in 1946. The model was developed precisely to analyse the business cycle. However it was later adapted to explain economic growth. According to the Harrod-Domar model there are three concepts of growth i.e. the actual growth rate ( $g$ ), warranted growth ( $g_w$ ) and the natural growth rate ( $g_n$ ). The actual growth rate is defined as

$$g = s/c \dots\dots\dots 1$$



where  $s$  is the ratio of savings to income ( $S/Y$ ) and  $c$  is the actual incremental capital-output ratio, that is, the ratio of extra capital or investment to the flow of output ( $\Delta K/\Delta Y = I/\Delta Y$ ). The expression of the actual growth rate (1) is ~~blacked out~~ it expresses the accounting identity that savings equal investment. This can be seen if we substitute the expressions for  $s$  and  $c$  into the equation (1) -  $s/c = (S/Y)/(I/\Delta Y) = \Delta Y/\Delta K = I$ , where  $I$  measures the growth of output.

To identify whether the actual growth rate will provide the basis for a steady advance in the future, in the sense that it keeps plans to invest and plans to save in line with one another at full employment, the Harrod-Domar model introduced the concepts of the warranted rate of growth and the natural rate of growth. The warranted rate of growth as defined by Harrod is that rate of growth which, if it occurs, will leave all parties satisfied that they produced neither more nor less than the right amount or it will put them into a frame of mind which will cause them to give such orders as will maintain the same rate of growth. Put differently, the warranted growth rate is the rate that induces enough investment to match planned saving and thus keeps capital fully employed, (in this scenario there is no under capacity or overcapacity) so that manufacturers are willing to carry on the investment in the future at the same rate as in the past. This rate is determined given that plans to save at any point in time are given by the Keynesian savings function:

$$S = sY \dots\dots\dots 2$$

where  $s$  is the propensity to save. This gives the potential supply of investment goods. The demand for investment is given by the acceleration principle, where  $c_r$  is the accelerator coefficient measured as the required amount of extra capital or investment to produce a unit flow of output at a given rate of interest determined by technological conditions. Thus

$$c_r = (\Delta K / \Delta Y = I / \Delta Y) \dots\dots\dots 3$$



The demand for investment, given by the accelerator principle is expressed as

$$I = c_r \Delta Y \dots\dots\dots \text{University of Fort Hare}$$

*Together in Excellence*

In order for planned savings to equal planned investment, we must have;

$$sY = c_r \Delta Y \dots\dots\dots 5$$

The required rate of growth for a moving equilibrium through time is

$$\Delta Y / Y = s / c_r = g_w \dots\dots\dots 6$$

This expression is the warranted rate growth,  $g_w$ . For a dynamic equilibrium, output must grow at this rate. At this growth rate, expenditure on consumption goods will equal the production of consumption goods and this is the only rate at which entrepreneurs will be satisfied with what they are doing and will not cause them to revise their investment plans. In other words, investment must grow at a rate equal to the product of the savings ratio and the productivity of capital. Given a constant savings-investment ratio, it also implies output growth at the rate  $s\sigma$  ( $\sigma$  is the productivity of capital).

The natural growth rate in this model is derived from the identity  $Y = L(Y/L)$ , where  $L$  is labour and  $Y/L$  is the productivity of labour, which depends on the natural rate of growth:  $y = l + q^*$ . The natural rate of growth is thus made up of two components which are – the growth of the labour force ( $l$ ) and the growth of labour productivity ( $q^*$ ) – they are both exogenously determined. This natural rate of growth plays two important roles in this growth. It defines the rate of growth of productive capacity or the long run full employment equilibrium growth rate. Secondly, it sets the upper limit to the actual growth rate which brings cumulative expansion in the Harrod-Domar model to a sticky end. For instance if  $g > g_w$ ,  $g$  can continue to diverge from  $g_w$  only until it hits  $g_n$ , when available labour has been completely absorbed ( $g$  cannot be greater than  $g_n$  in the long run). The question that can be analysed in the economy is the relation between  $g_w$  and  $g_n$ ; that is, the relation between the growth of capital and the growth of the labour force. Given fixed coefficients of production, the full employment of labour clearly requires  $g = g_n$  and the full employment of labour and capital requires

$$g = g_w = g_n \dots \dots \dots 7$$

Now we consider what happens if the warranted growth rate diverges from the natural rate. If  $g_w > g_n$ , there will be a persistent movement towards depression because the actual rate of growth will never be sufficient to stimulate investment demand to match amount of savings at full-employment equilibrium. Thus there will be too much capital and too much savings. However, if

$g_w < g_n$ , there will be a tendency towards demand inflation because there will be a tendency for the actual rate of growth to exceed that growth rate necessary to induce investment to match savings. The inflationary pressure will be accompanied by unemployment of the structural variety because the growth of capital falls short of the growth of the effective labour force and no changes in the techniques of production.

The basis of this model is that it explains an economy's growth rate in terms of the level of savings and productivity of capital. The model suggests that the economy's rate of growth depends on the level of savings and the productivity of investment (the capital-output ratio). In other words, they suggested that savings provide the funds which are borrowed for investment purposes, which in turn increase the marginal product of capital. Therefore people should, first of all, save then invest, thus there is no investment without savings which also means that there is also no growth.



## University of Fort Hare

*Together in Excellence*

The model further postulates that the expansion of the level of investment in both fixed and human capital is the key driving factors to economic prosperity for any nation. According to the model, to achieve economic growth, policies that encourage savings and generate technical progress need to be in place. The model therefore indicates that the major drive of economic growth is the level of savings and productivity.

However, like the Solow-Swan model the Harrod-Domar has been heavily criticised on basis that it relies on assumptions which are unrealistic in the long run these include the assumption of full employment, fixed relative prices of factors of production. Also, the model excludes the possibility of capital- labour substitution. In addition, the model is criticized for being analytically flawed and not addressing the role of technological change.

From the above discussion of the theories we can conclude that a strong association between savings and growth is firmly established with McKinnon and Shaw (the financial liberalisation hypothesis), neoclassical growth model (Solow-Swan), the Harrod-Domar model and endogenous growth model indicating that savings play a major role in stimulating growth. This implies that savings are very crucial as they play significant role in enhancing the economic growth of a country.

### 2.3: THEORIES ON THE ROLE OF ECONOMIC GROWTH IN SAVINGS

#### iv. Life-cycle hypothesis

The life cycle hypothesis (LCH) was first developed by Albert Ando and Franco Modigliani in the early 1960's. The main motivation for savings in this model, is to accumulate resources particularly for later consumption at the habitual standard during the old ages. The model indicates that savings should be positive for households in their working span and negative for retired ones, and wealth should be hump-shaped (Jappelli and Modigliani, 2003). The theory postulates a household's consumption pattern and assumes that individuals plan their consumption and savings behaviour over long periods, with the intention of allocating their consumption in the best possible way over their entire lifetimes, (Dornbusch, Fischer and Startz, 2004: 339). The key assumption of the model is that consumers prefer a smooth path of consumption over their lifetime rather than high levels of consumption in some periods and low levels in others. In general, people choose stable lifestyles; not for instance saving furiously in one period to have a huge spending in the next, but rather consuming at the same level in every period.

Even though individuals or economic agents will try to smooth out their consumption behaviour, income usually does not follow a smooth path. This, then implies that households will use savings and dissaving to achieve a fairly constant level of consumption in each period. In particular, they will dissave when income is relatively low, and save when income is relatively

high. Thus as income increases, economic agents will increase their savings for future use. At the core of the life cycle model is a utility function which states that an agent's life time utility depends on current consumption,  $C_0$  and future consumption ( $C_1, C_2, C_3, C_4, \dots, C_T$ ). This can be expressed mathematically as

$$U = U (C_0, C_1, C_2, C_3, C_4, \dots, C_T),$$

where, U is utility and T is number of years of remaining life span. Utility is maximised subject to budget constraints, that the present value of lifetime consumption is equal to the present value of lifetime income as shown below.



$$\sum_{t=0}^T \frac{C_t}{(1+r)^t} = \sum_{t=0}^T \frac{Y_t}{(1+r)^t}$$

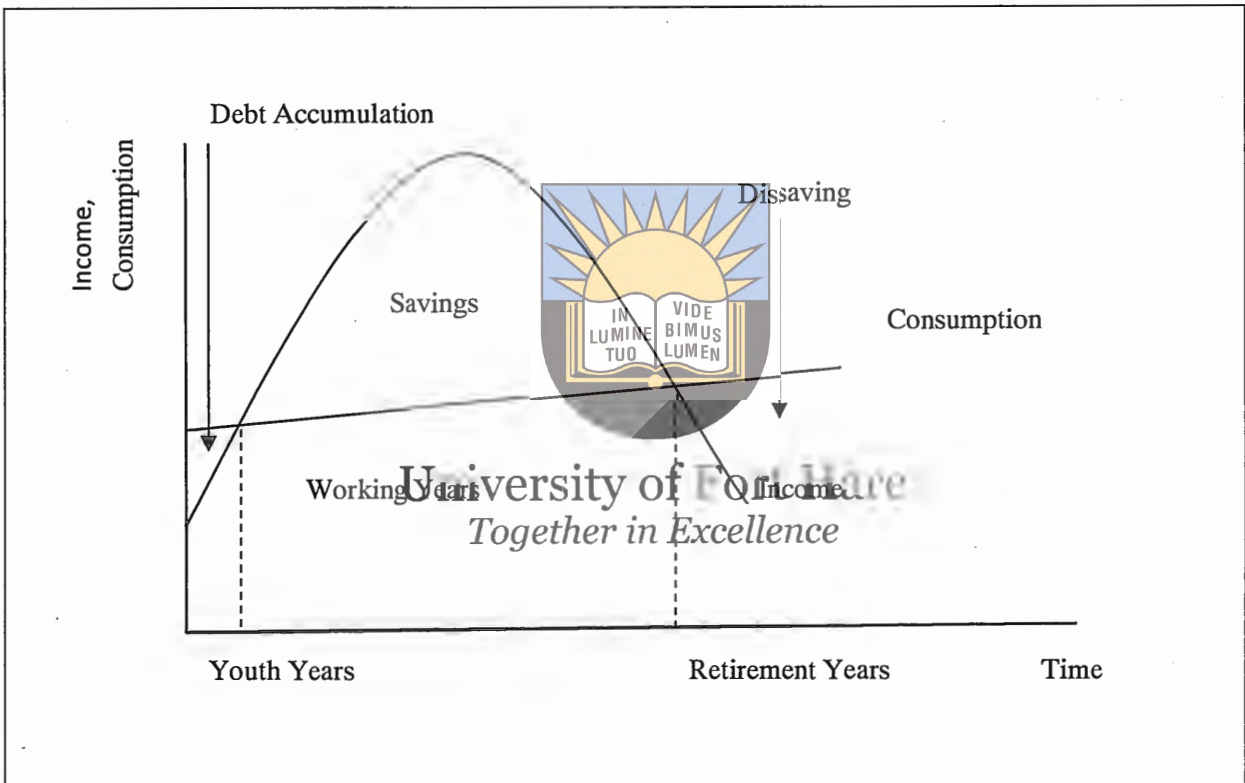
University of Fort Hare  
*Together in Excellence*

The LCH also plays an important role as it provides a direct link between monetary policy, interest rate and consumption. The LCH identified the role for real interest rates in capital markets in determining saving with two possibly opposite effects on saving- an income effect and a substitution effect. An increase in real interest rates makes individuals richer hence are prone to consume and reduce saving. However, higher interest rates also increase the return on savings, and hence provide an incentive to delay consumption and thus save. As for fiscal policy, LCH suggests that expenditures financed by deficit tend to be paid for by future generations; those financed by taxes are paid by current generations (Jappelli, 2005).

According to the LCH, the income stream of an individual is relatively low at the beginning and end of their life span and relatively high in mid life. In fact, the income profile of each generation is constant and productivity is generation specific. Thus the fundamental proposition

is that an increase in productivity growth raises the income of those who save relative to those who dissave, hence aggregate savings rate. In addition the aggregate savings rate also depends on the demographic structure of a nation and life expectancy but is independent of per capita income (Jappelli, 2005). This is illustrated by the diagram below.

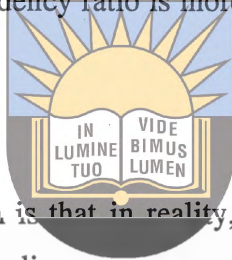
**Figure 2: Income stream of an individual from Youth to Retirement years**



As already mentioned, individuals borrow and lend in order to maintain slightly rising levels of consumption over their lifetimes. In the diagram the agent will

- Borrow or live off endowments in the early years (youth years)
- Save, accumulate assets and pay off debt in mid life (working years)
- Live off savings in retirement

In this theory the income is consumed over the agent's life span, leaving nothing to bequeath to heirs. The predictions of the life-cycle hypothesis have been evidenced in the empirical work by Irvine and Wang (2001) who examined the savings behaviour and wealth accumulation in a pure lifecycle model with income uncertainty. Their study focused on the role of income uncertainty and the role played by a retirement period during which time-expected earnings are zero. Their result indicated that income uncertainty can alter savings patterns over the lifecycle significantly, with the greatest influence on the wealth of young individuals. Loayza Schmidt-Hebbel and Servén, (2000) also supported the life-cycle hypothesis predictions by indicating that dependency ratios have a negative effect on private savings rates. It further reports that the negative of an increase in the old-dependency ratio is more than twice as large as of the young-dependency ratio.



However the weakness of this approach is that in reality, real world agents leave bequests to heirs. Actually older people appear not to dissave very much which implies they keep their assets intact and eventually pass these assets to their heirs rather than use their wealth for consumption during their own lifetimes. This brings to question the validity of this approach.

In summary, LCH is a model in which agents maximise utility from lifetime consumption subject to the constraint that lifetime consumption equals lifetime income. Agents/ households borrow and lend in capital markets to smooth consumption given an income stream. Income is relatively low in early and later life and relatively high in middle age. In this model the concern in one's life is the old age and retirement where earned income may be expected to be well below active life consumption. This means that consumption exceeds earned income financed by negative saving in the form of a reduction in wealth accumulated in the earning span. Incorporating uncertainty in the model, precautionary savings and accidental bequests all these may affect the age after which one should start observing wealth decumulation (Jappelli, 2005). The important result from this model is that aggregate consumption is some fraction of expected lifetime income which depends on agents preferences and on the rate of interest. In short the

theory argues that savings will increase when income increases and decrease when income is low. This result implies that growth is the driving force for savings.

#### v. The Permanent income hypothesis (PIH)

The permanent income hypothesis was put forward by Milton Friedman in the 1950's. It assumes that, what determines an individual's or household's smooth consumption pattern is their long-term income and not their current income level. Households prefer a stable consumption path to an unstable one (Sachs and Larrain, 1993: 91). Permanent income in this case is the steady rate of expenditure a person could maintain for the rest of his or her life, given the present level of wealth and the income earned now and in the future (Dornbusch, et al 2004: 342). In other words, it is the amount which, on average, an individual expects to receive consistently per year over the remaining years of his lifetime. Meaning that an individual will try to smooth out his/her consumption spending by consuming a certain proportion of his/her permanent income and the key determinants of consumption are an individual's real wealth (bonds, shares, physical assets, higher education level) rather than ~~by their disposable income~~. Therefore, according to the model, low income individuals have a higher propensity to consume, while a high income individual has a relatively higher transitory element to his/her income, which is lower than the average propensity to consume.

However, the permanent income hypothesis does not include any transitory or short lived increases or falls such as unusually high or low overtime payments. Transitory changes in income do not affect the long run consumer spending behaviour of the individual. Rather the theory suggests that any changes in income which are expected to be sustained, for example promotion, will only alter the value of permanent income.

In its simplest form the theory argues that consumption is proportional to permanent income:

$$C = c YP \quad (0 < c < 1)$$

where, YP is real permanent (disposable) income, C is real consumption and c is the long run average (and marginal) propensity to consume (Dornbusch, et al 2004:243). The above equation states that current consumption spending is proportional to permanent income and the remaining proportion is saved; consumers want a constant level of consumption, and each period equals to C.

To estimate permanent income the following relationship is used.



$$\text{Current Income} = \text{Permanent Income} + \text{Transitory Income}$$

## University of Fort Hare

*Together in Excellence*

The relationship above implies that in any given period actual (current) income will consist of an amount of income regarded as transitory. Due to uncertainty an individual may not be able to tell what part of any increase in income is permanent, for example, whether an increase in overtime will be sustained.

Given the above information, we also assume that households regard a fraction ( $\Theta$ ) of an increase in current income as permanent and  $(1 - \Theta)$  as transitory. This assumption implies that

$$YP = Y_{t-1} + \Theta (Y_t - Y_{t-1}) \dots \dots \dots i \quad (0 < \Theta < 1)$$

$$= \Theta Y_t + (1 - \Theta) Y_{t-1} \dots \dots \dots ii$$

The equation implies that a permanent income is equal to last period's actual income ( $Y_{t-1}$ ) plus the fraction of the increase in income  $[=\Theta (Y_t - Y_{t-1})]$  which is regarded as permanent. Equation (2) shows that permanent income can be interpreted in income and last period's income (with weights  $\Theta$  and  $(1 - \Theta)$ ).

Given the permanent income equation, the derivation of the consumption function requires the combining of the expression of permanent income and the assumption that consumption is proportional to permanent income as shown below.

$$C = c YP$$

$$YP = \Theta Y_t + (1 - \Theta) Y_{t-1}$$



Substituting for YP

University of Fort Hare

$$C = c[\Theta Y_t + (1 - \Theta) Y_{t-1}]$$

$$C = c\Theta Y_t + c(1 - \Theta) Y_{t-1}$$

The last equation shows the permanent income hypothesis consumption function. It states that current consumption is determined by current (disposable) income and last period's income. This means that the response of consumer spending to an increase in income is spread over several periods rather than all of it occurring in one period. In other words, an increase in income which accrues to economic agents is saved so that a fairly stable consumption is achieved. According to this theory, an increase in income whether it is transitory or not is saved. The effect on consumption of any change in income whether it is current or expected will be distributed over time by changes in saving. Thus, an increase in income will increase savings as the economic agent wants to spread this income over several years to smooth out consumption.

In short the implications of the permanent income hypothesis are that an increase in income will increase savings. It assumes that income growth is responsible for increases in savings. This is revealed when the theory predicts that most of the temporary increase in current income will be saved, while the permanent increase in current income will be spent.

In conclusion the life-cycle hypothesis and the permanent-income hypothesis indicate that growth is vital for increments in the savings rates. That is personal savings and consumption expenditure increase with an increase in income; conversely households draw down their savings when consumption grows faster than economic growth.



## 2.4: EMPIRICAL LITERATURE

Several studies have been done in different countries to determine the actual direction of causation between savings and growth. The results of these studies are mixed and differ across countries with some indicating an economic growth-led relationship while some studies indicate a domestic savings-led relationship and some indicating a bi-directional relationship.

### **i. Studies indicating an economic growth-led relationship**

Anoruo and Ahmad, (2001) used cointegration and the vector error correction model (VECM) to investigate the causal relationship between economic growth and growth rate of domestic savings for seven countries, which are Congo, Coted'Ivoire, Nigeria, Ghana, Kenya, South Africa, and Zambia. In this study three analysis were undertaken, these are: ascertaining the time series properties of economic growth and domestic savings with the help of augmented Dickey-Fuller unit root procedure; examining the long run relationship between economic growth and growth rate of domestic savings in the context of the Johansen and Juselius (1990) framework and performance of Granger-causality test to determine the direction of causality between economic growth and growth rate of domestic savings.

The study found that economic growth and the growth rate of domestic savings are cointegrated in all the cases except for Nigeria. The results from Granger-causality tests generally observed that economic growth engenders domestic savings for most of the sample countries.

The above finding is also supported by similar result of Carroll , Overland and Weil, (2000) who indicated that if utility depends on how consumption compares to a “habit stock” determined by past consumption, an otherwise growth model means that increases in growth can cause increased savings. The result that economic growth Granger-causes growth in domestic savings is also consistent with Jappelli and Pagano (1996). The study indicated that there is a strong correlation between growth and savings and that higher domestic savings follow after higher economic growth.



In 1998, Sinha and Sinha also conducted a study in Mexico titled: *Cart before the horse? The saving growth nexus in Mexico*. The results of that study show that the conventionally accepted view that the savings rate causes higher economic growth does not hold for Mexico. The empirical results show that private savings and GDP have a long run relationship. The results further show that there is evidence that the growth of GDP Granger causes the growth of private and public savings, but do not find any evidence of reverse causality. In fact the results indicated that the causality goes in the opposite direction.

Sinha, (1998) also analysed the relationship between savings and economic growth using time-series data for Pakistan from 1960-1995. Using modern time-series econometric techniques to study the relationship, the study distinguished between private and total savings. The study found that both private savings and total savings have a long run relationship with the GDP. The augmented Granger causality results indicate that the growth of GDP Granger causes the growth rates of both private savings and total savings. Nevertheless, the growth rate of private savings is found not to be Granger causing growth rate of GDP, which means that the growth rate of government savings Granger causes the growth rate of GDP. Policies that are aimed at increasing government savings are likely to promote economic growth. Chaudhri and Wilson, (2000) also analysed the savings, investment, productivity and economic growth of Australia for the period

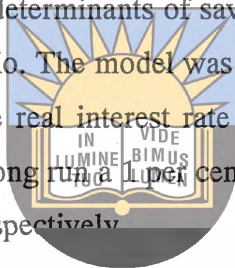
1891-1990. The study indicates that interactions between investment and productivity growth are complex and evolving. Savings appears to be determined residually in the growth process.

Morande (1998) did an analysis of savings in Chile and questioned what went right. The study reports that Chile's overall economic performance has been remarkable in many respects, including a significant and sustained increase in domestic savings, to figures of around 26% of GDP. It empirically assesses the reasons behind such notable behaviour of savings by applying co-integration models to check for long-run relationships and error-correction models to verify short-run adjustments. The study focused on annual private savings data for the period 1960 to 1995. The results indicate that private savings are positively affected by economic growth and a dummy reflecting the effect of pension funds. It also reports that most of the adjustments between short run and long run is completed in less than 3 years, where the variable representing income bears the bulk of such adjustments. The study also compares the two episodes of good economic performance in the last 30 years for the periods 1966-1981 and 1986 till the present. The study found that three basic differences arise concerning private savings: sustainability of growth, different access to foreign savings during the recovery from recession, and different scenarios with respect to the development of long-run capital markets.

Paxson, (1996) investigated whether observed cross-country correlation between aggregate savings rates and economic growth can be explained by models in which higher growth increases savings rates rather than other way around. The study observed that there are two explanations for why higher growth might increase savings. The first one is the life-cycle hypothesis, which means that higher growth will increase the life-time wealth of younger savers relative to older dissavers, thereby increasing the aggregate savings rate. The second explanation relates to the models of consumption with habit formation, which imply that consumption responds slowly to unexpected income growth, so unanticipated growth can produce a higher savings rate at least in the short run. The study assesses these explanations using time-series data of cross-sections of household surveys from four countries: the United States (US), Britain, Taiwan and Thailand. The evidence from this study indicates that although growth may increase savings rates, it will

not increase them by much. The study also indicates that even if the life-cycle model is valid, the estimates of age-specific saving rates imply only small effects of growth on the aggregate savings rate. The reason for this is that although there is some evidence that savings rates follow the hump-shaped pattern indicated by the life-cycle theory, it is also the case that income and consumption move together closely over the life-cycle. The age effects on savings rates are simply too small to imply a large effect of growth on savings.

Narayan and Narayan (2006) also used a savings model developed in line with the life-cycle hypothesis which argues that the main determinants of savings are the growth rate of per capita real income and the age dependency ratio. The model was extended through the inclusion of the current account deficits (CAD) and the real interest rate variables. The most important result from this study is that in the short and long run a 1 per cent increase in the growth rate increases savings by over 0.07 and 0.5 per cent respectively.

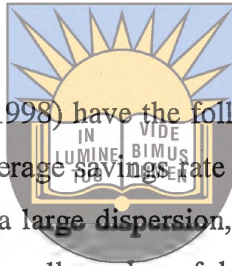


## University of Fort Hare

*Together in Excellence*

Elbadawi and Mwega (2000) concurred with the continuous decline of private savings in Sub-Saharan Africa, analysed the major determinants of private savings in the region. The main objective was to explain the region's dismal performance and identify policies that could help reverse the decline in the region's savings. The results of this study indicate that, instead of having savings transformed into investment and investment into growth, the Sub-Saharan Africa causality runs from growth to investment then to private savings. The study also indicated that a worrisome feature of savings and investment in Sub-Saharan Africa is the region's dependence on foreign savings, mostly overseas development assistance, to finance the gap between investment and saving. The study used the experiences of Kenya, Zimbabwe and Botswana to analyse the main factors that drive savings in these countries. This study also provided an empirical analysis of private saving in Sub-Saharan Africa and other regions in the period 1970-95 and suggests that private saving in Africa can be explained by standard behavioural models. These models indicate that private savings in Africa lag behind those in other regions notably the high performance Asian economies because of the region's lower per capita income, high young-age dependency ratio and high dependence on aid.

Prema-Chandra and Kunal, (2004) examined the determinants of private savings in the process of economic development, in the light of the Indian experience. This study found that the savings rate rises with both the level and the rate of growth of disposable income. In other words the study found a strong statistical support for the hypothesis that both a change in the rate of income growth and a change in income levels are powerful explicators of change in the private savings rate. Factors such as the real interest rate on bank deposits have a significant positive impact on the private saving rate, but the magnitude of the impact is modest. In addition, the spread of banking facilities in the economy and the inflation rate were found to have a positive impact the savings rate, and changes in the external terms of trade a negative impact on private savings.

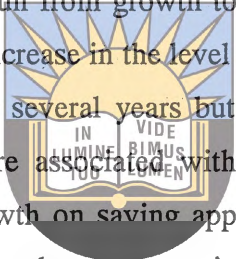


Loayza, Schmidt-Hebbel, and Serven, (1998) have the following to say on saving in the World: Stylized Facts report that the world's average savings rate has declined for the last two decades. However, country savings rates exhibit a large dispersion, especially in the developing regions. The study further reports that while in a small number of developing countries savings have risen substantially (together with growth), savings have stagnated or even declined in most other developing countries. This study thus postulates that the countries that save more exhibit, on average, more stable savings rates over time. It also reports that country saving rates tend to rise with per capita real income levels and growth rates, domestic investment, public savings, money stocks, and private financial wealth. Nevertheless, substantial heterogeneity in the correlation between savings and related variables is observed between industrial and developing countries.

A World Bank (1999) research project centred on the reasons why savings rates vary across countries revealed eight factors that affect saving rates. These factors include: income, growth, fiscal policy, pension reform, financial liberalization, external borrowing and foreign aid, demographics, and uncertainty. The project yielded a rich set of empirical results on the effect of each of these factors on private (and national) savings rates as explained below.

The real per capita income is found to be positively correlated with private savings rates. With this positive relationship between per capita income and private (and national) savings rates the project suggested that policies that spur development are an effective way of raising private savings. The project also points out that the influence of per capita income is larger in developing than in industrial countries, thus suggesting that the effect of the level of development on savings tapers off at medium or high levels of income.

The project also indicates that growth and savings are positively correlated. The results indicate that much of the causation appears to run from growth to savings, rather than from savings to growth. It is indicated that a sustained increase in the level of savings is typically followed by an acceleration of growth that persists for several years but eventually disappears. On the other hand, sustained increases in growth are associated with permanent increases in the rate of savings. The effect of real income growth on saving appears substantial, with a 1 percentage point increase in the rate of growth raising the private savings rate by 1 percentage point.

