AN ANALYSIS OF THE DETERMINANTS AND RECENT DECLINE OF PRIVATE SAVINGS IN SOUTH AFRICA

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ABSTRACT

Low domestic saving rates make South Africa highly dependent on foreign capital inflows to fund higher investment levels. These inflows are highly volatile and may prove to be unsustainable in the long-run. This study analyses the determinants of private saving in South Africa, with specific reference to the decline in private saving rates that occurred at a time of higher economic growth prior to the 2008 global financial crisis. The Johansen cointegration method is used to estimate separate vector error correction models (VECM) in order to assess the effect of specific variables on both corporate and household saving.

The results obtained that are common to both corporate and household saving show that the government budget balance negatively impacts private saving rates though the offset is less than one. The real prime overdraft rate positively impacts private saving, although the result is small. The impact of real Gross Domestic Product (GDP) is positive. In recent years, however, private saving rates fell alongside higher economic growth, which may reflect a structural change in corporate saving behaviour.

The results distinct to the corporate saving model show that commodity prices have a negative impact on corporate saving. This does not conform to *a priori* expectations, but is supported by the behaviour of these two variables in recent years. Foreign savings were found to impact negatively on corporate saving. This result is important, since the dependence of the South African economy on foreign capital inflows to fund higher investment levels is reflected by high current account deficits during recent periods of economic growth. Evidence of financial liberalization negatively impacting on private saving in South Africa due to the removal of borrowing constraints was found. A negative relationship was found between corporate saving and investment demonstrating that corporations have reduced levels of retained earnings for funding investment expenditures.

The results distinct to the household saving model provide evidence of a negative wealth effect in South Africa, with rising housing wealth found to increase consumption. Evidence of households "piercing the corporate veil" in South Africa was found. Therefore, households view corporate saving behaviour as essentially being conducted on their behalf. This finding and the finding that the offset between the budget deficit and private saving is less than one suggest that counter-cyclical fiscal policy will be an important policy response for achieving higher domestic saving rates in South Africa.

DECLARATION

Except for references specifically indicated in the text, and such help as has been acknowledged, this thesis is wholly my own work and has not been submitted to any other University, Technikon or College for degree purpose.

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TABLE OF CONTENTS

CHAPTER ONE:

INTRODUCTION

CHAPTER TWO:

MACROECONOMIC THEORY AND LITERATURE REVIEW

CHAPTER THREE:

LITERATURE REVIEW ON THE DETERMINANTS OF PRIVATE SAVING

CHAPTER FOUR:

ECONOMETRIC METHODOLOGY AND ANALYTICAL FRAMEWORK

CHAPTER FIVE:

EMPIRICAL RESULTS

CHAPTER SIX:

FINDINGS, CONCLUSIONS AND POLICY RECOMMENDATIONS

LIST OF TABLES

TEXT TABLES

APPENDICES TABLES

LIST OF FIGURES

TEXT FIGURES

APPENDICES FIGURES

CHAPTER ONE:

INTRODUCTION

1.1. CONTEXT OF THE RESEARCH

According to the Commission for Growth and Development (2008: 1), only thirteen economies since 1950 have grown at an average rate of 7 percent per annum or more for twenty-five years or longer[1]. At this rate of growth an economy doubles in size every ten years, making significant progress in poverty reduction and development possible, though not inevitable. International evidence has shown that those economies that achieved such high levels of sustained economic growth all had overall investment levels (including both public and private expenditures) of 25 percent of Gross Domestic Product (GDP) per annum or more (Commission for Growth and Development, 2008: 34). High levels of investment are needed to replace the depreciating capital stock as well as to grow the capital stock to such an extent that 7 percent per annum growth is sustainable. Investment levels are affected by the availability of domestic savings. The Commission for Growth and Development (2008: 3) states that a domestic savings rate of between 20 and 25 percent per annum or greater is evident in such high-growth economies. While in principle fast growing countries could fund their investment through capital inflows from abroad, the Commission for Growth and Development (2008: 54) notes that "there is no case of a sustained high investment path not backed up by high domestic savings".

A country's current account of the balance of payments records the value of merchandise trade (exports plus net gold exports less imports), trade in services, as well as foreign transfer payments and receipts (South African Reserve Bank, 2010: 26). In an open economy, the current account can be shown to equal the difference between domestic savings and investment, where savings includes government and private (corporate and household) savings, and investment includes investment by both public and private sectors. Countries with large deviations of savings from investment will thus record large current account deficits or surpluses. Corporate savings represents the dominant component of domestic savings in South Africa.

In 2009, the annual savings and dis-savings levels recorded by the corporate and household sectors in South Africa amounted to R110 380 million and R4 374 million (in current prices) respectively

[1] These economies include Botswana, Brazil, China, Hong Kong, Indonesia, Japan, the Republic of Korea, Malaysia, Malta, Oman, Singapore, Taiwan and Thailand.

(South African Reserve Bank, 2010: 124). Government dis-saving amounted to R66 557 million, yielding an aggregate domestic savings level of R372 826 million after accounting for consumption of fixed capital. Thus, for the year 2009, the ratio of gross savings to GDP was 15.6 percent. This is far short of the required ratio emphasized in the Report of the Commission for Growth and Development (2008). On the other side of the equation, gross fixed capital formation (investment) for 2009 amounted to R469 888 million (at current prices). This represents 22.2 percent of GDP, which is close to the recommended level for sustained economic growth purposes. Over the period from 2004 to 2007, corporate savings decreased significantly from R63 685 million to R7 908 million (in current prices). This occurred at a time of rising commodity prices. Over the same period, household savings also decreased from R3 351 million to minus R12 850 million (in current prices). The data clearly shows the lack of domestic savings which is needed to fund higher growth levels on a sustainable basis in South Africa.

South Africa therefore has a very large current account deficit. In order to finance this current account deficit, South Africa relies heavily on foreign capital inflows. Much of the foreign capital inflows into South Africa are portfolio capital (portfolio investment) rather than direct and other foreign capital inflows (Strydom, 2007: 6). These portfolio capital inflows are unsustainable and highly volatile, as was evident in the Rand exchange "crises" of 1996, 1998, 2001 and 2008.

1.1.1. HOUSEHOLD SAVINGS

In economic terms, savings are income that is not consumed in the current time period. Strydom (2007: 1) analyses household savings behaviour in South Africa and states two theories of the consumption function which explain motives for saving. These include Modigliani's (1954) life cycle theory and Friedman's (1957) permanent income hypothesis. Both of these theories emphasize the importance of income in the long-run as the main determinant of household consumption, and thus savings (Strydom, 2007: 2). Masson, Bayoumi and Samiei (1998: 487) use the life cycle theory to explain the significance of the age structure of a country's population and find that an economy is expected to have a high level of private savings if a large percentage of the population is of working age. This is because working individuals are saving for retirement. On the other hand, an economy is expected to have a lower level of private savings when a larger percentage of the population is in retirement as a greater proportion of those households' income is now being consumed (Masson *et al.*, 1998: 487).

