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ADDIS ABABA UNIVERSITY

**AN ECONOMETRIC ANALYSIS OF PRIVATE DOMESTIC
SAVING IN NAMIBIA**

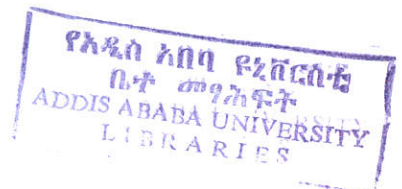
BY

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A THESIS

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An Econometric Analysis of Private Domestic Saving in Namibia

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**Dedicated to my beloved mother Tjijari Uanguta
and my late father Gebhardt Uanguta**

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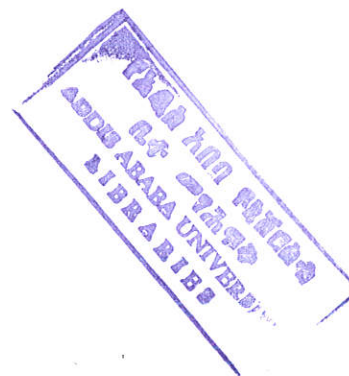
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The Abstract

This paper examines the determinants of private domestic saving in Namibia by means of a single model regression analysis. It reviews the empirical and theoretical literatures of both developed and developing countries. The review focuses on traditional theories of saving the Keynesian Absolute income hypothesis, Permanent income hypothesis, Life cycle hypothesis and Random walk hypothesis. It also laid stress on the recent determinants of private domestic saving; the income, interest rate, liquidity and borrowing constraints, public saving, macroeconomic stability. The study applied an intensive time series econometric analysis technique to avoid spurious results associated with time series data. The DF and ADF tests were applied to determine the stationarity and non-stationarity of the variables in the model. The study concludes that income and taxes are able to explain private domestic saving in Namibia.

CHAPTER ONE

INTRODUCTION

1.1 Background

Aggregate economic performance in sub-Saharan Africa during the last decade has remained unsatisfactory. Both domestic and external forces have contributed to this disappointing overall performance. Partly, the blame for this economic downturn was attributed to a sharp decline of average national saving rate from 10.7 percent in 1965-1973 to a low level of 4.8 percent in 1982-92 (Mwega, 1996). According to Lakshmi and Virmani (1990) the determinants of savings generally and the specific effects of government policies on savings and consumption are pivotal forces in investment and economic growth.

Economic growth is one of the major macroeconomic objectives of developing countries. For sustained economic growth there is a need for higher quality and quantity of investment (capital formation). In turn, capital formation is financed through saving, which is a sacrifice of current consumption. In the absence of a significant flow of foreign capital the main source of capital accumulation is domestic saving. As a result, it is said, "saving behaviour is a crucial element of the process of economic growth" (Fry 1988:131). Saving is not only important for capital accumulation but also for consumption smoothing in the future (see Gersovitz, 1988 and Deaton, 1989).

Developing countries depend largely on primary commodities, and prices of these commodities are extremely volatile, so that the incomes of countries that sell them fluctuate widely. Such fluctuations are generally considered undesirable in themselves, but their undesirable effects would seem to arise from their translation



into fluctuations in consumption.

If so, developing countries ought to save and dissave in order to ride out the fluctuations in income. Hence saving can be used to smooth consumption when there is a shortfall in income and in turn provides insurance for the poor in case of uncertainty.

1.2 STATEMENT OF THE PROBLEM

While the saving performance varies substantially across countries, Sub-Saharan Africa has recorded relatively lower saving rates when compared with other less developed countries (Mwega, 1996). In addition, the average national saving rate has been declining steadily since the early 1970s, in tandem with the declining trends in investment and growth. Such a huge decline in saving rate has led to an expansion of the saving-investment gap. The region has therefore increasingly relied on foreign savings and foreign aid in particular, to finance its capital formation. Such an increased reliance on foreign savings may not be sustainable because of the decline in concessionary capital inflow caused by donor fatigue and increased competition for these resources. There is also concern that this condition may increase external indebtedness and socio-political dependence on sometimes-unpredictable external forces for the region's development.

If Namibia is to avoid falling into this low saving-foreign aid dependence trap it is imperative to study the factors that influence domestic savings. Despite an extensive literature on saving behaviour, there remain a number of empirical issues which have not been conclusively resolved, including the effects of real interest rates, the relationship between growth and saving, and the extent to



which private saving offsets movements in public (dis) saving.

This will essentially be the focused issue of this study. Empirical evidence on the factors that affecting saving behaviour is not straightforward. According to Edwards (1994), existing work has been controversial or has offered limited help to policy-makers on how saving rates can be increased.

1.3 OBJECTIVES OF THE STUDY

More specifically, the main purpose of this study is to:

1. Explore and identify the major determinants of private domestic saving in Namibia.
2. Analyse private domestic saving behaviour in Namibia, with a particular emphasis on its response to various macroeconomic variables.
3. Determine the direction of causality between saving and economic growth.
4. Identify factors that may help improve the saving climate in Namibia.

1.4 SIGNIFICANCE OF THE STUDY

The study is important in that the policy makers and other relevant authorities may use this information in designing appropriate policies to maintain efficient and optimum levels of saving in Namibia. To date, there have been no empirical studies done in Namibia on savings in general and private domestic savings in particular. Since, this will be the first study to be undertaken in this area; this study's contribution would be as follows:

1. The study is expected to lay the foundation for empirical work on private domestic savings in Namibia.
2. Stimulate further research work and interest in the subject matters.

1.5 WORKING HYPOTHESIS

The validity of the following hypothesis will be tested empirically:

1. Taxes have significant and negative impact on private domestic saving in Namibia.
2. The relationship between private domestic saving and income is positive and significant.
3. The relationship between real interest rate and private savings in Namibia is insignificant because the real interest rate in Namibia has been predominantly negative. The hypothesis formulation is based on empirical studies controversy on the issue of interest rate elasticity. Many studies usually find a non-significant or a small interest rate elasticity of domestic savings (see Boskin 1987, Giovanni 1983 and Edwards 1994).

1.6 ORGANISATION OF THE STUDY

This study contains six chapters. Chapter one states the research problem and its objectives. Chapter two follows, with a survey of the theoretical and empirical literature on saving in both developed and developing countries. In essence, the literature review includes the traditional theories of saving; pre-Keynesian, Keynesian and post-Keynesian. And also, the recent determinants of saving; interest rate, macroeconomic instability, economic growth, external

factors and fiscal activities were reviewed in detail. Following this is a brief overview of the Namibian economy presented in chapter three. Chapter four details the model specification of private domestic saving in Namibia. It also, outlined the methodology of the study with particular emphasis on time series data properties.

The regression result analysis and time series properties of the variables in the private domestic saving are presented in the chapter five. While, the final chapter entails the conclusion, policy recommendations and the limitations of the study.

CHAPTER TWO

THEORETICAL AND EMPIRICAL LITERATURE REVIEW.

There is an abundant theoretical and empirical literature on private saving behaviour although different studies focus on different aspects of the issue. Surveys suggest that this literature is somewhat fragmented with no single model being able to deal with all dimensions of the saving issue (Edwards, 1994).

2.1 TRADITIONAL THEORIES

Traditional theories on saving, although in existence before, have been better articulated since World War II. The hypothesis on which these theories were built fall into three major categories: pre-Keynesian, Keynesian and post- Keynesian (not the school). Pre-Keynesian (Classical) theories emphasised the rate of interest (the return on saving) as the primary determinant of saving, while the Keynesian view stresses income as the primary determinant. Post-Keynesian theories emphasise wealth and lifetime resources as determinants of consumption and saving.

In the following, these alternate theories of saving will be reviewed. In particular, reference will be made to the Keynesian theory of saving known as the Absolute Income Hypothesis, and also the post-Keynesian theories the Permanent Income Hypothesis (Friedman, 1957) and Life-cycle hypothesis (Modigliani et. al., 1963).



2.1.1 ABSOLUTE INCOME HYPOTHESIS

This hypothesis relates consumption or saving to income by means of the marginal propensity to save. In its linear form, savings is considered to be a function of current disposable income:

$$S = a + bY^d \quad (1)$$

WHERE:

S= Saving

Y^d = Total disposable income

a,b= Parameters for dissaving and marginal propensity to save (MPS) respectively.

According to Daniel (1995) Keynes in his General Theory (1936) did the first formal attempt to model consumption and saving behaviour based on current income. According to his theory the principal variable which influences the consumption behaviour of individuals is real income. Using his famous "fundamental psychological law", he argued that an increase in income leads to a positive but smaller change in consumption, which implies that the marginal propensity to consume out of current income is positive and less than one. Individuals save the difference between actual current income and the expenditure in consumption. Thus, an increase (decrease) in income is followed by an increase (decrease) in saving. Mikesell and Zinser (1973) based on their own empirical investigation and from review of the studies relating to current income in developing countries.

They concluded that saving is not only determined by current income but also by other factors such as past income, the rate of growth of income and age distribution of households. In contrast, Quian (1988), using cross-section data for

rural and urban households in China, supports the Keynesian absolute income hypothesis and also found that a regime shift has an impact on household saving behaviour.

Although the Keynesian absolute income model has been used to analyse saving behaviour empirically, it has its own inherent problems. For instance, it neglects the role of interest rates and future income in the decision of current consumption and saving (Sachs and Larrain 1993). Keynes (1936) postulated that the average propensity to consume falls as income rises. Economists like Kuznets (1940) cited in Friedman (1957), challenged this postulation in the 1940s who discovered that the ratio of consumption to income was remarkably stable. Moreover, the observed facts in the late 1940s contributed to the emergence of other theories such as life cycle and permanent income hypothesis to help explain the anomalies.

2.1.2 PERMANENT INCOME HYPOTHESIS (PIH)

The hypothesis views current income (Y) as a sum of two components, permanent income (Y^P) and transitory income (Y^T).

$$\text{That is } Y = Y^P + Y^T \quad (2)$$

Hence, the permanent income saving function is:

$$S = \alpha_0 + \beta_1 Y^P + \beta_2 Y^T \quad (3)$$

Where;

S = Saving

β_1, β_2 = Marginal propensities to save

As reviewed by Houthakker (1958), the basis for Friedman's permanent

income hypothesis is the division of both consumption and income into permanent and transitory components. Friedman, as quoted in Houthakker (1958), argued that permanent income "is to be interpreted as the mean income regarded as permanent by the consumer unit in question, which in turn depends on its horizon and foresightedness". The transitory component, therefore, can be defined as the difference between current "measured" income and permanent income. Hence, this hypothesis assumes that individual's planning horizon is indefinitely long.