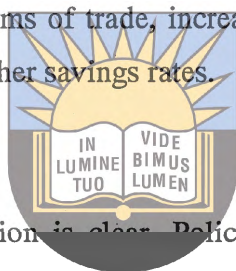


The logo of the University of Fort Hare is a shield-shaped emblem. At the top is a sun with rays. Below the sun is an open book. The Latin motto 'IN VIDE BINAUS' is written across the book. The shield is flanked by two vertical banners. The entire emblem is set against a dark background.

University of Fort Hare  
*Together in Excellence*

Ozcan, Gunay and Ertac, (2003) investigated the effects on private saving rates of a number of policy and non-policy variables for the period 1968-1994. In this study the empirical private saving model for Turkey is estimated. The empirical results support the hypothesis that the private savings rates have strong inertia. The findings also indicate that government savings do not tend to crowd out private savings and that the Ricardian equivalence does not hold strictly. Income level is found to have a positive impact on the private savings rate and the growth rate of income is not statistically significant. The study also revealed from a policy point of view, financial depth and development measure of Turkey suggests that countries with deeper financial systems will tend to have higher private savings rates. It also indicates that private credit and real interest rates try to capture the severity of the borrowing constraints and the degree of financial repression in Turkey. Moreover, the negative impact of the life expectancy rate lends support to the life-cycle hypothesis. The precautionary motive for savings is supported by the findings that inflation captures the degree of macroeconomic volatility and has a positive impact on private savings in Turkey.

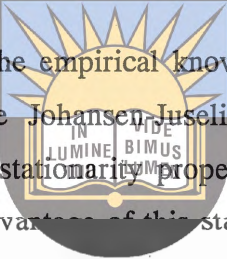
Dani, (1998) conducted a study of transitions from low to high savings rates. He reported that the central message from the study was a negative one. The study reported that focusing on savings performance does not seem to be a profitable strategy for understanding what makes for successful economic performance. The study clearly points out that increases in savings appear to be the outcome of economic growth, not a fundamental determinant of it. The typical pattern in this study is that growth rates (benchmarked against world norms) return to their pre-transition levels within a decade. It indicates that countries that have experienced saving transitions due to rapid increases in worker remittances exemplify this point and very few of these countries have experienced increases in their long-run growth rates. On the other hand, countries that undergo growth transitions, (due to improved terms of trade, increased domestic investment, (and other reasons) do end up with permanently higher savings rates.



Given these results the policy implication is clear. Policies geared towards raising domestic savings do not deserve priority when designing economic programs. The study thus indicates that the key to generating vicious circles of high growth-high investment-high savings is to kindle the animal spirits of entrepreneurs by increasing the expected profitability of their activities. Enhancing production and investment incentives seem preferable to working on savings incentives.

Orazio, Lucio, and Antonello, (1999) critically analysed the Saving, Growth and Investment using a panel of countries. The main aim of the study was to provide an exhaustive and careful descriptive analysis of the correlations among savings, investment and growth rates. The study's motive was to establish what the main (aggregate) 'stylized facts' are that link these variables. For that purpose the study used a new data set gathered by the World Bank, containing a wide range of variables for 150 countries. The study estimated flexible dynamic (reduced form) models and identified long-run and short run correlations among the variables. The summary of results indicate the following.

Three results are extremely robust across data sets and estimation methods. Lagged savings rates are positively related to investment rates. Investment rates Granger-cause growth rates with a negative sign and growth rates Granger-cause investment rates with a positive sign. Also, lagged investment positively Granger causes savings in all cases. In the study, growth and savings seem to be mutually and positively related, but an important exception arises once the study includes additional controls in the three variable system. The relationship between savings and growth in this scenario shows that growth is (positively) Granger causing savings in many specifications and data sets, but often the effect is quite weak.



Ahmad and Marwan, (2003) extended the empirical knowledge on the determinants of gross savings ratio in Malaysia utilizing the Johansen Juselius (1990) cointegration and error-correction model to deal with the non stationarity properties of time series of the variables involved. The study indicates that the advantage of this statistical approach is that it avoids the problem of spurious regressions. The results of this study suggest that the savings ratio is determined by the dependency ratio, economic growth, interest rate and foreign direct investment (FDI) in the long run. The short-run error-correction model reveals that in addition to these five variables, the savings ratio is also influenced by tax policies and growth in exports. As part of the major findings of this study economic growth appears to have played a key role in explaining the high saving ratios observed in the past three decades.

## **ii. Studies indicating a savings-led relationship**

Cardenas and Escobar, (1998) analysed the determinants of savings in Colombia using the framework of an intertemporal model. The study indicates that national savings partially respond to temporary changes in output, according to the permanent income hypothesis. Higher government expenditures (in relation to their permanent level) are associated with lower national saving rates, thus disproving the Ricardian equivalence hypothesis. In other words, it is possible to increase national savings rates by raising the public sector savings rate (preferably through cuts in expenditures rather than higher taxation).

Apart from the predictions obtained from the intertemporal approach, the study tests other common hypotheses regarding savings behaviour. In particular, the study finds that changes in national savings and changes in investment are perfectly correlated, and that savings cause growth (in the Granger sense). Additional econometric evidence in the study also suggests that increases in urbanization and age dependency have a significantly negative effect on private savings in Colombia. The result that higher savings rates lead to economic growth is consistent with DeGregorio (1992) and Japelli and Pagano (1994). Loayza, Schmidt-Hebbel, and Serven, (2000) also support the idea that private savings rise with the level and growth rate of real per capita income and that the influence of income is larger in developing than in developed countries.



The study also argues that much of the recent reduction in private savings in Colombia can be accounted for by the increase in current government expenditures as well as by the effects of higher taxation. On the other hand, lower margins induced by trade liberalization explain the reduction in savings by firms. Using the results which were found the study indicated that the recent decline in private savings was of a temporary nature, so no major offsetting policy interventions were required.

University of Fort Hare  
*Together in Excellence*

Aghion, Comin and Howitt, (2006) developed a theory according to which domestic saving affects economic growth even in a world of capital mobility. The theory developed is based on the idea that technological progress in relatively poor countries generally requires a mix of foreign investment and local entrepreneurial effort. The foreign investment is needed in order to transfer frontier technological knowledge to local innovating sectors. Local savings matters for innovation, and therefore growth, because it allows the domestic banks to co-finance projects and thus to attract foreign investment. The theory predicts that savings should affect growth, but not so much in relatively rich countries that, due to their small distance to the technological frontier, depend less on foreign investment to adopt new technologies. This prediction is borne out by the panel of 118 countries for which the study has data on savings over the period 1960-2000. In this sample the study finds a strong and robust effect of lagged average savings on

productivity growth for poor countries but a significantly smaller effect for rich countries. This effect operates entirely through total factor productivity (TFP) rather than through capital accumulation. Furthermore, the study shows that savings are significantly associated with higher levels of FDI inflows and equipment imports and that the effect that these have on growth is significantly larger for poor countries than for rich.

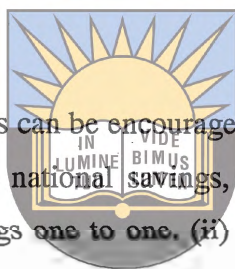
### **iii. Studies indicating a bi-directional relationship**

Dawit (2003) conducted a study on the causal relationship between economic growth and gross domestic savings in Ethiopia. The study used the cointegration and vector error correction model (VECM) to examine the causal relationship between real economic growth and the growth rate of real GDS for Ethiopia- in the period 1960-2003. The time series properties of real GDP and real GDS were ascertained using the Augmented Dickey-Fuller (ADF) test. The long run relationship between economic growth and growth rate of gross domestic savings was explored using the Johansen co-integration procedure (Stock and Juselius, 1990 and Johansen, 1991). The results from the Johansen cointegration procedure indicated that the null hypothesis of no-cointegration between real economic growth and real gross domestic savings growth rate (at  $r = 0$ ) is rejected at the 1 percent significance level. However, the null hypothesis that ( $r = < 1$ ) could be rejected at 5 percent but not at 1 percent. The results of the cointegration tests therefore indicate that there is a long-run relationship between real GDP and real GDS in Ethiopia.

Overall, the findings of the study lend supports to the hypothesis that the faster growth rate of real gross domestic savings (RGDS) causes higher growth rates of real gross domestic product (RGDP) in Ethiopia. However, a higher rate of growth of real GDP was found to cause faster growth of GDS to lesser extent. Thus, the study finally established that there is bi-directional (feedback) causal relationship between real GDP and real GDS.

Schmidt-Hebbel, Serven and Solimano, (1996) provide a policy-oriented review of recent theoretical and empirical work on the determinants of savings and investment and on their links to growth. The study reports that despite the vicious circle of high saving, investment, and rapid

growth experienced by some countries (notably in East Asia), the connections among these three variables are complex, and causality runs in several directions. However, the recent theoretical and empirical literature supports four main conclusions. Firstly, saving and growth reinforce each other that is causality runs in both directions. Secondly, saving and investment are highly correlated due to low capital mobility, domestic policies that restrict large current-account imbalances or common factors that push both variables in the same direction. Thirdly, physical investment is a necessary, but not sufficient, condition for growth. Finally, human capital investment, technological innovation, and appropriate policies are also necessary for sustained high growth.

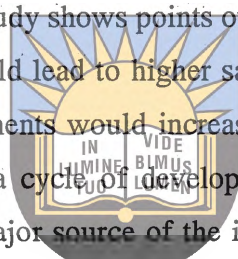


The study suggest ways in which savings can be encouraged which are: (i) raising public savings is an effective and direct way to raise national savings, because evidence shows that public savings do not crowd out private savings one to one. (ii) inflows of foreign savings should be allowed and encouraged to support domestic investment, even if they help to finance consumption, as long as the country's domestic economic policy framework is sustainable, its banking system effectively regulated and supervised, and its government restrained from providing guarantees on foreign credit flows. (iii) Private savings are not expected to rise in response to interest rate liberalization. Evidence shows that market-determined interest rates are likely to improve financial intermediation, the quality of investment, and the quality of portfolio choices (thus avoiding or reversing capital flight and possibly raising measured saving flows). Interest rates will be ineffective, however, in increasing overall savings flows. (iv) Financial deepening has ambiguous effects on private savings. In fact, relaxing constraints on consumer borrowing depresses private savings, sometimes contributing to unsustainable consumption booms as those evidenced in Latin America in the 1980s and in Mexico in the early 1990s.(v) Starting a mandatory, fully-funded pension system may boost private savings significantly.

The study also suggested a way to promote capital formation, product innovation, technological advancement, and growth. This is done through the provision of a supportive policy and an institutional framework. Such a framework would consist of four ingredients: (1)

macroeconomic stability to reduce the uncertainty surrounding investment; (2) a comparatively distortion-free relative price structure, to raise the productivity of investment; (3) a well-defined (and effectively enforced) code of property rights, to create an environment conducive to a low cost of doing business; and (4) adequate political institutions, to foster social consensus and political stability.

Shahbaz and Mahmood, (2004) also carried out an empirical investigation on savings and investment behaviour in Pakistan. They found that a high income leads to high savings, thereby confirming the McKinnon effect. The study shows points out that if there is an arbitrary big push in GDP growth for some period, it would lead to higher savings, which would positively affect investments, and an increase in investments would increase GDP, which would again increase savings. Thus by initiating that push, a cycle of development can be started. The study also indicates that domestic savings are a major source of the investment. However, foreign savings were found not to be effective for investment in Pakistan. The study therefore suggests that government make policies which are supportive of an increase in domestic savings rather than relying on foreign investment.



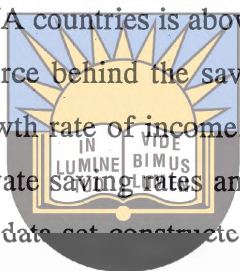
University of Fort Hare  
*Together in Excellence*

Masson, Bayoumi, and Samiei , (1998) examined a broad set of possible determinants of private saving behaviour using data for a large sample of industrial and developing countries. In this study both time-series and cross sectional estimates were obtained. The empirical results suggested that there is a partial offset on private savings of changes in public savings and (for developing countries) in foreign savings, that demographics and growth are important determinants of private savings rates, and that interest rates and terms of trade have positive, but less robust, effects.

The results also identify a number of channels through which growth influences saving. A direct positive association between GDP growth and private savings emerges from most of the specifications, especially for developing countries, although it is unclear whether there is a

causal effect in either direction or a joint response to a third factor. A suggestive result concerns the level of per capita income (for the United States) and savings. For developing countries, the analysis finds a generally significant positive effect on the level, but a negative effect on the squared level, of per capita income. This result implies that beyond a certain point a higher income has a negative effect on the private savings rate.

Ozcan, (2000) analysed empirical determinants of private savings for a sample of economies in the Middle East and North Africa (MENA) over the period 1981-1994. The study argues that the mean savings ratio for the selected MENA countries is above the mean world savings ratio (0.26 vs. 0.16, respectively). However, the force behind the savings in the MENA countries can be delineated, to a large extent, by the growth rate of income. This study used panel estimation to investigate the relationship between private saving rates and several macroeconomic policy and non-policy. A cross-country time-series data set constructed for the World Bank Saving Project is used.

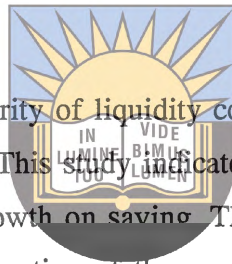


## University of Fort Hare *Together in Excellence*

In this region (MENA) private saving rates are found to have a strong inertia and they are highly serially correlated. This implies that the effects of a change in a given savings determinant are fully realised in the longer term than the short-term. It is found that in this region the real per capita income level has a positive impact on the private savings rate which indicates that, *ceteris paribus*, more advanced countries tend to save a higher percentage of their GDP. The real per capita growth rate is positively related to savings, which supports the hypothesis that there is a vicious circle that goes from faster growth to increased savings to even higher growth.

The study also indicates that, from a policy point of view, the financial depth and development measure of the MENA region suggests that countries with deeper financial systems will tend to have higher private savings rates. The severity of borrowing constraints and the degree of financial repression is also captured by private credit and real interest rates. The study also indicates that the precautionary motive for savings is supported by the findings that inflation captures the degree of macroeconomic volatility and has a positive impact on private savings in the area.

Romm, (2005) used the Johansen VECM estimation technique to examine the directions of association between savings and growth in South Africa over the period 1946 – 1992. The study examined the aggregate private savings rate and its interaction with investment and growth and it finds that the private savings rate has a direct as well as an indirect effect on growth. This implies that the private savings rate affects steady state per capita output directly as well as indirectly through the investment rate. On the other hand, the study also finds that a higher steady state per capita output positively affects the savings rate. These empirical results lend support to both the Classical and Keynesian views on the savings-investment-growth relationship in South Africa.



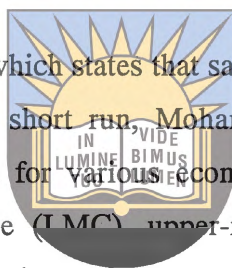
Romm, (2005) also noted that the severity of liquidity constraints will influence the extent to which growth affects the savings rate. This study indicates that the more binding the liquidity constraints, the greater the effect of growth on saving. The reason for this is that with greater liquidity constraints, the current consumption of the young is constrained by present income. Thus, they cannot react to a lifetime income when making their consumption decisions. The results of this study have significant policy implications. The financial intermediation in this case has two contrasting effects on growth. Firstly, it promotes growth because it increases the rate of return on capital via a more efficient allocation of credit to investment. In contrast to this, an efficient capital market can inhibit growth by reducing savings because of the lack of liquidity constraints. If banks make credit available to firms, as well as to households intending to invest in either physical capital or human capital, while rationing it at other times, capital accumulation and growth will be enhanced.

Also the effect of factors such as human capital and technological innovation which are necessary for economic growth were found to be two-fold. This implies that they do not only have a direct effect on growth but also by promoting growth they promote a higher savings rate and thus the investment rate, which further promotes growth. With this result the study recommends that if policy aims to promote growth by increasing the savings rate, it need not only focus on factors affecting savings but also on those factors directly promoting growth.

The study further highlighted that the expansion of credit to the private sector over the past 20 years and particularly in the past decade in South Africa, has become detrimental to long-term growth. It further postulates that not only does the extension of credit decrease private savings directly by increasing the consumption ratio, but it also dampens any beneficial effect that growth has on the savings rate. The study suggests that financing fixed capital investment and entrepreneurial activity to a large degree and reducing the role of credit in consumption smoothing might result in an optimal allocation of credit.

#### **iv. Studies with mixed results**

Given that the conventional perception which states that savings contribute to higher investment and hence higher GDP growth in the short run, Mohan (2006), examined the relationship between savings and economic growth for various economies with different income levels: Low-income (LIC), low-middle income (LMC), upper-middle income (UMC) and higher-income (HIC). The primary purpose of the study was to investigate the relationship between domestic savings and economic growth for various economies using time series annual data. To determine the direction of causality, Granger causality tests were conducted. The objective was to determine whether the direction of causality in these economies differed according to their income class namely: low-income (LIC), low-middle income (LMC), upper-middle income (UMC) and higher-income (HIC). The empirical results suggest that the economic growth rate Granger causes growth in the rate of savings in 13 countries. The opposite results prevailed in 2 countries. In 5 countries, a bi-directional causation was found. The direction of causality in this study is somewhat consistent with the theory especially in the case of upper-middle income (UMCs) and higher-income (HICs) economies. The main conclusion of the study is that income class of a country does play an important role in determining the direction of causality. In low-income (LICs) economies the empirical results were found to be mixed while in all high-income (HICs) countries except for Singapore, the causality ran from economic growth to growth in the rate of savings. However, in upper-middle income (UMCs) countries a bi-directional causality was more prevalent.



University of Fort Hare  
*Together in Excellence*

Agrawal, (2000) analysed the performance of South Asian countries regarding the savings and investment rates and tried to compare them with East Asia. Econometric analysis of the determinants of savings and investment ratios in South Asia were carried out. The study reported that savings as a proportion of GDP are in the low to medium range for the South Asian countries as compared to high for the East Asian countries, where it has been over 30 percent since 1980. Econometric results of the study show that the main factors behind the lower rates of savings in South Asia are: (a) a less rapid decline in the age dependency ratio (which has remained virtually stagnant in Nepal, Pakistan and Bangladesh), while falling dramatically in East Asia (and Sri Lanka), (b) the moderate to low rates of growth of gross national product (GNP) compared to East Asia, and (c) the less prudent fiscal management by many South Asian governments such as India, Pakistan and Sri Lanka leading to low or negative public sector savings. Interest rates on bank deposits were found to have a positive but insignificant effect on savings.



## University of Fort Hare *Together in Excellence*

Gross fixed investment as proportion of GDP was reported to have been lower in South Asia compared to East Asian countries. Econometric analysis suggest that the availability of much smaller inflows of foreign direct investment and the lesser availability of domestic credit are some of the main factors behind the lower investment rates in South Asian countries as compared to East Asian countries.

Of great importance was the focus on Granger causality analysis to test whether the high savings rates caused high growth or high growth rates led to high savings rates in the countries under consideration. The study highlighted that this question is of vital significance for development policy. For instance, if high savings rates lead to high growth, development policy must focus on ways to increase the savings rate, while if high growth leads to high savings, development policy must focus on other factors which lead to high growth, such as human capital, technological progress and trade policy.

The study found evidence that higher savings rates cause higher growth rates of real GNP in two countries (Bangladesh and Pakistan) and that a higher growth rate Granger cause higher savings rates in two countries (India and Sri Lanka), with the results for Nepal failing to reject non-causality in either direction. The results of this study of South Asian countries contrasts sharply with the previous empirical findings (mostly based on data from East Asian countries, which have among the highest savings rates in the world) that savings rates do not cause growth but are determined by it. The study ended with a plausible conclusion that in the case of countries with low savings rates, low levels of savings may well become a significant constraint on growth by restricting the supply of funds available for capital formation and growth.



Using the VECM (Engle and Granger) and VAR procedures, Agrawal P, (2001) analysed the relation between savings and growth for seven Asian countries. The study established that the savings rate has been remarkably high (over 30% since 1980) in East Asian countries. The econometric analysis in this study shows that the main factors behind the high rate of savings in East Asia are the high rate of income per capita and the rapidly declining age dependency ratio. Special institutional features in some countries such as the high central provident fund rates in Singapore have also contributed to the high savings rates. The effect of higher real interest rates on the savings rate was found to be insignificant for four of the seven countries considered. Of the three remaining countries, the interest rate was found to be negative in Indonesia while in Thailand and Malaysia it was positive. In all the cases where interest rate was significant, the coefficient was usually small enough that interest rates changes of a few percentage points are likely to have an insignificant impact on the savings rates. This implies that trying to influence the savings rates by manipulating interest rates is not likely to be a practical policy in most of these countries.

The main focus of this study was on whether a high saving rates granger causes high growth or high growth rates lead to high savings rates in the seven Asian countries. The results show that a high real income per capita or a high growth rate did cause the savings rates to be high in six of the seven countries considered. However in three of the countries considered namely: Indonesia,

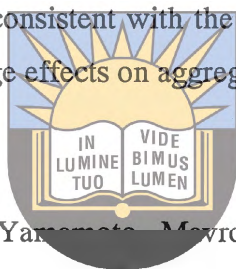
Malaysia and Taiwan evidence of simultaneous reverse causality from saving rates to growth was found. The study therefore ascertains that although the causality primarily runs from high growth to high savings rate in many cases, there also exists a feedback effect with high savings rates leading to high growth or high GNP per capita. Although the study indicates that many Asian countries could have benefited from this vicious circle of high growth leading to high savings and vice versa, it specifies that the feedback is much stronger from growth to saving than from savings to growth. As a result the study suggested that development policy focus less on promoting high savings rates and more on promoting growth rates through other appropriate policies.



Ahmad, Marwan and Salim (2003) also empirically investigated the factors that have influenced the savings behaviour in the fast growing Asian economies of Singapore, South Korea, Malaysia, Thailand and the Philippines. The study reports that savings in these countries are related to income, interest rate, dependency ratio and foreign capital inflow. In this study both short run and long-run movements of savings are modelled during the years 1960-1997. An error correction representation of the data was used to explain the short run dynamics. The study's main conclusion is that Singapore, South Korea, Malaysia and Thailand share a common set of determinants of savings. The empirical results indicated that (i) foreign savings deter domestic saving both in the short and long run; (ii) savings does not Granger cause economic growth, except for Singapore; (iii) interest rates turn out to be significant both in short and long run savings functions- it was found to be positive in Singapore, Korea and Malaysia but negative in Thailand. This finding reflects the extent of financial liberalisation in these countries. (iv) In the long run the causality runs from economic growth to domestic savings.

Saltz (1999) noted that past studies have revealed a correlation between savings and GDP growth in the Third world and these studies have hypothesized that higher rates of savings cause higher growth rates of real GDP. It is against this background that he decided to explore the alternative hypothesis: that higher growth rates of GDP cause increased savings using the Granger causality test. The empirical evidence presented in this study lends far greater support to

the hypothesis that faster growth of real GDP causes higher growth rates of savings, not vice versa. Of the seventeen countries analysed, this result was observed in ten countries, including two countries in which there was bi-directional causality. Also important is the result that four cases in seventeen countries indicates that the growth rate of savings positively cause an increase in the growth of real GDP. Overall, the findings of this study do not lend support to the hypothesis that faster growth rates of savings cause higher growth rates of real GDP. The study therefore suggested that policy makers in Third World countries be cognizant of these results and concentrate on promoting economic growth rather than just promoting savings. The evidence in this study therefore suggests that policies which promote growth of real GDP will lead to a more rapid growth in savings. This result is consistent with the result by Deaton and Paxson, (2000) who indicated that growth may have large effects on aggregate savings.



Using the methodology of Toda and Yamamoto, Mavrotas and Kelly (2001) examined the relationship between growth and savings for India and Sri Lanka. This study used the methodology of Toda and Yamamoto as a way of avoiding problems and possible misleading inferences associated with the asymptotic nature of Granger causality testing in time-series studies. In this study the relationship between gross domestic product, gross domestic savings and private savings was examined. The study finds that there was no causality between GDP growth and private savings in India, while it appears that there is bidirectional causality between private savings and growth in Sri Lanka. The study therefore concluded that existing 'evidence' on the subject should be treated with caution, given the inappropriateness of the econometric methodology adopted in most of the previous empirical studies using time-series data.

Rather than using panel-estimation methods which have been used by many previous studies Anderson, (1999) carried out tests of causality in time-series settings. In this study saving and GDP are estimated in bivariate vector autoregressive or vector error-correction models for Sweden, the United Kingdom (UK) and the United States of America (USA). Tests of Granger non-causality were performed within the estimated systems. The main results show that causal chains linking savings and output differ across countries. The study indicates that for the UK and

for Sweden, where standard tests indicate a long-term relationship between the variables, the temporal interdependence differs. In the UK there is a bi-directional causality between GDP and gross savings. In the Swedish case, the temporal dependence is more unidirectional in its nature with saving leading to output growth. The results actually show that the long run relationship between savings and output has a positive sign in the output equations for both the UK and Sweden. This implies that increases in savings relative to output in a previous period lead to increases in output in a later period. This is consistent with the 'mechanical' link through capital accumulation which is the main focus of the neo-classical growth models. In the US there is no statistically significant long-run relationship between savings and GDP. The fact that there is a long run stationary relation between gross savings and output for two of the countries conforms to the most elementary of the predictions from growth theory.



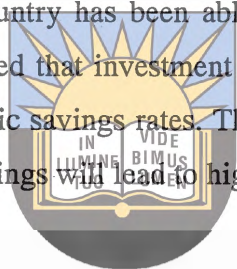
The study also indicates that the variables (savings and GDP) can be connected in Granger-causal chains through different channels-in the 'long run' and 'short run' which might differ both regarding the direction and the sign. For instance there are no statistically significant short run chains for Sweden. However for both the US, where there was no long run chain and the UK there are indications of short run chains. In the US the short-run causality runs in both directions while for the UK it appears to have a unidirectional chain from savings to output.

University of Fort Hare  
*Together in Excellence*

#### v. Studies indicating no causality

Sinha and Sinha, (2007) analysed the relationship between per capita saving and per capita GDP for India using the Toda and Yamamoto tests of Granger causality. The study used time-series data from 1950 to 2004. Three types of savings were distinguished which are: household savings, corporate savings and public savings. Using Toda and Yamamoto tests of Granger causality, the results of the study show that there is bi-directional causality between per capita household savings and per capita corporate savings. The study however revealed that there is no evidence of causality in any direction between per capita GDP and per capita corporate savings/per capita household savings.

Claus, Haugh, Scobie, and Tornquist, (2002) examined savings and growth in an open economy (New Zealand). The study indicated that concern has been raised by an apparent lack of savings in New Zealand and that it has been argued that policies which foster savings are important, as higher savings lead to higher economic growth. Therefore, this study was put forward to investigate the link between savings, investment and growth in New Zealand. The theory predicts that increased total savings (from domestic or foreign savers) will lead to higher investment and higher growth. In an open economy with access to foreign capital, domestic savings and investment can diverge without necessarily impending. Given that investment portfolios in New Zealand appear to be diversified, the implication is that barriers to capital mobility are likely to be small. The country has been able to access foreign savings to meet investment demands. The study concluded that investment and economic growth do not appear to have been constrained by low domestic savings rates. This result contradicts what the theory predicts, which is that increased total savings will lead to higher investment and output.