Aron and Muellbauer (2000b: 513) examine a consumption function to analyse household savings ratios of South Africa from the late 1960's to 1997. Several conclusions are reached, among which is that financial liberalization has caused savings to decrease as it has allowed households to increase consumption by substantially increasing their ratios of debt to income - a conclusion consistent with Masson *et al.* (1998: 486). Harjes and Ricci (2005: 60) find that financial liberalization has had a significant negative impact on private savings; specifically since households have acquired greater access to bank credit. Given real interest rates and asset-to-income ratios in South Africa, Aron and Muellbauer (2000b: 538) find that the effect of a permanently higher economic growth rate on household saving in South Africa is likely to be small. Furthermore, Aron and Muellbauer (2000b: 541) conclude that apart from encouraging strict lending by the financial sector, there may be a role for tax incentives to encourage higher household saving rates.

High marginal tax rates on households in South Africa are found to inflict tax payments out of saving (Strydom, 2007: 5). Strydom (2007: 9) concludes that households have reacted to the South African tax system by substituting savings in favour of asset categories thereby increasing their asset market wealth. This has resulted in the net worth of households increasing substantially, thereby affecting the level of credit extension, as households appear to have lower gearing ratios (Strydom, 2007: 9).

1.1.2. CORPORATE SAVINGS

The tax system may also encourage households to perform tax arbitrage, thereby accruing savings in the corporate sector, and hence increasing corporate savings. The literature on corporate savings generally lacks an agreed-upon theoretical model. A great deal of empirical work has been conducted on household savings behaviour as it is generally concluded that corporate savings behaviour follows similar reasoning to that of household savings behaviour (Smith, 1963).

For corporations, a decision must be made as to whether income accruing to shareholders will be distributed in the form of dividends or retained in the corporation. Smith (1963: 299) argues that "the decision to retain a certain proportion of income is governed by motives that cannot be viewed as the same as those governing the individual in (his) saving decision". There is only an indirect link to the consumption decisions of households. The motives for corporate savings are thus related to the maximization of returns to shareholders (Smith, 1963: 299). Furthermore, Smith (1963: 299) states that corporate savings cannot be viewed as a "means of reorganizing the expected stream of income over a finite expected life", as would be concluded by Modigliani's (1954) life cycle theory.

Smith (1963: 309) conducts a case study on corporate saving behaviour for Canada. The main findings are that the level of corporate saving is influenced by the demand for investment funds as well as by current and expected corporate income. The proportion saved out of corporate earnings is found to depend on both the previous level of dividends and on the demand and supply conditions for corporate funds (Smith, 1963: 309). Thus, the level of dividends to be paid out to shareholders is partly affected by investment opportunities.

Aron and Muellbauer (2000b) examine the determinants of corporate saving relative to national income in South Africa. Key determinants analysed include the inflation rate, real interest rates and financial liberalization. Changes in personal tax rates on dividends are also analysed. They state that one would expect the level of corporate savings to increase when funds are difficult to acquire as a consequence of higher real interest rates and access to foreign finance being denied (Aron and Muellbauer, 2000b: 529). In accordance with Smith (1963), Aron and Muellbauer (2000b) state that this is because corporate saving is mainly conducted to finance investment opportunities. Aron and Muellbauer (2000b: 529) also state that a higher level of corporate saving is expected when income growth rates have increased because investment opportunities have consequently become more profitable.

Prinsloo (2000: 9) shows how domestic savings in South Africa vary with successive upswings and downswings in the business cycle. In general, the trend is that savings rates strengthen relative to GDP when the economy is in a downswing and, conversely, weaken relative to GDP when the economy is in an upswing. This can be attributed to optimism and a feeling of security experienced in an upswing, whereas caution and lower income growth are evident in a downswing (Prinsloo, 2000: 9). However, Aron and Muellbauer (2000b) contradict Prinsloo (2000); specifically, they conclude that an economic upswing is associated with greater export earnings and thus increased savings levels. Smith (1963: 309), in agreement with Aron and Muellbauer (2000b), finds that the ratio of corporate saving to corporate income is expected to increase during booms and decrease during recessionary periods. However, in recent years, greater export earnings were recorded in South Africa, yet corporate savings failed to increase.

Harjes and Ricci (2005) investigate private savings in South Africa. They find the main determinants of private savings include "measures for fiscal policy, commodity prices, inflation, interest rates, and income-related measures" (Harjes and Ricci, 2005: 48). Most interesting is the analysis of South Africa's production and export of commodities such as gold and platinum. Price movements in these

commodities should affect domestic savings via profits generated from the mining and minerals sectors; specifically, when commodity prices rise, greater export earnings are expected thereby resulting in greater domestic savings rates. This occurs via increased corporate saving.

1.1.3. PIERCING THE CORPORATE VEIL

Sachs and Larrain (1993), Prinsloo (2000), Aron and Muellbauer (2000b), Harjes and Ricci (2005), amongst others, suggest there may exist a partial offsetting relationship between the two components of private saving. The relationship referred to is households "piercing the corporate veil". Through this, corporations are believed to make savings decisions on behalf of households. It is suggested that household savings decrease when corporate savings increase as a result of changes in inflation and tax rates (Aron and Muellbauer, 2000b: 512). Consequently, dividend payouts to shareholders decrease, thereby raising the value of equities, from which households stand to gain. Sachs and Larrain (1993: 110) state that a number of studies have found evidence in favour of households "piercing the corporate veil". It is due to this concept that Prinsloo (2000: 25) argues that the composition of private savings in South Africa is not as important as the actual absolute level of private savings. This study aims to analyse the nature of this relationship for South Africa.

The research is important for policies to increase future economic growth of South Africa. A higher level of domestic savings is vital for developing economies, such as South Africa, since reliance on foreign capital inflows may prove to be extremely volatile and risky. Foreign investors may decide to remove their funds from the local markets at any time. Should South Africa become a better saver, it would not be as reliant on these foreign capital inflows. Corporations should be increasing their savings levels especially, due to current greater export earnings arising from high commodity prices. Such increases in savings would prove highly beneficial to achieving sustainable economic growth for South Africa.

1.2. GOALS OF THE RESEARCH

The goals of the research are to analyse why both corporate and household savings rates in South Africa have fallen in recent years and to consider the implications of this fall for the sustainability of higher investment and growth levels.

The research will:

- Analyse the determinants of corporate and household savings in South Africa in terms of variables identified in the literature.
- Assess the significance of such findings for policies designed to achieve sustainably more rapid growth in South Africa.