According to this hypothesis consumption depends not on current income but on permanent income, i.e., a longer-term estimate of income. This is because of the proposition that consumers choose a stable consumption path rather than an unstable one. However, income is bound to fluctuate and hence saving changes to absorb the deviation of current income from the average (permanent) income to smooth the level of consumption (see Modigliani 1971).

This assumes the existence of a perfect capital market. The above argument suggests that saving be determined by the deviations of current income from permanent income, i.e., transitory income. As a result, saving increases when transitory income is positive and vice-versa when it is negative.

From their survey data of empirical studies in developing countries and their own estimation, Mikesell and Zinser (1973) support "a medium term version of Friedman permanent income hypothesis". A study in rural India by Bhalla (1979) shows that permanent and transitory income is a better determinant of saving than current income, irrespective of the definition of permanent income and whether the marginal propensity to save out of transitory income is higher than permanent

income. The hypothesis major setback is that of measurement since it can not be observed directly in the form of cross-section or time series data. As a solution different measurement mechanisms are suggested in the literature: (i) it can be approximated by the predicted value obtained from the current income function; (ii) the most common approach is to use a weighted average of past incomes (see Bhalla, 1979). A number of empirical studies have been done to test the hypothesis in developed and developing countries irrespective of their definition of permanent income the results are not conclusive (see Lakshmi et al, 1990).

2.1.3 LIFE - CYCLE HYPOTHESIS (LCH)

The idea behind life-cycle consumption and saving behaviour is similar to Friedman's permanent income hypothesis; life time resources affect consumption and saving except that life is indefinitely long for the LCH. According to LCH, the individual is assumed to maximise his utility subject to the present value of lifetime resources, which consists of the net worth carried over from the past and expected non-property income. Hence, consumption is a function of lifetime resources and returns on capital depending on one's stage in the life cycle (Ando and Modigliani 1963).

According to this hypothesis individuals save during their working years to finance the debt incurred earlier in their young ages and to maintain their consumption standard in their retirement years. The important insight of the life-cycle hypothesis is that the evolution of consumption is not determined by income, the consumption patterns are shaped by tastes and by life-cycle needs, and not by the temporal pattern of life-cycle labour income.

Given the ability to borrow and lend, anticipated changes in incomes have no effect on consumption; if income is low in early life, but is anticipated to be higher later, there is no need to delay higher consumption because any borrowing incurred now can be repaid later. The findings of Ando and Modigliani (1963) were consistent with the prior predictions of the model. In contrast, the evidence from Italy and Japan substantiates that young households save a considerable amount out of their current income (see Ando et al 1992). However, the study by Ali (1995) found it difficult to test LCH directly for Ethiopia due to the unavailability of annual time series data on private wealth.

2.1.4 RANDOM-WALK HYPOTHESIS

Hall (1978) combines PIH/LCH with rational expectations to arrive at the random walk hypothesis. This implies that the best predictor of future consumption is just last years (periods) level of consumption and is not related to other current and past economic variables.

It can be represented functionally as follows:

$$C_t = C_{t-1} + \varepsilon_t \quad (4)$$

Where C_t is current consumption, C_{t-1} denotes last year's consumption and ε_t stands for a random amount that is not predictable at time $t-1$ which includes the impact of all new information available at time (t) . He tested this hypothesis using post war US data and found some empirical support that consumption is associated with its own immediate past. The results show that real disposable income has no power in explaining consumption, but immediate past values of changes in stock helped in predicting the level of consumption.

A Study by Raut and Virmani (1990) tested Hall's random-walk hypothesis of consumption on aggregate data from twenty-three developing countries. Their results rejected the hypothesis with fixed interest rates assumption, but when the assumption is relaxed the results support the hypothesis that consumption follows a random walk with drift. This can be explained intuitively as follows, while a consumer's earnings fluctuate over his lifetime, if capital markets are perfect and there is no uncertainty about the rate of interest, then by borrowing and lending, a consumer will smooth out his/her consumption stream evenly over his/her lifetime. Thus if his/her utility function satisfies some general conditions, consumption in each period will be proportional to life-cycle wealth or permanent income rather than to current income. Since permanent income has greater persistence, that is, it follows a random walk, so does the share of consumption in income.

2.2 NATURE OF DATA FROM EMPIRICAL LITERATURE

It is also imperative to provide a brief insight of nature of data used in empirical studies. According to Boskin and Kotlikoff (1985), aggregate time series studies are more suitable than cross-section studies for empirically examining propositions about the neutrality of fiscal programs such as social security. Econometric analysis applied to aggregate data is likelier to yield a truer test of the Ricardian equivalence hypothesis than the results obtained by extrapolating from micro data. Evidence from aggregate time series does not unanimously support the Ricardian equivalence hypothesis (see Bernheim, 1987).

Furthermore, test of the Ricardian equivalence hypothesis in cross-section data require a specification of transfer and changes in dynastic resources, such a

process might be quite complicated. Also, observations of consumption behaviour from time-series data differ from those of cross-sectional data (see Sargent 1979, chap. 12). What is observed is that the average propensity to consume out of current income is higher than the marginal propensity to consume in the cross-sectional data. But in time-series data when the variables are averaged over ten years, these two propensities are equal (see Williamson, 1968). Data on income, consumption, saving, and related aggregate variables from SNA (System of National Accounts) sources are maintained by various international organisations, including the UN, IMF, OECD, and the World Bank. These data suffer from inadequacies, inconsistencies and biases that have undoubtedly affected the quality of existing empirical work. The problems range from inadequate sector coverage, incomplete measurement and variable misclassification, to exclusion of capital gains and other sources of mismatched between saving flows and wealth changes. The study further pointed out, that other data related to saving, including public-finance and rate of return information, are also subject to measurement problems and are widely dispersed in different sources.

According to the paper by Schmidt-Hebbel and Serven (1996), the implication of these data problems surely should not be to stop empirical research. The right inference is correct some of the problems and therefore assembling a world data base of adequate aggregate time-series data for a consistent set of variables and a large number of countries is a first priority for carrying out empirical research on savings.

A large number of empirical saving studies are based on inadequate saving data. They rely on to aggregate measures of saving ranging from gross domestic to

national to private sector saving, when the relevant decision unit is the household or the individual.

2.3 RECENT DETERMINANTS OF PRIVATE DOMESTIC SAVINGS

There are many previous empirical studies of saving in developing countries (for surveys, see Mikesell and Zinser 1973, Gersovitz 1988 and Deaton 1990) and many others. Before delving into the discussion of the literature, it is useful to note the types of data they used, because the differences in results usually derive from the differences in the data sets. Typically the studies used time series to cross-section on the rates of national saving (see, for instance, Gupta 1987, Fry 1988). A few studies used data on private sector saving or household consumption, but none of the studies of developing countries focussed on aggregate household saving or on the combination of household consumption and income from which household saving was derived (Schmidt-Hebbel et al 1992).

An examination of the above theories of saving brings out various variables that could determine saving. The main determinants of saving and consumption considered in the literature fall into five groups: income and wealth; public deficits and saving; rates of return; foreign saving; and demographic variables. The individual contribution of some of these variables to private saving in developing countries, as identified in the empirical literature, is reviewed below.

2.3.1 INTEREST RATE.

The interest rate is another determinant of savings that has received attention both in developed and in less-developed countries. But empirical

investigations in developing countries (Giovanni, 1983), sometimes run counter to theoretical analysis. As a reward for accumulating financial assets and postponing current consumption, interest rates influence the willingness to save currently earned income. In this sense, the supply of loanable funds should be positively related to interest rates. The higher the reward, the more individual economic units will tend to save, *ceteris paribus*. But on the demand side is a reverse, interest rates constitute an element of the cost of capital. The higher the interest rates, and therefore the more costly is borrowed money, the less capital firms will demand.

From that argument the demand for loanable funds will be inversely related to the levels of interest rates. Accordingly, interest rates should be set at an equilibrium point to satisfy both, supply and demand for loanable funds.

Determining such an equilibrium level of interest rate is a challenge to all economies.

According to the intertemporal model the relationship between saving and interest rate depends on the relative strength of substitution and income effects provided that a country is a net saver. As a result, this conventional analysis provides an ambivalent solution to the effect of real interest rate on saving (see, Sachs and Larrain, 1993 and Dornbusch and Fischer, 1994). Empirical work¹ on the interest elasticity of saving in both developed and developing countries appears to be inconclusive. Deaton (1992), cites from empirical evidence that saving is not much influenced by interest rates. But, this view is contested by a number of economists including Fry (1988, ch.12) who believe that saving is in truth very sensitive to changes in yields, and that the failure of econometric analysis to

¹ For a critical review of empirical evidence on the interest responsiveness of saving

document that sensitivity comes from flaws in data and econometric procedure. The study by Boskin (1987) is the first to find a positive relationship between private saving and the rate of return for the United States. A study by Fry (1988) confirmed the relationship with a positive real interest rate's coefficient in the saving function of 14 Asian countries. Studies from sub-Saharan Africa by Lipumba et.al. (1989), and Mwege et. al (1990) for example, find the interest rate to be insignificant in influencing the saving rate.

The theory postulates higher interest rates, increase the opportunity cost of consumption hence households increase saving (the substitution effect), while they increase the wealth of positive savers, hence, their consumption increases (the income effect). Ogaki et al (1994) and Masson et al (1995) postulate that the interest elasticity of private saving is higher in middle and higher-income countries because of less dominance of subsistence consumption than is the case with poorer countries.

2.3.2 LIQUIDITY AND BORROWING CONSTRAINTS

In the context of the inter-temporal model individuals dissaving depends on their ability to borrow for consumption against future income. If they are faced with borrowing constraints, for example due to banks reluctance to lend due to uncertainty of future incomes or risk of moral hazard from default behaviour on the side of borrowers, individual who would like to borrow to increase present consumption cannot do so. They are constrained in consumption to their current liquidity - current income and assets.