University of Fort Hare  
*Together in Excellence*

With the increasing interest in the recent advances in growth literature, the focus has been on the sources that lead to high and sustainable growth. The savings rate, among others, has been thought to play an important role in economic growth, particularly through its association with investment. Motivated by these arguments, Erden, (2005) examined the question of whether savings policies would be effective in bringing about larger capital accumulation and so higher economic growth in Turkey. The study's main focus was on capturing the responses of the private sector to a policy shock. The study used annual data spanning from 1963 to 2002 on domestic private investment and savings in an effort to find out the direction of a casual relationship, if any, between the two.

Employing the bivariate VECM procedure, the result suggests that domestic private savings and investment were closely related and formed a stable long-run relationship before the structural adjustment reforms implemented in 1980. In addition, private investment activities were largely determined by savings innovations during this period. However, the linkage between the two did not appear to hold after 1980. These findings are consistent with the Feldstein and Horioka

argument that the higher the degree of international capital mobility, the weaker the association between domestic saving and investment. Given that the Turkish economy has turned into a relatively open one with the introduction of liberalization reforms in 1980s, the degree of capital movements appears to have risen. This has rendered any impacts of domestic private savings on investment obsolete. The study therefore concludes that there does not appear to be an investment mechanism through which the domestic savings rate enhances economic growth. The study indicates that more research is needed to identify both theoretically and empirically other mechanisms through which the savings rate operates, to generate a high and sustainable economic growth.

Table 2.1 below gives a summary of empirical results from the studies reviewed on the causality between savings and economic growth.



University of Fort Hare  
*Together in Excellence*

**Table 2.1: Summary of key results on causality between savings and economic growth.**

No	Authors	Methodology	Direction of Causality
1	Anoruo and Ahmad, (2001), Elbadawi and Mwega (2000), Sinha, (1998), Orazio, et al, (1999)	Granger causality tests	Economic growth granger causes savings.
2	Cardenas and Escobar, (1998), Aghion, Comin and Howitt, (2006), DeGregorio (1992) and Japelli and Pagano (1994). Loayza, Schmidt-Hebbel, and Serven, (2000)	Granger causality tests	Savings causes increases in economic growth.
3	Dawit (2003), Schmidt-Hebbel et al, (1996), Room (2005), Shahbaz N and Mahmood K, (2004), Ozcan, (2000)	Granger causality tests	Bi-directional causality between savings and growth
4	Mohan (2006), Agrawal, (2001), Ahmad et al, (2003), Saltz (1999)	Granger causality tests	Mixed Results
5	Sinha and Sinha, (2007), Erden, (2005), Claus et al, (2002)	Granger causality tests	No Causality

## Research framework

From the above discussion of the literature, it is evident that there is an on-going debate on the relationship between savings and growth. According to theoretical literature a strong association between savings and growth is firmly established with McKinnon and Shaw (the financial liberalisation hypothesis) indicating that savings are responsive to interest rates, and higher savings rates will finance a higher level of investment which will lead to a higher economic growth rate. The neoclassical growth model (Solow-Swan), endogenous growth model and the Harrod-Domar growth model also indicated that savings play a major role in stimulating growth. On the other hand the life-cycle hypothesis and the permanent-income hypothesis indicate that income growth is vital for increments in the savings rates.



From the various studies which have been reviewed in this study it is not possible to identify clearly actual direction of causality between savings and economic growth. Some studies have indicated that the relationship may run from economic growth to savings while others have illustrated that savings are very crucial in stimulating growth. Yet other studies have purported that a vicious circle exists between savings and growth which implies that savings are responsible for stimulating high growth, while at same time growth is also responsible for high savings. A few studies on the other hand have indicated that there may be no causation between savings and economic growth.

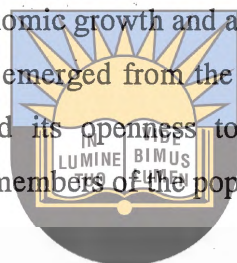
Given the views from both theory and empirical literature, one can not actually ascertain the actual direction of causality between savings and growth as causation runs from both directions. As a result this study supports the idea that there is a bi-directional (feedback) relationship between savings and growth in the South African economy.

## CHAPTER 3

### OVERVIEW OF SAVINGS AND ECONOMIC GROWTH IN SOUTH AFRICA

#### 3.1: INTRODUCTION

In a country, economic growth depends to a large extent on the nature and quality of economic policy (Collier and Dollar, 2001). For instance, in the developing world if there is a good environment for households and firms to save and invest, economic growth is generally observed (Khamfula, 2004). Since democracy in 1994, South Africa has tried to devise various macroeconomic policies to enhance economic growth and address the various inequalities among its citizens. In other words, the country emerged from the apartheid era with an urgent need to complement its political liberation and its openness to global trade and investment with economic growth that would benefit all members of the population.



#### University of Fort Hare *Together in Excellence*

The country has managed to gain significant growth. South Africa's gross domestic (GDP) is four times that of its African neighbours or 25% of the entire continent's GDP (IMF, 2005). With this massive figure, the country can be regarded as the economic powerhouse of Africa. Though the country has achieved this status, it has come through difficult situations especially during the apartheid era, having been put under economic restrictions. The South African economy, in particular, has experienced decades of vigorous growth especially in the third quarter of the twentieth century. However, the economy went into decline in the fourth quarter and this decline was halted in 1994. In 1998 the decline in economic growth recommenced despite the end of sanctions and an inflow of aid (Jones, 2000).

The decline in the South African economy was coupled by dramatic changes in some sectors of the economy, for instance in the mining, finance and transport. However, together, the growth in these sectors was not sufficient to counterbalance the growth in population. In addition to this the manufacturing sector failed to act as the engine of growth. The failure in the economy was triggered mainly by the sanctions, combined with increased military expenditure. The other

force which contributed to the long term decline was the population explosion which to about 44 million by the year 2000.

Maasdorp, (2000: 10) clearly highlights some of the reasons which contributed to the collapse of the South African economy. Firstly, he identifies structural problems as a one of the reasons which has limited the potential for economic growth. He argues that the long standing trade protection to foster import substitution has hampered exports, foreign exchange controls misallocated scarce capital resources and concerns over the availability of strategic materials led to further resource misallocation.



The second reason mentioned is the domestic and international pressure surrounding apartheid which gained momentum and forced the National Party government to react in two main ways. Maasdorp in this case explains that under the doctrine of the 'total onslaught', the South African government drastically expanded the defence capabilities of the security services. It also developed an armaments industry, further engaged in military activities in neighbouring countries such as Angola, Mozambique, Namibia and Zimbabwe, stockpiled strategic reserves and essentially militarised South African society. These activities were carried out at a great cost. Also introduced at the same time were various 'mild' political reforms involving a relaxation of some restrictions associated with petty apartheid and also the introduction of the Tricameral Parliament in 1983. Even though these reforms were implemented, they failed to placate the disenfranchised black majority. The trade unions and the liberalisation movements exploited the resultant social stresses in a successful campaign to make the urban black areas of South Africa ungovernable.

The third factor as Maasdorp reports, was the international reaction to apartheid and the South African authorities' draconian attempts to quell unrest in the townships. This resulted in the imposition of trade and investment sanctions. The economic boycott on investment appears to have been successful as it culminated in the 'debt standstill' of August 1985 with South Africa

becoming a net exporter of capital and being obliged to adhere to a strict debt repayment schedule. As a consequence of these sanctions the country was forced to run a current account surplus. This further forced the country to partly use its domestic savings for net repayments of foreign debt. Thus, domestic savings were not available for domestic investment. Jenkins, (1995: 117) clearly points out that domestic savings were absorbed by expensive capital-intensive projects. This move reduced investment in sectors which would have generated higher growth of output and employment in the country.

In addition to the debt repayment schedule the country experienced capital flight and there was a total net outflow between 1985 and 1989 of 3.3 percent of GDP (Prinsloo, 2000). The disinvestment during this period generated substantial outflows of long-term capital. Furthermore, the inflow of such capital was cut off by a combination of perceptions of growing risk in lending to South Africa and a successful political pressure on banks to stop lending. However, it could also be stated that considerable amounts of short-term capital also left the country. All these outflows of capital together with the regular repayments on the short-term debt and the cessation of inflows of foreign direct investment and long-term loans led to a sustained deficit on the capital account. This massive outflow of capital reduced the availability of savings for investment and limited the flexibility of economic policy. This made the recovery of the economy very difficult.

Maasdorp further argues that even the newly elected non-racial government which in 1994 should have emphasized economic liberalisation as its top economic priority. He indicates that the subsequent failure of the Reconstruction and Development Programme (RDP) policy and the GEAR macroeconomic strategy to boost the economy substantially can be traced to three factors which are: foreign companies that had previously disinvested from South African were loathe to come back, a crime wave that increased skill emigration, depressed tourism and discouraged foreign investment and finally new employment legislation, which further distorted the labour market and raised real wages above equilibrium levels.

As from 1985 onwards the balance of payments which reflects domestic and international economic developments and determines domestic economic variables often dictated the macroeconomic policy. This was mainly due foreign debt commitments. This was a period where deflationary policies were introduced to reduce domestic expenditure in order to maintain surpluses on the current account, creating a situation where the country could not afford to increase imports because of the strain which would be placed on the balance of payments. This meant that strict monetary policy measures to curb domestic spending remained until the 1990s. The country, therefore, had to generate trade surpluses through export growth and import restraint, a situation which prevailed in 1993.



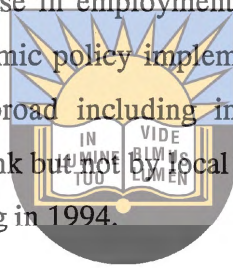
The effects of the financial sanctions meant that South Africa had limited access to international capital markets and with scheduled repayments of debt, the country ended the period 1985-93 with a relatively low foreign debt exposure. The outflows of capital exceeded the current account surplus of the balance of payments by R1.7 billion which implies that net reserves declined by that amount. Although the impact of the trade sanctions was less effective, they meant that South Africa incurred additional costs and lost export markets, some of which were never recovered. Overall, the sanctions led to the intensification of the concentration of ownership in the economy as multinationals were bought by large South African conglomerates. Their effect on employment was indirect rather than direct in sense that, by restricting economic growth and damaging investor confidence, fewer jobs were created than would have been. They also contributed to falling real incomes especially for Whites whose real wages fell completely throughout the 1980s. On the other hand, the wages of the Blacks in formal employment rose rapidly partly because of the influence of the new African unions and continued company policies to eliminate discrimination.

University of Fort Hare  
*Together in Excellence*

### **Macroeconomic policies in South Africa**

As from the 1980s onwards, the National Party (NP) government came to a market-based policy of deregulation and non-intervention. The government sought to enhance the role of the private sector in its policy making. In 1994 when the African National Congress (ANC) took power,

there was continuity in these policies. However, once in power, the ANC elaborated its stance on this economic liberalisation by adopting macroeconomic policies which could scarcely be faulted. Thus the government implemented a macroeconomic policy which led to the containment of the fiscal deficit, single digit inflation and lower interest rates. The objective of this policy was to achieve strong economic growth that would lay the foundation for the reduction in unemployment and a more equitable distribution of income and wealth. For this reason, the government produced a 1994 White Paper (the Reconstruction and Development Programme, RDP) whose primary goal was to increase economic growth, increase the rate of investment to stimulate growth and to modernise production. This in turn would bring increased wage employment, better wages for those in employment and greater equality of income and wealth (Weeks, 1998). The macroeconomic policy implemented in this case was welcomed by the private sector both locally and abroad including institutions such as the International Monetary Fund (IMF) and the World Bank but not by local unions (Maasdorp, 2000). The policy implemented saw economic growth rising in 1994.



## University of Fort Hare


*Together in Excellence*

In 1996 the government launched a new policy statement called Growth, Employment and Redistribution (GEAR) whose objective was to grow the economy, generate jobs and achieve equitable distribution of income. The target was a 6% growth by the year 2000. For the period 1993 to 1995 the objective of enhancing economic growth was achieved. The country recorded a positive growth rate of 1.23% in 1995 up from a negative growth rate -2.14% in 1993. The GEAR programme was however disturbed by the global economic crisis which spread to SA in 1998. The crisis resulted in a decrease in the world demand for South African exports between 1995 and 2000, bringing a massive shedding of labour in South African firms. Furthermore, the growth of the manufacturing export sector fell from 10% per year to about 0% in 1999 owing to the global crisis.

The GEAR programme in fact was insufficient to attract the domestic and foreign investment the country required in order to reach the high real growth rates necessary for modernising the

productive economic sectors, improving the social sectors and making in roads into unemployment. Overall the objectives of GEAR were never met (Michael, 2000).

The failure to meet the targeted objective of GEAR compelled the government to come up with alternative macroeconomic policies. Before 2000, the Southern African Reserve Bank was pursuing a monetary policy that stressed financial stability over economic growth. High interest rates were maintained in order to avoid capital flight, excessive pressure on the exchange rate and high inflation. The policy only succeeded partly because the high interest rates had a stifling effect on economic growth. The policymakers also tried simultaneously to pursue the following three objectives: an open capital market to enable access to external finance, a stable nominal exchange rate to underpin international trade and the freedom to adjust interest via monetary policy (Khamfula, 2004). The South African monetary authorities then introduced inflation targeting with a range of 3 to 6 percent with its main concern being price stability. This policy succeeded in keeping inflation within the target range.

The logo of the University of Fort Hare, featuring a sun rising over an open book with the Latin motto 'IN LUMINE VERITATIS' and 'UNIVERSITY OF FORT HARE' written on the pages.

University of Fort Hare  
*Together in Excellence*

The government has also made some major transformation in the budgetary and expenditure processes. It has introduced some new systems of financial planning, expenditure management, reporting and accountability. Activities such as budgeting are taking place within the Medium Term Expenditure Framework (MTEF), a rolling framework intended to provide greater certainty to line departments for planning and implementing policy programmes which are budgeted and evaluated on the basis of output-linked performance indicators, rather than on inputs. The MTEF also enables a combination of fiscal restraint and a strategic reprioritisation for allocation efficiency for the treasury. It has been supported by the Public Finance Management Act (PFMA) which imposes strong controls over financial management in all public sector institutions and requires departments to set objectives for their expenditure.

The above fiscal reforms have contributed to a steady decline in the fiscal deficit which has been kept below 3% of GDP as stated in GEAR. The government has also been formally committed to

promoting growth through private investment and has proposed a tax cut on company profit or income as the most effective mechanism to increase investment (Michael, 2000). It should be pointed out that fiscal policy does affect private investment and thus growth. It affects private investment under the view that investment is dependent on savings and fiscal policy thus influences private investment by affecting the volume of savings. As a result of this the tight fiscal policy which South Africa implemented is supposed to promote investment by raising total domestic saving and reducing interest rates. The government has therefore expected that reducing the deficit and establishing a record of credibility and consistency in their fiscal policy would boost private investment. However, the boost has not yet happened as investment has continued to be sluggish, (Ndikumana (2005). This is explained latter in this chapter.



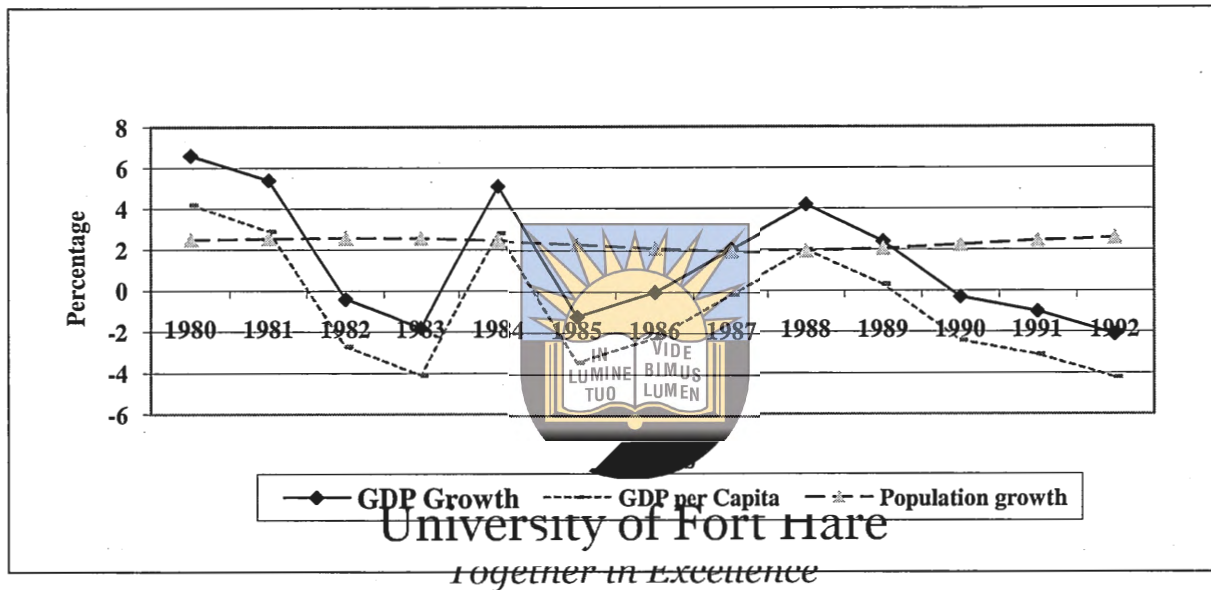
Finally the government has implemented the Shared and Accelerated Growth Initiative of South Africa (ASGISA) whose ultimate objective is to halve unemployment and poverty by 2014. As part of ASGISA the government also introduced the Joint Initiative For Priority Skills Acquisition (JIPSA). The motivation behind government's JIPSA is the view that a shortage of skills in the country is constraining GDP growth. The immediate focus of JIPSA thus will be on the skills identified by ASGISA. In other words, JIPSA seeks to equip people with skills so that they can participate in accelerated growth (Behar, 2006). However, the achievements of these programmes cannot be examined at this point in time.

### **3.2: TRENDS IN ECONOMIC GROWTH: 1980-1992**

The real GDP growth of South Africa has been declining since 1980 (Figure 3.1) below. The population grew at an average of 2.5 percent per year from 1980 to 1985 with per capita GDP growth being negative since 1982. The dismal economic performance during this period implied that standards of living fell as real economic growth lagged behind population growth. Even though there was a recovery in 1986-1988 which was based on reckless government consumption expenditure, growth in South Africa has been increasingly influenced by continuing political uncertainty and growing social unrest. This has led to an increasingly unstable growth in the economy. In all these years, South Africa's investment of an increasing share of its income in

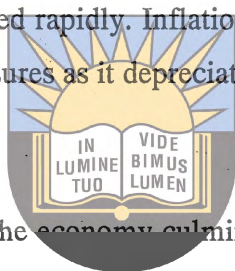
the economy has not been matched by satisfactory economic growth. This was seriously felt in three important sectors of the economy - agriculture, mining, and manufacturing - where growth fell and productivity faltered (World Bank, 1994).

**Figure 3.1: GDP Growth, GDP per Capita and Population Growth**



Mining output at the same time decreased throughout the 1980s and total factor productivity growth in manufacturing has been low - 0.5 percent per year. This level was well below the levels achieved in high-performing economies. Also coming into play was rising unemployment. During the Apartheid period employment growth deteriorated consistently coupled with a shift away from agriculture. Given that the labour supply growth has changed little over the past 30 years, an even more striking issue is the growing imbalance that exists between black labour supply and employment in the formal sector. Even though subsistence agriculture in the homelands and the informal sector provide an invaluable source of employment for the rest, roughly one quarter of blacks are without work. Unemployment is disproportionately concentrated among females and young people, and only a few new entrants to the labour market can expect to find wage jobs. This level of black unemployment is not only a great waste of resources but it also fuels social unrest (World Bank, 1994).

From Figure 3.1 above it can be observed that as from 1989, the South African economy has been in a deepening recession with GDP falling from 2.4 percent in 1989 to -2.1 percent in 1992. This situation as discussed above has been made worse by this growing unemployment. In addition the recession is suggested to have been rooted in the demand shock that followed a substantial and sustained fall in parastatal investments after 1985. This recession was further intensified as private sector confidence declined with growing political uncertainty and social turmoil. The falling economic growth, a large foreign debt, misallocated resources and fiscal strains all created the environment for economic stagnation. Also during this period public spending was rising while the tax base was under pressure. This scenario ensured that public debt was run up while the tax burden increased rapidly. Inflation at the same time was rising and the exchange rate started to show these pressures as it depreciated (Strydom, 2002).



The developments which took place in the economy culminated in a major balance of payments constraint. Balance-of-payments problems greatly constrained the economy as limited access to international finance has meant that the external current account has had to remain in surplus. In mid-1988, the current account started to slip into deficit following moderate growth in the economy (see Figure 3.2). To protect foreign exchange reserves and dampen inflation following a depreciation of the rand, interest rates were raised and new import duties were imposed. This curbed growth and pushed the economy back into recession. Figure 3.2 below shows the ratio of balance on current account to gross domestic product at current prices (percentage).

**Figure 3.2: Ratio of Balance of current account to GDP**

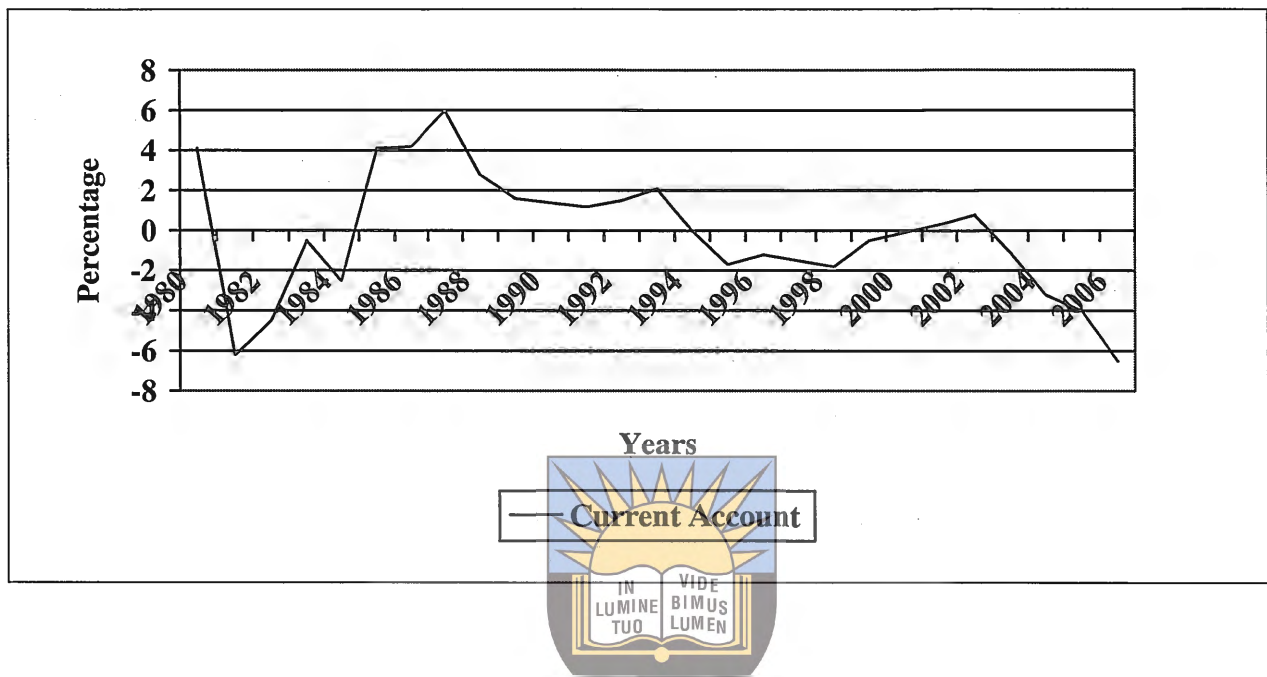


Figure 3.2 above shows that as from 1994, South Africa returned to the ‘normal’ developing economy situation with a current account deficit and net capital inflows. This situation occurred after the debt standstill period between 1985 and 1993, when the current account was in surplus and foreign savings negative because of foreign debt repayment. The figure also shows that the current account deficit which shows the contribution of foreign savings to overall savings has remained very small since 1994, never rising above 2 percent of GDP. As from 1999, the account has been more or less in balance.

In spite of its high investment to GDP ratio in the 1980s (see Table 3.1), South Africa did not generate more jobs and satisfactory growth with this investment. This was partly for the following reasons.

- During the 1980s both investment and growth in the capital stock declined. This decline was also accompanied by a substantial increase in the capital intensity of the economy which further hampered employment growth.

- The allocation of capital stock deteriorated during the same period. This implies that investment was increasingly channelled towards activities with lower-than-average capital productivity such as the public sector.
- The inadequate acquisition of good and quality skills within the workforce contributed in the sense that it lowered the returns on investment and slowed productivity growth.
- Rising wages and the industrial unrest which had occurred since the early 1980s further dampened the employment growth in the country.

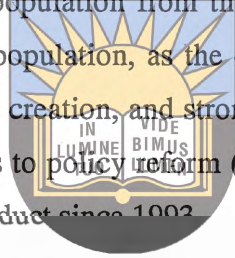
**Table 3.1: Gross Capital Formation as a ratio of GDP (Percentage)**

Years	Gross Capital Formation as a ratio of GDP (Percentage)
1980	25.9
1981	27.5
1982	27.5
1983	26
1984	24
1985	22.8
1986	19.6
1987	17.8
1988	19.4
1989	20.2
1990	19.1
1991	17.2
1992	15.7

From 1980 gross capital formation as a ratio of gross domestic product was very high, well above 20 percent. But as from 1986 gross capital formation started to decrease continuously. This was attributed to the reasons stated above and a strict debt repayment schedule which the country was engaged in as from 1985.