1.3. METHODS, PROCEDURES AND TECHNIQUES[2]

The Johansen (1988) and the Johansen and Juselius (1990) test for cointegration and Vector Error Correction Model (VECM) will be used to establish the impact of key macroeconomic variables on separate models of corporate saving and household saving. Such variables include a commodity price index, the prime overdraft rate, the inflation rate, the real growth rate, an indicator of household wealth, a proxy for financial liberalization, the government budget balance, and gross fixed capital formation of private business enterprises in South Africa. According to Gujarati (2003: 822), two variables are said to be cointegrated if they have a long-run or equilibrium relationship between them. The Johansen test for cointegration examines cointegration in general multivariate systems where there exist at least two integrated variables (Alexander, 2008: 235).

Data will be obtained from the South African Reserve Bank's online download facility, Thomson Datastream, the World Bank, and ABSA Home Loans. Most of the data is available quarterly and where it is available only annually it will be converted into a quarterly frequency in order to ensure the robustness of results. The period under study will range from 1981Q1 to 2010Q4.

1.4. ORGANISATION OF THE STUDY

This study is organised as follows: The next chapter presents the macroeconomic theory surrounding private saving. The theoretical literature on both corporate and household saving as well as the hypothesis of households "piercing the corporate veil" are also discussed in the next chapter. An important aspect of time series analysis is graphical analysis. As such, the historical trends in the three components of domestic saving are covered in Chapter Two. Chapter Three discusses the empirical literature on the determinants of private saving. The determinants discussed in Chapter Three are those that will be used in the empirical analysis of this study. Chapter Four outlines the

[2] A detailed discussion of the empirical methodology is presented in Chapter Four

econometric methodology and analytical framework used in this study. Specifically, the Johansen cointegration framework is presented. Also included in Chapter Four is a graphical analysis of the relationships between both corporate and household saving, and each of the variables included in each of the corporate and household saving models. The empirical results are presented and discussed in Chapter Five. The results obtained from each of the corporate and household saving models are presented separately. Finally, Chapter Six discusses the findings and conclusions, as well as presents policy recommendations aimed at achieving sustainably higher private saving rates in South Africa.

CHAPTER TWO:

MACROECONOMIC THEORY AND LITERATURE REVIEW

2.1. INTRODUCTION

As discussed in Chapter One, low domestic saving rates in South Africa make the local economy reliant on foreign capital inflows to fund higher investment levels required for sustainable economic growth. From 2000 to 2010, South Africa's gross saving ratio as a percentage of GDP, averaged 15.4 percent (South African Reserve Bank, 2011a). Of this, 14.41 percent represented gross private saving in South Africa. Since corporate saving is the dominant component of private saving in South Africa, 12.71 percent represented gross corporate saving. Private saving in South Africa is still very low and as such, ways of stimulating saving in the private sector is of critical importance.

Similarly, total investment expressed as a ratio of GDP in South Africa, averaged 17.82 percent over the same period (South African Reserve Bank, 2011a). It is clear that foreign capital inflows are relied upon in order to finance this gap between aggregate saving and investment. Foreign capital inflows into South Africa are mainly in the form of portfolio capital inflows into the local bond and equity markets, which have proven to be extremely volatile and subject to investor sentiment in the past. Thus, it is important that South Africa seeks ways to stimulate the domestic saving rate to fund higher investment levels. In comparison to other emerging market economies, South Africa's saving rate falls far behind (Eyraud, 2009).

According to the World Bank (2011b), South Africa faces a longer term challenge of increasing the GDP growth rate to between 6 and 7 percent. The Commission for Growth and Development (2008) has shown that those countries that achieved fast, sustained growth, have recorded domestic saving rates of between 20 and 25 percent of GDP per annum, while simultaneously achieving investment levels of 25 percent or more of GDP per annum. The Commission for Growth and Development (2008: 54) states that "just as growth depends on investment, investment depends on a country's ability to finance it – out of its own savings or from foreign sources". The amount of foreign borrowing is limited due to its inherent riskiness.

It is clear then that South Africa is lacking in terms of achieving desirable saving and investment rates required to achieve growth rates of 7 percent or more per annum. A necessary precondition to achieving high growth rates is achieving high saving rates.

The following sections form part of this chapter: Section 2.2 provides the definitions and context of the different components of private saving in South Africa. Economic theory applicable to savings, investment, the current account balance as well as the relationship between these variables is discussed in section 2.3. Section 2.4 presents household intertemporal theories of consumption focusing specifically on Modigliani and Brumberg's (1954) life cycle hypothesis and Friedman's (1957) permanent income hypothesis. While there is little information on the saving behaviour of corporations, section 2.5 discusses theoretical concepts of corporate saving. Section 2.6 covers a common hypothesis in the literature of households "piercing the corporate veil" (Carroll and Summers, 1987; Gersovitz, 1988; Barr and Kantor, 1994; Prinsloo, 2000; Aron and Muellbauer, 2000b). This is important in understanding private saving in South Africa. An analysis of the trends in private saving in recent years in South Africa is discussed in section 2.7 while a graphical analysis is presented in section 2.8. Finally, section 2.9 concludes this chapter and introduces the next.

2.2. DEFINITIONS AND CONTEXT OF PRIVATE SAVING IN SOUTH AFRICA

Discretionary gross domestic saving in an economy consists of three components, namely government saving, corporate saving and household saving. Included in gross domestic saving is consumption of fixed capital, which is commonly referred to as the provision for depreciation (South African Reserve Bank, 2011c). In order to arrive at the figure for net saving, consumption of fixed capital is subtracted from gross domestic saving.

Saving is that part of income which is not consumed, and is therefore defined as future consumption (Romer, 2006: 348). This applies to all three components of domestic saving. Prinsloo (2000: 1) defines saving in a country as the amount of income or resources produced in an economy in a given year, that is not consumed immediately, but which is rather put to use in a way that will provide returns to the economy in the future. After replacing depreciated capital, a country's net saving is all that is available to fund investment in new capacity, unless foreign capital inflows are available. A relatively moderate level of domestic saving could limit a country's rate of investment, impede a country's rate of economic growth, and make a country vulnerable to international capital adjustments (Prinsloo, 2000: 1). According to the Commission on Growth and Development (2008:

3), countries could rely quite heavily on foreign capital inflows to finance investment needs, yet capital inflows have shown to be volatile. Thus, foreign saving represents an imperfect substitute for domestic saving to finance higher investment levels.

Household saving is defined as that part of current income, after the payment of direct tax, that is not consumed or "transferred as part of household current consumption" (Prinsloo, 2000: 3). Household saving includes current expenditures made to decrease liabilities such as the repayment of capital on loans for both housing and consumer durables. Any proportion of current expenditure, which is not financed by current income and which is instead financed by the use of credit, increases household liabilities and is therefore seen as negative saving (Prinsloo, 2000: 4). Romer (2006: 349) states that the decision made between saving and consumption is driven by preferences between current and future consumption and information regarding future consumption prospects.