Empirical studies on developing countries (see Schmidt-Hebbel et al .1991, 1992a and 1992b) take real money and quasi-money (broadmoney, M2) as a proxy for liquidity constraints in determining household consumption and saving behaviour. The M2 generally shows a degree of monetization in the economy. The less economy is monetized the higher the liquidity and borrowing constraints and vice versa. These studies find an inverse relationship between monetary assets and saving rate, since monetary reduce the extent of liquidity constraints, as result, induces an increase in the level of consumption and thus depress the saving rate. Liquidity constraint in a study by Mwega (1996) is proxied by the share of domestic credit allocated to the private sector. The coefficient of this variable was found to be non-significant (at least at 10 percent level), implying that liquidity and borrowing constraints either are not important in the model or their influence is captured by some other variables in the model or that this variable is a poor proxy.

2.3.3 ECONOMIC GROWTH

Saving may also depend on income fluctuations. Simple consumption-smoothing models predict that temporary fluctuations in income should primarily affect saving. Most empirical studies of developing countries have not looked closely at the effect of income fluctuations on saving. An exception is Gupta (1987), which consistently finds that saving responds significantly and positively to temporary income shocks. Economic growth increases the income of workers relative to that of non-workers (the youth and retirees) and therefore leads to more saving to cater for increased consumption during their retirement (Mwega, 1996). On the other hand, growth may also reduce liquidity and borrowing constraints inducing

household to increase consumption. From theory and empirical evidence there is a two-way causation between savings and growth. A virtuous cycle results as growth leads to more savings and this enhances economic growth through capital formation. Economic growth may lead to higher degree of monetization of the economy and also to expansion of domestic credit to private sector and hence reduction in the constraints. What is important to most studies is which direction of causality is dominant? While the worldwide experience shows a strong and positive correlation between saving rates and growth rates, what drives what is hotly debated. This is not an abstract academic question, but rather has an enormous policy importance because its answer will determine the policy priorities for achieving high growth. For example, is rapid growth mainly due to a higher saving rate or does saving mainly respond to economic growth? If saving were a major growth determinant, increasing it would be a central aspect of policy process whereas if the converse, the focus should largely be on factors stimulating growth (Schmidt-Hebbel and Serven 1996). The World Bank (1994) report postulates that private savings largely follow economic growth, so that the key is not forcing up the saving rate, but creating an environment that facilitates rapid accumulation, efficient resource use and rapid productivity growth. A study by Carroll and Weil (1993) also uses causality tests and find that it is growth that mainly 'causes' changes in the private saving rate.

2.3.4 FISCAL POLICY STANCE

The government budget balance (public saving) may or may not influence private domestic saving. The influence depends on the assumptions made, the neo-classical believe it may have no impact, the Keynesian says may have some impact

or is fully crowded -out (Ricardian equivalence i.e., an increase in public saving is exactly matched by a corresponding decrease in private saving).

Fiscal policy plays a major role in the direction of economic activity in LDCs and in particular in influencing private domestic saving decision (Mlambo, et al., 1997). The effect of fiscal adjustment on private domestic saving hinges on how the fiscal deficit is corrected. If the deficit were corrected by tax increases, it would certainly have a negative effect on private domestic saving. Taxes can also affect the rate of private domestic saving in various ways. These include tax exemptions and preferential treatment of particular types of savings, social security schemes, and mechanisms for compulsory lending to the public sector and substitution of income taxes with consumption taxes. A study on India by Muhleisen (1997) concludes that traditional tax incentives are unlikely to lead to a strong response of the private domestic saving.

Empirical results suggest that the most direct means to raise domestic saving is through generating higher public saving [e.g. Masson et.al (1995)]. On other hand, it is argued that public saving would depress private saving through a Ricardian equivalence effect (i.e. an increase in public saving is expected to be exactly matched by a decrease in private saving so that national saving remain constant). For Ricardian equivalence to hold, the following conditions must be satisfied jointly: no liquidity constraints; equal discount rates for the public and private sectors; and certainty of future income, tax and public expenditure flow. For a further discussion of these conditions and surveys of empirical studies Webb et al (1992) cites the following references Hayashi (1985), Hubbard and Judd (1986), Berheim (1987), and Leiderman and Blejer (1988). Ricardian equivalence has been



widely rejected in empirical studies of industrial countries. The pervasiveness of borrowing constraints is most often cited as the main reason for its rejection.

However, this proposition appears to have been refuted by a number of studies in developing countries, that have found widely varying offset factor, ranging from close to zero [Haque and Montiel, (1989)] to around 50 percent [Corbo and Schmidt-Hebbel (1991)], among others. By contrast, a survey by Seater (1993) criticises much of the empirical work as being inadequate and it concludes that the evidence supports the hypothesis.

2.3.5 MACROECONOMIC INSTABILITY

Macroeconomic instability, whose proxy is inflation has ambiguous results on private domestic saving. Inflation may affect saving independently from its effect through real interest rate. High inflation often contributes to stagnation in output or outright recession, which will be reflected in the income variable. Higher inflation also increases economic instability and uncertainty about future rates of return on real assets and income levels (Schmidt-Hebbel et al, 1992). Theoretically, the effect of inflation on private saving is ambiguous, as uncertainty about future asset values could either discourage saving because of the substitution effect of the lower real rate of return or encourage saving for precautionary motives. Similarly, the increase in uncertainty of future income streams affects private saving ambiguously, depending on the form of the underlying utility function. A comprehensive treatment of the effects of different sources of uncertainty on saving can be found in Gersovitz (1988). Inflation increases uncertainty about future real income and therefore induces people to accumulate more in order to safeguard future consumption levels.

According to Rutayisire (1990), inflation has positive influence on household saving in physical assets. As inflation erodes the real value of financial assets, individuals tend to substitute financial assets for physical assets. Thus, inflation has a negative effect on financial savings. This notion suggests the importance of not only keeping the inflation rate at low levels, but also to minimise its variability.

Inflation may however reduce real wealth (if due to structural rigidities they are not fully indexed) and consumption, therefore leading to an increase in saving. On the other hand, it may also increase uncertainty and hence precautionary saving. According to Masson et al (1995), saving is negatively correlated with inflation, while Edwards's (1994) reports inconclusive results. According to Mlambo and Elhiraika (1997), a reform to macroeconomic policy environment is a key requirement to achieving a stable and credible environment that will induce a strong response to private saving and investment in SADC² countries.

2.3.6 THE EXTERNAL FACTORS

Some development economists argue that foreign capital inflow, especially loans and grants, may have a negative impact on domestic saving. The relation between these two variables has been considered as quoted by Kidane (1992) from Griffin (1970), Papanek (1972) and Suckling (1975). What is of interest in this particular relation is whether foreign capital inflow is a complement or a substitute for domestic saving. Some argue that foreign capital inflow may have negative impact on domestic saving because it may replace the latter. According to Suckling (1975) quoted by Kidane (1992), displacement may be

² SADC is a development community for Southern African states (South Africa, Namibia, Botswana, Malawi, Zambia, Lesotho, Swaziland, Zimbabwe, Tanzania, Angola, Mozambique, Madagascar, Seychelles and Democratic Republic of Congo).

crucial in private sector because foreign capital inflow from developed countries along with the experience and know-how of entrepreneurs could have a discriminatory effect on domestic savers. It has been postulated that large external debt has a negative impact on private savings in developing countries [Hadjimichael and Ghura (1995)]. The theory predicts that the presence of high debt raises expectations of high future tax liabilities for its servicing and hence induces capital flight. Given such potentially pervasive effect of foreign debt on private saving the external debt factor may well be non-linearly related to private saving, a possibility, which is amenable to empirical assessment. But there are also others who state that savings and capital inflows tend to complement each other.

Another external aspect, which is likely to be correlated with saving, is the terms of trade. According to Mwega (1990), there is likely to be a positive relationship between changes in terms of trade and saving, the so-called Harberger (1950) and Laursen-Metzler (1950) effect. An improvement in the terms of trade increases incomes and hence saving, especially if the improvement is considered transitory and therefore not expected to last. This effect may be particularly important in Africa where exports are limited to a few primary commodities, which are sold in highly volatile markets. Some empirical studies cited in Mwega (1996) find positive relationship between changes in terms of trade and saving (Ostry and Reinhart 1992, Azam 1995, Bevan et al 1992). According to Mwega, Betvan et al (1992) analysed the impact of the 1976-77-coffee boom on rural savings in Kenya. Proceeds from this boom caused by a frost in Brazil- were fully passed on to the farmers and they show that about 60 percent was saved.

CHAPTER THREE

BRIEF OVERVIEW OF THE NAMIBIAN ECONOMY

3.1 GEOGRAPHY AND POPULATION

Namibia, which covers 824 268 km² of desert and savannah, is three times the size of Great Britain. The country shares South Africa's northern border and Botswana's western border. To the North is Angola and the narrow Caprivi-strip links the country to Zimbabwe and Zambia. The Orange River forms the southern border with South Africa while the Kunene river forms the northern border with Angola. The population is estimated at 1.5 million, growing at 3.5 per cent per annum. This makes Namibia one of the lowest population density areas in the world with an average 1.7 people/km². Some 27 per cent of the population live in urban areas, mainly Windhoek the capital city and in the coastal towns of Walvis bay, Swakopmund and Oranjemund. It is a young nation with 71 per cent of the total population below the age of 29 [Namibia Review, 1992(vol.1):12]

3.2 ECONOMIC STRUCTURE

Due to the close historic ties that the country has had with South Africa, the Namibian economy is very dependent on South Africa. Almost close to 70 per cent of Namibian's imports are from South Africa while about 80 per cent of primary products are exported to South Africa. This situation coupled with the limited potential for economies of scale due to the small market has resulted in a small manufacturing base. Namibia gained its independence from South Africa, in 1990.

The country is among the low middle income³ countries in sub-Saharan

³According to world bank report (1992) quoted in Namibia Public Expenditure

Africa (SSA) with a per capita income of U\$ 2,080 in 1996 and with a population of 1.58 million. The Namibian economy is an open one, heavily dependent on exogenous factors such as the economic performances of its trading partners, especially South Africa.

Equally, its reliance on primary sectors makes it dependent on climatic conditions, notably the level of oxygen in seawater (fishing) and weather conditions (Agriculture). Any change in these conditions may have a considerable impact on the country's economy. This vulnerability is clearly demonstrated by the adverse impact of the severe drought and exceptionally low oxygen levels in Namibian fishing waters have already on the livestock and fishing industries over the past few years.

The economy of Namibia is still randomly affected by major political and economic occurrences both locally and internationally, over which the people and the government of Namibia have little or no control in the short-run. The Namibian uranium exports is a case in point which was affected severely by restructuring of economic systems and opening up of commodity markets in Eastern Europe. The situation had resulted into oversupplied of uranium and hence dramatic decline in its price.