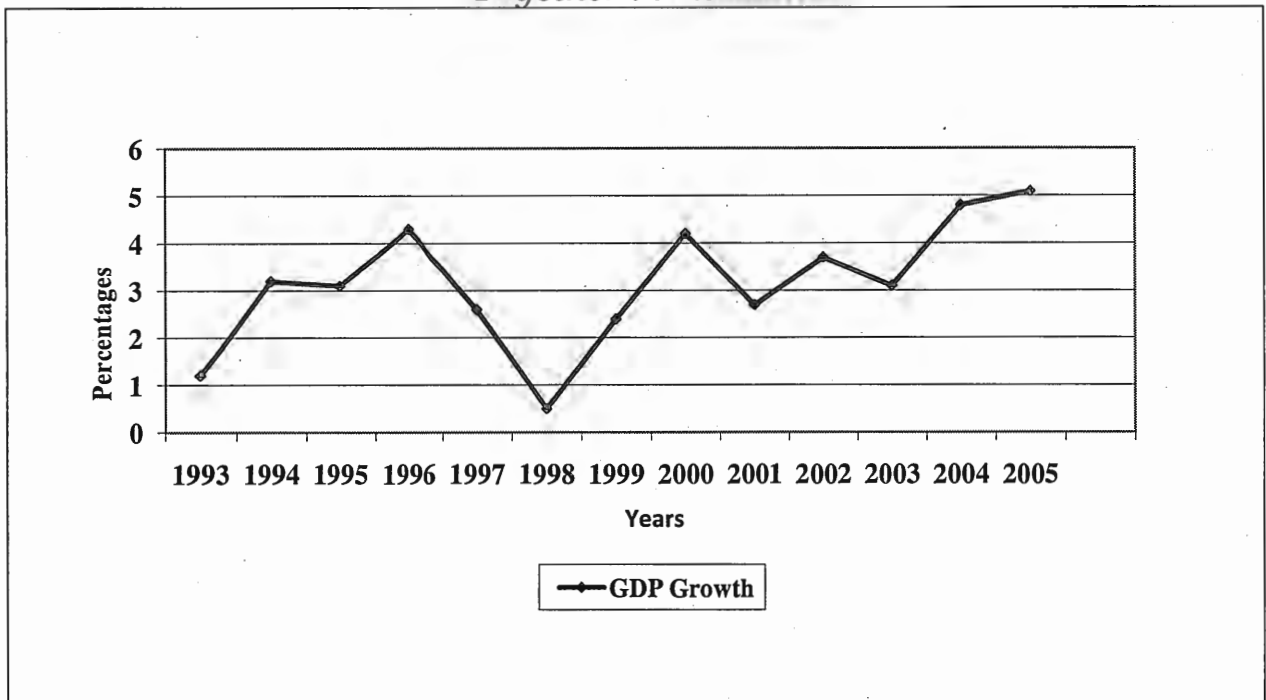
### 3.3: TRENDS IN ECONOMIC GROWTH: 1993-2006

Compared to the previous ten years, the decade since 1994 did see an improved growth performance in South Africa. Nevertheless, the improvement was modest, on average, both by international standards and the standard of South Africa's own history (Du Plesis and Smit, 2007). In fact, the South African economy has managed to achieve a substantial success in the area of macroeconomic stabilization in the post-apartheid era. As mentioned in Chapter 1, the stabilization has not yielded the growth rates that are needed to raise the living standards of the majority of the population. Despite this remarkable success in the areas of macroeconomic stabilization, the country still faces difficult challenges arising from the legacy of marginalization of the majority of the population from the main stream economy. Raising the living standards of the majority of the population, as the country intends to do, requires faster economic growth, vigorous employment creation, and stronger and sustained private investment brought about by high savings responses to policy reform (Ndikumana, 2005). Figure 3.2 below shows the changes in gross domestic product since 1992



University of Fort Hare

Figure 3.3: GDP Growth in the Post-Apartheid era




From Figure 3.2 the GDP growth of South Africa started to recover from the deep recession experienced from 1989 to 1992 as indicated above in Figure 3.1. During the period 1993 – 2006 South Africa's real economic growth rate averaged 3.29 percent and 1.39 percent in per capita terms. This percentage figure represented a substantial improvement on the 0.77 percent growth rate and 1.39 percent in per capita terms which was recorded during the period 1980 – 1992. Du plessis and Smit (2007), report that although this increase in economic growth was a welcome improvement, South Africa's growth performance remained relatively low by world standards.

A closer look on first five years after 1994 shows that the South African growth performance appears to have been gathering pace at an average of 2.8 percent. However as from 1999 the country has been in the upward phase of the business cycle. This is the longest period of economic expansion recorded in the history of the country and the average economic growth from 1999 to 2006 was 3.9 percent. Although the South African Reserve Bank (SARB) indicates that there is no sign of expansion coming to an end, it is difficult to identify this performance with a change in the long-run growth potential of the economy, as the recovery has also been co-extensive with the longest post-war upswing of the South African business cycle (Ndikumana, 2005).

Although there is a substantial improvement in South Africa's growth performance the behaviour of investment which is derived from saving (discussed in **Section 3.4**) should be considered. Investment as a ratio of gross domestic product during the post apartheid era is still very low and is fluctuating between the range of 15 to 18 percent (Table 3.2 below). Compared to the period 1980 – 1990 the gross capital formation averaged 22.6 percent (Table 3.1 on page 10) this is very high compared to the 16.03 percent for the period 1994 to 2006 (Table 3.2 below). Despite that, on a yearly basis, investment seems to be very low. The Finance Minister Trevor Manuel (2003) pointed out that investment in South Africa was growing. In fact the Minister indicated that despite the stagnation of global markets, total investment in South Africa grew by more than 8% in the first half of 2003, continuing the momentum achieved in the latter half of 2002, which saw an increase of 9%. He further pointed out that private investment expanded by 7% in the same

period. The Minister also added that the increase in investment in the domestic economy had been spurred by the fact that South Africans were able to diversify their savings and earnings.

Given the current trend in investment, Manuel indicated that South Africa still had a number of challenges to overcome to increase the pace of investment, adding that the rate of investment had to rise from the current levels of around 16% of GDP in order for the country to experience more rapid growth, development and poverty reduction. He also pointed out that sustained growth, job creation and poverty alleviation demanded that the economy invest more. The Minister also highlighted that increased levels of investment could be achieved by dipping into the global savings pool. The major point which the Minister emphasised is that vast majority of the savings for investment in South Africa must come from South African citizens and corporations. As we shall see in **Section 3.4** the domestic savings for South Africa which should contribute more to investment are seriously decreasing. This might reflect why investment and economic growth are very low.

The logo of the University of Fort Hare, featuring a shield with a sunburst at the top, an open book in the center, and the motto 'IN SUPREMO TUO' on the left and 'VIDE SUPREMO TUO' on the right.

University of Fort Hare  
*Together in Excellence*

**Table 3.2: Ratio of gross fixed capital formation to GDP**

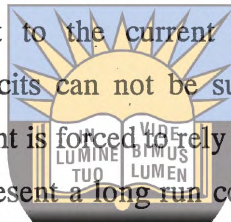
Years	Ratio of gross fixed capital formation to GDP
1993	14.7
1994	15.2
1995	15.9
1996	16.3
1997	16.5
1998	17.1
1999	15.5
2000	15.1
2001	15.1
2002	15
2003	15.9
2004	16.1
2005	17
2006	18.7

### 3.4: GROSS DOMESTIC SAVINGS IN SOUTH AFRICA

Gross domestic savings (GDS) is defined in the national income accounting literature as the net of gross disposable income after accounting for consumption. They are domestic resources that feed into the monetary system as funds to finance investment. A balance between domestic savings and investment reflects the foreign saving position of the country. The excess savings of a country would lead to foreign lending reflected by an outflow of capital while the deficiency in national saving as is the case in SA would lead to an import of capital through foreign borrowing. The deficiency in national savings will be reflected in the surplus or deficit on the current account of the balance of payments. When domestic investment exceeds domestic savings, the shortfall will be shown as a deficit on the current account of the balance of payment. This must be financed by import saving from other parts of the world.

### 3.4.1: TRENDS IN GROSS DOMESTIC SAVINGS (GDS)

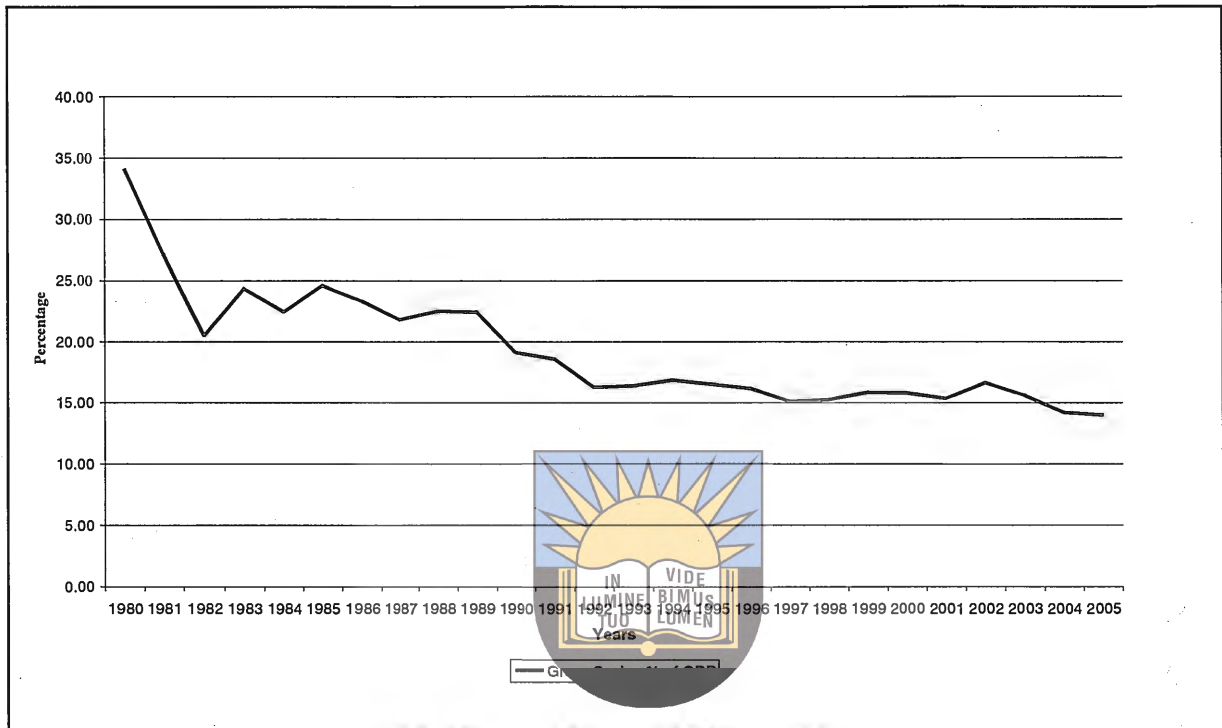
South Africa has experienced a steady decline in its national savings rate over the past decades. This has been accompanied by a fall in domestic investment. The national savings rate which is defined as the ratio of national savings to gross national disposable income remained well above 20 percent in the 1980s (Harjes and Ricci, 2006). However, this subsequently fell to less than 20% in the first years of the new millennium. In fact, South Africa's national savings have remained between 14.5 percent and 17 percent of gross domestic product (GDP) since 1994 which is well below the savings level in the 1980s. As mentioned in section 3.4 above, macroeconomically, if the domestic economy generates insufficient savings to finance investment, foreign savings equivalent to the current account deficit must make up the difference. However, large current deficits can not be sustained for very long unless capital inflows are large and stable, so investment is forced to rely mainly on domestic savings. Thus the central question is whether savings represent a long run constraint on investment hence growth (as neoclassical economist argue) or whether a high investment will generate higher savings via its impact on income growth (as Keynesian theory suggests). The South African policy has been premised on the former view with a key justification for the tight fiscal stance from 1993 to raise government savings which had become negative (Gelb, 2005). Figure 3.3 below shows the gross savings of South Africa as a percentage of gross domestic product since 1980.



University of Port Harcourt

Key justification for the tight

**Figure 3.4: Gross saving as percentage of GDP**



University of Fort Hare  
*Together in Excellence*

Source data calculated from: [www.dti.gov.za](http://www.dti.gov.za)

The gross savings as a percentage of gross domestic savings has been declining since 1980 as indicated by the graph. The major decline in the gross savings in South Africa occurred during the period 1980 – 1982 when gross saving fell from 34 percent to 20 percent.

### **3.4.2: ANALYSIS OF THE COMPONENTS OF GROSS SAVINGS**

The components of aggregate gross savings are the private savings which are composed of household and corporate sector savings and government savings. Household savings or personal savings are that part of current income, after the payment of direct taxes, that is not consumed or transferred as part of household current consumption. Corporate savings on the other are the balancing item between the income and expenditure accounts after the current receipts and payments of companies have been taken into consideration. Corporate saving can also be described as the retained income of private and public incorporated financial and non-financial

enterprises. Government savings are the total of the retained profits of public enterprises and retained taxes and other current receipts not disbursed on current outlays by the government (Prinsloo, 2000).

The changes in the components of aggregate savings are shown in Table 3.3 on the next page. The analysis of the trends in the private savings (household and corporate sectors) in Table 3.3 show that the savings ratio for the private sector decreased largely between 1980 and 1987. However, an upward and downward trend for the period 1982 to 1987 is noticeable but a relatively slight decrease over the period 1990 to 2000. However, the gross savings ratio for the general government declined progressively and turned negative in 1982 onwards.



Table 3.3 also shows that the gross savings in South Africa averaged 19.28 percent of the gross domestic product in the period from 1980 to 2005. However, as from 1980 a downward trend became noticeable in the aggregate savings rate. As a result the average savings rate in the period 1986 to 1990 fell to 21.85 percent compared to 25.55 percent between 1980 and 1985. This downward trend continued, with average savings rates further decreasing from 21.85 to 15.19 for the period 2001-2005. The savings rate slowly decreased for the period 1996-2000 and 2001-2005 with the average decreasing from 15.65 to 15.19 percent, a slight decrease of 0.46 percent.

Gross savings were higher during the period 1980-1985 largely due to the windfall profits of gold-mining companies as the price of gold reached exceptionally high levels during this period. However the major decrease in gross savings relative to gross domestic product during the long downswing from 1989 to 1993 was mainly due to a deterioration in the savings ratio of the general government. During the same period when government savings were decreasing there was relative stability in the private savings ratio.

**Table 3.3: Components of gross saving as percentage of gross product (1980 -2005)**

Year	Government Savings as % of GDP	Household Savings as % of GDP	Corporate Savings as % of GDP	Gross Saving as % of GDP
1980	0.24	0.61	33.3	34.15
1981	0.14	0.2	26.86	27.2
1982	-0.09	0.15	20.46	20.53
1983	-0.18	0.15	24.37	24.35
1984	-0.4	0.54	22.31	22.45
1985	-0.42	0.86	24.18	24.63
1986	-0.56	0.6	23.29	23.33
1987	-0.93	0.85	21.9	21.83
1988	-0.69	0.99	22.22	22.53
1989	-0.8	1.08	22.15	22.43
1990	-0.88	0.62	19.38	19.13
1991	-1.33	0.75	19.18	18.6
1992	-3.65	1.77	18.16	16.28
1993	-3.79	1.65	18.54	16.4
1994	-3.63	1.09	19.42	16.88
1995	-2.88	0.76	18.64	16.53
1996	-3.74	0.86	19.05	16.18
1997	-3.64	0.89	17.99	15.13
1998	-2.63	0.84	17.97	15.25
1999	-1.96	0.78	17.86	15.88
2000	-2.23	0.75	17.28	15.8
2001	-0.87	0.6	17.55	15.38
2002	-1.03	0.52	17.19	16.68
2003	-2.17	0.96	16.83	15.63
2004	-2.75	0.37	16.6	14.23
2005	-1.2	0.13	15.1	14.03
<b>Averages</b>				
1980-1985	-0.12	0.47	25.25	25.55
1986-1990	-0.77	0.83	21.79	21.85
1991-1995	-3.06	1.2	18.79	16.94
1996-2000	-2.84	0.82	17.66	15.65
2001-2005	-1.6	0.52	16.27	15.19
1980-1989				24.34
1990-1999				16.62
2000-2005				15.29
1980-2005				19.28

Source data calculated from: [www.dti.gov.za](http://www.dti.gov.za)

### 3.4.3: TRENDS IN SAVINGS BY THE PRIVATE SECTOR (HOUSEHOLD AND CORPORATE SAVINGS)

#### *i. Trends in savings by the corporate sector*

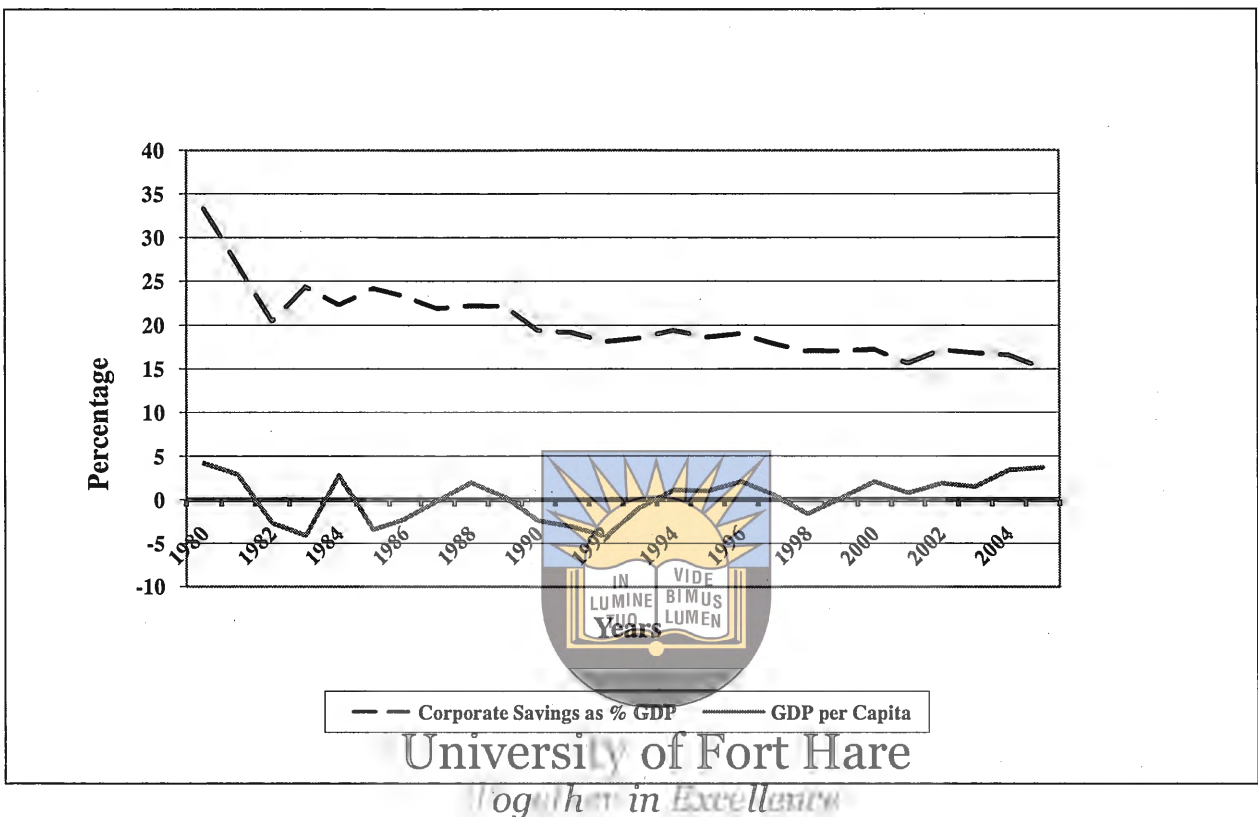
Like the overall gross domestic savings, gross savings by the corporate sector have been falling since 1980 see Table 3.3. The ratio of the corporate sector's gross savings, as a percentage of the gross domestic product, decreased from an average of 25.25 percent in the 1980s to 16.27 percent in the period from 2001 to 2005. For the period between 1983 and 1985 (see Figure 3.4 below) the decrease in the savings by the corporate sector was equally matched by an increase in the growth of gross domestic per capita (growth of gross domestic per capita is used here as a measure of real income). However, the corporate sector tends to strengthen its savings when the economy is in a downward phase of the business cycle (recession). The savings ratio of the corporate sector thus increased during 1985 when the economy's growth was declining. Between 1988 and 1989 the corporate savings ratio was relatively constant at about 22 percent. This was a result of a slight increase in the savings rate when the economy



University of Fort Hare  
*Together in Excellence*

During the upward phase of the business cycle in the 1990s, as shown by the increase in the growth rate of output particularly for the period 1993 to 1996 corporate savings rose markedly. However, the slow growth in the output which has remained below the expected level has kept the corporate savings well below 17 percent despite some improvement in 2003 to 2005. Despite this fact, the ratio of gross corporate saving as a percentage of gross domestic product has been decreasing, it is still the mainstay of gross domestic savings in South Africa. This is quite clear from Table 3.3 where one can see corporate savings contributing higher percentages than government and household savings. The two have been below 1 percent since 1980. Figure 3.4 below shows the trends in the corporate sector's savings.

**Figure 3.5: Trends in the Corporate sector's savings**



Prinsloo, 2000 indicates some factors which could have contributed to the relatively stable performance of the corporate saving from the early 1980s. These include

- The prevailing tax policies could have influenced the decision to accumulate income as a corporate sector rather than as an individual, as well as the decision to increase corporate savings rather than the option of distributing profits as dividends.
- Changes in tax arrangements also could have affected the decision to distribute profits or retain them as corporate savings as one third of all dividends received by individuals were tax free and the balance was taxed at each individual's marginal rate.
- The effective tax rate of companies which fluctuated around an average of 24 percent between 1975 and 1996, which then declined from a high of 29.7 percent in 1990 to an average of about 23.8 percent between 1995 and 1999.

## ii. Trends in the household saving / personal savings

By the year 1994 which signalled the end of apartheid, South Africa was left with first-world financial markets and a third world social infrastructure. As happened to the rest of the other sectors in the economy in South Africa, the South African financial services sector underwent dramatic changes seeking to extend access to financial services to the traditionally underserved population. Given this aim and more than ten years after the end of apartheid still, 42 percent of South Africans have never had a bank account and 54 percent are currently unbanked. In fact estimates indicate that 17.5 million South Africans are unbanked. The unbanked can be categorised as those without a basic checking or savings account. In addition to this many household in South Africa are relying on alternative financial institutions even though they have bank accounts (Darian and Katy, 2005).



In fact, commercial banks including the big four which are Absa, FirstRand, Nedbank and Standard Bank traditionally did not serve low income earners, micro-entrepreneurs and the poor (collectively known as the unbanked) (Schepers, 2004). The direct consequence of being the under-banked is that individuals might pay more for basic financial services. Moreover the under-banked lacked the tools they need to save and to build assets which enable these households protect themselves from negative economic shocks. This might be the reason why household savings as we shall see later in this chapter are very low, less than 1 percent. The diagram below represents the landscape of financial services available to South Africans with the unbanked and the under-banked tending to transact in the alternative financial services sector and the informal economy.

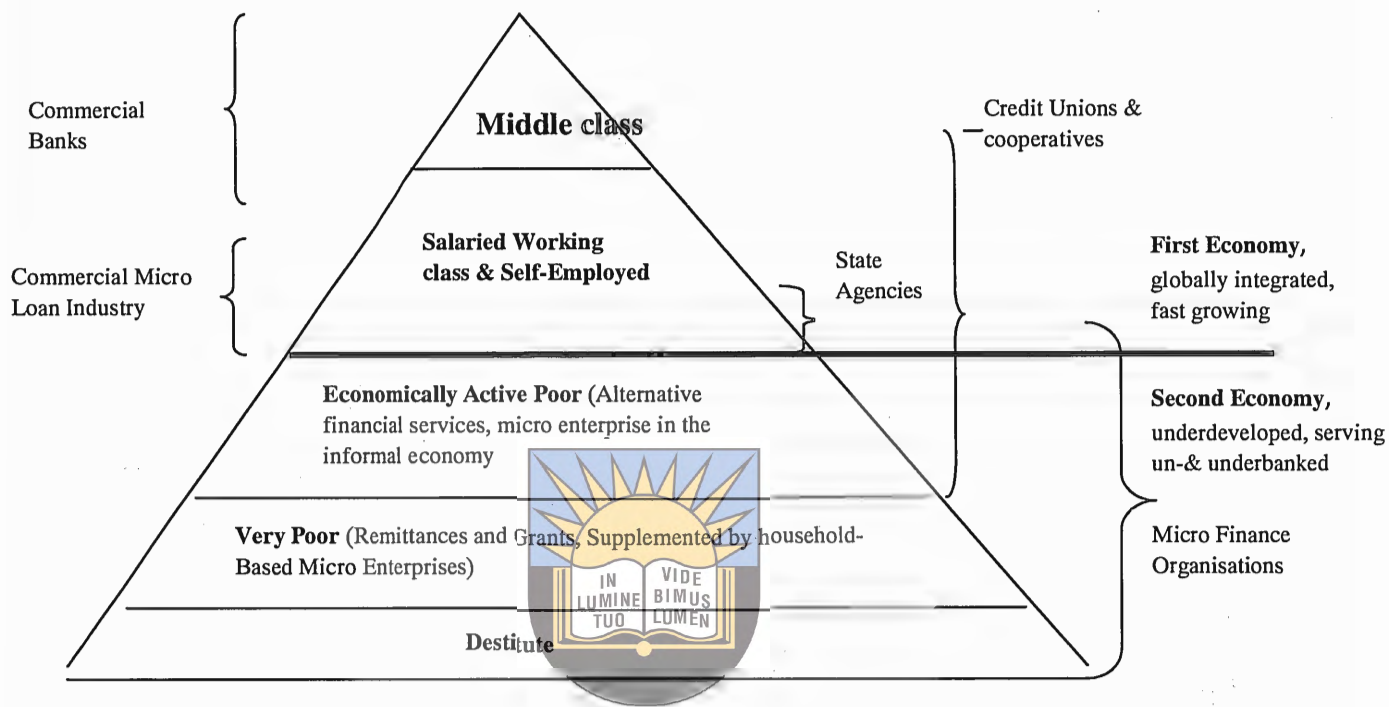
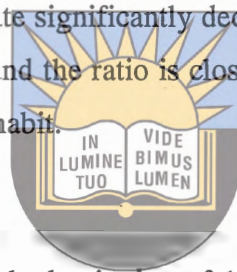


Diagram adapted from The Center for Financial Services Innovation 2005  
**University of Fort Hare**  
*Together in Excellence*

Overall for the past twenty years personal savings in South Africa, as a percentage of gross domestic product, have been declining (see Figure 3.5 below). As a percentage of gross domestic product, household savings have declined and remained below 2 percent since 1980. The savings rate by households deteriorated between 1980 and 1981 and remained stable between 1982 and 1983. The deterioration in the personal savings ratio at the beginning of the 1980s coincided with a greater use of credit by the households. Households during this period were linked to rising debt levels as households borrowed to maintain consumption levels and contractual savings (insurance and pension funds). This lower rate of personal saving was thus reflected in the higher ratio of consumer debt which is the total of household credit and outstanding mortgages to the disposable income of households.