Prinsloo (2000: 4) defines corporate saving as the balancing item in the income and expenditure accounts after full consideration of the current receipts and payments of corporations have been taken into account. Corporate saving is thus the retained income of both private and public incorporated financial and non-financial enterprises (Prinsloo, 2000: 4). More specifically, Prinsloo (2000: 4) defines corporate saving as the "sum of gross operating surpluses of companies, less the net dividend, interest, rent and royalties payable by them to the other sectors of the economy and to the rest of the world, less direct taxes on income and wealth and other net transfer payments made to the general government, the household sector and the rest of the world". This represents gross corporate saving. Net corporate saving is gross corporate saving less the consumption of fixed capital (depreciation) and the change in inventories after valuation adjustment (Prinsloo, 2000: 4).

Saving by households can be decomposed into two components, namely contractual saving and discretionary saving. According to the South African Reserve Bank (2011c), contractual saving represents the act of saving against agreed contracts such as life assurance premiums, contributions to pension funds or contributions to retirement annuities. Discretionary saving represents all after-tax income of households that is not spent (or consumed) or saved under contractual saving. Examples of discretionary saving include deposits in saving accounts as well as fixed deposits. In South Africa, contractual saving represents the largest proportion of saving, while discretionary saving has tended to be very low and even negative at times (South African Reserve Bank, 2011c). According to the South African Reserve Bank (2011c), this is due to the fact that consumption expenditure by households, which is partly financed by credit (borrowing), plus contractual saving periodically

exceeds the after-tax income of households. Prinsloo (2000: 4) states that although the difference between contractual and discretionary saving is unimportant from a macroeconomic point of view, increases in contractual saving schemes that are simultaneously accompanied by increases in the financial liabilities of households will leave the level of household saving unchanged and will only cause a rearrangement in households' saving portfolios.

From 2006 to 2010 corporate saving in each year represented approximately 59%, 13%, 50%, 61%, and 64% of total gross saving (South African Reserve Bank, 2011a). With the exception of 2007, corporate saving represents the largest component of aggregate domestic saving in South Africa each year and is therefore very important in terms of policies aimed at increasing the level of total domestic saving. As mentioned above, domestic saving includes provision for depreciation, which in absolute terms is the largest contributor to domestic saving. Since corporate saving represents the dominant component of domestic saving in South Africa, consumption of fixed capital by private business enterprises also represents a significant part of the gross domestic saving rate, i.e. corporations make most of the provision for depreciation (South African Reserve Bank, 2011b: 124).

Empirically, much work has been conducted on household saving, while much less has been conducted on corporate saving. According to Aron and Muellbauer (2000b: 513) there is no generally agreed upon theory of corporate saving or corporate finance which parallels the intertemporal models of households. Poterba (1991: 455) states that although corporations are responsible for approximately half of private saving in the United States (US), most empirical studies on saving focus wholly on household saving behaviour. According to Smith (1963: 297) this has in part reflected the relatively uncertain status of the corporation as a separate behavioural entity in much of economic analysis. Keynes (1936: 108) emphasized household saving behaviour and stated that the motives for saving for corporate, government and other institutions were "largely analogous to, but not identical with, those actuating individuals". Due to the inherent difference in nature of the corporate versus the household entity, and with each facing different incentives and motives, it is necessary to analyse each of these components of private saving in turn and to draw relevant policy conclusions thereon. According to Smith (1963: 297), in economic theory the study and analysis of saving behaviour has historically been of private saving and the division of private saving between corporate and household saving has been left indeterminate, even though empirical tests on saving have generally been on data of household saving rather than on data of private saving. Smith (1963)

thus highlights the lack of a distinction between corporate and household saving in terms of empirical analysis.

2.3. ECONOMIC THEORY: SAVINGS, INVESTMENT AND THE CURRENT ACCOUNT

Keynes (1936: 61) defines saving as the "excess of income over expenditure on consumption". Accordingly, if income represents the value of output, which in turn equals the amount of consumption plus investment, and saving is income less consumption, then it follows that saving equals investment.

In order for a developing economy to increase its annual GDP, investment in new capital needs to exceed depreciation so that the capital stock increases. Investment for a particular period represents the addition to capital equipment as a result of the productive activities occurring in that period (Keynes, 1936: 63). Such investment can be financed by either one of three sources: private saving, government saving (government budget surplus), or borrowing from the rest of the world (financing the current account). As mentioned above, total domestic saving in an economy consists of government, corporate and household saving, where the summation of corporate and household saving make up private saving.

Household income, which also represents national income, is consumed, saved or paid out in the form of taxes (Froyen, 2009: 72, 73). This can be shown as:

$$Y = C + S + T \quad \ldots (2.1)$$

where Y is household income, C is household consumption, S is household saving and T is taxes paid by households.

In an open economy, national income (Y) is equal to the sum of the components of aggregate expenditure (aggregate demand), which is the Keynesian equation:

$$Y = C + I + G + X - M \quad \ldots (2.2)$$

where Y and C are as above, I is investment by both the public and private sectors, G is government expenditure/purchases, X is exports and M is imports (Dornbusch, Fischer and Startz, 1999: 189).

Rearranging equations (2.1) and (2.2) yields the following:

$$I + G + X - M = S + T \quad \ldots (2.3)$$

and

$$I = S + (T - G) + (M - X) \quad \ldots (2.4)$$

where $(T - G)$ is the government budget balance and $(M - X)$ is borrowing/lending from/to the rest of the world (Froyen, 2009: 74, 75).

Since investment includes government investment, the difference between $(T - G)$ is government saving or dis-saving and thus may be included in S. It should be evident that should taxes exceed government expenditure a fiscal surplus will be recorded. Conversely, should government expenditures exceed taxes a fiscal deficit will be recorded. Similarly, if exports exceed imports, a surplus trade balance will be recorded and the economy will be lending an amount of $(X - M)$ to the rest of the world via a deficit on the capital account of the balance of payments. Conversely, if imports exceed exports, a deficit trade balance will be recorded and the economy will be borrowing an amount of $(M - X)$ from the rest of the world (a capital account surplus). Thus, part of the saving accumulated in the rest of the world will be used to finance investment in the domestic economy (Edwards, 1996; Agosin, 2001). This results in foreign capital inflows into the domestic economy.

The above analysis leads to the determination of total domestic saving in an economy. This consists of private saving (S above), and government saving ($T - G$ above). Investment is financed by total domestic saving as well as foreign borrowing, i.e. saving from the rest of the world.