The mainstays of the economy are producers of government services, mining, agriculture and fishing. These sectors contribute substantially to GDP, which is some US\$2.4 billion. The economy recorded a high share of general government sector for 1996/97 of about 26.6 percent of GDP at basic prices and 16 percent for mining. Excessive dependence on government's GDP contribution makes the

review, middle-income countries are those with GNP per capita that ranges

Namibian economy vulnerable in terms of growth prospects. Ultimately, for this contribution to be sustainable, government can only spend what it collects in tax earnings from the private sector, as excessive borrowings are risky and counter-productive (World Bank report, 1995)

3.2.1 AGRICULTURE

Although agriculture contributes only 11 per cent to GDP, almost 70 per cent of the population depend on it for a livelihood. Subsistence farming is widespread in the country. Like many other developing countries, Namibia has two distinct forms of agriculture: commercial and subsistence agriculture. Commercial farming in Namibia utilises about 44 percent of the land that is suitable for agriculture and supports about 25 percent of the population. Communal farming is practised on 40 percent of the agricultural land, of which a larger part is marginal land. Moreover, about 90 percent of the rural population derive their livelihood from some form of subsistence agriculture. The Government scheme of "affirmative action loans and advances is one of the major projects aimed at redressing land ownership imbalances. The commercial sector is predominantly in the hands of the few the whites that are about 5 per cent of the total Namibian population. The land is not arable in the main, which explains why 85 per cent of agricultural turnover is derived from meat production. A substantial percentage of this meat production is exported to South Africa and under Lome convention to Europe. The other products derived from the sector except meat is a karakul pelt, karakul wool and to a smaller extent, ostrich meat and hides.

Meatco is country's biggest processor of meat products and the company has three EEC-approved factories located at Windhoek, Okahandja and Otavi. Most of the country does not venture itself into crop production due to the low and uneven rainfall, except for a small part in the north where maize and wheat are grown.

3.2.2 MINING

The mining sector has been the major driving force in the Namibian economy and it will continue to play a leading role in the economic development of this country for years to come. The dominance of mining the sector in the Namibian economy is evident in terms of the sector's contribution to GDP and its overwhelming shares in exports. Diamond mining is dominant, contributing to about 73 per cent of total mining activity in Namibia. The good quality of Namibia's diamonds is the key to the industry success.

The country produces 98 per cent gem-quality diamonds, of which 40 per cent are mined offshore. Namdeb Company which is a 50/50 joint venture between the Namibian government and Swiss- based De Beers Centenary AG, is responsible for the bulk of diamond mining activity in the country. The mining of marine diamonds has increased significantly and consequently Namdeb had increased production from this source tenfold between 1990 and 1993.

3.2.3 FISHING

Fishing and fish processing contributes just about 6 per cent to GDP. Namibia after independence became a significant player in the international fishing industry, ranking amongst the top ten in the world in terms of catches. It is also regarded as one of the biggest African fishery nations by production and exports.

The fishing industry has been identified as one of the sectors that have a great potential for growth. Sustainable fish resources in 1991 were estimated between 1.3 and 1.5 million tonnes of fish per annum. Under Namibianisation arrangement the quota system was introduced and fishing licences for the Namibian vessels are given for much longer period, than given to foreign vessels. The main exploited species are pilchard, hake, horse mackerel, rock lobster and deep-sea monk. Fishing output has been unstable over the past years (Ministry of Finance Review, 1991).

3.2.4 GENERAL GOVERNMENT POLICIES

The economic policies pursued by the government are basically aimed at the attainment of the dual objectives of growth and equity within the context of macroeconomic stability. The underlying factors for the choice of these two objectives are the realisation that only through accelerated growth of the economy can a meaningful improvement in the welfare of the people be achieved. The same effort will ease the concern about the persistent highly skewed income distribution and the need therefore to implement socially equity programmes. Another factor implicit in pursuing policies aimed at achieving macroeconomic stability is out of the realisation that these would not only enhance activities in the domestic economy, but also assist in integrating Namibia economy into the regional, as well as the global economy.

In what follows a brief overview of the Namibian financial system will be provided and also some highlights on savings in Namibia.

3.2.5 FINANCIAL STRUCTURE IN NAMIBIA

3.2.5.1 BANKING AND FINANCE

Considerable headway has been made so far to further deepen the Namibian financial system, but many initiatives and actions need to be followed up to ensure consistency and faster progress. In particular, new legislation related to the banking and insurance industry is being followed up with enabling and supporting regulations. Namibia has a fairly well developed financial infrastructure by many LDCs standard. The Financial intermediation contribution in 1996 as percentage share of GDP at constant 1990 prices stood at 17 percent. The government of Namibia plays a very crucial role in enhancing the position of financial system in the country.

The government has put in place an appropriate legal framework, including well-established property rights as well as an efficient judicial system to make the system much more efficient and reliable. In addition, the Central bank of Namibia has a good financial safety net (explicit or implicit deposit quarantees) to avoid liquidity crisis. Such a set up may have a positive effect to overall saving behaviour in the country (Namibian economic review, 1992).

However, the financial and banking institutions are mainly urban based that asymmetry in itself may likely undermine rural household saving. Institutions in place include merchant banks, building societies, life and short term insurers, pension and provident funds.

3.2.5.2 STOCK EXCHANGE

The Namibian Stock Exchange (NSE) was launched on 12 October 1992. It had a slow start with few companies applying to be dual listed with the



Johannesburg Stock Exchange (JSE). It was only in August 1994 that the first primary listing took place. Since then the exchange has grown by leaps and bounds, mainly through the addition of JSE dual listed stocks. The first major primary listings took place in May 1996 pushing the market capitalisation of primary listed companies through the N\$1 billion mark. Of the 26 listed companies in 1996, 12 have their main activities in South Africa and are dual listed on the JSE. Institutional investors, managing Namibian pension and life insurance funds, account for over 90 per cent of trading on the NSE. Trading on the NSE has picked up considerably since the promulgation of article 28, compelling local insurance and life institutions to invest 35 per cent of their assets in Namibia. This has led to an increased demand for stock and a re-rating of local stocks in line with the JSE.

3.2.5.3 EXCHANGE RATE SYSTEM AND EXCHANGE CONTROL

The Namibian dollar is currently linked to the South African rand in accordance with the Common Monetary Area⁴ (CMA) agreement, which, inter alia, allows free flow of capital between member's states. Because of the agreement, South Africa monetary policy and foreign exchange control measures are also applicable in Namibia, notwithstanding its applicability for Namibia. Although speculation of delinking has erupted from time to time, the Bank of Namibia and the Government denied any possibility of delinking in the foreseeable future. The exchange control regime in Namibia, during recent years, was characterised by a continuous liberalisation process, which include divesting of more authority to authorised dealers. This move was necessary and clearly and conformity with the

⁴ The CMA is a monetary area that consists of South Africa, Namibia, Swaziland

Bank of Namibia's objective of transforming from a regulatory to a monitoring authority. To this end, the liberalisation process was initially, design to address the Financial rand system. We all know that a dual exchange rate system was designed to act as a buffer for foreign currency outflows from the Common Monetary Area and as a disincentive of disinvestments from the CMA. This mechanism was abolished during 1995 (Budget Statement, 1998/1999).

The second phase of liberalisation process allowed institutional investors to acquire foreign assets by way of asset swaps providing for the exchange with foreigners of part of their foreign assets for local assets, while direct investment by Namibian was also sanctioned. As a further liberalisation measure, Namibia acceded to Article VIII section 2, 3 and 4 of the IMF Articles of Agreement, with effect from September 1996. IMF members accepting the obligations of Article VIII are required to refrain from imposing restrictions on payments and transfers from current international transactions. Following on this, the Bank of Namibia, during 1997, abolished virtually all quantitative limits applicable to international payments for goods and services (Budget Statement, 1998/1999).

3.2.5.4 MONETARY POLICY

Namibia's primary monetary policy objective has been to support the fixed exchange rate between the Namibian Dollar and the South African Rand. In spite of the introduction of the N\$, Namibia's monetary policy is effectively still determined by the South African Reserve Bank as there is no exchange control between Namibia and South Africa. The Namibian Dollar and the South African Rand are linked at par

(1:1). The restrictive monetary policies pursued by the South African Reserve Bank have curbed money supply and credit growth in Namibia to single digit figures. As a result of that Namibia since June 1997 experienced also single digit inflation with the rate currently revolving around 7 per cent and below.

3.2.5.5 PUBLIC FINANCE AND FISCAL POLICY

By international standards Namibia's level of public debt is low. However, the increasing proportion of government expenditure allocated to servicing debt (now the second largest expenditure category after wages and salaries) coupled with the lack of fiscal discipline reflected in regular additional budgets is cause for concern. Namibia's external debts to GDP and debt-service ratios were 12.5 and 3 per cent respectively at the end of 1993. The ratios are extremely low compared to other low and middle-income countries. There is also growing threat emanating from financial guarantees issued by the Government in favour of borrowing activities by external public agencies and state-owned enterprises, which could possibly further increase government ultimate indebtedness. These concerns, therefore, require a closer examination of all the issues pertaining to debt management in Namibia. Debt servicing is crowding out public expenditure on services and capital investment while the overall level of public debt is crowding out private investment. Continuous budget deficits, however, could endanger the reputation of creditworthiness as the government could be forced to borrow increasing amounts externally (World Bank Public Expenditure review, 1995). The solutions, in some view, lie in greater fiscal discipline, down sizing of the public sector and privatisation of some state assets.

3.2.5.6 DOMESTIC CREDIT

Credit extended to the private sector has increased on average by 28 per cent per annum between 1992 and 1995, while total production at current prices increased by only 14 per cent per annum. It can therefore be concluded that the Namibian economy has to a significant extent been stimulated by credit since independence.

3.2.6.7 EXTERNAL AID

While Namibia receives significant amounts of aid, much of it does not enter through the government budget (i.e. it is off budget). This creates several problems for the government. It poses more difficult to derive an accurate estimate of available resources (to ensure that highest priority projects are financed) to explicitly consider the current cost implications of projects and to meet national development goals. In addition, growing concern among the donors has led to requests for improved transparency in resource allocation and use of their funds. Aid management can and must be improved, but it will require leadership by the government and co-operative action by the development partners. According to World Bank public expenditure review (1995) the overriding principle underlying aid management reform in Namibia is that Government should take charge of aid process. The government should constantly evaluate if aid is in line with the country's development goals and should incorporate aid flows into the macroeconomic framework. The process should not be donor driven.