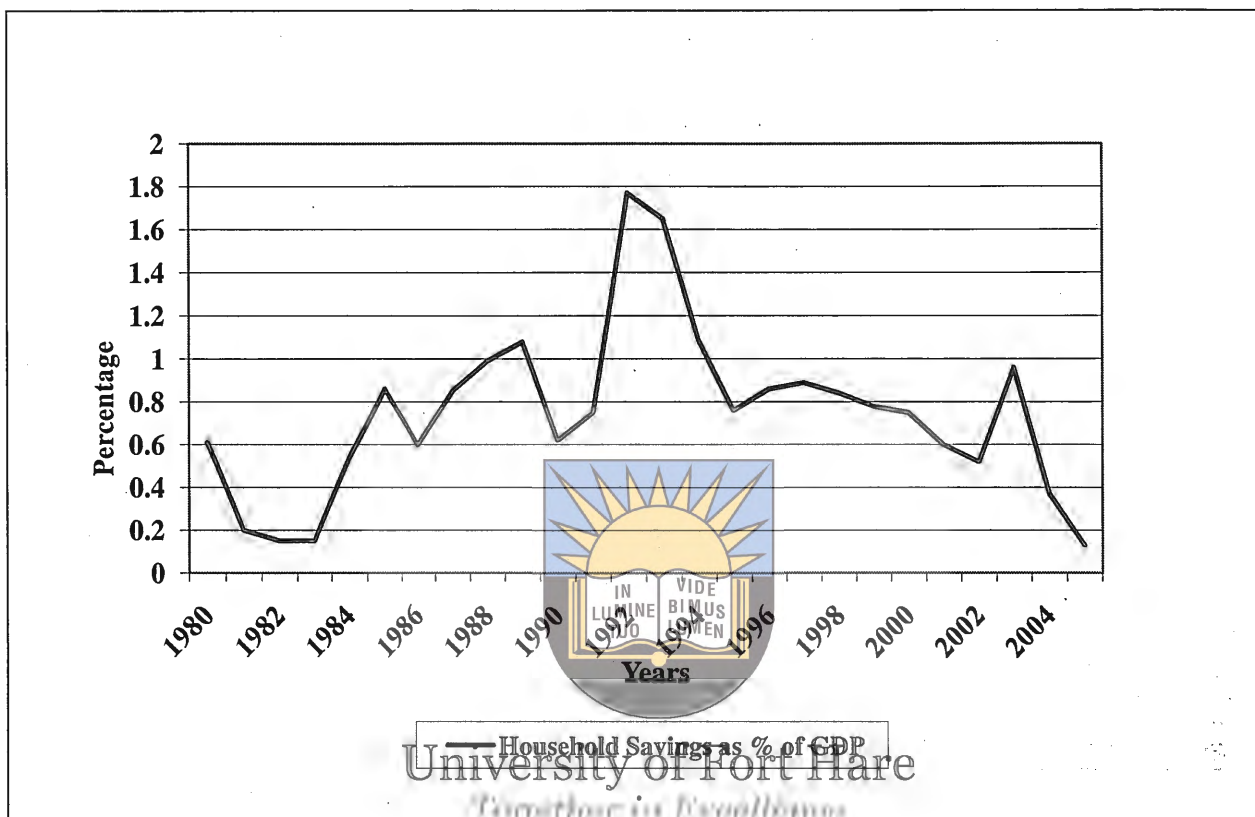
However, the saving rate improved between 1984 and 1990. This was largely due to the slow and declining performance of the economy. Household savings rather increased and reached a peak

between 1992 and 1994, before falling again. The tightening of monetary policy and the relatively high real interest rates during this period helped to restrain the demand for credit and this forced the debt to asset ratio to fall to an average of 18.7 percent (Prinsloo, 2000). Between 1996 and 2000 the rate increased slightly despite the policies implemented by the government, for example GEAR. Prinsloo, 2000 points out that a quarterly analysis of the savings behaviour by households suggests that the deterioration in the savings ratio of households has slowed down since the beginning of 1997. He indicates that this was broadly consistent with a decline from 1998 in the ratio of household debt to disposable income of households and the fact the average real after tax return on savings turned positive during the second half of the 1990s. Between 2003 and 2005 the household savings rate significantly decreased. In fact, household savings in South Africa have seriously decreased and the ratio is close to zero percent which indicates that South Africans do not have the savings habit.



The decrease in personal savings from the beginning of 1995 up to the recent years is because households increasingly turned to greater use of credit to finance their higher levels of consumption expenditure, thus pushing down their saving ratio to even lower levels. It should be remembered that prior to 1994 several groups of population were unable to borrow from the banking sector as mentioned earlier due to factors such as low income or lack of a creditworthy track record. In recent years these constraints have begun to ease. As a result, many households in these categories (the unbanked) now have rising disposable incomes and they are beginning to spend their wealth on expensive durables such as cars, furniture and other household equipment. However, much of the increased spending is on credit. This is fuelled by a desire for conspicuous consumption to impress the neighbours and family. Moreover, the younger generation across the population spectrum are apparently gripped by status, image, labels and material goods as a way to demonstrate their wealth. Business Report, (2008) shows that households owed a total of R1.1 trillion, while household income equalled R1.4 trillion-pushing the ratio between debt and income to 82 percent from 77.6 percent in the previous year.

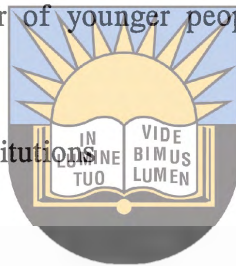
**Figure 3.6: Trends in Household savings**



Referring to this poor rate of savings by households, Stals, 2001 indicates there is great concern in South Africa about this low level of saving by private households. He indicates that were it not for the continued good rate of saving maintained by the corporate sector and an important reduction in dissaving by the general government in recent years, South Africa would by now, have become entirely dependent on the unreliable and unpredictable source of foreign direct investment for the financing of its capital expansion programmes. He even suggested that the remedy for the low savings rate of private households in South Africa must therefore be sought in either a reduction of consumption expenditure as a percentage of total income or in lower effective taxation or a combination the two.

Stals also provides the reasons for the decline of household savings in South Africa as indicated by Prinsloo, (2000). The following were listed as the reasons responsible for the decline in personal saving.

- Rising marginal personal tax rates
- Persistently high rates of inflation over a long period of time
- Demographic trends particularly the absorption of more low-income people in economic activity
- The relative rise in the number of younger people in the total economically active population of the country
- The deregulation of financial institutions
- Easier access to credit facilities



## University of Fort Hare

*Together in Excellence*

Despite this poor performance in household savings Prinsloo also indicates that the decline in households savings over the past twenty years or so was part of the global weakening in households' savings performance. He even indicates that personal savings ratios declined in several industrialised countries and in South Africa this has in part been related to the decline in the real income growth of households which may to some extent reflect the rise in unemployment. He also referred to the role that the government can play with its tax policies in influencing savings by corporates and individuals. He points out that in South Africa private households are reluctant to reduce consumption from any level once established. Thus, a rise in taxes, particularly direct income taxes is therefore normally followed by a reduction in saving rather than consumption.

The most important thing about personal savings is that in the past they came from contractual savings. They came mostly in the form of regular contributions made by employers and employees over a long period of time to pension funds and life insurance policies. On the other

hand, discretionary savings have been negligibly small in contribution and in recent years, for most of the time, they have been negative. In fact substantial borrowing by the households from banking institutions for the financing of consumption which is counted as negative savings in macroeconomic analysis exceeded total discretionary savings. This resulted in a growing amount of private sector indebtedness (Stals, 2001).

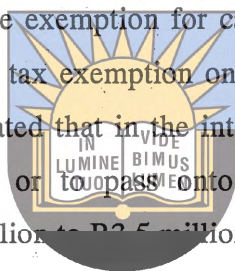
Although most of the empirical literature does not provide clear evidence that the effect of taxes on saving is either statistically significant or quantitatively important. The common method which the government employs in an attempt to influence savings behaviour is to exempt investment income in full or partially from income tax. The motive behind this is to influence the marginal rate of return on accumulated savings in order to influence the flow of savings. South Africa has followed this route in a bid to stimulate household savings. In the month of June 2007, Appel reports on the new law to promote savings introduced by the Finance Minister Trevor Manuel. In this article he indicates that the Minister has introduced the new Taxation Laws Amendment Bill which aims to help South Africans manage their savings in an environment of rising personal debt. The Minister, he wrote, told Parliament in Cape Town that personal income tax relief would be granted to the public across the board as a result of the steadily growing economy and administrative efficiencies of the South African Revenue Service.

The Minister also announced that the tax free-threshold for low income earners is set to be increased from R40 000 to R43 000 with the 18 percent tax bracket being raised from R100 000 to R112 500 and the 40 percent tax bracket raised from R400 000 to R450 000. The Minister emphasised that the raising of the thresholds for taxable earnings would effectively put R8.8 billion worth of personal income back into the pockets of taxpayers for which savings can be increased. The Minister also pointed out that the long term savings for pension, provident funds and individual retirement annuities can now grow tax-free so as to maximise the savings 'nest egg' of future retirees.

The other amendment that is related to the Bill is a new tax regime for lump sum payouts on retirement or death. Under the draft law:

- The first R300 000 lump sum amount will be tax free.
- Amounts between R300 000 to R600 000 will be subject to 18 percent tax.
- Amounts between R600 000 to R900 000 will be subject to 27 percent tax.
- All amounts above R900 000 will be subject to 36 percent tax

The Minister added that interest and dividend exemption for individuals aged below 65 will increase from R16 500 to R18 000 and for older individuals will increase from R24 500 to R26 000. The Minister also indicated that the exemption for capital gains and capital losses would increase from R12 500 to R15 000 and tax exemption on donations would also increase from R50 000 to R100 000. Finally he indicated that in the interest of making sure that individuals have sufficient funds upon retirement or to pass onto future generations the estate duty exemption would increase from R2.5 million to R2.5 million.



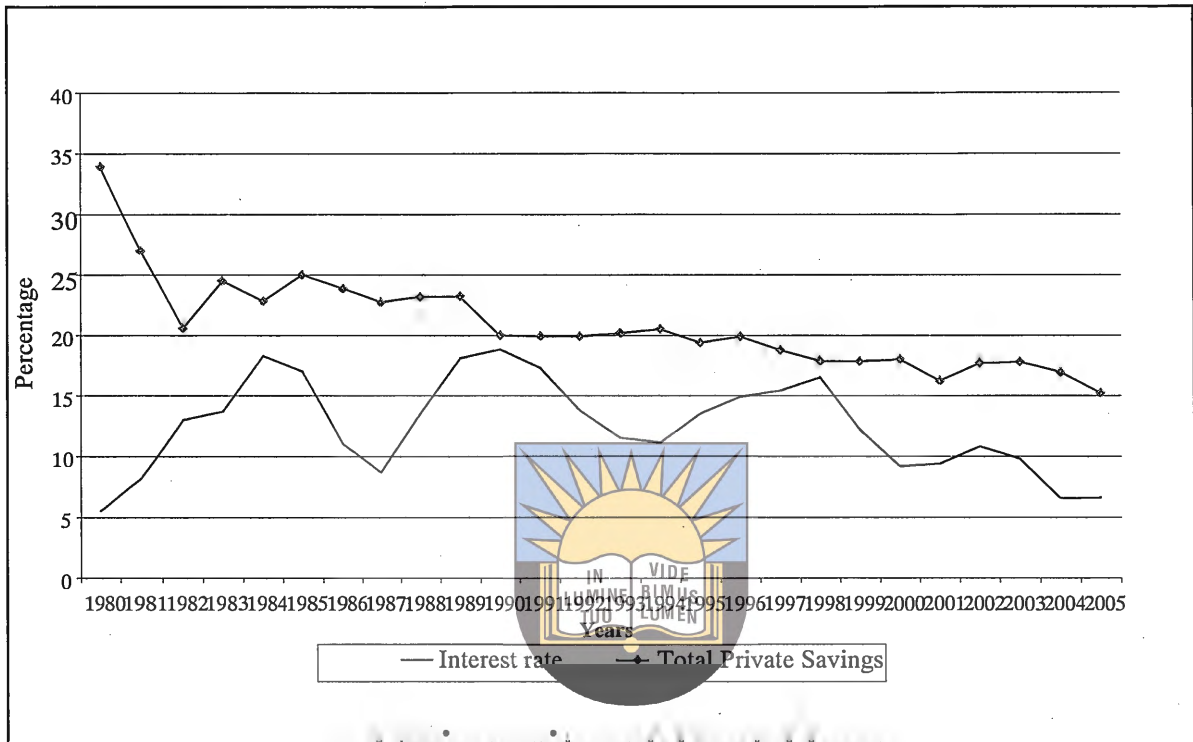
## University of Fort Hare

*Together in Excellence*

### **iii. An analysis of Private savings and its response to bank deposit rate**

Figure 3.6 below shows that the decrease in the gross private savings in the early 1980s seems to have been negatively correlated with the bank deposit rate. A lower rate of interest of about 5% in 1980 caused the private sector to reduce their savings as the return on deposits was lower. The decrease continued until 1982 when the interest rate reached 13%. This continuous increase in the interest rate caused the savings rate to improve in tandem with the interest rate during the period 1982 to 1984. However, a marked decrease in interest rate from 1985 to 1987 to about 8% resulted in a slight decrease in private savings. Private savings remained relatively stable when interest rates recovered between 1988 and 1990. A slight decrease was again noticeable during the period 1991 to 1996 when interest rates were lowered. From 1998 to 2005, interest rates and private savings exhibited a similar trend, suggesting that consumers responded well when there was a decrease or increase in the interest rates.

**Figure 3.7: Private savings and bank deposit rate**

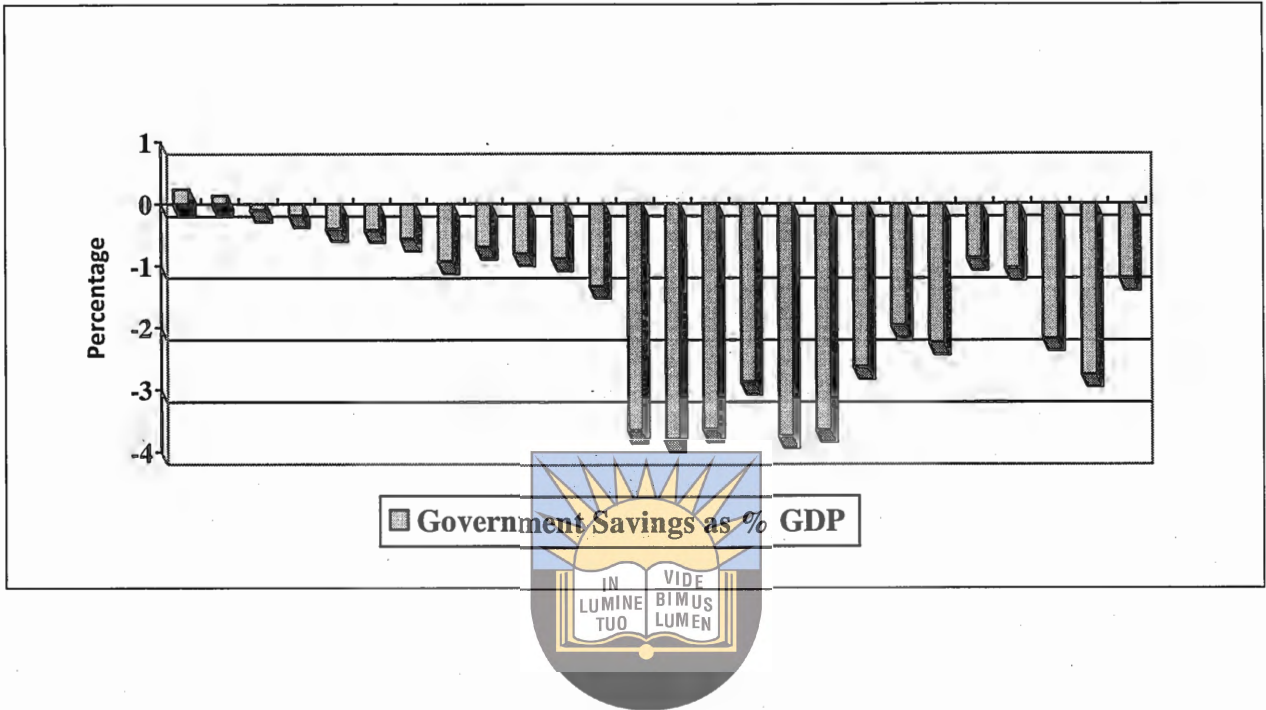


University of Fort Hare  
*Together in Excellence*

**iv. Trends in government savings**

The gross savings ratio of the general government in South Africa is very low (see Figure 3.7). For the period 1980 – 1981 gross saving by the general government was slightly above zero. However, as from 1982 right through to the 1990s the gross saving by the government was negative. The decline of savings by the government from 1985 was due to the net repayments of foreign debt. However the decline can also be attributed to the substantial increases in the level of government consumption expenditure and the escalating cost of servicing government debt.

**Figure 3.8: Trends in Government saving as a ratio of GDP**



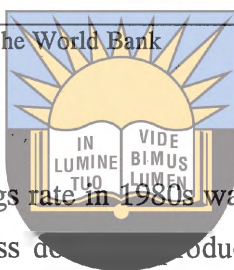
**3.5: COMPARING SOUTH AFRICA'S SAVINGS WITH OTHER COUNTRIES**

South Africa's average savings rate in the 1980s compared well with the savings rate of other middle-income economies, in particular those with an average per capita income of between US\$2000 and US\$ 3000 per annum (World Bank, 1999). However, during the 1990s, South Africa's savings rate deteriorated while the savings rates of the other developing economies improved. This is illustrated in Table 3.4 below.

**Table 3.4: South Africa's gross saving as percentage of gross domestic product compared to middle-income economies**

Country	1980	1996	1997
Botswana	36	43	45
Malaysia	33	42	44
South Africa	34	16	15
Brazil	21	18	19

Source World Bank Indicators, 1998 and 1999, the World Bank

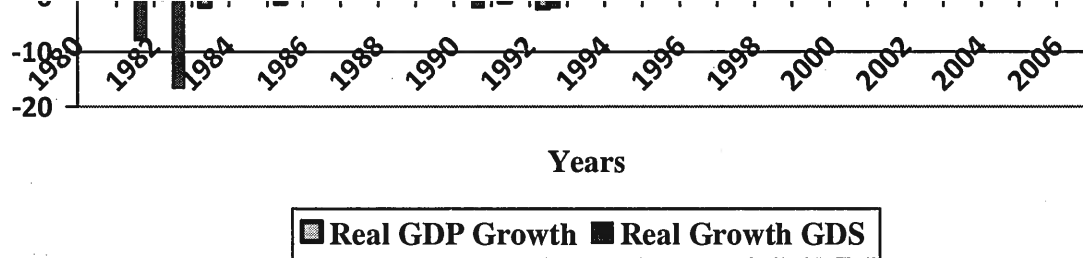


The weakening of South Africa's savings rate in 1980s was largely due to net outflow of capital which averaged 2.4 percent of the gross domestic product between 1985 and 1993. The high capital outflow was largely due to the intensification of international economic sanctions against the apartheid regime.

University of Fort Hare  
*Together in Excellence*

**3.6: RELATIONSHIP BETWEEN REAL GROWTH RATE IN GROSS DOMESTIC SAVINGS (GDS) AND REAL GROSS DOMESTIC PRODUCT (GDP)**

As can be seen from Figure 3.9 below, there seems to be a similar trend between the real growth rate of gross domestic savings (GDS) and real growth rate in gross domestic product (GDP). The falling of the real growth rate in the early 1980s was accompanied by a massive decline in the growth of real domestic savings. The real growth rate picked up in 1984 before decreasing due the debt standstill in 1985. The increase in the growth rate of the savings period 1983-1984 was also followed by a slight increase in the growth rate which turned positive from negative. This increase did not last long as the growth rate decreased again, down to zero in 1986. Both the growth rate of GDS and GDP followed a similar trend for the period 1987-1991. Except for the



### 3.7: CONCLUSION

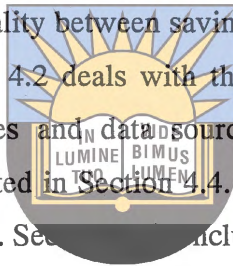
This chapter reviewed trends in economic growth and savings in South Africa since 1980. From 1980 both gross savings and economic growth have decreased. The decrease in the two can be attributed to the sanctions which were imposed on the country. The decrease in savings and growth was also matched by a decrease in gross fixed capital formation. However, the decrease in savings was coupled by a greater use of credit by households. As from 1994 when the country attained democracy it implemented a number of macroeconomic policies with the aim of stimulating the economy in a variety of ways. The policies have however managed to increase growth but not to the expected level. This also applies to gross savings which have been decreasing and are not able to raise investment necessary to boost the economy.

## CHAPTER 4

### METHODOLOGY AND DATA ANALYSIS

#### 4.1: INTRODUCTION

The literature reviewed in the previous chapters provides some insights into the link between savings and economic growth. In particular, it has been indicated that savings through their intermediate link with investment are vital for economic growth and vice versa. On the other hand, the literature is not conclusive on the causality between economic growth and savings. This chapter seeks to establish the causality between savings and economic growth. The chapter is divided into seven sections. Section 4.2 deals with the model specification. Section 4.3 is concerned with definitions of variables and data sources. The review of the econometric techniques used for this study is presented in Section 4.4. Section 4.5 presents the results while Section 4.6 deals with the causality tests. Section 4.7 concludes the chapter.



University of Fort Hare  
*Together in Excellence*

#### 4.2: MODEL SPECIFICATION

Agrawal, (2001) indicates that in order to examine the causal relationship between savings and economic growth and to investigate the direction of causation it is important that other factors that affect the savings rate be taken into account. Given this view the variables which affect the savings rate will now be considered in the following proposed savings function which is a modified version of that found in Agrawal, (2001).

$$GDS_t = \beta_0 + \beta_1 YPC_t + \beta_2 Growth_t + \beta_3 RD_t + \beta_4 POL_t + \beta_5 INF_t + \beta_6 FSD_t + \varepsilon_t \dots \dots \dots 4.1$$

where,

$GDS$  = gross domestic savings (GDS);

$RD$  = Real deposit rate;

$INF$  = Inflation rate;

$YPC$  = Real income per capita;

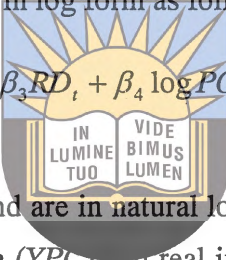
$Growth$  = Growth of real income;

$FSD$  = Financial sector development;

$POL$  = Political instability;

$\beta_i$  are coefficients to be estimated and  $\varepsilon_t$  is the disturbance term.

The estimated function can be expressed in log form as follows:



$$\log GDS_t = \beta_0 + \beta_1 YPC_t + \beta_2 Growth_t + \beta_3 RD_t + \beta_4 \log POL_t + \beta_5 \log INF_t + \beta_6 \log FSD_t + \varepsilon_t \dots 4.2$$

All the variables are defined as before and are in natural logarithms except for the growth of real income ( $Growth$ ), real income per capita ( $YPC$ ) and real interest rate ( $RD$ ) because they contain either negative or positive values.

University of Fort Hare  
*Together in Excellence*

The neoclassical growth model (Solow-Swan) (see Chapter 2) indicates that if the savings rate is high, the economy will have a large capital stock and a high level of per capita output. Capital formation (investment) used as an intermediate link between saving and growth, for the purposes of this study (see Chapter 1) implies there are feedback effects between savings, investment and growth. The following investment function is also considered.

$$I_t = a_0 + a_1 GDS_t + a_2 Growth_t + a_3 POL_t + a_4 CRED_t + a_5 RD_t + a_6 FSD_t + \mu_t \dots 4.3$$

Where,

$I$  = Domestic investment;

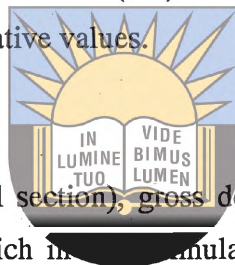
$CRED$  = Credit

$a_i$  are coefficients to be estimated and  $\mu_t$  is the disturbance term.

$POL$ ,  $GDS$ ,  $Growth$ ,  $RD$  and  $FSD$  are defined as before. The estimated function can also be expressed in log form as follows:

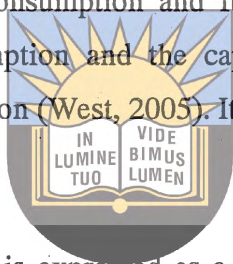
$$\log I_t = a_0 + a_1 \log GDS_t + a_2 Growth_t + a_3 \log POL_t + a_4 \log CRED_t + a_5 RD_t + a_6 \log FSD_t + \mu_t \dots \dots 4.4$$

As explained above, the real deposit interest rate ( $RD$ ) can not be expressed in log terms because the variables have either positive or negative values.



As mentioned in Chapter 2 (theoretical section), gross domestic savings provide the funds to finance domestic capital formation which in turn stimulates growth. Given the nature of this relationship between domestic savings and growth, gross domestic savings are used as a measure of savings in this study. Growth in real income is included in this model because the life cycle hypothesis and permanent income hypothesis predicted that higher savings are associated with higher levels of real income or output. The expected sign of the coefficient of growth is positive. According to the neoclassical growth model (see Chapter 2), increases in the savings rates will lead to higher steady state levels of income or output per capita. Thus, real gross domestic product (GDP) per capita (constant prices) is used as a measure of real income and the sign of its coefficient is expected to be positive. The real deposit rate ( $RD$ ) is included due to the financial liberalisation theory by McKinnon, (1973) and Shaw, (1973) which assumed that financial liberalisation will be associated with higher real interest rates as financial restrictions in the financial system are reduced (artificial ceilings), finally stimulating savings. The prime assumption in this model is that savings are responsive to interest rates. In this case a higher interest rate will have a positive effect on savings since it is viewed as the reward for delaying consumption. Higher savings rates in this case will finance a higher level of investment which will lead to a higher economic growth rate. Agrawal, (2001) indicates that the real interest rate is the Fischerian price of current consumption in terms of future consumption, thus analytically, an increase in interest rates will have an ambiguous effect on savings because of a positive

substitution effect towards future consumption and a negative income effect due to increased real returns on saved wealth. Ahmad et al, (2003) show empirically that the interest rate turns out to be significant both in the short and long run savings funds. On the other hand, Schmidt-Hebbel et al, (1996) indicate that interest rates will be ineffective in increasing the overall savings flows. The expected sign of the coefficient of the interest rate is either positive or negative. Financial sector development is included because it affects access to appropriate savings instruments and the expected sign of its coefficient is positive. Political instability plays an important role in the sense that it encourages saving. The uncertainty of the future forces people to guard more aggressively against shocks in the economy. The expected sign of the coefficient is positive. Uncertainty about the price of future consumption and future asset values impacts on real-disposable income and thus on consumption and the capacity to save. This uncertainty is captured by inflation in the savings equation (West, 2005). It is expected to have a positive sign.



According to Romm, (2005) investment is expressed as a function of savings, growth, credit, financial sector development and political instability. Savings and growth are included in the equation because there are feedback effects between the variables. The expected sign of the coefficients are positive. It is expected that growth in income or output has a positive effect on investment and is seen as a proxy for future earnings. Financial sector development is included because it could help promote faster rates of capital accumulation by strengthening the banks and financial systems, and the expected coefficient is positive. Because uncertainty in the economy is a very serious issue to investors and is negatively related to investment, uncertainty is proxied using political instability. The expected sign of political instability is negative. The credit ratio is included in the investment function due to the fact that a higher ratio will increase investment in the economy. Romm, (2005) clearly indicates that credit extension is a comprehensive indicator of the financial intermediaries and it shows the extent to which the financial system can channel savings into investment. The expected sign of the coefficient of credit is positive.

### 4.3: DEFINITION OF VARIABLES AND DATA SOURCES

There are three basic sources of the data in this study: the International Financial Statistics (IFS) year books and the Department of Trade and Industry, Republic of South Africa which are available on-line (<http://www.dti.gov.za>) and the World Resources Institute, (2007) available on-line (<http://www.earthtrends.org>). The International Financial Statistics is a standard source of international statistics on all aspects of international and domestic finance. It provides access to time series data, for a particular country, of major economic aggregates used in economic analysis. These data include information such as data on exchange rates, international liquidity, international banking, money and banking, interest rates, prices, production, international transactions, government accounts, and national accounts. The IFS and World Resources Institute data are combined with those of the Department of Trade and Industry, Republic of South Africa, to give more valuable information on the gross domestic product, domestic capital formation (domestic investment), gross domestic savings and other variables which are proxies for the study.



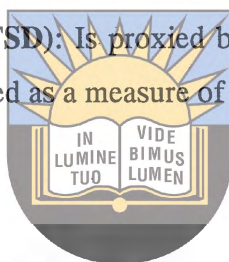
Briefly the variables are defined as follows:

University of Fort Hare

*Together in Excellence*

- **Real deposit rate (RD):** Is calculated as the nominal deposit rate less the expected rate of inflation. Expected inflation is generated from the actual inflation rate.
- **Real income per capita (YPC):** Real gross domestic product per capita (in constant domestic prices) is used as a measure real income.
- **Growth of real income (Growth):** The real (in constant domestic prices) gross domestic product is used as a measure of income. The growth rate of GDP is then used as a measure of the growth rate in income.
- **Inflation (INF):** This is the inflation rate for South Africa and has been calculated from the consumer price index (CPI). It was calculated as: 
$$\text{Inflation rate} = \frac{(CPI_1 - CPI_0)}{CPI_0} \times 100$$
- **Investment (I):** This is the domestic investment rate (gross fixed capital formation) for South Africa expressed as a ratio of gross domestic product (GDP).