Following on from this analysis, the current account balance can be shown to equal the following:

$$Current\ Account = S - I \quad \ldots (2.5)$$

since

$$S - I = X - M \quad \ldots (2.6)$$

and since total domestic saving plus the trade account balance must equal domestic investment:

$$S + (M - X) = I \quad \ldots (2.7)$$

Consequently, countries with large deviations of savings from investment will record large current account deficits or surpluses (equation 2.6). When domestic saving is greater than domestic investment, a current account surplus is recorded; conversely, when domestic saving is less than domestic investment, a current account deficit is recorded. When domestic investment exceeds domestic saving, the shortfall must be financed either by foreign capital inflows (borrowing from the rest of the world) or by depleting a country's stock of international reserves (Prinsloo, 2000: 2). The result of these may be a change in the country's exchange rate. Due to very low savings rates (see figure 2.2 below), since 1994 South Africa has relied heavily on foreign savings to fund higher investment levels. As a result, current account deficits were recorded. When investment increased to 23.1 percent of GDP in 2008, savings were 16 percent of GDP and so the current account deficit rose to 7.1 percent of GDP (South African Reserve Bank, 2011a).

Equation (2.7) above shows that the level of domestic investment is limited to the level of domestic saving plus the current account balance (deficit). Consequently, the level of domestic saving as well as the current account deficit limits sustainable economic growth. It is essential to increase and improve these two components in order to allow for sustainable economic growth in the long-run.

As discussed above, a rise in investment above the level of domestic savings will result in a current account deficit. However, if increased investment is associated with an increase in economic growth, corporations could be expected to increase the amount of retained earnings (savings) in order to help pay for said investment expenditure. This rise in corporate saving should have dampened some of the deterioration in the current account balance caused by rising investment. This was not the case in recent years in South Africa where rising private sector fixed investment was accompanied by falling corporate savings.

The result is that South Africa recorded increases in the level of investment as well as decreases in the level of aggregate savings, especially through a decrease in corporate saving and thus private saving. This in turn caused the current account deficit to worsen at a time of record commodity prices.

2.4. HOUSEHOLD INTERTEMPORAL THEORIES OF CONSUMPTION

There exist many motives for saving by households. Intertemporal consumption models have been developed to determine and explain household saving behaviour. The life cycle hypothesis and

permanent income hypothesis suggest that households maximise the benefits of consumption over their lifetime (Prinsloo, 2000: 16). This is subject to the constraints of the expected income over the life of the household as well as the initial wealth of the household. Romer (2006: 348) states that individuals divide lifetime resources equally over each period of life and that individuals' consumption behaviour is thus determined by income accrued over the individuals' entire lifetime. This represents the individuals' total lifetime resources and is referred to as permanent income (Romer, 2006: 348).

The standard Keynesian model of saving behaviour shows that saving depends wholly on current income and that the saving-to-income ratio is expected to be an increasing function of income (Modigliani and Cao, 2004: 148). Consequently the national saving ratio would increase as per-capita income increases within a country or between countries. The saving function is linear in form. According to Keynes (1936: 96), on average, individuals will "increase their consumption as their income increases, but not by as much as the increase in their income". This is especially the case when analyzing shorter periods as a "man's habitual standard of life usually has the first claim on his income, and he is apt to save the difference which discovers itself between his actual income and the expense of his habitual standard" (Keynes, 1936: 97). Accordingly, an increase in income will often be associated with an increase in saving, while a decrease in income will often be associated with a decrease in saving, "on a greater scale at first than subsequently" (Keynes, 1936: 97). The increment in saving per unit increase in disposable income represents the marginal propensity to save (MPS), which is the slope of the Keynesian saving function (Froyen, 2009: 78).

The consumption function depicts the relationship between consumption and income (Dornbusch *et al.*, 1999: 190). The demand for consumption goods is said to increase with increases in income; households with higher incomes consume a greater amount than households with lower incomes, while higher income countries generally have higher levels of aggregate consumption and lower income countries generally have lower levels of aggregate consumption (Dornbusch *et al.*, 1999: 190). The marginal propensity to consume (MPC) represents the increase in consumption per unit increase in income (Dornbusch *et al.*, 1999: 190). What is not consumed is saved. From the above, the consumption function, together with the individuals' budget constraints, will determine the overall level of saving. The Keynesian consumption function assumes that individuals' consumption behaviour in a specific period relates to their income in that same period (Dornbusch *et al.*, 1999: 302).

Empirically, the Keynesian model of saving behaviour is generally employed to explain the saving behaviour of poorer countries as individuals with low incomes "may not be able to afford the sufficient level of saving when they are young and productive to support their consumption in old age", or at least this may not be as much as individuals with higher incomes (Modigliani and Cao, 2004: 148).

The ability to make intertemporal transfers of resources represents the foundation of the life cycle hypothesis developed by Modigliani and Brumberg (1954). The life cycle hypothesis originally emphasized the choices about how to maintain a stable standard of living given changes in income over an individual's lifetime (Dornbusch *et al.*, 1999: 302). The life cycle hypothesis views individuals as planning their consumption and saving decisions over long periods with the intention of allocating their consumption in the best possible way over their lifetimes (Dornbusch *et al.*, 1999: 302). Specifically, Modigliani and Brumberg (1954: 390) derive the foundation of the life cycle hypothesis from utility analysis; assuming that individuals receive utility only from present and prospective consumption and from assets to be inherited. An individual's utility is assumed to be a function of his or her own aggregate consumption in current and future periods (Ando and Modigliani, 1963: 56). Thus, the individual is said to maximize utility subject to the resources available to him or her. These resources represent the sum of current and discounted future earnings over his or her lifetime as well as his or her current net worth (Ando and Modigliani, 1963: 56). The life cycle hypothesis therefore implies different marginal propensities to consume out of permanent income, transitory income and wealth (Dornbusch *et al.*, 1999: 302).

Modigliani and Brumberg (1954: 391) describe four motives for saving: the first represents the need to add to the estate for the benefit of one's heirs; the second represents the fact that the pattern of current and prospective income receipts tend to not coincide with the preferred consumption; the third motive stems from uncertainty and represents the precautionary saving motive, which is the need to accumulate assets through saving in order to meet possible emergencies; finally, the fourth motive too stems from the presence of uncertainty and states that it is necessary to have an equity stake in certain kinds of assets before an individual can receive services from them. In the absence of uncertainty, an individual could borrow the entire sum necessary to purchase the assets and pay off the loans as the assets are consumed. However, uncertainty regarding the individual's ability to pay forces the individual to hold at least a partial equity in these assets (Modigliani and Brumberg, 1954: 391-393).

Modigliani and Brumberg's (1954) theory of consumption is thus based on "the idea that people make intelligent choices about how they want to spend at each age", which is limited by resources available over the duration of the individual's life (Deaton, 2005). According to Deaton (2005), by building up and later running down assets, individuals while still working are able to make provision for their retirement and are able to smooth out consumption expenditure according to differing needs at different ages, which occurs independently of the individual's level of income at each stage. If households are intertemporal utility maximisers of consumption, then saving for retirement is a necessary characteristic of the life cycle hypothesis (Strydom, 2007: 3).