3.2.6 Trends of Savings in Namibia

The table below shows the trends of economic activity, public and private savings in Namibia.

Table 3.1: Savings are expressed as a ratio of GDP (%).

YEAR	1980	1981	1982	1983	1984	1985
GDP	1526.5	1559.5	1778.8	1859.0	2090.5	2732.0
Sg/GDP	+8.5%	+4.9%	+7.3%	+4.4%	+9.5%	+9.6%
Sp/GDP	22%	20.7%	17%	20%	13.8%	16.5%

Source: The Department of Finance the SWA/Namibia Information Service.

Saving by the general government has been volatile over the past years. During 1985 an increase of 32,9 per cent was noted, and this was as result of higher tax receipts rather than the curtailment of the rise in expenditure. The average private saving rate over the period 1980-1985 is recorded as 18.3 percent while the public saving stood at 7.4 percent.

The level of gross domestic saving, which in 1989 stood at N\$ 530 million, or at 10.6 per cent of the GDP, fell in 1990 to N\$ 413.8 million or to 7.3 per cent of the GDP. This decreased savings ratio resulted directly from reduced savings in the household, corporate and in the government sectors. During 1990 gross domestic saving was by far insufficient to cover gross domestic investment which at that stage was still on a fairly firm level. During 1991 the level of gross domestic saving rose to 17.3 per cent of GDP and suddenly fell to 12.0 per cent in 1992.

Table 3.2 Namibia: Key Savings Indicators 1992-1998 percentage of GDP

YEAR	Gross domestic saving	Gross national saving	Private saving
1992	12.0	24.1	23.0
1993	9.6	20.9	18.8
1994	16.9	27.5	24.8
1995	12.8	25.3	23.3
1996	13.5	25.6	26.4
1997	14.2	25.7	24.5
1998	19.1	29.0	29.0

Source: Namibia Recent Economic Developments and Prospects, Government Draft, 1999

Although the gross domestic saving to gross domestic output ratio fell mildly during 1993, saving in relation to gross domestic investment advanced from 14.3 per cent to 16.7 per cent. The higher saving to investment ratio is the result of higher savings combined with a lower level of capital formation. This implies that Namibia has enhanced its net lending position with the rest of the world, or as counterbalance in the current account of the balance of payments, it has improved its current account surplus.

Despite of higher corporate tax payments, originating mainly from mining,

corporate saving advanced by about 11 per cent during 1993, which in essence reflects the reduced cost of borrowing as a result of declining interest rate tendencies.

CHAPTER FOUR

EMPIRICAL MODEL SPECIFICATION AND METHODOLOGY

The model to be used in this study was employed in number of studies, including, Mlambo (1997), Muhleisen (1997), Mwega (1996). This paper built its model on the same principle employed by previous authors and took into account distinct structural features of the Namibian economy. This is an eclectic model and could have weaknesses of lack of coherence.

From the above review of literature, the study postulates that the private domestic saving rate in Namibia is a function of the following variables (with the indicated hypothesised direction of impact).

- (I) Macroeconomic stability, proxies by inflation the sign is unknown a priori.
- (II) Fiscal policy variable: Tax, a priori its sign is expected to be (-ve).
- (III) Liquidity constraint and borrowing, proxies by domestic credit to the Private sector (-ve).
- (IV) Real interest rate, its sign depends on the interaction between an income and a substitution effects, and is therefore unknown a priori.
- (V) Income, a priori its sign is expected to be (+ve).

MODEL FORMULATION:

$$SP = F(GDP, T, RIR, \pi, DCP) \quad (5)$$

4.1 DATA SOURCES AND TRANSFORMATIONS OF VARIABLES

This part discusses the definitions of the variables, the data sources and the data transformation corresponding to relation (5).

SP = Private domestic savings

GDP= Gross domestic product used as a proxy for income.

T= Taxes

R= Real interest rate (i.e. $RIR = i - \pi$)

π = Inflation rate, proxy for macroeconomic instability.

DCP = Domestic credit to private sector, as a proxy for liquidity constraints.

As indicated earlier, the research will attempt to identify variables that determine private domestic saving pattern in Namibia. As we know from the theory saving is a residual item as such its interpretation should be done cautiously. From various empirical studies including Fry (1988) private domestic saving is determined by both quantifiable and non-quantifiable variables (i.e. social and cultural factors). But due to absence of research done to capture the non-quantifiable variables this study, will focus on the definitions of quantifiable variables only.

The study dependent variable is private domestic saving obtained as a residual of public saving from gross domestic saving. Most important variable to be considered to explain private domestic saving is income. This type of income is practically proxy by two sources either GNP (Gross National Product) or GDP (Gross Domestic Product). But due to the nature of the study GDP is much more

preferred because it helps to explaining the private sector capacity to mobilise resources domestically.

Furthermore, rate of return to saving is proxies by real interest rate. The real interest rate⁵ is theoretically defined as nominal interest rate less inflation. The nominal interest rate in this study is proxies by deposit rate, since the rate is the only one that attracts saving. Inflation is derived from the annual average of CPI (Consumer Price Index), although there are other methods like GDP deflator to compute inflation. The former is taken to be relatively better to reflect the structure of the Namibian economy as an importing country. Due to unavailability of broad money (M2) data domestic credit to the private sector is used to proxy borrowing constraints in the economy. The data includes allocation of credit and loans to non-public sectors. The tax variable is taken as total tax revenue⁶.

The following original variables were obtained from the National accounts of the Central Bureau of Statistics and Bank of Namibia for the observations 1980-1997 and complemented by sources from the Ministry of Finance for the observations 1967-1979: Private domestic saving, Inflation and Gross Domestic Product (GDP). All variables are measured in current prices in local currency units. Some other original variables were obtained exclusively from the Bank of Namibia sources: Domestic credit to the private sector and Nominal deposit rate. Another important measure used is the GDP deflator, was used for deflating all variables except real interest rate and inflation to have real values.

⁵ See Irving Fischer equation in any standard macroeconomics textbook, which is $RIR = \text{nominal interest rate} - \text{inflation}$.

⁶ Total tax revenue net of transfers and subsidies to the private sector.

The author has done some extrapolation on missing observations, based on the average growth rate of the variables.

The period of the study is 1967-1997 the period was not chosen for a particular events. But is primarily due to data availability. The type of data used is annual time series.

4.2 FORMULATION OF COINTEGRATING MODEL AND ECM

Using Cointegration analysis, this study will empirically investigate the long-run behaviour of private domestic saving in Namibia. From equation (5) and taking above analysis into account and also adding a dummy to capture a shift in regimes a long-run model of private domestic saving will be formulated in log-linear form as follows:

$$LRSP_t = \alpha_0 + \alpha_1 LR GDP_t + \alpha_2 LRT_t + \alpha_3 RIR_t + \alpha_4 L\pi_t + \alpha_5 LRDCP_t + \alpha_6 DUM + \varepsilon_t \quad (6)$$

Where: LRSP= log of real private domestic saving.

LRGDP= log of real gross domestic product.

LRT= log of real taxes.

RIR= real interest rate.

$L\pi$ = log of inflation

LRDCP= log of real domestic credit to the private sector.

DUM= dummy to capture a shift in regime (1990)

The empirical analysis, thus far, will be focusing exclusively on the long-run determination of private domestic saving. The short- term dynamics in saving will be

incorporated into the analysis through an error correction specification. The error correction model combines long-run information with short-run adjustment mechanism. To do this, define an error correction term which, is nothing other than the residual from the levels regression. The error correction term is then used to estimate the ECM:

$$\Delta LRSP_t = \beta_0 + \beta_1 \Delta LR GDP_t + \beta_2 \Delta LRT_t + \beta_3 \Delta RIR_t + \beta_4 \Delta L\pi_t + \beta_5 \Delta LRDCP_t + \beta_6 ECM(-1) + \beta_7 Dum + \varepsilon_t \quad (7)$$

The variables are the same as specified in equation (6) except that equation (7) added a new variable that captures the error correction term denoted by *ecm* lagged by one period.

Since the difference terms and the error correction term are all $I(0)$ we may estimate equation (7) by OLS. This study will be using aggregate time series data to analyse saving behaviour as opposed to cross-sectional data. The reason for this is due to a real lack of household survey data that are suitable for testing the predictions of consumption and saving theory. Also many household surveys of income and expenditure do not generate plausible figures for saving. Most likely, the problem is attributed to measurement error.

4.3 METHOD

A number of econometric testing would be done on macroeconomic time series data, which will include; stationarity testing and cointegration. This testing is essential in this study to avoid spurious results associated with trended time series and to allow for an analysis of both long-run and short-run dynamics.

4.3.1 STATIONARITY AND NON-STATIONARITY TESTING

A time series is said to be stationary, if the joint and conditional probability distributions of the series are unchanged if displaced in time. Thus, the means and variances of the series are constant overtime, while the value of the covariance between two periods depend only on the gap between the periods and not the actual time at which this covariance is considered. But, if one or more of the conditions above are not fulfilled, the series is non-stationary.

In general the statistical properties of regression analysis using non-stationary time series are dubious. Without going into this theory, the indication is that if series are non-stationary one is likely to finish up with a model showing promising diagnostic test statistics even in the case where there is no sense in the regression analysis (i.e, spurious regression). A non-stationary series can be transformed to a stationary series by differencing (d) times to be integrated of order (d).

4.3.2 TESTING FOR THE ORDER OF INTEGRATION.

Before any sensible regression analysis can be performed, it is essential to identify the order of integration of each variable (provided, of course, that the variable can be transformed into a stationary variable through differencing. There are number of unit root tests, but this study considered only two; the Dickey-Fuller (DF) and Augmented Dickey Fuller (ADF). These tests will enable us to test whether variables are stationary $I(0)$ or need to be differenced several times to render them stationary.

These tests are formulated as follows:⁷

4.3.2.1 Dickey Fuller.

It is based on the estimation of three different equations as specified below:

$$\Delta Y_t = \rho Y_{t-1} + \varepsilon_t \dots\dots\dots (1)$$

$$\Delta Y_t = \alpha_0 + \rho Y_{t-1} + \varepsilon_t \dots\dots\dots (2)$$

$$\Delta Y_t = \alpha_0 + \rho Y_{t-1} + \alpha_1 (t - t_m) + \varepsilon_t \dots\dots (3)$$

Equation (1) has no drift, (2) has a drift and (3) has a drift and a non-stationary trend process. That is time trend subtracted from its mean (t_m). All the equations are subject to the null hypothesis y_t sequence contains a unit root and the disturbance term ε_t is a white noise process.