- **Political instability (POL):** Is the index of political instability and is used as a proxy for uncertainty in economy. This variable is measured using the Freedom House's *Index of Political Freedom*. This index measures political rights on a scale of 1 to 7. 1 represents the highest level of political rights while 7 represent the lowest.
- **Gross domestic savings (GDS):** Is measured as the ratio of gross domestic saving (GDS) to gross domestic product (GDP).
- **Credit (CRED):** Is the credit extended to the private sector, that is, other loans and advances expressed as a ratio of gross domestic product (GDP).
- **Financial sector development (FSD):** Is proxied by the ratio of broad money (M2) to gross domestic product. This is used as a measure of financial development.



#### 4.4: REVIEW OF ESTIMATION TECHNIQUES

University of Fort Hare  
Together in Excellence

The aim of this study is to determine empirically the direction of causality between domestic savings and economic growth in South Africa using time series data for the period 1980-2006. As mentioned earlier in this chapter, other variables which are crucial for savings are considered. Thus, the estimation of the savings function above is done first. Co-integration and causality test procedures follow. In particular this study uses the causality framework first introduced by Granger (1969) and later modified by Engle and Granger (1987). The steps involved in conducting a granger causality test are as follows:

- (i) Testing for Stationarity or unit root using Dickey Fuller and the Augmented Dickey-Fuller tests;
- (ii) Cointegration, Error correction modelling (ECM) and Model adequacy;
- (iii) Causality tests.

#### 4.4.1: TESTING FOR STATIONARITY

Performing causality tests requires that variables be in a stationary state and cointegrated. Before estimation is done one has to know whether a time series is stationary or non stationary. According to Gujarati, (2003: 798) a series is stationary if its mean, variance and autocovariance remain the same no matter at what point we measure them; they are time invariant. If a series is not stationary it is referred to as nonstationary, which implies that the series has a time varying mean or a time-varying variance or both. Brooks, (2002: 375) indicates that if we have a nonstationary series, it must be differenced  $d$  times before it becomes stationary. The series is regarded as integrated of order  $d$  (where  $d$  is the order of integration). The order of integration ( $d$ ) shows the number of unit roots in the series or the number of differencing operations it takes to make the series stationary.



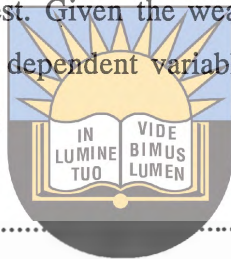
Given that most time series data exhibit time characteristics, that is, they follow a nonstationarity path, the regression of such series leads to spurious regression results (nonsense regression). This makes a statistical inference invalid. In other words, a spurious or nonsense correlation involves observing from a regression a large correlation coefficient that exists merely because the variables share a common trend over time. In this case the variables do not lend support to any theory that ties them together, for instance, they are not cointegrated. Thus any regression involving the series would yield spurious results. Engel and Granger (1987) clearly indicate that if the dependent variable is a function of a nonstationary process, the regression will produce influenced results, which cannot explain the real situation and is poor in predicting the real relationship. There are several techniques for testing stationarity, such as the correlogram test, visual plot of data, and the unit root test. This study uses the unit root test particularly the Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) tests to test for stationarity.

#### 4.4.2: DICKEY-FULLER (DF) AND AUGMENTED DICKEY-FULLER (ADF) TESTS

The Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) involve testing the order of integration through unit root tests. For the DF test the following equation is estimated.

$$\Delta y_t = a_o + \rho y_{t-1} + \alpha_1(t) + \varepsilon_t, \dots \dots \dots 4.3$$

Where,  $y_t$  is the relevant time series,  $\Delta$  is the difference operator,  $t$  is linear time trend and  $\varepsilon_t$  is the error term. The equation is tested against the null hypothesis that there is a unit root series integrated of order one. The DF test is only valid if  $\varepsilon_t$  is white noise ( $\varepsilon_t$  is assumed not to be autocorrelated). This implies that the error term should satisfy the assumptions of normality, constant error variance and independent (uncorrelated) error terms, otherwise the results of the DF will be biased. The fact that the DF does not account for the possibility of autocorrelation in the error term is the weakness of the test. Given the weakness of the DF, the solution is to augment the test by using  $p$  lags of the dependent variable, thus we use ADF test. The test equation for ADF is expressed as follows:



$$\Delta y_t = a_o + \rho y_{t-1} + \alpha_1(t) + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \varepsilon_t, \dots \dots \dots 4.4$$

## University of Fort Hare

*Together in Excellence*

As in the DF, the hypothesis is that there exists a unit root in the time series. Thus  $H_0: \rho = 0$  is tested against the alternative hypothesis that the series is stationary,  $H_1: \rho < 0$ . If the calculated statistic exceeds the DF or MacKinnon critical tau values, the null hypothesis that  $\rho = 0$  is rejected, thus the series is stationary. On the other hand, if the calculated statistic does not exceed the critical tau value, the null hypothesis is not rejected, thus the time series is nonstationary.

Despite the fact that the Dickey-Fuller test is the popular method used to test the unit root, the method has some weaknesses. The test is weak in the sense that it fails to detect a false null hypothesis. The other criticism levelled against the Dickey-Fuller (Brooks, 2002: 381) is that its power is low if the process is stationary but with a root close to the nonstationary boundary. This implies the Dickey-Fuller test fails to detect stationarity when in fact the series follows a stationary process.

The variables used in this study were tested for stationarity before estimation. The visual plot of the data and the DF and ADF were used. The results obtained from the DF and ADF tests are presented in Table 4.1 below and the results obtained from the visual plot of the data are presented in Figure 4.1.

**Table 4.1: The Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) results**

Variable	Dickey-Fuller (DF)			Augmented Dickey-Fuller (ADF)			Order of Integrati on(I)
	No constant No Trend	Constant No Trend	Constant Trend	No constant No Trend	Constant No Trend	Constant Trend	
Growth	-2.461*	-3.579*	-4.191*	-2.115*	-3.524*	-4.978**	I (0)
DGrowth	-6023**	-5.896**	-5.965**	-5.893**	-5.769**	-5.664**	I (0)
LGDS	-2.053*	-2.671	-4.024*	-1.708	-1.754	-3.17	I (1)
DLGDS	-5.405**	-5.773**	-5.705**	-6.274**	-6.923**	-6.492**	I (0)
LINF	-1.221	-0.4895	-2.949	-2.949	-0.2573	-2.426	I (1)
DLINF	-5.745**	-6.053**	-6.049**	-4.22**	-4.739**	-4.816**	I (0)
LI	-0.2905	-1.533	-0.7418	-0.243	-2.455	-1.772	I (1)
DLI	-2.978**	-2.917	-3.681	-2.837	-2.777	-3.69*	I (0)
RD	-2*	-2.588	-2.659	-2.371*	-3.173*	-3.782*	I (0)
DRD	-4.072**	-4.024**	-3.934*	-4.485**	-4.427**	-4.322*	I (0)
YPC	-3.271**	-3.218*	-4.099*	-3.081**	-3.019*	-4.778**	I (0)
DYPC	-5.989**	-5.862**	-5.952**	-5.82**	-5.726**	-5.65**	I (0)
LPol	-1.205	-1.036	-0.956	-1.1124	-1.528	-1.511	I (1)
DLPol	-4.508**	-4.431**	-4.457**	-4.411**	-4.331**	-4.41*	I (0)
LFS	1.834	0.7774	-1.143	1.823	1.012	-0.7878	I (1)
DLFS	-3.936**	-3.848**	-3.911*	-3.868**	-3.774**	-3.903*	I (0)
LCred	4.4903	-3.08*	-2.672	1.836	-1.128	-2.449	I (1)
DLCred	-5.546**	-5.384**	-5.367**	-3.712**	-3.619*	-3.699*	I (0)
Critical Values 5%	-1.955	-2.985	-3.594	-1.955	-2.985	-3.603	
Critical Values 1%	-2.66	-3.72	-4.374	-2.66	-3.734	-4.394	

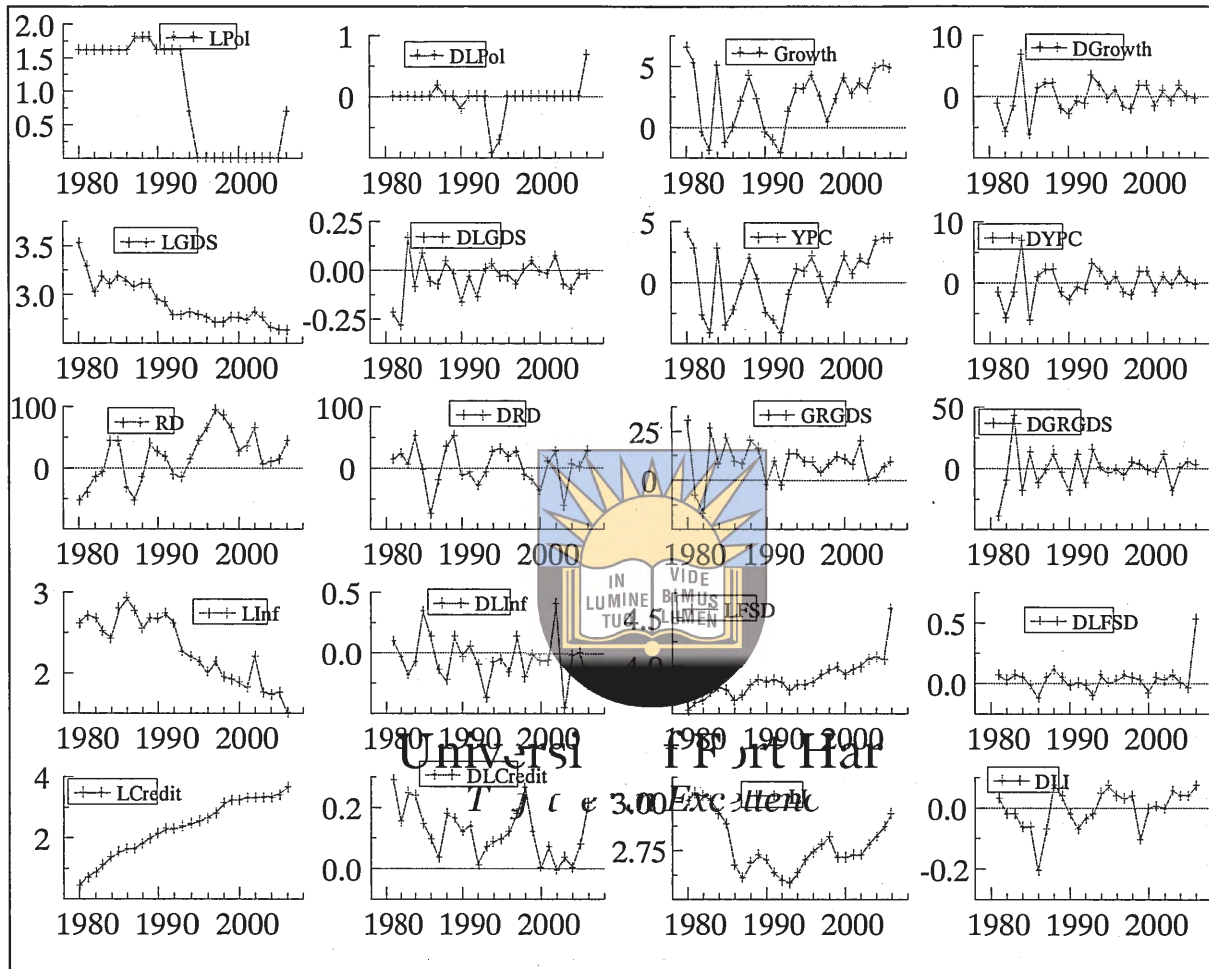
From Table 4.1 using the DF and ADF tests, it can be seen that *Growth* and *YPC* are stationary in levels. Thus, the variables are obviously stationary in first difference. This result also

confirms what has been established if we consider Figure 4.1, where it could be seen that the variables are stationary both in levels and first difference. The *RD* passes stationarity in levels at 5 percent using the ADF test. However, it becomes more stationary in first difference as it passes stationarity both at 5 percent and 1 percent. *Pol*, *CRED*, *I*, *FSD*, *GDS* and the *Inf* are nonstationary in levels. In their first difference *I*, *GDS*, *Pol*, *CRED*, *FSD* and *Inf* become stationary. Taking into account the graphs of these variables, (see Figure 4.1) it could be seen that all the variables appear to pass stationarity in their first difference.



University of Fort Hare  
*Together in Excellence*

**Figure 4.1: Stationarity graphs**



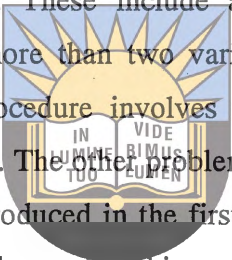
Using visual inspection from Figure 4.1 it can be seen that *Growth* and *YPC* are stationary both in level terms and in first difference. These variables are however more stationary in first difference. *Pol*, *CRED*, *I*, *FSD*, *RD*, *GDS* and *Inf* exhibit time characteristics which imply that they are nonstationary in level terms. In their first difference, *RD*, *Pol*, *Credit*, *FSD*, *GDS*, *I*, and *Inf* becomes stationary. All the variables enter the models in their first difference.

#### 4.4.3: COINTEGRATION AND ERROR CORRECTION MODELLING (ECM)

The cointegration test was done after ensuring the variables are of the same order I (1) or first difference stationary. In most cases, if two variables are I(1) are linearly combined, their

combination would also be I(1) and such variables will only be I(0) or stationary, if the variables are cointegrated. The variables move together over time, although they could be individually non-stationary. This indicates that in the long-run the two variables are bound to a state of equilibrium by some relationship. There are several ways of testing for cointegration of the variables. The commonly used methods are the Engle-Granger approach and the Johansen and Juselius method.

The study used the Johansen and Juselius method because the Engle-Granger 2-step method suffers from a number of weaknesses. These include a lack of power in unit root and cointegration tests. Thus, if there are more than two variables there may be more than one cointegrating relationship. Since the procedure involves the use of residuals from a single relationship it cannot treat this possibility. The other problem is that this method relies on a two-step estimator. As a result, any error introduced in the first step is carried into the second step (Asteriou and Hall, 2007: 317). Also when using this method there could be a simultaneous equation bias if the causality between two variables runs in both directions.



University of Fort Hare  
*Together in Excellence*

**Johansen and Juselius (1990) approach**

Given that Engle and Granger test suffers from the above limitations, this study will utilise the Johansen and Juselius maximum likelihood method, in which a vector error correction framework will be employed. This method is used to test for cointegration in a multivariate case and this makes it possible for one to estimate and test for more than one cointegrating vector in the system (Brooks, 2002:408).

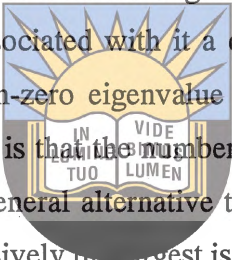
The Johansen and Juselius method uses two test statistics which are the maximum eigenvalue and the trace test. Under the Johansen technique the two test statistics are formulated as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^g \ln(1 - \hat{\lambda}_i) \dots\dots\dots 4.12$$

and

$$\lambda_{\max}(r, r+1) = -T \ln \left( 1 - \hat{\lambda}_{r+1} \right) \dots\dots\dots 4.13$$

where  $r$  is the number of independent cointegrating vectors under the null hypothesis.  $\hat{\lambda}_i$  is the estimated value for the  $i$ th ordered eigenvalue from the  $\Pi$  matrix and the larger is  $\hat{\lambda}_i$  is, the larger and more negative  $\ln(1 - \hat{\lambda}_i)$  will be, and thus the larger the test statistic will be. It has to be noted that each eigenvalue will have associated with it a different cointegrating vector, which will be eigenvectors. A significantly non-zero eigenvalue indicates a significant cointegrating vector.  $\lambda_{trace}$  is a joint test where the null is that the number of cointegrating vectors is less than or equal to  $r$  against an unspecified or general alternative that there are more than  $r$ . The  $\lambda_{trace}$  starts with  $p$  eigenvalues and then successively the largest is removed.  $\lambda_{trace} = 0$ , when all  $\lambda_i = 0$ , for  $i=1, \dots, g$ .



**University of Fort Hare**  
*Together in Excellence*

The  $\lambda_{\max}$  is similar to  $\lambda_{trace}$  except that it conducts separate tests on each eigenvalue, and its null hypothesis is that the number of cointegrating vectors is  $r$  against an alternative of  $r+1$ . The Johansen and Juselius test provides critical values for the two tests and if the test statistic is greater than the critical value, the null hypothesis that there are  $r$  cointegrating vectors in favour of the alternative that there are  $r+1$  for  $\lambda_{trace}$  or more than  $r$  for  $\lambda_{\max}$  is rejected (Brooks, 2002: 405). It should be noted that the Johansen and Juselius technique indicates that the maximum eigenvalue is more reliable than trace test in indicating the number of cointegrated variables.

In order to apply the Johansen and Juselius method it is crucial to specify the appropriate lag lengths in the system. Using Table 4.2 which presents the  $\lambda_{trace}$  and  $\lambda_{\max}$  test statistics together with their 95% critical values, the null hypothesis that there is a zero cointegration vector is clearly rejected by both the  $\lambda_{trace}$  and  $\lambda_{\max}$  test statistics. However, the hypothesis that there is

less than or equal to one cointegrating vector cannot be rejected by the two tests for the savings model. We can conclude that there is only one cointegrating vector in the savings model. Using the  $\lambda_{trace}$ , Table 4.3 we cannot reject the hypothesis that the investment model has one cointegrating vector.

### COINTEGRATION RESULTS FOR THE SAVINGS MODEL

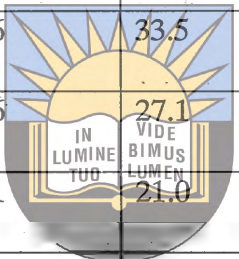
Table 4.2 below shows cointegration results obtained using the Johansen and Juselius technique for the savings model and Figure 4.2 shows a graphical view of the cointegrating vectors. As indicated earlier, the maximum eigenvalues are more reliable than the trace tests. We cannot reject the hypothesis that there is at least one cointegrating vector for the savings function. The graphs in Figure 4.2 further confirm these results.



University of Fort Hare  
*Together in Excellence*

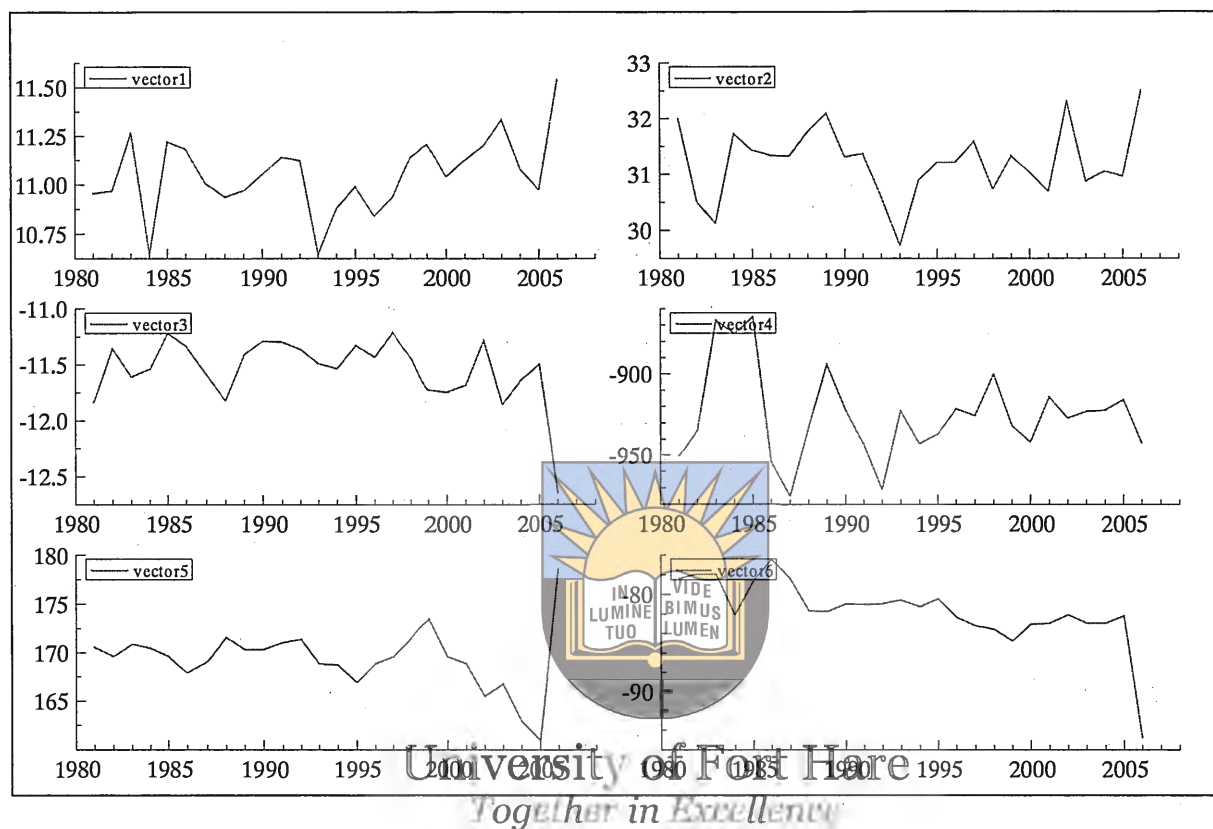
**Table 4.2: Cointegration analysis for the savings model period 1980 to 2006**

H <sub>0</sub> Rank = p	$\lambda_i$	Maximum Eigenvalue Statistics		Trace Statistics	
		-Tlog (1- $\lambda_i$ )	$\lambda_{max}$ 95%	-T $\sum$ log (1- $\lambda_i$ )	$\lambda_{trace}$ 95%
P = 0	0.8903	57.46**	45.3	157.3**	124.2
P ≤ 1	0.7157	32.7	39.4	99.84*	94.2
P ≤ 2	0.6272	25.66	33.5	67.14	68.5
P ≤ 3	0.5196	19.06	27.1	41.49	47.2
P ≤ 4	0.4232	14.31	21.0	22.42	29.7
P ≤ 5	0.2671	8.08	14.1	8.12	15.4
P ≤ 6	0.0014	0.04	0.04	0.04	3.8



University of Fort Hare  
Together in Excellence

**Figure 4.2: Cointegration vectors for the savings model**

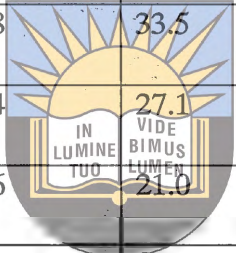


**COINTEGRATION RESULTS FOR THE INVESTMENT MODEL**

Table 4.3 below shows the cointegration results obtained for the investment model. Using these results, the null hypothesis of no cointegrating vectors is rejected. In other words the hypothesis that there is one cointegrating vector cannot be rejected. This is because the test statistic of 132.8 is greater than the critical value of 124.2 ( $\lambda_{trace}$ ). Figure 4.3 also shows a graphical view that there is at least one cointegrating vector in the model.

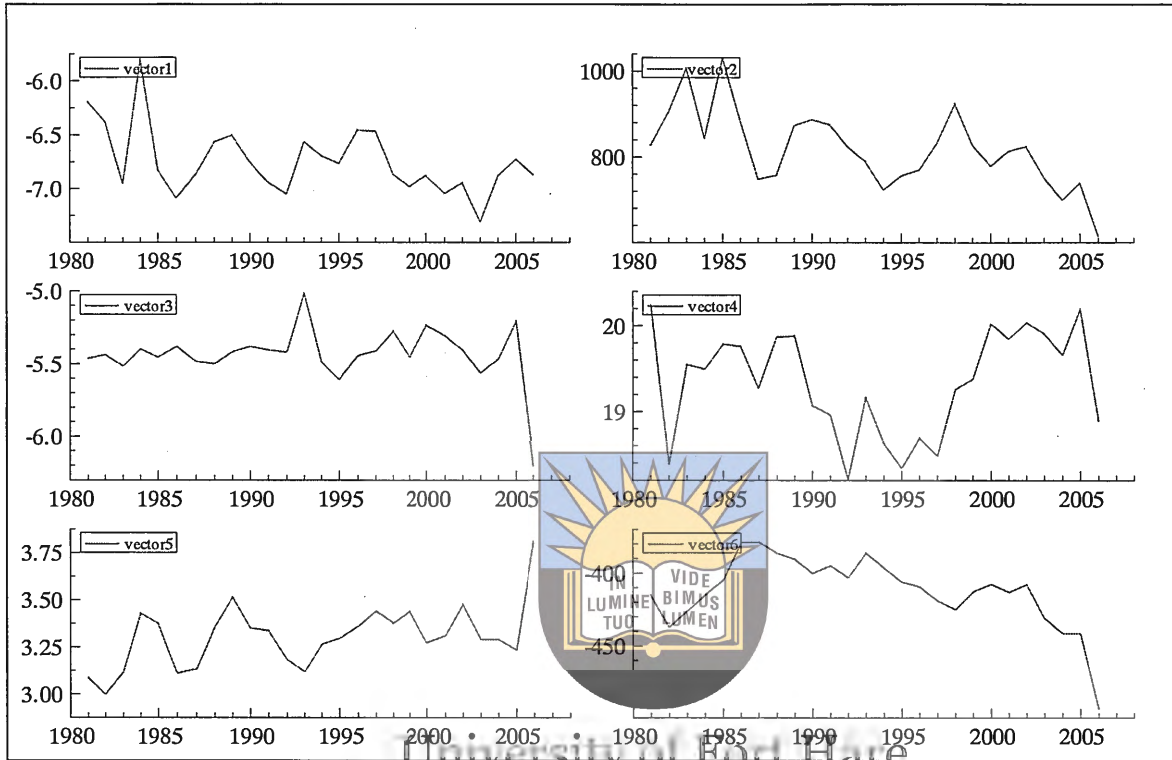
**Table 4.3: Cointegration results for the Investment Model period 1980 to 2006**

H <sub>0</sub> Rank = p	$\lambda_i$	Maximum Eigenvalue Statistics		Trace Statistics	
		-Tlog (1- $\lambda_i$ )	$\lambda_{max}$ 95%	-T $\sum$ log (1- $\lambda_i$ )	$\lambda_{trace}$ 95%
P = 0	0.8363	45.25	45.3	132.8*	124.2
P ≤ 1	0.7142	31.31	39.4	87.59	94.2
P ≤ 2	0.6244	24.48	33.5	56.28	68.5
P ≤ 3	0.4607	15.44	27.1	31.79	47.2
P ≤ 4	0.3418	10.46	21.0	16.36	29.7
P ≤ 5	0.2049	5.73	14.1	5.901	15.4
P ≤ 6	0.0067	0.7	8.8	0.17	3.8



University of Fort Hare  
Together in Excellence

**Figure 4.3: Cointegration vectors for the investment model**



University of Fort Hare  
Together in Excellence

**ERROR CORRECTION MODEL (ECM)**

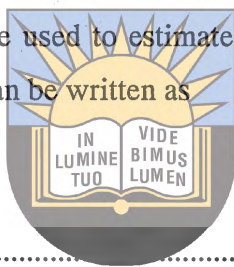
The Granger representation theorem (Granger, 1983; Engle and Granger, 1987) states that if a set of variables are cointegrated, then there exists a valid Error-Correction Representation of the data. Thus, if  $Y_t$  and  $X_t$  are both  $I(1)$  and have a cointegrating vector  $(1 - \beta)$ , there exist an error-correction representation, with  $Z_t = Y_t - \beta X_t$  of the form

$$\theta(L)\Delta Y_t = \delta + \Phi(L)\Delta X_{t-1} - \gamma Z_{t-1} + \alpha(L)\varepsilon_t, \dots \dots \dots 4.5$$

where  $\varepsilon_t$  is white noise and where,  $\theta(L)$ ,  $\Phi(L)$  and  $\alpha(L)$  are polynomials in the lag operator.

$$\Delta Y_t = \delta + \Phi \Delta X_{t-1} - \gamma \left( \frac{1}{t-1} \right) - \beta X_{t-1} + \varepsilon_t \dots\dots\dots 4.6$$

Where the error term has no moving average part, the systematic dynamics are kept as simple as possible. Intuitively, it is clear why the Granger representation theorem should hold, if  $Y_t$  and  $X_t$  are both  $I(1)$  but have a long-run relationship, there must be some force which pulls the equilibrium error back towards zero. The error correction model does exactly this. It describes how  $Y_t$  and  $X_t$  behave in the short-run, consistent with a long-run cointegrating relationship. If the cointegrating parameter  $\beta$  is known, all terms in equation 4.5 are  $I(0)$  and no inferential problems arise. The OLS method can be used to estimate the parameters of the ECM. In this case the error-correction model (ECM) can be written as



$$\Delta Y_t = \Phi_0 \Delta X_t - \gamma [Y_{t-1} - \alpha - \beta X_{t-1}] + \varepsilon_t \dots\dots\dots 4.7$$

**University of Fort Hare**  
*Together in Excellence*

where, the constant is only present in the long-run relationship. If however equation (5) the error correction model, contains a constant, this implies that the deterministic trends in both  $Y_t$  and  $X_t$  and the long run equilibrium correspond to a steady rate growth path with the unit root test, which indicates the series has a deterministic trend.

$$\Delta Y_t = \Delta X_{t-1} = \frac{\lambda}{(1 - \Phi_1)} \dots\dots\dots 4.8$$

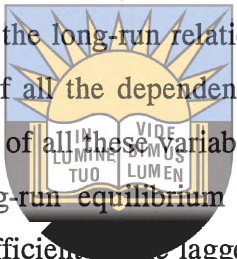
The Vector Auto Regression model (VAR) describes the dynamic evolution of a number of variables from their common history. If we consider two variables say  $Y_t$  and  $X_t$ , the VAR consists of two equations and a first order VAR would be given by:

$$Y_t = \delta_1 + \theta_{11}Y_{t-1} + \theta_{12}X_{t-1} + \varepsilon_{1t} \dots\dots\dots 4.9$$

$$X_t = \delta_2 + \theta_{21}Y_{t-1} + \theta_{22}X_{t-1} + \varepsilon_{2t} \dots\dots\dots 4.10$$

where,  $\varepsilon_{1t}$  and  $\varepsilon_{2t}$  are two white noise processes of independent history of  $Y_t$  and  $X_t$ , but can be correlated.