According to Deaton and Paxson (2000: 212), the life cycle model of consumption "predicts that changes in an economy's rate of economic growth will affect its aggregate saving rate". In this intertemporal model of consumption, younger individuals save for their retirement years and older individuals consume their previously accumulated assets. An increase in the rate of economic growth within an economy will increase the economy's aggregate level of savings since economic growth increases lifetime resources, and thus savings, of younger age groups relative to older age groups (Deaton and Paxson, 2000: 212). Deaton and Paxson (2000: 212) however state that more realistic and complicated models derived from the life cycle model yield ambiguous conclusions regarding the relationship between economic growth and savings. One such example presented is that younger individuals may have lower current income but higher lifetime wealth and may therefore need to borrow in order to finance current consumption levels (Deaton and Paxson, 2000: 212). To the extent that these individuals borrow enough, at sufficiently higher rates of economic growth, their lifetime wealth will be high enough relative to that of their elders such that further increases in the rate of economic growth will cause aggregate saving to fall.

Friedman (1957) developed the permanent income hypothesis to explain the relationship between consumption and income. The permanent income hypothesis splits consumption and income into permanent and transitory components and hypothesizes that the necessary form of the consumption function is one of proportionality (Laumas, 1969: 857). Consumption is related not to current income but to a longer term estimate of income (Dornbusch *et al.*, 1999: 304). Specifically, permanent consumption is proportional to permanent income. According to Shapiro (1978: 122), household permanent income in one year is not indicated by current income for that year, but is rather determined by the expected or anticipated income to be received over a long period of time. Rational individuals would therefore spend a proportional amount of what they perceive to be their permanent

income. Consumption decisions made by individuals are not made according to current levels of income, but rather according to longer term income expectations; therefore, transitory income changes have little impact on consumption (and saving) decisions. Permanent income is the steady rate of consumption an individual maintains for the rest of his or her life, given the current level of wealth as well as income earned today and in the future (Dornbusch *et al.*, 1999: 304).

Laumas (1969: 857) states that a crucial characteristic of Friedman's (1957) permanent income hypothesis is that the "transitory components of income and consumption are uncorrelated". According to Shapiro (1978: 123) this suggests that in a period in which a household's measured income contains a negative transitory component, it does not decrease its consumption. Specifically, unexpected increases or decreases in income result in equivalent increases or decreases in saving, i.e. consumption is unaffected by windfall gains and or losses (Shapiro, 1978: 123). Therefore, the MPC out of transitory income is zero. Due to this hypothesis, the difference between transitory and permanent income and consumption may prove to be a very important determinant of savings (Laumas, 1969: 857).

Common to both Modigliani and Brumberg's (1954) life cycle hypothesis and Friedman's (1957) permanent income hypothesis is the importance of long-term income as the main factor of household consumption (Strydom, 2007: 2). Both hypotheses pay careful attention to microeconomic foundations (Dornbusch *et al.*, 1999: 305).

Modern consumption theory incorporates the impact of uncertainty on consumption and therefore savings. Specifically, the link between income uncertainty and changes in consumption is examined; changes in consumption arise as a result of unexpected (uncertain) changes in income (Dornbusch *et al.*, 1999: 307). The modern analysis begins by stating that individuals choose consumption in each period such that lifetime utility is maximized subject to total lifetime consumption equating lifetime resources, yielding the optimal path which equates marginal utility of consumption across all periods in one's lifetime (Dornbusch *et al.*, 1999: 307). However, in the presence of uncertainty, individuals are unable to equate marginal utilities since future marginal utility is uncertain. Consequently individuals equate current marginal utility with the expected value of future marginal utility (Dornbusch *et al.*, 1999: 307). Hall (1978) incorporated rational expectations theory to this analysis and derived a random walk model, which yields the conclusion that future consumption should equal current consumption plus a random error (Romer, 2006: 354). Consumption thus follows a random walk (Romer, 2006: 354). This random walk hypothesis implies that the change in consumption is

unpredictable, i.e. that no information available at time $t-1$ can be used to predict the change in consumption from time $t-1$ to time t (Romer, 2006: 354, 355).

2.5. THEORETICAL UNDERSTANDING OF CORPORATE SAVING

Keynes (1936: 108) briefly discusses corporate saving behaviour and states that "apart from the savings accumulated by individuals, there is also the large amount of income, varying perhaps from one-third to two-thirds of the total accumulation" which is withheld by government, corporations and other institutions. According to Smith (1963: 299), a corporation must decide whether income accruing to shareholders is to be distributed in the form of dividends or retained in the corporation. The decision to retain income (or a proportion thereof) rather than pay it out in the form of dividends is governed by motives that cannot be viewed as being the same as those governing individuals in their saving decision. The decision is only indirectly related to the satisfaction of human wants through consumption of goods and services (Smith, 1963: 299).

Keynes (1936) lists four motives for corporate saving. These include the "motive of enterprise", which is conducted to secure resources for further capital investment expenditure without the need to raise further debt or equity; the "motive of liquidity", which is conducted to secure liquid resources that may be needed in times of emergencies or recessionary times; the "motive of improvement", which is conducted to secure increasing income to protect management from criticism; and the "motive of financial prudence and the anxiety to be 'on the right side' by making a financial provision in excess of user and supplementary cost", which is conducted to release debt and write off the cost of assets before the actual rate of wastage and obsolescence occurs (Keynes, 1936: 108, 109).

Aron and Muellbauer (2000b: 529) discuss three potential motives for an increase in the level of corporate saving. Firstly, when outside finance is expensive due to high real interest rates, or when this outside finance is difficult to obtain due to access to foreign finance being denied, corporate saving should be higher. Secondly, when expected corporate income growth rates are high, a higher level of corporate saving is expected. This is because greater investment expenditure will become profitable and corporations will save to fund part of this (Aron and Muellbauer, 2000b: 529). Finally, in cyclical upturns and "in gold price booms", it is expected that companies will save a greater proportion of their income, since profits may be temporarily high.

Smith (1963: 299) states that the motives for corporate saving are related to the maximisation of returns to the owners of the corporation and that the investment decision is not made independently of whether the available source of funds is internal or external. Smith (1963: 299) also discusses the fact that the saving and investment decisions of corporations are closely linked. According to Tarshis (1955: 374), once tax rates are set, the saving function of the business sector is determined within narrow limits. Specifically, "given the level of sales and the wage rate, gross profits before depreciation allowances and taxes will be pretty well determined" (Tarshis, 1955: 374). Thus, with specified capital assets and tax rates, the business' net profit will be established. Corporate management then has discretion in terms of deciding how much should be paid out in the form of dividends and thus the level of undistributed profits retained within the company (Tarshis, 1955: 374). Tarshis (1955: 374) concludes that given the level of gross business product, the tax structure determined externally, specified wage rates, and capital assets, the level of business saving depends on the discretion of management to the extent that the dividend rate itself may vary.