4.3.2.2 AUGMENTED DICKEY FULLER (ADF).

$$\Delta Y_t = \alpha_0 + \rho Y_{t-1} + \alpha_1 (t - t_m) + \sum_{i=1}^k \alpha_i \Delta Y_{t-1} + \varepsilon_t \dots\dots\dots (4)$$

This augmentation is to include lag of ΔY_t and this improves the statistical fit of the equation and ρ is more efficient now with added information. The same hypothesis is being tested.

4.3.3 TEST FOR UNIT ROOT IN THE PRESENCE OF OUTLIER.

The cumulative sum of recursive residual (CUSUM) and the cumulative sum

⁷. See, Ndungu, N., (1997), AERC Research Paper: 58.



of residual square (CUSUMQ) will be used to detect outlier if the regression does contain lagged dependent variable. Alternatively, the Chow test will be used (based on the F- statistic) which is:

$$F(m, n - k_r - m) = \frac{RSS_r - RSS_1}{RSS_1} * \frac{n - k_r - m}{m}$$

Where RSS_r is the residual sum of squares for the model estimated over the whole sample period, RSS_1 is the residual sum of squares from the estimated equation for the first sample, k_r is the number of regressors (including the constant) in the restricted equation, and n is the number of observations in the full sample.

In this case m is a number of omitted observations. Hypotheses to be tested are;

H_0 : Parameters' Stability

H_1 : No Stability

4.3.4 TESTING FOR COINTEGRATION.

Variables are cointegrated, if a linear combination of these variables assumes a lower order of integration. These variables must always be of the same order of integration individually. That is, they are individually non-stationary, integrated of the same order but their linear combination is integrated of lower order. Thus, simply put, variables are cointegrated with one another if the residuals from the levels' regression are stationary. If variables are cointegrated then the levels' regression is not spurious, thus OLS estimates are consistent. Indeed, they are 'super-consistent', meaning that the probability distribution converges on the population value more rapidly than with $I(0)$ variables. However, the usual t-tests do not apply. Although the levels' regression is consistent, it is usual to proceed to

estimation of the error correction model (ECM) which contains information on both the long and short-run relationship between the variables. Basically, there are number of cointegration tests, but this study considered only the Engle and Granger two step procedures due to the nature of the data and the alternative procedure have been avoided as it can only be applied to a large sample size (Greene,1998)

4.3.5 THE ENGLE-GRANGER TWO STEP PROCEDURES

The first step of this procedure involves a test for the order of integration of the variables involved in the postulated long-run relationship. Essentially, the residual from the OLS applied to the series in levels is saved. Due to the properties of super converge the estimated parameters can be viewed as an estimate of the long- run and the residual (lagged by one period) can be viewed as an error term (Sjoo, 1997).

The second step involves, the testing for a unit root, in the residual process of the cointegrating regression obtain in the first step. The null hypothesis for this test is that the estimated error term has a unit root and the alternative is that variables are cointegrated.

4.3.6 GRANGER CAUSALITY TEST

A VAR model is to be used as the basis for testing causality in the Granger sense between private domestic saving and growth. A variable (X) is said to "Granger cause " (Y) the other variable, if its (X) lagged coefficients in (Y) equation is significant, and vice versa.

$$\Delta Y_t = \alpha_0 + \sum_{i=\infty}^n \alpha_i \Delta X_{t-i} + \varepsilon_t \dots\dots\dots (1)$$

$$\Delta X_t = \alpha_0 + \sum_{i=\infty}^n \beta_i \Delta Y_{t-i} + \varepsilon_t \dots\dots\dots (2)$$

$$Y_t = \alpha_0 + \sum_{i=\infty}^n \alpha_i X_{t-i} + \varepsilon_t \dots\dots\dots (1a)$$

$$X_t = \beta_0 + \sum_{i=\infty}^n \beta_i Y_{t-i} + \varepsilon_t \dots\dots\dots (2a)$$

Model (1) and (2) correspond to the assumption that seasonal components of the entire system are stochastic, while in (1a) and (2a) it is assumed that both trend and seasonal components are deterministic.

CHAPTER FIVE

EMPIRICAL RESULTS AND ANALYSIS

This section reports and discusses the empirical findings yielded by the model developed in the previous chapter. A study of this nature requires a comprehensive understanding of time series data characteristics and its application to yield some plausible results. As discussed previously in the methodology part, the DF and ADF tests were used to provide information on unit root test of the variables.

5.1 UNIT ROOT TEST ON THE VARIABLES IN THE PRIVATE DOMESTIC SAVING MODEL

The unit root tests of DF and ADF were applied to all variables included in the cointegrating regression model. The tests were applied to variables in both their levels and differences. As already mentioned, in the methodological part, that most time series data are non-stationary in levels and need to be differenced (d) times to transformed them stationary. This essentially is done to avoid spurious regression results associated with non- stationary variables. The Table below reports on the result yielded by DF and ADF tests, showing the non-stationarity and the order of integration of the variables.

W e could see from the table below, that all variables have a unit roots in levels. They needed to be differenced once to transform them stationary, hence all variables are I (1) process in their differences. The decision criteria of both DF and ADF tests, is based on their absolute values: if the calculated statistic values (figures not in the bracket) is greater than the value of the tabulated critical values (figures in the bracket) we conclude on that basis that a given variable is stationary. In other

words, we reject the null hypothesis the one of non-stationarity.

Table 5.1 The DF and ADF statistics

Variable	DF		ADF		Order of Integ.
	W/trend	W/out trend	W/trend	W/out trend	
$LRSP_t$	-3.4284 (-3.5671)	-2.2415 (-2.9627)	-2.8279 (-3.5731)	-2.0344 (-2.9665)	NS
$\Delta LRSP_t$	-7.6973 (-3.5731)	-7.8607 (-2.9665)	-5.1344 (-3.5796)	-5.2292 (-2.9706)	I(1)
$LRGDP_t$	-1.1501 (-3.5671)	-.93241 (-2.9627)	-2.1348 (-3.5731)	-1.8086 (-2.9665)	NS
$\Delta LRGDP_t$	-5.1490 (-3.5731)	-3.8430 (-2.9665)	-3.5868 (-3.5796)	-3.1501 (-2.9706)	I(1)
RIR_t	-2.2824 (-3.5671)	-2.4309 (-2.9627)	-2.7405 (-3.5731)	-2.9340 (-2.9665)	NS
ΔRIR_t	-5.0537 (-3.5731)	-5.0219 (-2.9665)	-4.4695 (-3.5796)	-4.3705 (-2.9706)	I(1)
LRT_t	-2.5777 (-3.5671)	-.12950 (-2.9627)	-2.7064 (-3.5731)	-.098744 (-2.9665)	NS
ΔLRT_t	-5.5527 (-3.5731)	-5.4811 (-2.9665)	-4.4644 (-3.5796)	-4.4120 (-2.9706)	I(1)
$LINF_t$	-1.9722 (-3.5671)	-2.4155 (-2.9627)	-1.3369 (-3.5731)	-2.1572 (-2.9665)	NS
$\Delta LINF_t$	-7.8240 (-3.5731)	-7.5702 (-2.9665)	-6.1244 (-3.5796)	-5.4252 (-2.9706)	I(1)
$LDCP_t$	-2.3272 (-3.5671)	-1.7984 (-2.9627)	-2.5262 (-3.5731)	-1.9614 (-2.9665)	NS
$\Delta LDCP_t$	-4.8393 (-3.5731)	-4.1153 (-2.9665))	-4.4031 (-3.5796)	-3.9540 (-2.9706)	I(1)

95 % critical values in brackets

The critical values depend on whether a test was done with trend or without trend (see above table).

The ADF test is an improvement of DF test in that it includes lags of a variable and this improves the statistical fit of the equation and the parameter on which the hypothesis is based is more efficient with this added information.

5.2 TESTING FOR COINTEGRATION

This study tested for cointegration of variables by using the test proposed by Engle and Granger (1987). This test has not been selected randomly, but is a second best alternative available given the sample size available. It is certainly acknowledged that Johansen’s procedure is more superior, than the latter but due to large sample size properties of the procedure and also taking into account the degree of freedom in this study (marginally above 30) the procedure was avoided.

Table 5.2 Testing for unit root in the residual of the cointegrating model

DF		ADF	
With trend	Without trend	With trend	Without trend
-5.4164 (-3.5671)	-5.4838 (-2.9627)	-4.1732 (-3.5731)	-4.2908 (-2.9665)

95 % Critical values in bracket

The residual from the cointegrating regression shows to be a white-noise process, meaning its mean and variance are constant overtime. This is shown to us evidently from the above table by DF and ADF tests with and without trend. The rule of thumb is, if the calculated statistic (Values outside brackets) is greater than tabulated value (inside bracket) then a conclusion is drawn that the residual is stationary. The implication of the stationarity of the residual from cointegrating model is that income, taxes, inflation, real interest rate and domestic credit to private sector are cointegrated with private domestic saving in Namibia. Consequently, this outcome is a clear justification to use an error correction model to estimate the parameters of the private domestic saving model more efficiently.

5.3 THE ERROR CORRECTION MODEL ESTIMATES AND ANALYSIS

The estimated error correction model (ECM) in our study yielded the following results⁸:

$$\begin{aligned} \Delta Lrsp_t = & 0.532\Delta Lrgdp_t - 0.293\Delta Lrt_t - 0.0014\Delta Linf_t + 0.112\Delta rir_t - \\ & (3.25)^* \quad (-2.17)^* \quad (-0.137) \quad (1.16) \\ & 0.327\Delta Lrdcp_t + 0.039DUM - 0.775ECM(-1) \\ & (-0.82) \quad (0.72) \quad (-2.21)^* \end{aligned}$$

$$R^2\text{-adj} = 0.65 \quad F(7, 22) = 5.7173 (0.34) \quad DW\text{-statistic} = 2.06$$

Values in parenthesis are t-values **significant at 1% *significant at 5 % level

Diagnostic tests:

LM test for serial correlation: CHI-SQ (1)= 0.0016118 [.968]

Ramsey's Reset test for functional form: CHI-SQ (1)= 0.53587 [.511]

Jarque-Bera test for normality: CHI-SQ (2)= 0.71927 [.657]

Breusch-Pagan test of heteroscedasticity: CHI-SQ (1)= 0.08240 [.774]

The study assumed a first-order autoregressive distributed lag (ADL) because of the small sample size. Assuming higher-order leads to loss of degrees of freedom that will make the study analysis extremely difficult.