In short the ECM is a model which is used to capture any short-run dynamics of the system and to distinguish between the short-run and the long-run relationships among variables. The ECM involves regressing the first difference of all the dependent variables on the contemporaneous and lagged values of the first differences of all these variables including the dependent variable and the lagged residuals from the long-run equilibrium regression. However, of particular interest in the ECM equation, is the coefficient of the lagged residual because it represents the speed adjustment parameter. The value of this parameter is expected to be less than one in absolute terms for the stability of the system and for the variables in the long-run regression to be cointegrated. The direction of the adjustment would be indicated by the sign of this parameter and if the model deviates from its long-run path, the sign and magnitude of this parameter would indicate the direction of adjustment and the speed at which the variables adjust in the short-run to go back to its long-run equilibrium path, (Islam and Ahmed, 1999).



UNIVERSITY OF PORT HARCOURT  
 SOLE AGENT FOR THE VARIABLES

**4.5: PRESENTATION OF RESULTS**

The saving function (equation 4.1) and investment function (equation 4.2) were estimated using the vector error correction model (VECM). Time series data for the period 1980 to 2006 for South Africa is used. Tables 4.4 and 4.5 below show the results of the savings model and the investment model respectively.

**Table 4.4: Results of savings as a function of growth, interest rate, political instability, income per capita, inflation, financial sector development plus the error term.**

Independent variables	Coefficient	t-values
Constant	-0.0304	-2.25
DGrowth <sub>t-1</sub>	0.0125	1.95*
DLPol <sub>t</sub>	0.0481	0.94
DYPC <sub>t</sub>	0.0214	3.55***
DRD <sub>t</sub>	-0.001	-1.95 *
DLInf <sub>t</sub>	0.2834	3.13***
DLFSD <sub>t</sub>	0.0952	0.84
i1983	0.3351	4.25***
Ect <sub>t-1</sub>	0.4582	-2.36**

where, \*, \*\*, \*\*\*, indicates the level of significance at 10%, 5% and 1% respectively.

Standard error            0.0635555

F(8,16) = 3.792 [0.011]\*

R<sup>2</sup> = 0.654726

AR 1-2 test: F (2,14) = 1.3153 [0.2996]

ARCH 1-1 test: F (1,14) = 0.031692 [0.8613]

Normality test: Chi<sup>2</sup>(2) = 0.46380 [0.7930]

Hetero test: Chi<sup>2</sup>(15) = 0.00000 [1.0000]

RESET test: F(1,15) = 2.6953 [0.1214]

**Table 4.5: Results of Investment as a function of interest rate, credit, political instability, financial sector development, growth, savings, dummy variables and the error term**

Independent variables	Coefficient	t-value
Constant	0.0105	1.17
DRD <sub>t</sub>	-0.0009	-0.317
DLCredit <sub>t</sub>	0.3397	2.95***
DLPol <sub>t</sub>	-0.0246	-0.785
DLFSD <sub>t</sub>	0.1179	1.42
DGrowth <sub>t-1</sub>	0.0102	2.77***
DLGDS <sub>t-2</sub>	0.0618	0.595
i1985-1988	0.0855	-4.12***
Ect <sub>t-1</sub>	-0.3715	-2.28**

where, \*, \*\*, \*\*\*, indicates the level of significance at 10%, 5% and 1% respectively.

Standard error = 0.0346116

R<sup>2</sup> = 0.82672

F(8,15) = 8.946 [0.000]\*\*

AR 1-2 test: F (2,13) = 0.83848 [0.4545]

ARCH 1-1 test: F (1,13) = 0.60676 [0.4500]

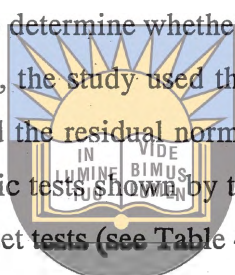
Normality test: Chi<sup>2</sup>(2) = 0.48647 [0.7841]

Hetero test: Chi<sup>2</sup>(15) = 11.960 [0.6820]

RESET test: F (1,14) = 0.89014 [0.3614]

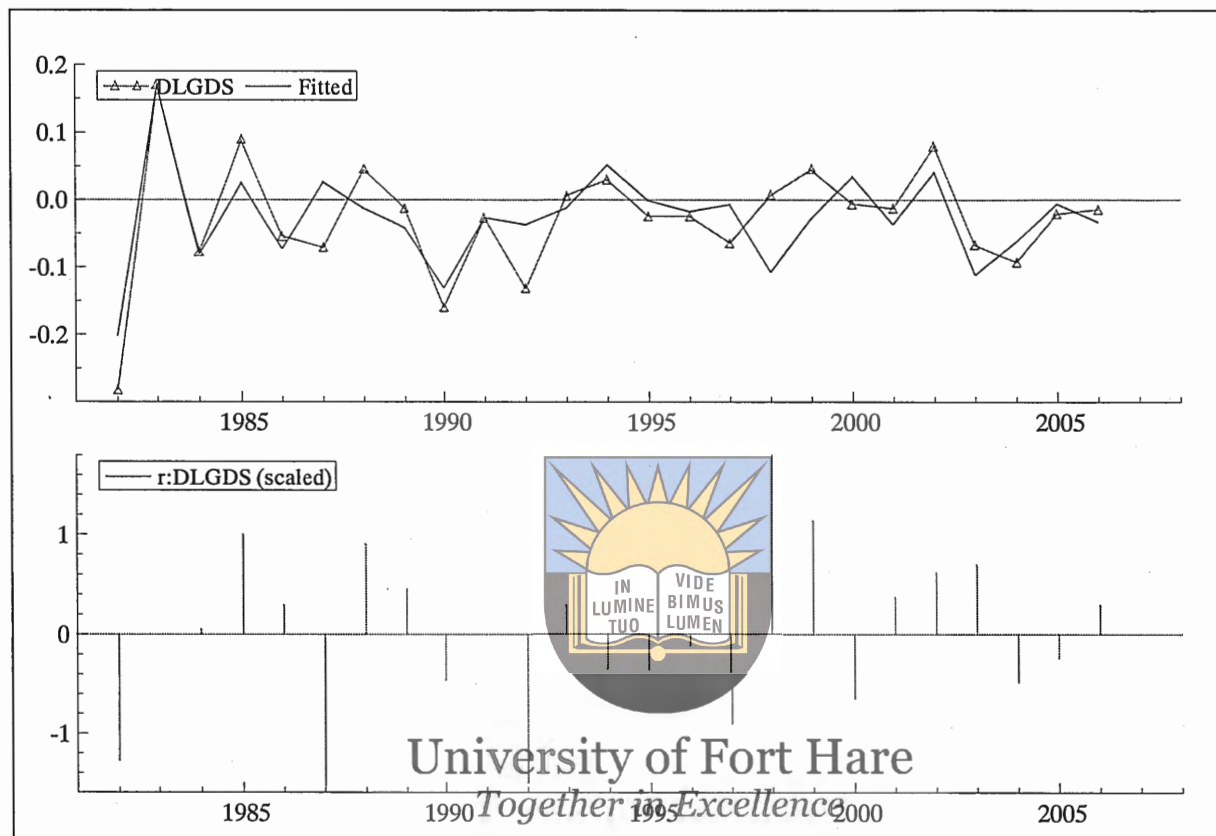
#### 4.5.1: ANALYSIS OF RESULTS

The results in Table 4.4 and Table 4.5 indicate that the estimated models which are the savings model and the investment model are robust. This is indicated by the adjusted  $R^2$  of 65% and 83% for both the models respectively and this shows that the explanatory variables account for the changes in the dependent variables very well. This is also confirmed in Figure 4.4 and Figure 4.5 which show how the estimated model tracks the actual or fitted values. The F-values in both models are statistically significant, suggesting a robust model. The standard errors in both models are very low, also suggesting that the models are significant overall. All the coefficients carry the right signs which conform to economic theory. This study assessed the adequacy of the model by performing diagnostic checks to determine whether the residuals of the error-correction equations approximate white noise. Thus, the study used the autocorrelation test (AR), ARCH, the heteroscedacity test, the reset test and the residual normality test. Both models, savings and investment, produced very good diagnostic tests, shown by the autocorrelation (AR), ARCH, the heteroscedacity test, the normality and reset tests (see Table 4.4 and Table 4.5). This implies that the models do not suffer from autocorrelation and heteroscedasticity. In addition, the regressed models show that the residuals are normally distributed and are well specified, as they pass the RESET tests.

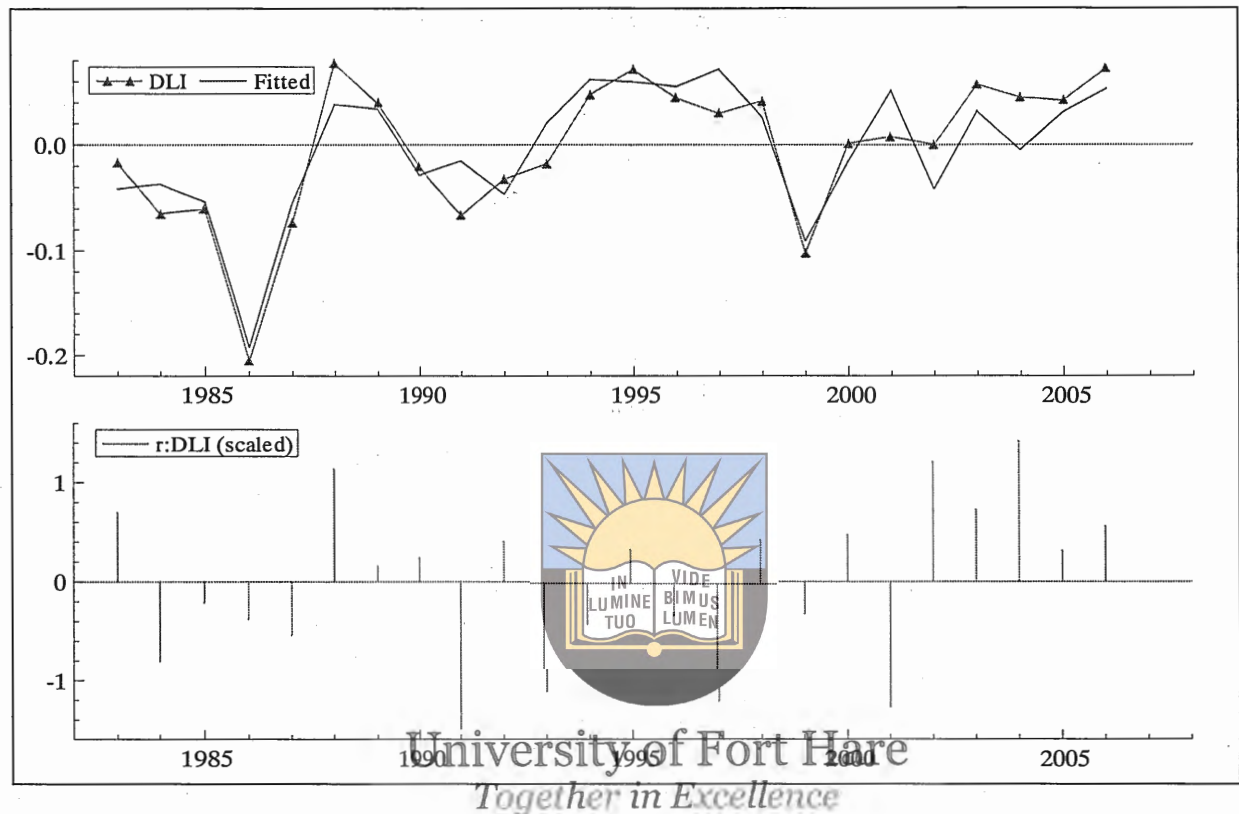


University of Fort Hare  
*Together in Excellence*

**Figure 4.4: Actual versus Fitted values and Scaled Residuals for the Saving model**



**Figure 4.5: Actual versus Fitted values and Scaled Residuals for the Investment model**

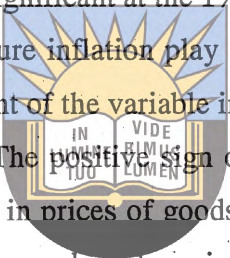


We now turn to each variable on the savings function. Growth in real income ( $DGrowth_t$ ) is statistically significant at 5%; this is shown by the T-value which is approximately 2. The variable has a positive sign as predicted by the theory (life cycle hypothesis and permanent income hypothesis) which predicted that higher savings are associated with higher levels of real income. The coefficient of growth in real income shows that a 10% increase in the growth in real income will result in a 0.12% increase in gross domestic savings. This result was found by several studies including Narayan and Narayan (2006), Prema-chandra A and Kunal S, (2004), Loayza, Schmidt-Hebbel, and Serven, (1998) and Ahmad and Marwan, (2003).

Real income per capita ( $DYPC_t$ ) has the predicted positive sign and is statistically significant at the 1% level with a t-value of 3.55. This means that an increase in real income per capita increases savings sufficiently to increase the saving rate. Specifically, a 10% increase in the real

per capita income will result in a 0.21% increase in domestic savings. This result, confirms other studies e.g. World Bank, (1999), Ozcan, (2000), Ozcan, Gunay and Ertac, (2003) and Room, (2005). Loayza, Schmidt-Hebbel, and Serven, (1998), also support the idea that private savings rise with the level and growth rate of real per capita income and that the influence of income is larger in developing than in developed countries.

Inflation ( $DLInf_t$ ) as a measure of uncertainty which concern the price of future consumption and future asset values, (with either a negative or positive sign expected) had a positive sign. The coefficient of the variable is statistically significant at the 1% level as shown by a t-value of 3.13. The result shows that expectations of future inflation play an important role in determining the domestic savings rate. Thus, the coefficient of the variable implies that a 1% increase in inflation results in a 0.28% increase in savings. The positive sign obtained is consistent with the priori expectations in the sense that an increase in prices of goods and services leads to an increase in the savings rate so that consumption of the goods and services is affordable.



University of Fort Hare  
*Together in Excellence*

Agrawal, (2001) indicated that the real interest rate is a Fischerian price of current consumption in terms of future consumption. Thus an increase in interest rates will have an ambiguous effect on savings due to a positive substitution effect towards future consumption and a negative income effect due to increased real returns on saved wealth. As a result of this, there have been considerable controversy and disagreement over the effects of the real interest rate on savings. Thus with this view, the expected sign of real deposit interest rate was expected to be either positive or negative. The result on Table 4.4 shows that the coefficient of the real deposit interest rate is negative and is statistically significant at 10%. The coefficient of the real deposit rate is however so small in absolute terms that it cannot cause a significant decrease in the domestic savings in South Africa. This result conforms to other studies e.g. Agrawal, (2001) which found that the effect of high interest rates on savings was negative in Indonesia and concluded that the real interest rates have a minor impact on the savings rates and the sign of the effect vary from country to country. Schmidt-Hebbel et al, (1996) also indicated that market-determined interest rates are likely to improve financial intermediation, the quality of investment, and the quality of

portfolio choices. Thus, interest rates will be ineffective, however, in increasing overall savings flows.

The dummy variable ( $i1983$ ) is statistically significant at 1% with a T-value of 4.25. This result shows that the various activities which occurred during the same year would have caused a 0.33% increase in the gross domestic savings. The introduction of various mild political reforms involving a relaxation of some restrictions associated with apartheid and the introduction of a Tricameral Parliament could have triggered an increase in the savings rate. These reforms could have influenced individuals and companies to save more. In addition, the savings rate could have reached these high levels due to the windfall profits of gold mining companies when the price of gold reached exceptionally high levels during this period, Prinsloo, (2000).

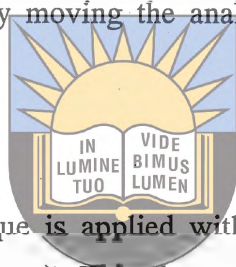


The financial sector development ( $DFSD_t$ ) has a positive sign as expected but the T-value is statistically insignificant. This implies that the financial sector development which affects access to appropriate savings instruments does not have a great impact on the savings rate in South Africa. This result which shows that financial reforms do not have a great impact on the saving rate was not expected, given the fact that there has been a vast improvement in the financial sector which has been rated among the top 10 globally with 55 locally controlled banks, 12 foreign controlled banks and five mutual banks, IMF, (2005).

As expected, political instability ( $DLPol_t$ ) has a positive sign but it is statistically insignificant. This implies that the uncertainty of the future which normally forces individuals to guard more aggressively against shocks in the economy thus increase savings is not influencing individuals and the corporate world to increase savings. This might be attributed to the fact there is stability in the South African economy both politically and economically.

(iv) No causality: None of the variable Granger causes the other.

It should be noted that the application of the traditional Granger model requires that the variables X and Y be stationary. Given that the majority of the economic variables are non-stationary in level terms, the traditional Granger model is conducted using regressions based on differenced stationary variables. Using differenced stationary variables however throws away useful long-run information about the causal relationship between the variables. Thus, the technique propounded by Granger (1983, 1986) and Engle and Granger (1987) makes a significant contribution towards testing causality by moving the analysis from a static formulation to a dynamic one.

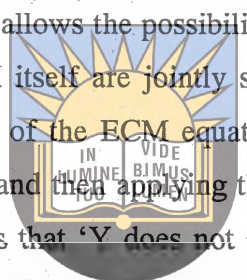


The test of causality using this technique is applied within the cointegration and the error-correction model (ECM) (discussed above). This dynamic formulation allows for causality between two variables to stem from a common trend or long-run equilibrium relationship. In other words the model considers the possibility that the long-run information in the data represented by the lagged level of a variable, X, may help to explain the current changes in another variable, Y, even if the short-run information in the data given by the past changes in X do not. The logic behind this model is that if X and Y have a common trend (cointegrated), then the current changes in Y are partly the result of Y moving into alignment with the trend value of X. This type of causality may not be detected by the traditional Granger. The ECM can also be used to detect the possibility of having reverse or bi-directional causality. Causality in at least one direction must exist within the ECM as long as X and Y have common trends thus the possibility of no causality is ruled out when variables share a common trend (cointegrated), Islam and Ahmed, (1999).

In the ECM method, the first test is to find out whether the residuals series from the long-run regression is stationary or not. If the residuals series is nonstationary then there is no meaningful relationship between the variables. In this case there is no need to proceed to test for the

existence of a causal relationship. On the hand, if the test indicates the existence of the long-run relationship, then we can proceed to test for causality by forming the error-correction model involving the first differences of the cointegrated non-stationary variables which also include the lagged residuals of the long-run equilibrium model.

When applying the ECM, the null hypothesis that 'X does not Granger cause Y' is not rejected or rejected based on the standard Wald F-test to determine the joint significance of the restrictions under the null hypothesis. If it is rejected one can conclude that X Granger causes Y. It should be noted that the ECM as mentioned earlier allows the possibility that X Granger causes Y, even if the coefficients on lagged changes in X itself are jointly significant. Testing causality in the reverse direction requires the estimation of the ECM equation with the first difference of the other variable as the dependent variable and then applying the Wald F-test against its restricted version. In this case the null hypothesis that 'Y does not Granger cause X' is rejected if the appropriate coefficients including the coefficient of the lagged residual are jointly significant. Y will in this case Granger cause X. If all of the above null hypothesis are rejected, then there exists a bi-directional (feedback) causality between X and Y.



University of Fort Hare  
*Together in Excellence*

Table 4.6 below shows granger causality results based on the Wald F-test from the estimated VECM. The table presents both the calculated and theoretical F-values under the null hypothesis under scenarios of granger causality with and without the error correction model.

#### 4.6.1: GRANGER CAUSALITY RESULTS

**Table 4.6: Granger causality results based on the Wald F-test**

<b>A. Granger Causality Without Error Correction</b>			
$H_0$ : GDS does not granger cause Growth			
Calc. F	Crit. F 5%(1%)	Number of lags	Accept/Reject
3.7771**	2.21(3.02)	2	Reject $H_0$ at 5%,1%
$H_0$ : Growth does not granger cause GDS			
1.6257	2.21(3.02)	2	Accept $H_0$ at 5%,1%
<b>B. Granger Causality With Error Correction</b>			
$H_0$ : GDS does not granger cause Growth			
3.5125**	2.21(3.02)	2	Reject $H_0$ at 5%,1%
$H_0$ : Growth does not granger cause GDS			
2.323*	2.21(3.02)	2	Reject $H_0$ at 5%
Note: *,**indicates level of significance at 5% and 1% respectively			

Table 4.6 above shows that the traditional Granger test which involves testing for causality without the error correction term shows that the null hypothesis 'GDS does not granger cause Growth' is rejected both at 5% and 1% level of significance. The reason for rejecting the null hypothesis is that the calculated F-value is greater than the critical F-values both at 5% and 1%. This result is evidence that increasing savings will lead to increases in the growth rate in the short run. Thus, in this case the causality flows from savings to economic growth. This result is consistent with the neoclassical growth model which claims that steady-state or proportional growth is determined by the rates of saving and population growth. In particular the model

proposed an increase in the stock of capital leads to a higher level output and faster growth at least in the short to medium term. In the same way, the reverse null hypothesis that '*Growth* does not granger cause *GDS*' cannot be rejected both at 5% and 1%. This is due to the fact that the calculated F-value is less than the critical F-values both at 5% and 1%. This traditional Granger test would lead one to conclude that gross domestic savings does granger cause economic growth at least in the short to medium term.

Nevertheless, the application of Granger (1983, 1986) and Engle and Granger (1987) which makes use of the error correction and which moves the analysis from a static formulation to a dynamic one gives different results. This more advanced test shows that the null hypothesis '*GDS* does not granger cause *Growth*' is rejected at 5% as well as 1%. This is shown by the calculated F-value (3.5125) which is greater than the critical F-values both at 5% and 1% respectively. The result constitutes evidence that increasing savings seems to have led to increasing the growth rate through both the dynamic and lagged ECM effects. This result indicates uni-directional Granger causality running from savings to growth. On the other hand, the reverse null hypothesis that '*Growth* does not granger cause *GDS*' is rejected at 5% (calculated F-value greater than critical F-value) but is not rejected at 1% (calculated F-value less than critical F-value). This result implies that increasing growth seems to increase savings though it is rejected at 1%. In other words there is uni-directional Granger causality flowing from growth of real income to savings. The result that high income leads to high saving, confirms the McKinnon effect. Given that the null hypothesis is rejected in both cases. When the error correction model is used, one can conclude that there is a bi-directional relationship between savings and growth in South Africa. Though one can conclude a bi-directional relationship, the causality seems to be more significant when flowing from saving to growth. The results confirm other studies e.g Agrawal (2001), Dawit (2003), Shahbaz and Mahmood, (2004), Room (2005) and Ozcan (2000).

#### 4.7: CONCLUSION

This chapter sets out the analytical framework that was used to determine the relationship between savings and economic growth. The model which links savings, economic growth and other variables that affect savings was specified and estimated. Included was also the investment function which acts as a link between savings and economic growth as indicated by theory in Chapter 2. Data were tested for stationarity using the DF and ADF tests. The Johansen and Juselius technique was used to test for cointegration. The causality tests between savings and growth were performed using both the traditional Granger test (causality without the error correction term) and the Granger and Engle-Granger causality test (causality with the error term).



University of Fort Hare  
*Together in Excellence*

## CHAPTER 5

### CONCLUSIONS AND POLICY RECOMMENDATIONS

#### 5.1: CONCLUSIONS

This chapter draws conclusions from the results of the study and puts forward recommendations for future policy formulation. In spite of the adaptation and implementation of the new economic policy that targets an increase in savings and economic growth, South Africa failed to achieve the targeted goals and maintain sustainable economic growth. The country has long been affected by a slow growth rate in domestic savings and economic growth for the past several years dating back to the early 1980s. The main objective of this study was to examine empirically the causal relationship between savings and economic growth in South Africa using time series data for the period 1980-2006. The study hypothesised that there is a positive and bi-directional causality relationship between savings and economic growth. That is, savings cause economic growth and increases in economic growth cause increases in savings. Thus, the study assumed that savings enhance investment, which in turn boosts growth in the economy. Agrawal, (2001) indicated that in order to examine the causal relationship between savings and growth and to investigate the direction of causation, it is important that other factors affecting the savings rate be taken into account. In this regard, this study examined the major factors that affect the savings rate. Thus, the savings rate was modelled as a function of real per capita income, growth, real deposit interest rate, political instability, real inflation rate and financial sector development. Given that investment was used as link between savings and economic growth, an investment function was also specified.