Smith (1963: 302) concludes that corporate saving is mostly determined by "current and expected income and investment opportunities, by capital consumption allowances, and by the costs of internal and external funds". Accordingly, one should expect large differences in dividend pay-out ratios among corporations, but should expect the observed level of corporate saving to be related to both the level of observed income and the level of gross investment less capital consumption allowances (Smith, 1963: 303). In terms of the stability of dividends, Smith (1963: 304) states that the decision to increase or decrease the level of corporate saving out of a given amount of income generated, depends partially on the previous period's absolute level of dividends and so "adjustment of saving to changes in current and expected income and investment opportunities will lag" (Smith, 1963: 304).

Tarshis (1955: 376) states that the MPS of business, i.e. the ratio of the change in business saving to the change in the business gross product, depends on three relations. These include the marginal effect of a change in business gross product on profits before tax, the marginal tax rate charged on profits, and the marginal dividend rate made from profits after tax (Tarshis, 1955: 376).

Poterba (1987: 466) states that there exist three major views on how dividend and corporate income taxation affect corporate saving. The first two entail changes in household dividend tax rates not affecting corporate saving, while the third view concludes that dividends are set by balancing the dividend tax burden against the benefits of paying out dividends to shareholders and suggests that changes in the relative tax burden on dividends and capital gains will affect corporate saving

(Poterba, 1987: 466). The third view is supported by empirical evidence and argues that shareholders value dividend payments (Poterba, 1987: 470). Specifically, corporations pay dividends because, at the margin, the benefits from paying dividends just equal the additional tax burdens associated with dividends. These benefits include an advantage that is reflected in the company's market value, the signaling role in showing managerial confidence in the company's prospects and the need to restrict managerial discretion (Poterba, 1987: 471).

2.6. PIERCING THE CORPORATE VEIL

A hypothesis commonly referred to in the literature (Poterba, 1987, 1991; Sachs and Larrain, 1993; Prinsloo, 2000; Aron and Muellbauer, 2000b; Agosin, 2001) is that households "pierce the corporate veil". This hypothesis states that since households ultimately own business corporations, they are able to view corporate budget constraints perfectly, and thus alter their own household savings decisions based on corporate savings decisions. Ultimately, household and corporate saving should offset each other and thus exhibit a negative relationship. Accordingly, individuals "perceive" corporate savings as being a substitute for, or extension of, household savings (Prinsloo, 2000: 25). Prinsloo (2000: 25) states that the composition of domestic saving in South Africa is thus not as important as the actual level or rate of domestic saving. This study tests this hypothesis to determine whether or not such a relationship exists between corporate and household savings and whether this would have any policy implications for increasing the overall level of private saving in South Africa.

Sachs and Larrain (1993: 109) too state that households ultimately own corporations and as a result, the level of overall private saving can be determined by households. They show what happens to total private savings when corporations change their saving policies. When a corporation increases its level of saving by one unit, rather than paying that additional unit of saving out to shareholders in the form of dividends, household disposable income is found to decrease by one unit (Sachs and Larrain, 1993: 109). This is because household disposable income is equal to the sum of household output as well as any dividends received from corporations. If households wish to maintain their previous level of disposable income they will reduce savings by one unit. As these two movements cancel out, the total level of private saving will remain the same (Sachs and Larrain, 1993: 110). Therefore, if the level of corporate saving increases, the level of household saving should decrease as households will regard the corporation as performing saving on their behalf (Sachs and Larrain, 1993: 110).

Barr and Kantor (1994: 65) explore the fact that households own the shares of corporations who save and buy assets on behalf of shareholders and therefore act on behalf of households when making saving and investment decisions. They note that the claims of households on the assets and income (or profits) of corporations may be direct, such as for shareholders, or indirect, such as in the form of rights to pension funds or retirement annuities. Pension funds and other contractual saving institutions own shares on behalf of households since they act as custodians of their savings. Barr and Kantor (1994: 66) analyse this relationship for South Africa over the period from 1970 to 1991 and find evidence that higher corporate saving offsets lower household saving. Barr and Kantor (1994) conclude that a decrease in household saving represents only a compositional change in private saving. A focus on improving government saving would thus be beneficial in increasing total domestic saving in South Africa (Aron and Muellbauer, 2000b: 512).

Aron and Muellbauer (2000b) suggest the notion of households "piercing the corporate veil" is somewhat incomplete. They provide three main reasons to support this. The first is that if households were able to observe corporate budget constraints perfectly, then dividend income would be expected to have no direct effect in a consumption model after taking into account the equity wealth effect (Aron and Muellbauer, 2000b: 512). The second reason is simply that it is highly unlikely that corporations will behave in the exact manner that households would have them behave in terms of savings behaviour. Finally, factors such as financial liberalization, changing terms of trade, changes in government savings behaviour, and lower real interest rates, may cause corporate and household savings levels to be positively related and thus move in the same direction (Aron and Muellbauer, 2000b: 512).

Aron and Muellbauer (2000b) identify several important linkages between corporate and household saving in South Africa. Over the period under study, the authors find the level of private saving to be relatively stable and pose the question as to whether this stability can in fact be attributed to households "piercing the corporate veil". After testing the hypothesis they found evidence of piercing the veil using both the corporate and household saving equations (Aron and Muellbauer, 2000b: 539). Specifically, Aron and Muellbauer (2000b: 539) conclude that "household expenditures appear to respond to the value of equities rather than to after-tax dividend payments, whereas the corporate tax rate is influenced by the personal dividend tax rate and by inflation". Yet the authors state that the importance of inflation in explaining the secular increase in corporate saving out of net profits is only partially explained by corporations serving the tax needs of their shareholders. Aron and Muellbauer

(2000b: 539) attribute other reasons to being "poor returns on alternative assets in an inflationary environment" and conclude that even if households were able to see through corporate budget constraints perfectly, "piercing the corporate veil" turns out to be only one factor in explaining sectoral shifts in savings.

Poterba (1987: 455) states that most studies model household consumption and saving behaviour as a function of the private sector's budget constraint, "implicitly assuming that households 'pierce the corporate veil' and take full account of corporations saving on their behalf". Consequently, a reform in the tax system in the US which aims to reallocate tax burdens between households and corporations will not affect the level of private saving (Poterba, 1987: 455). Poterba (1987: 456) empirically analyses the relationship between corporate and household saving using US time series data and finds that household saving adjusts only partly to offset shifts in corporate saving. Specifically, Poterba (1987: 503) found that a one dollar decrease in corporate saving is likely to result in only a twenty-five to fifty cent decline in total private saving. Accordingly, if corporations use after-tax profits to pay out dividends, corporate saving decreases while disposable income and, hence household saving, increases (Poterba, 1987: 461). In a later empirical study, Poterba (1991: 64) found consistent yet weak evidence for the US, Great Britain and Canada, which suggests that higher dividend tax rates lower consumption.