From the ECM model, is observed from both R^2 and the adjusted (R^2), that variability in the regressand is explained by 0.70 and 0.65 percent respectively, indeed the regression fit the data well. This overall fit compares favourably with

⁸ Estimation is carried out using the Microfit 3.0(286).

other time series data estimations of saving functions in developing countries such as Lipumba et al (1989), which explains roughly 60 per cent of variation of the dependent variable.

The problem of serial correlation, which is indicated to us by Durbin-Watson statistic of 1.4476 that is less than 2, in cointegrating regression model is anticipated because of lack of lag structures in the model. A low statistic is also an evidence of an $I(1)$ series. The problem was eradicated in the Error correction model as observed from an improved DW –statistic of 2.06; this is because of presence of lag structure in differencing. The F-test of the model shows the joint significance of explanatory variables power in explaining the regressand. The battery of diagnostic tests, show no serious problem in the model. The constant has the expected negative sign and is significant at the 10 percent level of significance (see, appendix, Table 2). The implication is that there is minimum level of income required above which saving will be possible.

The Jarque- Bera test for normality based on a test of skewness and kurtosis of residuals does seem to provide any signal of the presence of normality problem. According to Ramsey's Reset test using the square of fitted values provide no indication of functional form in the error correction model to be inadequate. The Lagrange Multiplier (LM) test of residual serial correlation does not show any problem of serial correlation in the model. The heteroscedasticity test based on the regression of squared residuals on squared fitted values does not show any problem of heteroscedasticity, implying homoscedastic presence (i.e. constant variance). This should be the case because the estimated model is in log form and also the variables used in the model are deflated by some measure. Both

techniques applied to the model are said to be remedies to heteroscedasticity problem (Maddala, 1992:20)

The directions of impact of the estimated coefficients of private domestic saving are consistent with prior expectations. The error correction coefficient (0.78) shows that 78 percent of any deviation from the equilibrium condition is made up in the current period. The results indicate a positive and significant relationship between saving and income. The result accords with most of the previous studies in particular for developing countries. Secondly, the tax variable carries a consistent sign, which is negative and is statistically significant in the model. This is quite consistent with theory in that an increase in tax reduces the income, hence saving. This by implication supports the Keynesian Absolute income hypothesis that postulates that a decline in disposable income suppresses saving. The coefficient of the real interest rate is positive from the regression results but is never significant at least at the 10 percent level.

This outcome is consistent with some of the empirical literature discussed in the previous chapters. The studies from Sub-Saharan Africa by Lipumba et al (1989) on Tanzania and Mwega et al (1990), for example have found the interest rate to be negative and insignificant in influencing the saving rate. The finding of this study is not clear with respect to Mackinnon and Shaw hypothesis (1973), which postulates that by raising deposit rate will increase a rate of return and as result would have positive effect on saving rates. The result conforms to the hypothesis on the basis of the sign, but its impact has no discernible effect or put differently has no effect at all. Fry (1988), in his book concedes, that the magnitude of the effect is small and positive, although the coefficient is statistically insignificant. Thus, only large

changes in real interest rates would be economically important. Raising real interest rates often induces shift in the composition of portfolios, but has ambiguous or minor effects on saving.

Similarly, inflation variable is negative and statistically insignificant in the model. Although, the argument that inflation affect saving independently from its effect through the real interest rate is valid, nevertheless, its effect in this case is not significant. The explanation could be that inflation in Namibia was not that much of a problem to the economy. This explanation could further be justified by stability test that shows that Namibian economy was not subjected to major shocks if any have minimal effect on macroeconomic stability. The dummy of independence from 1990 were included in the model, but proved to be non-significant in the dynamic model but significant in the long-run static model⁹ at the 10 percent level of significance (see, appendix , Table 1).

The proxy for borrowing constraints produces negative and insignificant coefficient. The result is plausible with respect to the direction of impact, although the impact of the variable is statistically not significant. The insignificance of the variable could be that the variable used is a poor proxy for liquidity and borrowing constraints, suggesting that that liquidity and borrowing constraints either are not important, or captured by some of other variables in the model.

⁹ Note that the longrun static results have not been reported(see, appendix,

5.4 TEST OF STABILITY

The Namibian economy has been characterized by various shocks. These shocks include independence in 1990 and many others.

Given all these shocks that confronted the economy at different periods the model have been tested for stability and structural breaks. The Cusum and CusumSQ tests were used to detect systematic and sudden changes in the parameters of the model, respectively. Due to the nature of the test of being recursive the dummies were not included in the model. The econometric software package used (Microfit 3.0) usually displays two graphs for CUSUM and CUSUMSQ with a pair of straight lines drawn at 5 percent level of significance respectively. The decision criteria, is very simple, if either of the line lines are crossed then the null hypotheses that states that the regression model is correctly is rejected. The result shows that these shocks did not have significant impact to the Namibian economy. This is clearly characterized by absence of serious outliers or structural breaks in the plot of the regression model (see, Fig.1 & 2 Appendix).

5.5 Saving and Growth: Granger Causality

The granger test helps to assess the direction of causation between two variables. Strictly speaking, the granger method in this study tested whether saving granger causes growth and vice versa. The test was conducted by running a bivariate vector autoregressions (VAR) on real GDP growth and private domestic saving in Namibia. Growth is said to “Granger cause” saving if the lagged growth coefficients in saving equation are significant, and vice versa. Since growth could

affect changes in saving rather than levels, the test was also run on differences in the saving rate. Table 5.3 on the next page shows the coefficients significance from causality model (see, Chapter 4) on the formulation of the model.

Table 5.3: Causality results between real growth of gross domestic product and private domestic saving

Regressors	Regressands	Coeff.significance (t-ratios)	Lags included
Y_t	X_t	2.3079*	1
ΔY_t	ΔX_t	1.1327	1
X_t	Y_t	1.5272	1
ΔX_t	ΔY_t	0.30517	1

* Denotes significant at 5 % level of significance

The results from the above table show that the direction of causality between private domestic saving denoted by (x) and growth of real GDP denoted by (Y) is rather weak and positive. The only significant causality is observed from the level regression, of growth of real gross domestic product regressed on saving. This can be seen from the coefficient significance given by the t-ratio of 2.3079 lagged by one period. The theoretical interpretation of this result could be that an increase private domestic saving in levels leads to increase in real growth of gross domestic product. But an increase in real growth of gross domestic product seems to have a poor effect on private domestic saving both in levels and changes as seen from their coefficient significance levels. The dependent variables were lagged by three periods, in the four models, but still the significance of the coefficients was deteriorating than the lag by one period

CHAPTER SIX

CONCLUSION, POLICY RECOMMENDATIONS AND LIMITATIONS OF THE STUDY

6.1 CONCLUSION

This study has attempted to assess the determinants of private domestic saving in Namibia by means of a single model multiple regression analysis. The study finds the determinants of private domestic saving in Namibia are real income and taxes. The impact of these variables is quite apparent as seen from the regression results. Moreover, the paper has demonstrated that it is also possible to develop a dynamic specification for the private domestic saving which efficiently track actual deviation from the equilibrium to be make up in the current period. Both the longrun- static and error correction specifications of the private domestic saving in Namibia show the importance of income and taxes in explaining the variations in the dependent variable.

The hypothesis of real interest rate being insignificant in the case of Namibia failed to be rejected. Real interest rate does not encourage saving in Namibia as observed from the results. This may be because the substitution effect and income effects of higher real interest rates offset each other or because intertemporal consumption decisions are limited by liquidity constraints.

Without saying much about inflation and real interest rate, because of their non-significance in the model. It will be fair to suggest that reducing inflation seems to encourage private domestic saving, but raising the deposit rate has no discernible effect on saving. The direction of causality seems to be running from saving in level to growth but very poor from growth to saving both in levels and changes.

This kind of outcome can be attributed to the flaws in data and number of observations used for the study only around 31, which is less than generally advocated in time-series analysis. If this technique is to be useful for economists and policymakers, however, some experience of its practical application for annual data series of lengths typically available is desirable. Also, it should be borne that Granger causality can be influenced by expectations. If, for instance, expectations of future growth raise current savings then this will appear in the data as though savings is "causing" output, whereas in reality it is expectations of output changes that are causing saving to grow.

6.2 POLICY RECOMMENDATIONS

There are number of appropriate fiscal measures that need to be devise to increase saving and investments in less developed countries. For example, the positive relationship between income and private domestic saving found in this study suggests that if saving is to be maintained at existing or raise from that level. The strategy is to preventing the economy from falling below the level of its normal working, so that the output and income of the people, and therefore, saving do not fall. The serious problem of skewed income distribution the country inherited from the colonial regime must be redressed given the importance of the income variable in private domestic saving model. Generally, very poor people save little or nothing and income must rise above the subsistence level before increases in income result in increased savings rates. But the above statement may be ambiguous without having information on the marginal propensities to save (consume) of both the higher income earners and the poor. A study that will look



into the propensities to consume or save between the rich and poor would be appropriate for Namibia.

Another important factor on private domestic saving model in Namibia is taxes. The study seems to suggest that the authority have to be very cautious in designing tax policies. A higher tax imposed on household and businesses appears to reduce disposable income and hence, saving. Generally, tax is a very important instrument that keeps public sector in place and active, hence, its importance need not be overemphasized. The authority should continue with its good policies to encourage the development of capital markets that are widely acknowledged as an important factor affecting the growth of long-term savings and their efficient use in an economy. The Namibia Stock Exchange should play a crucial role in directing private domestic saving to most productive investment in the economy. Inflation in many developing countries were found to be a significant factor in private saving's model. But due to lower inflation, and as a result, no severe macroeconomic instability, the authority is encouraged to continue under the present arrangement of CMA (Common Monetary Area). The arrangement is recognized to benefit Namibia in terms of lower inflation and hence macroeconomic stability (Tjirongo,1995).