The study was anchored on different theories which suggest that the relationship between savings and growth is more complex. Some suggest that savings are crucial for stimulating economic growth and some suggest that growth plays a significant role in increasing savings in the economy. McKinnon and Shaw (the financial liberalisation hypothesis), neoclassical growth model (Solow-Swan), the Harrod-Domar model and the endogenous growth model (Romer) suggest that savings play a major role in stimulating growth. In contrast to this view, are the life-

cycle and the permanent-income hypotheses which suggest that growth is vital for increments in the savings rates. The different views thus prompted the study to investigate a bi-directional relationship between savings and economic growth.

In addition to these theories, a number of studies revealed that factors such as real income and income growth, real interest on bank deposit, the rate of inflation, external terms of trade, age dependency ratio, rate of growth in population, urbanisation, trade liberalisation, financial sector development, political instability, high dependence on aid and foreign savings are major factors which affect savings. The studies also reveal that the causality between savings and economic growth differ from country to country which implies that in one country savings can be influential in causing increases in growth while in another country growth will cause increases in savings. Results from many countries also suggest that a bi-directional relationship can be found between savings and growth.



## University of Fort Hare

*Together in Excellence*

In order to examine the relation between savings and growth and their relationship to investment, the study first applied the Dickey-Fuller and the Augmented Dickey-Fuller tests to establish stationarity of the data. The Dickey-Fuller and the Augmented Dickey-Fuller tests indicated that growth (Growth) and real income per capita (YPC) are stationary both in levels and in first difference. However, most of the variables indicated that they are non-stationary in levels but stationary in their first differences. The study then applied the Johansen and Juselius cointegration techniques to determine whether there was any long run relationship between savings, growth and other factors which affect savings as well as factors that have an impact on investment. The results from the cointegration estimates suggest some evidence of the existence of a long run relationship between savings, growth and other factors affecting savings. The results also indicate that there is a long run relationship between investment, growth, savings, credit, real deposit interest rate, political instability and financial sector development.

The fact that there was evidence of cointegration allowed the estimation of the vector error correction model (VECM) which provided parameter estimates for the long run. The estimates from this long run relationship indicate that an increase in growth, real income per capita, inflation and a dummy variable will result in an increase in savings while interest rates will cause an insignificant decrease. An increase in growth and credit will result in an increase in investment with savings having a positive effect. The fact that there is a positive relationship between investment, savings and economic growth suggests that there are feedback effects between variables. Thus investment is very crucial in linking savings and economic growth.

Of particular interest in the VECM is the speed of adjustment parameter or coefficient. This parameter measures the speed of adjustment to which the variables adjust in the short run deviation to go back to its long run equilibrium path within a given year. The estimate of this parameter suggests that about 45% of the variation in the savings rate from its equilibrium level is corrected within a year. The study also found that 37% is the speed of adjustment in the investment model. This speed of adjustment shows that within a year 37% of deviations in the long run equilibrium will be eliminated. The speeds of adjustments are very low but seem to be reasonable given the structural rigidities faced by many developing countries such as South Africa.

Finally, the study performed Granger causality tests to determine the actual direction of causality between savings and growth. The traditional Granger test which involves testing for causality without the error correction term shows that the null hypothesis; 'GDS does not granger cause Growth' is rejected. This result indicates evidence that increasing savings will lead to increases in the growth rate in the short run. Thus in this case the causality flows from savings to economic growth. The reverse null hypothesis that 'Growth does not granger cause GDS' could not be rejected. This traditional Granger test would lead one to conclude that gross domestic savings does Granger cause economic growth at least in the short to medium term.

The application of the advanced Granger test which makes use of error correction also shows that the null hypothesis; 'GDS does not granger cause Growth' is rejected. The result shows evidence that increasing savings seem to have led to increasing the growth rate through both the dynamic and lagged ECM effects. This result suggests uni-directional Granger causality running from savings to growth. On the other hand, the reverse null hypothesis that; 'Growth does not granger cause GDS' is also rejected. This result implies that increasing growth seems to increase savings. In other words, there is uni-directional Granger causality flowing from growth of real income to savings. Given that the null hypothesis is rejected in both cases when using the error correction model one can conclude that there is a bi-directional relationship between savings and growth in South Africa. Though one can conclude a bi-directional relationship, the causality seems to be more significant when it flows from saving to growth.



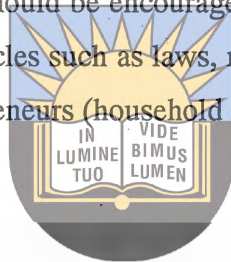
## 5.2: POLICY RECOMMENDATIONS

Given the results obtained, the study suggests ways in which savings can be encouraged which are:

University of Fort Hare  
*Together in Excellence*

- Raising income per capita and income growth. This could be seen as an effective and direct way to increase savings. Given the positive relationship between per capita income, growth and savings the study suggests that policies that encourage development in the economy are an effective way of raising private savings. Tools such as reducing taxation of incomes could be used.
- The effect of higher real interest rates on the savings rate was found to be significant but the coefficient was so small that interest rates changes of a few percentage points are unlikely to have a significant impact on the savings rates. This result leads one to suggest that trying to influence the savings rates by manipulating interest rates will not be a practical policy in South Africa.
- The significance of inflation in this study requires a comparatively distortion-free relative price structure. This is very important since it concerns the price of future consumption and future asset values which will affect the savings rate.

The major objective of this study was to test whether savings are crucial in stimulating economic growth or increases in economic growth will lead to increases in savings. Given that savings were found to stimulate growth in the short to medium term (uni-directional causality), policies geared towards raising domestic saving should be given priority when designing economic programs in the short to medium term. Given that a bi-directional relationship between savings and economic growth exist in the long run, the study suggests that the implementation of appropriate policies which encourage both increases in domestic savings and economic growth should be put into operation. Thus, the policies which generate a cycle of high savings-to high investment-to high growth and vice versa should be put in place. Entrepreneurship which is the driving force behind economic growth should be encouraged. Thus entrepreneurial talent should be fostered and there should be no obstacles such as laws, rules and regulations that could act as a deterrent to the development of entrepreneurs (household and corporate).



### **5.3: LIMITATIONS OF THE STUDY**

Though the study examined the relationship between savings and growth in the South African economy, it did not examine this relation in the context of an open economy. Thus the effect of foreign saving and access to foreign capital were not taken into account.

### **5.4: AREAS FOR FURTHER RESEARCH**

The study suggests that more research be done to identify both theoretically and empirically, other ways in which the savings rate operates to generate high and sustainable economic growth and vice versa. More research is also required to analyse the effects of foreign savings and access to foreign capital on savings and economic growth.

## REFERENCES

Aghion P, Comin D and Howitt P, (2006): *When Does Domestic Saving Matter for Economic Growth?*(online) Available: [http://www.economics.harvard.edu/faculty/aghion/papers/When\\_Does\\_Domestic\\_Saving.pdf](http://www.economics.harvard.edu/faculty/aghion/papers/When_Does_Domestic_Saving.pdf); Accessed: 12/05/2008

Agrawal P, (2000): *Savings, Investment and Growth in South Asia*, (on line) Available at [http://www.saneinetwork.net/pdf/SANEI\\_I/Agrawal.PDF](http://www.saneinetwork.net/pdf/SANEI_I/Agrawal.PDF), Accessed: 31/08/2007.

Agrawal P, (2001): *The relation between savings and growth: cointegration and causality evidence from Asia*, *Applied Economics*, 2001, 33, 499-513.

Ahmad Z. B and Marwan A. T, (2003): *Determinants of Gross National Saving in Malaysia Analysis 1960-2000*, *Savings and Development Quarterly Review*, Issue 4-2003.

Ahmad Z. B, Marwan A. T and Salim R, (2005): *Growth dynamics in the Asian countries*, *Journal of Asian Economics* 13: 827-845.

University of Fort Hare

Together in Excellence

Anderson B, (1999): *On the causality between Saving and Growth: Long- and Short Run Dynamics and Country Heterogeneity*, Department of Economics, Uppsala University; (on-line) Available: <http://www.nek.uu.se/pdf/1999wp18.pdf>; Accessed: 05/03/2007

Anoruo E and Ahmad Y, (2001): *Causal relationship between domestic savings and economic growth: Evidence from Seven African countries*, African Development Bank, Blackwell Publishers.

Appel M, (2007): *New law to promote savings*, (on line) Available: [http://www.southafrica.info/doing\\_business/economy/fiscal\\_policies/taxationlaws-080607htm](http://www.southafrica.info/doing_business/economy/fiscal_policies/taxationlaws-080607htm), Accessed 15/09/2007

Asteriou D and Hall S. G, (2007): *Applied Econometrics*, Palgrave Mcmillan, New York.

Banking Council of South Africa, (2003): *Financial Sector Charter*, (on-line) Available: [www.banking.org.za/Downloads/Charter\\_Final.pdf](http://www.banking.org.za/Downloads/Charter_Final.pdf), Accessed: 26/07/2007.

Behar A, (2006): *ASGISA and JIPSA: Will those who remain unskilled also get a share*, (on line) Available, [http://www.commerce.uct.ac.za/research\\_units/dpru/Behar\\_unskilledshare.pdf](http://www.commerce.uct.ac.za/research_units/dpru/Behar_unskilledshare.pdf), Accessed 09/10/2007

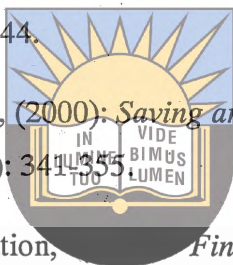
Brooks C, (2002): *Introductory econometrics for finance*, Cambridge University Press, United Kingdom.

Business Report, (2008): *R1.1 trillion in debt a 'shocking' burden for SA*, (on line) Available: <http://www.busrep.co.za/index.php?fSectionId=&fArticleId=4436621>.

Cardenas M and Escobar A, (1998): *Saving determinants in Colombia, 1925-1994*, Journal of Development Economics, Vol. 57(1): 5-44.

Carroll C. D, Overland J, and Weil N. D, (2000): *Saving and Growth with Habit Formation*, The American Economic Review, Vol. 90 (3): 341-355

Center for Financial Services Innovation, *Financial services Trends and Recent innovations in South Africa. Lessons for the United States*, (on line) Available: <http://www.cfsinnovation.com/>, Accessed: 11/08/2007



University of Fort Hare  
Together in Excellence

Chaudhri D. P and Wilson E, (2000): *Savings, Investment, Productivity and Economic growth of Australia for the period 1891-1990: Some Explorations*, The Economic Record, Vol. 76 (232): 55-73

Claus I, Haugh D, Scobie G, and Tornquist J, (2002): *Saving and Growth in an open economy (New Zealand)*, The Treasury, Wellington, New Zealand, (on-line) Available: <http://www.treasury.govt.nz/workingpapers/2001/twp01-32.pdf>, Accessed: 22/04/2007.

Collier P and Dollar D, (2001): *Can the World Cut Poverty in Half? How Policy Reform and Effective Aid Can Meet International Development Goals*, World Development, 29 (11): 1787-802

Dani R, (1998): *A study of Transitions from low to high saving rates*, (on line), Available: <http://www.worldbank.org/research/projects/savings/pdf/files/rodpaper.pdf>, Accessed: 21/11/2007.

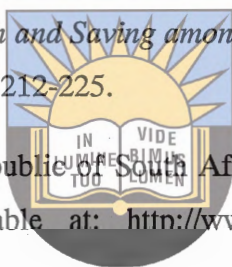
Darian D and Katy J, (2005): *Financial services Trends and Recent innovations in South Africa: Lessons for the United States*, The Center for Financial Services Innovation, (on line) Available: <http://www.cfsinnovation.com/>, Accessed: 11/08/2007

Dawit S, (2003): *Causal Relationship between Economic Growth and Gross Domestic Savings: Case of Ethiopia*, on line available: <http://www.eaecon.org/EEA/conferences/papers/Dawit.doc>, Accessed: 20/04/2007.

De Gregorio J, (1992): *Economic growth in Latin America*, Journal of Development Economics, Vol. 39: 59-84.

Deaton A and Paxson C, (2000): *Growth and Saving among individuals and households*, Review of Economics and Statistics, Vol. 82(2): 212-225.

Department of Trade and Industry, Republic of South Africa, (2007): *South African Quarterly Bulletin Statistics*, (on line), Available at: <http://www.dti.gov.za/econdb/resbank/rb.html>, Accessed: 11/11/2007.



University of Fort Hare

Dornbusch R, Fischer S and Startin R, (2004): *Macroeconomics 9<sup>th</sup> edition*, McGrahil, Irwin, Boston.

Domar E.D, (1946): *Capital Expansion, Rate of Growth, and Employment*, Econometrica, Vol. 14: 137-47

Du plessis S and Smit B, (2007): *South Africa's growth revival after 1994*, Bureau for Economic Research, University of Stellenbosch.

Eisner R, (1995): *Saving, Economic Growth and the arrow of Causality*, Challenge, M. E Sharpe, Inc.

Elbadawi A. I and Mweha M. F, (2000): *Can Africa's Saving Collapse be reversed?* The World Bank Economic Review, Vol. 14 (3): 415-43.

Engle R.F. and Granger C.W.J, (1987): *Coo-integration and Error Correction: Estimation and Testing*, Econometrica, Vol. 55: 251-76

Erden L, (2005): *Structural Adjustment and Domestic Private Saving and Investment Interaction in Turkey: A Cointegration Analysis*, (on line) Available: [www.bayar.edu.tr/~iibf/dergi/pdf/C12S12005/LE.pdf](http://www.bayar.edu.tr/~iibf/dergi/pdf/C12S12005/LE.pdf), Accessed: 25/09/2007.

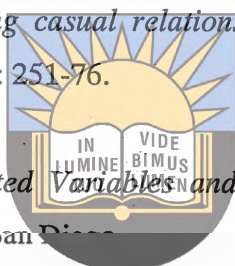
Friedman M, (1957): *A theory of the consumption function*, Princeton University Press.

Gelb S, (2005): *An overview of South African economy*, State of the nation 2004 – 2005, (on line) Available: <http://www.theedge.org.za/Content/Publications%20list/HSRC%20SoN%20piece.pdf>, Accessed: 17/10/2007.

Granger, C. W. J, (1969): *Investigating casual relations by econometric models and cross-spectral methods*, *Econometrica*, Vol 55: 251-76.

Granger, C. W. J, (1983): *Co-Integrated Variables and Error-Correction Models*, Working Paper, 83-13, University of California, San Diego.

Granger, C. W. J, (1986): *Developments in the Study of Cointegrated Economic Variables*, *Oxford Bulletin of Economics and Statistics*, Vol 48: 213-228.



University of Fort Hare  
Together in Excellence

Gujarati N. D, (2003): *Basic Econometrics- 4<sup>th</sup> Edition*, McGraw-Hill/Irwin, New York.

Harjes T and Ricci L. A, (2006): *What drives saving in South Africa?* (on line) Available: <http://www.imf.org/external/pubs/nft/2006/soafrica/eng/paso afr/sach4.pdf>, Accessed: 12/07/2007.

Harrod R, (1939): *An Essay in Dynamic Theory*, *Economic Journal*, Vol. 49: 14-33.

International Financial Statistics, (2007): *International Financial Statistics year book*, Publication Services International Monetary Fund, Washington, D.C, USA.

International Monetary Fund (IMF), (2005): *South Africa: Economy overview*, (on line) Available at: <http://www.imf.org/external/np/sec/pn/2002/pn0275.htm>; Accessed: 09/09/2007.

Irvine I and Wang S, (2001): *Saving behaviour and wealth accumulation in a pure lifecycle model with income uncertainty*, European Economic Review 45 (2): 233-258

Islam M. A and Ahmed M. S, (1999): *The Purchasing Power Parity Relationship: Causality and Cointegration Tests using Korea-U.S Exchange rate and prices*, Journal of Economic Development, Vol. 24: 2.

Jappelli T and Pagano M, (1996): *The Determinants of savings: Lessons from Italy*, Paper presented at the Inter-America Development Bank Conference on Determinants of Domestic Saving in Latin America, Bogota, Colombia.

Jappelli T and Modigliani F, (2003): *The Age-Saving Profile and the Life-Cycle Hypothesis*, Centre for studies in Economics and Finance, (on line) Available: <http://www.csef.it/WP/wp9.pdf>; Accessed: 03/09/2007.

Jappelli T and Pagano M, (1994): *Saving, Growth and Liquidity Constraints*, The Quarterly Journal of Economics, Vol. 109 (1): 83-109.

Jappelli T, (2005): *The Life-Cycle Together in Fiscal Policy and Social Security*, Centre for studies in Economics and Finance, online (available): <http://www.csef.it/WP/wp140.pdf>; Accessed: 11/10/2007.

Jenkins C, (1995): *Adjusting to economic sanctions in South Africa*, In Morrissey O and Stewart F (eds), *Economic and Political Reform in Developing Countries*, London, St Martin's Press, 97-122.

Johansen S, (1991): *Estimation and Hypothesis Testing of Co-integration vectors in Gaussian vector autoregressive Models*, Econometrica, Vol. 59: 1551-80.

Johansen S and Juselius K, (1990): *Maximum Likelihood Estimation and Inference on Co-integration with Applications to the Demand for Money*, Oxford Bulletin of Economics and Statistics, Vol. 52: 169-210

Jones S, (2000), (ed): *The Decline of the South African Economy*, Edward Elgar Publishing Limited, USA.



University of Fort Hare

Kaldor N, (1957): *A Model of Economic Growth*, Economic Journal, 67.

Khamfula Y, (2004): *Macroeconomic policies and economic growth in South Africa*, University of the Witwatersrand, Johannesburg, South Africa.

Loayza N, Schmidt-Hebbel K, and Servén L, (2000): *What derives private saving across the World?* The Review of Economics and Statistics, Vol. 82 (2): 165-181.

Loayza N, Schmidt-Hebbel K, Servén L, López H, (1998): *Saving in the World: Stylized facts*, (on-line) Available: <http://www.worldbank.org/research/projects/savings/pdf/stylectxt.pdf>; Accessed: 12/06/2007.

Manuel T, (2003): *Investment in SA growing*, (on line) Available: [http://www.southafrica.info/doing\\_business/investment/invest.htm](http://www.southafrica.info/doing_business/investment/invest.htm); Accessed: 19/07/2007.

Maasdorp G, (2000): *Chapter 2: Economic Survey*. In: S Jones, ed: *The Decline of the South African Economy*, Edward Elgar Publishing Limited, USA.

Masson R. P, Bayoumi T, and Sambo T, (1998): *Evidence on the Determinants of Private Saving*, The World Bank Economic Review, Vol. 12(3): 483-501.

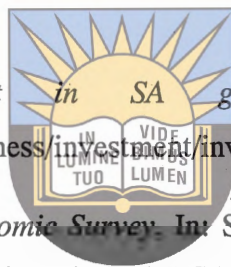
Mavrotas G and Kelly R, (2001): *Old wine in new bottles: Testing causality between savings and growth*, The Manchester School, Vol. 69: 97-105.

McKinnon R. I, (1973): *Money and Capital in Economic Development*, Brookings Institution: Washington DC.

Michael S, (2000): *Economic Policy Research Institute: Macroeconomic Options for Job Creation and Social Development*, (on line) Available <http://www.epri.org.za/rp15.doc>; Accessed: 17/10/2007.

Modigliani F and Ando A, (1963), "The life cycle hypothesis: aggregate implications and tests", *American Economic Review*, Vol. 15: 62-70.

Mohan R, (2006): *Causal relationship between savings and economic growth in countries with different income levels*, Economics Bulletin 2006, Vol 5.



University of Fort Hare

Together in Excellence

Morande G. F, (1998): *Savings in Chile. What went right?* Journal of Development Economics Vol. 57 (1): 201–22.

Narayan P. K and Narayan S, (2006): *Savings behaviour in Fiji: an empirical assessment using the ARDL approach to cointegration*, International Journal of Social Economics; Vol 33 (7): 468-480.

Ndikumana L, (2005): *Can Macroeconomic Policy Stimulate Private Investment in South Africa? New Insights from Aggregate and Manufacturing Sector-Level Evidence*, Political Economy Research Institute, Department of Economics, University of Massachusetts.

Orazio P. A, Lucio P, and Antonello S, (1999): *Saving, Growth and Investment: A macroeconomic analysis using a panel of countries*, The World Bank Group.

Ozcan K. M, (2000): *Determinants of Private Savings in the Arab Countries, Iran and Turkey*, WorldBank,(online)Available:<http://www.worldbank.org/wbi/mdf/mdf3/papers/finance/Ozcan.pdf>; Accessed: 11/09/2007).



## University of Fort Hare

Ozcan K. M, Gunay A and Ertac S, (2003): *Determinants of Private Saving Behaviour in Turkey*, Applied Economics, Vol.35: 1405–1416.

Palumbo A, (1996): *Notes on Investment, Savings and Growth*, Contributions to Political Economy (1996) 15, 105-115.

Paxson C, (1996): *Saving and growth: Evidence from micro data*, European Economic Review, Vol. 40(2): 255-88.

Prema-Chandra A and Kunal S, (2004): *The Determinants of private saving in India*, World Development Vol. 32(3): 491–503.

Prinsloo J. W, (2000): *The behaviour of the South African economy*, (on line) Available: <http://www.reservebank.co.za/internet/Publication.nsf/LADV/.pdf>; Accessed: 02/03/2007.

Ramsey F, (1928): *A Mathematical Theory of Saving*, Economic Journal, Vol 38: 543-559.

Robinson J. (1962): *Essays in the Theory of Economic Growth*, London: Macmillan.

Romer P. (1986): *Increasing Returns and Long-run Growth*, Journal of Political Economy 4, 1002-1017.

Romm A. T, (2005): *The relationship between saving and growth in South Africa: A time series analysis*, South African Journal of Economics Vol. 73:2.

Sachs J and Larrain F. B, (1993): *Macroeconomics in the global economy*, Englewood Cliffs, N.J, Prentice-Hall.

Saltz I. S, (1999): *An Examination of the Causal Relationship between Savings and Growth in the Third World*, Journal of Economics and Finance, Vol. 23: No. 1, 90-98.

Schmidt-Hebbel K, Serven L and Solimano A, (1996): *Saving and Investment: Paradigms, puzzles, policies*, The World Bank Research Observer, Vol. 11 (1): 87-117.

Schoombee A, (2004): *South African banks and the Unbanked: Progress and Prospects*, South African Journal of Economics, Vol. 72(3): 581-591.



## University of Fort Hare

Shahbaz N and Mahmood K, (2004): *Together in Excellence: Consumer Behaviour in Pakistan: An Empirical Investigation*, (on line) Available: <http://www.pide.org.pk/pdf>; Accessed: 12/05/2007.

Shaw E. (1973): *Financial Deepening in Economic Development*, Oxford University Press: New York.

Sinha D and Sinha T, (1998): *Cart before Horse? The Saving-Growth nexus in Mexico*, Economics Letters, 61: 43-47.

Sinha D and Sinha T, (2007): *Relationships among Household Saving, Public Saving, Corporate Saving and Economic Growth in India*, Munich Personal RePec Archive, Paper No. 2564.

Sinha D, (1998): *The role of Saving in Pakistan's Economic Growth*, Journal of Applied Business Research, Vol 15(1):79-85.

Solow R. M, (1956): *A contribution to the theory of economic growth*, Quarterly Journal of Economics, Vol. 70: 65-94.

Stals C, (2001): *Personal saving and Taxation*, South African Savings Institute, Savings Review, Vol. 1.

Strydom P.D.F, (2002): *Macroeconomic policy*, In: S Jones, ed: *The Decline of the South African Economy*, Edward Elgar Publishing Limited, USA.

Swan T. W, (1956): *Economic Growth and Capital Accumulation*, Economic Record, Vol 32: 334-61.

Thirwall A. P, (2003): *Growth and Development with special reference to developing economies-8<sup>th</sup> Ed*, Palgrave Mcmillan, New York.

Tobin, J; (1965): *Money and Economic Growth*, *Econometrica*, Vol 34: 69-72

Treasury, (1996): *Growth, Employment and Redistribution (GEAR)*, (on line) Available: <http://www.treasury.gov.za/documents/gear/shortterm18>, Accessed: 17/06/2007.

Weeks J, (1998): *Stuck in Low GEAR? Macroeconomic Policy in South Africa, 1996-1998*, (on line) Available: <http://mercury.soas.ac.uk/economics/workpaper/wp85.pdf>; Accessed: 17/10/2007.

West K. L, (2005): *Determinants of Australia's national saving rate over the period 1980 to 2002*, School of Policy, University of Newcastle, (on line), Available at: <http://www.nzae.org.nz/conferences/2005/12-West.PDF>, Accessed: 02/10/2007.

World Bank, (1994): *South Africa: Stimulating growth*, Africa Region, Number 21, (on line) Available: <http://www.worldbank.org/afr/findings/english/find21.htm>, Accessed: 21/01/2007.

World Bank, (1999): *Why do savings rates vary across countries?* World Bank Policy and Research Bulletin, Vol. 10(1)

World Bank, (1998 and 1999): *World Bank Indicators*, The World Bank

World Resources Institute, (on line), Available: <http://earthtrends.org/>, Accessed: 10/10/2007.

## APPENDIX

### Data used in the regression

Year	Growth	Pol	GDS	YPC	RD	Inf	FSD	Credit	I
1980	6.6	5	33.9	4.2	-53.62	13.8	34.6	1.57	20.33
1981	5.4	5	27.2	2.9	-37.91	15.2	37.01	2.09	21.02
1982	-0.4	5	20.5	-2.7	-13.58	14.7	38.03	2.44	20.65
1983	-1.8	5	24.3	-4.1	-6.31	12.3	40.77	3.11	20.29
1984	5.1	5	22.5	2.8	-45.04	11.5	43.25	3.96	19.02
1985	-1.2	5	24.6	-3.4	44.16	16.3	42.77	4.61	17.90
1986	0.0	5	23.3	-2.2	-30.75	18.6	38.1	5.08	14.57
1987	2.1	6	21.7	-0.1	-50.51	16.1	39.77	5.27	13.54
1988	4.2	6	22.7	2	-14.97	12.8	44.82	6.30	14.63
1989	2.4	6	22.4	0.3	38.62	14.7	47.29	7.43	15.22
1990	-0.3	5	19.1	-2.4	26.5	14.4	46.32	8.40	14.91
1991	-1.0	5	18.6	-3.1	18.83	15.3	46.8	9.69	13.95
1992	-2.1	5	16.3	-4.2	9.33	13.9	46.25	9.85	13.51
1993	1.2	5	16.4	-0.9	16.11	9.7	41.99	10.55	13.27
1994	3.2	2	16.9	1	15.4	9	44.77	11.53	13.91
1995	3.1	1	16.5	1	15.4	8.6	44.83	12.74	14.93
1996	4.3	1	16.1	1	65.73	7.1	46.03	14.38	15.61
1997	2.6	1	15.1	0.5	95	8.47	49.22	17.31	16.08
1998	0.5	1	15.1	0.5	84	6.9	51.64	22.62	16.76
1999	2.4	1	15.9	0.2	66.54	6.9	53.53	25.49	15.13
2000	4.2	1	15.8	2.1	29.11	6.52	50.16	25.63	15.14
2001	2.7	1	15.6	0.8	37.9	6.14	52.46	27.57	15.26
2002	3.7	1	16.9	1.9	64.85	9.2	54.31	27.41	15.26
2003	3.1	1	15.8	1.5	5.49	5.8	58.61	28.44	16.15
2004	4.8	1	14.4	3.4	11.03	5.7	59.57	28.65	16.88
2005	5.1	1	14.1	3.7	13.43	5.8	57.92	31.14	17.60
2006	5.0	2	13.9	3.6	42.36	4.5	98.75	38.61	18.91