6.3 LIMITATION OF THE STUDY

Although the study on one hand yielded some plausible results for private domestic saving, it is on other hand subjected to a number of criticisms. To mention but a few, the study failed to test for validity of traditional theories of saving the

Absolute Income, Permanent income and Life cycle hypotheses and is mainly due to severe limitations and unavailability of data. Moreover, income is not disaggregated, hence, make it difficult for transitory and permanent income estimation. From the theory, we know that households are responsible for substantial part of saving in both developed and developing countries. Accordingly, most economic models treat the motivation for saving from the household perspective. According to Webb et al (1992), the shortage of household data in most developing countries had made most empirical work on saving to used only aggregate saving data, so that the results may not be useful for predicting household behaviour. It is quite apparent that this study is also suffering from the same setback. A lack of long data span, make it extremely difficult for thorough application of time series properties in the study. Another serious problem that needs to be observed from this study is the one of endogeneity; meaning saving may be better estimated through simultaneous equation models. Hence, there is need to undertake studies in saving with different specification.

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APPENDICES

TABLE:1 THE LONGRUN STATIC MODEL OF PRIVATE DOMESTIC SAVING

Ordinary Least Squares Estimation

Dependent variable is LRSP

31 observations used for estimation from 1967 to 1997

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LRGDP	.60908	.43346	3.4051[.004]
LINF	-.096311	.098163	-.98113[.337]
LRT	-.10096	.039333	- 2.5669[.017]
RIR	.0046842	.0060208	.77799[.445]
LRDCP	-.0051977	.096065	-.054107[.957]
DUM	.10401	.060343	1.7237[.098]
CONS	- 2.6021	1.3546	-1.9209[.067]

R-Squared .66113
F-statistic F(6, 24) 5.4230[.010]
R-Bar-Squared .59336
S.E. of Regression .075530
Residual Sum of Squares .13691
Mean of Dependent Variable 2.3353
S.D of Dependent Variable .092028
Maximum of Log-likelihood 40.0600
DW-statistic 1.4476

Diagnostic Tests

Test Statistics	* LM Version	F Version	*
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A:Serial Correlation *CHI-SQ(1)= 2.086828[.126]*F(1,23)= 2.064439[.237]*

B:Functional Form *CHI-SQ(1)=.45783[.532]*F(1,23)=.39854[.558]*

C:Normality *CHI-SQ(2)= .94810[.678]* Not applicable

D:Heteroscedasticity *CHI-SQ(1)=.78871[.681]*F(1,29)=.7751[.693]*

A:Lagrange multiplier test of residual serial correlation

B:Ramsey's RESET test using the square of the fitted values

C:Based on a test of skewness and kurtosis of residuals

D:Based on the regression of squared residuals on squared fitted values

TABLE:2 THE ERROR COORECTION MODEL OF PRIVATE DOMESTIC SAVING

Ordinary Least Squares Estimation			
Dependent variable is DLRSP			
30 observations used for estimation from 1968 to 1997			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLRGDP	.53168	.16356	3.2508[.003]
DLINF	-.0013779	.010067	-.136860[.892]
DLRT	-.29262	.13500	-2.1676[.041]
DRIR	.11229	.097022	1.15737[.576]
DLRDCP	-.32717	.39911	.81973[.421]
ERROR(-1)	-.77599	.35125	-2.2092[.038]
DUM	.039450	.054952	.71791[.480]
CONS	-2.8390	1.5212	-1.8663[.075]

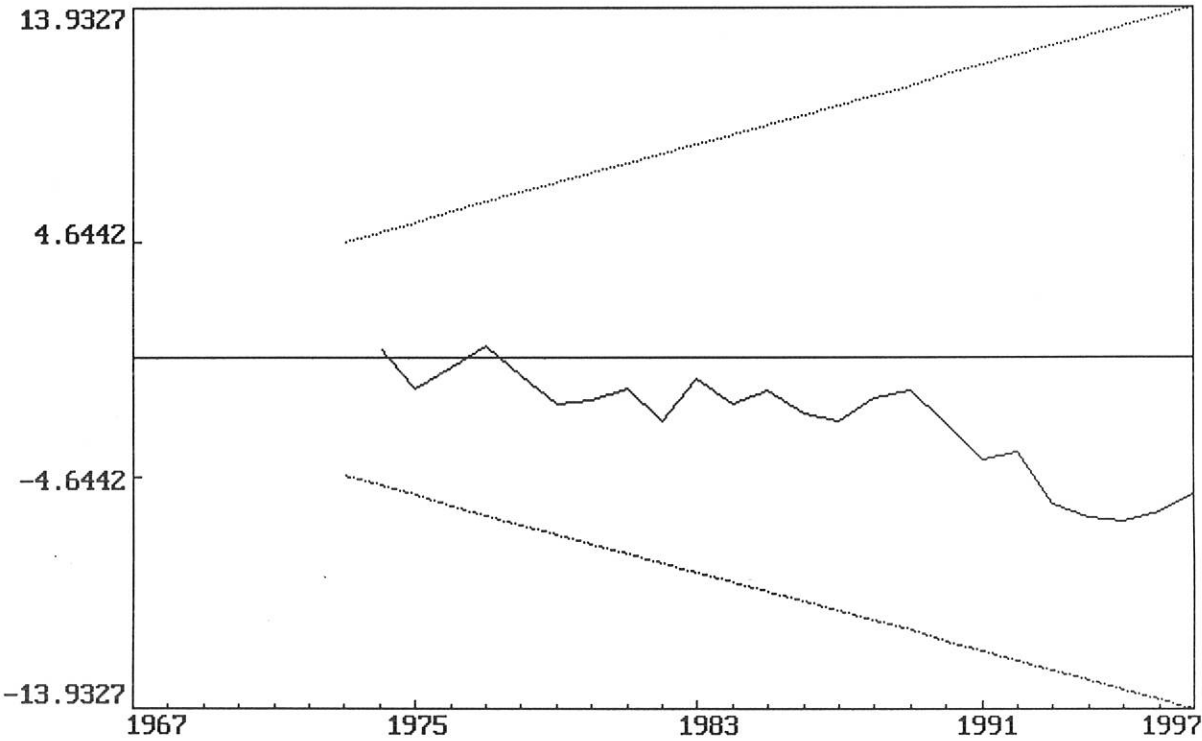
R-Squared	.70814		
F-statistic F(7, 22)	6.2721[.009]		
R-Bar-Squared	.635175		
S.E. of Regression	.11290		
Residual Sum of Squares	.28042		
Mean of Dependent Variable	.0021286		
S.D. of Dependent Variable	.11655		
Maximum of Log-likelihood	27.5218		
DW-statistic	2.0581		

Diagnostic Tests			
Test Statistics	LM Version	F Version	*

A:Serial Correlation	*CHI-SQ(1)=.001612[.968]*	F(1,21)=.00113	[.974]*
B:Functional Form	*CHI-SQ(1)=.53587[.511]*	F(1,21)=1.9390	[.178]*
C:Normality	*CHI-SQ(2)= .71927[.657]*	Not applicable	
D:Heteroscedasticity	*CHI-SQ(1)=.082400[.774]*	F(1,28)=.077119	[.783]*

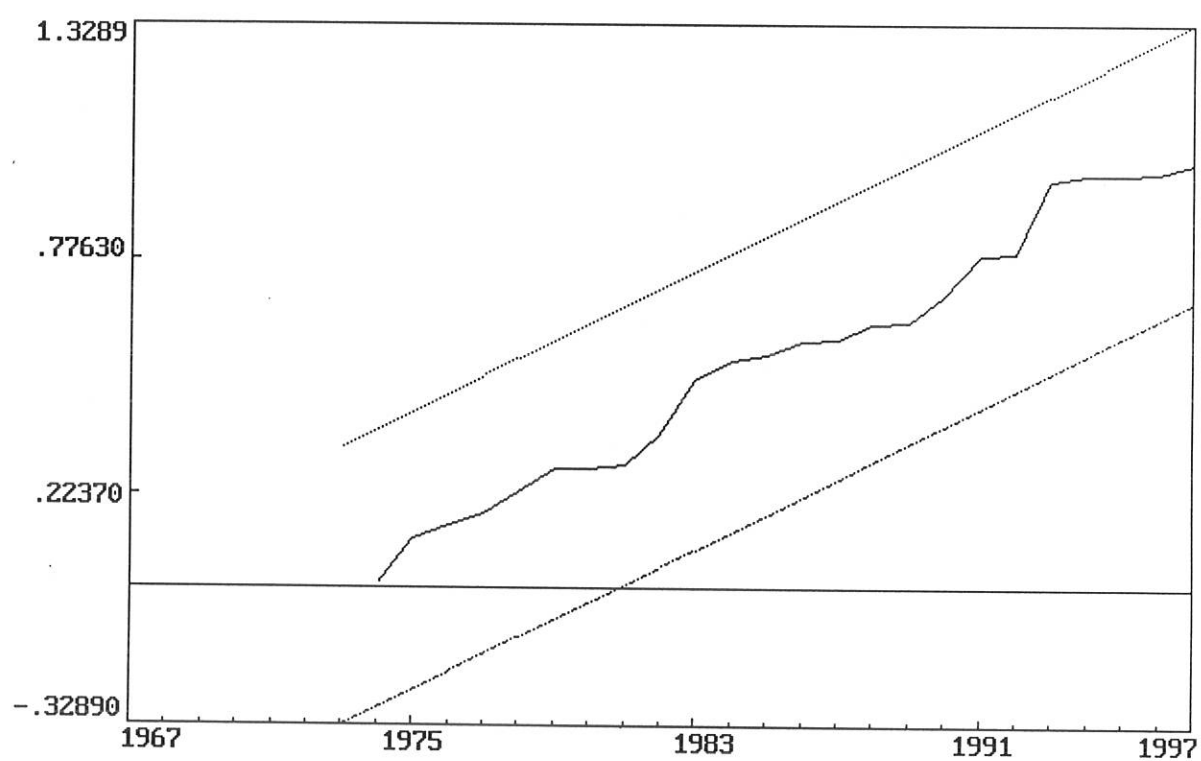
A:Lagrange multiplier test of residual serial correlation			
B:Ramsey's RESET test using the square of the fitted values			
C:Based on a test of skewness and kurtosis of residuals			
D:Based on the regression of squared residuals on squared fitted values			

Figure1: Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

FIGURE2: Plot of Cumulative Sum of Squares of Recursive Residuals



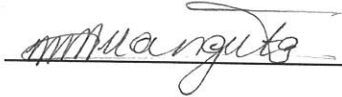
The straight lines represent critical bounds at 5% significance level

Declaration

I, the undersigned, declare that this thesis is my original work, and that all sources of material used for the thesis have been duly acknowledged.

Declared by:

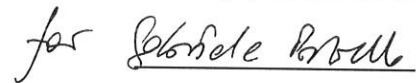
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