Agosin (2001) finds that most empirical research on savings behaviour makes the "implicit or explicit assumption that aggregate saving can be analysed as if it were the product of household decisions". This assumption implies that corporate and household saving decisions are determined by the same set of factors. Agosin (2001: 508) finds that any increases in corporate saving are not offset by subsequent decreases in household saving in the long-run and thus rejects the notion of households "piercing the corporate veil".

In recent times, both corporate and household saving rates fell in South Africa. Therefore, the "piercing the corporate veil" hypothesis seems not to hold over this period. Households could only have "pierced the corporate veil" if they desired a lower level of aggregate private savings. This could be due to higher asset prices, i.e. house prices and equities. Thus, an analysis of the decline in both corporate and household saving in recent years is critical for future policies aimed at increasing the domestic saving rate as evidently these two components of private saving do not appear to offset each other.

2.7. TREND ANALYSIS OF PRIVATE SAVING IN SOUTH AFRICA

From 2004 to 2007, corporate saving in South Africa fell significantly from R63 685 million to R7 908 million (South African Reserve Bank, 2011a). Specifically, corporate saving in each year represented approximately 4.5%, 2.8%, 1.9% and 0.4% of GDP (South African Reserve Bank, 2011a). This occurred at a time when commodity prices rose and economic growth exceeded 5 percent per annum for the first time since the 1960s. For a commodity producing country, such as South Africa, it is surprising that higher profits were not retained and indeed that corporate saving fell in absolute terms. At a time of rising commodity prices, one would expect corporate export earnings to rise and for this to translate into higher saving rates for corporations (Barr and Kantor, 1994; Aron and Muellbauer, 2000b; Harjes and Ricci, 2005). Booming exports and strong global growth supported by low global interest rates translated into an acceleration of global economic growth which should have produced higher corporate and household saving. However, this was not the case.

According to the South African Reserve Bank (2011b: 11), the fall in the national saving ratio, defined as total savings to total GDP, in the first quarter of 2011 was largely a result of a fall in corporate saving. Corporate saving (including provision for depreciation) represented 15 percent of GDP in the first quarter of 2011 (South African Reserve Bank, 2011b: 12). This shows a fall in the level of corporate saving from 16.9 percent of GDP in 2010. The South African Reserve Bank (2011b: 12) attributes this fall in corporate saving as being largely a result of weaker growth in the operating surpluses of incorporated businesses and further mentions that dividend payouts increased (this is discussed further in Chapter Six).

Over the period from 2002 to 2008, household saving also fell substantially from R5 380 million to negative R13 261 million (South African Reserve Bank, 2011a). Specifically, household saving in each year represented approximately 0.46%, 0.39%, 0.24%, 0.07%, -0.52%, -0.64%, and -0.58% of GDP (South African Reserve Bank, 2011a). The household debt to disposable income of households ratio increased significantly over the period from 2004 to 2008; an increase from 57.8% to 81.8% (South African Reserve Bank, 2011a). According to Luüs (2005), individuals' willingness to accumulate debt since the early 1980s is a result of various factors. These include the inflation of house and equity prices over the long term which strengthened the balance sheet of households thereby allowing for increases in debt levels. Another factor includes financial liberalization; the deregulation of local banks created new financing facilities thereby increasing the availability of consumer credit (Luüs, 2005). Furthermore, when individuals face declining real per capita income

levels, increased borrowing is evident as individuals seek ways to maintain lifestyles during these times (Prinsloo, 2000: 16). This increase in household debt significantly hampers the ability of households to increase their saving levels.

Household saving rose to 1.5 percent of GDP in the first quarter of 2011 (South African Reserve Bank, 2011b: 12). The South African Reserve Bank (2011b: 12) concludes this was the result of increases in households' final consumption expenditure as well as disposable income.

Table 2.1 shows annual net savings figures for both corporate and household saving over the period from 2000 to 2010. It is clear that from 2004 to 2007, corporate saving fell significantly. From 2003 to 2008, household saving too fell significantly. Table 2.1 therefore shows the significant fall in private saving which occurred over the period from 2004 to 2007, thereby confirming the fact that corporate saving was the larger contributor to this fall.

According to the World Bank (2011b: 19), household consumption as a percentage of disposable income in South Africa has been high and household indebtedness has increased significantly in the 2000s, which has contributed to low household saving rates. The World Bank (2011b: 19) attributes this fall in household saving to an adverse declining trend in the household disposable income to GDP ratio. Another factor contributing to the low household saving rate is the high unemployment rate, which prohibits households from saving as well as prevents more robust increases in household incomes (World Bank, 2011b: 19).

Table 2.1: Annual Saving Figures in Rand Millions
(South African Reserve Bank, 2011a)

R Millions	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Corporate Saving	37827	29786	51958	55155	63685	44519	33019	7908	37800	110380	195280
Household Saving	6097	2532	5380	4960	3351	1142	-9229	-12850	-13261	-4374	-4072
Private Saving	43924	32318	57338	60115	67036	45661	23790	-4942	24539	106006	191208

Similarly, table 2.2 shows the annual figures presented in table 2.1 as ratios of GDP. It is clear that corporate saving is the dominant component of private saving as the corporate saving ratios of GDP closely mirror those of the private saving ratios of GDP.

Table 2.2: Annual Saving Figures as a Ratio of GDP (South African Reserve Bank, 2011a)

Percentages of GDP	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Corporate Saving	4.10	2.92	4.44	4.33	4.50	2.83	1.87	0.39	1.66	4.61	7.33
Household Saving	0.66	0.25	0.46	0.39	0.24	0.07	-0.52	-0.64	-0.58	-0.18	-0.15
Private Saving	4.76	3.17	4.90	4.72	4.74	2.91	1.35	-0.25	1.08	4.42	7.18

From 2002 to 2008, South Africa's current account balance worsened. Specifically, the balance on the current account went from a surplus of R9 680 million in 2002 to a deficit of R161 874 million in 2008 (South African Reserve Bank, 2011a). Figure 2.1 graphs total gross saving, total investment and the current account balance as ratios of GDP in South Africa over the period from 1981 to 2010. It is clear that when total gross saving falls below total investment, the difference must be financed by the current account balance which is then a deficit (Smit, 2006). In periods such as the early and late 1980s, total gross saving was greater than total investment and as such a current account surplus was recorded. This was due to the high gold price experienced during that time (Barr and Kantor, 1994; Prinsloo, 2000; Aron and Muellbauer, 2000b). Since private saving represents the dominant component of total saving in South Africa, a decrease in private saving results in a significant worsening of the current account balance. As such, foreign capital inflows are used to fund higher investment levels through the current account.

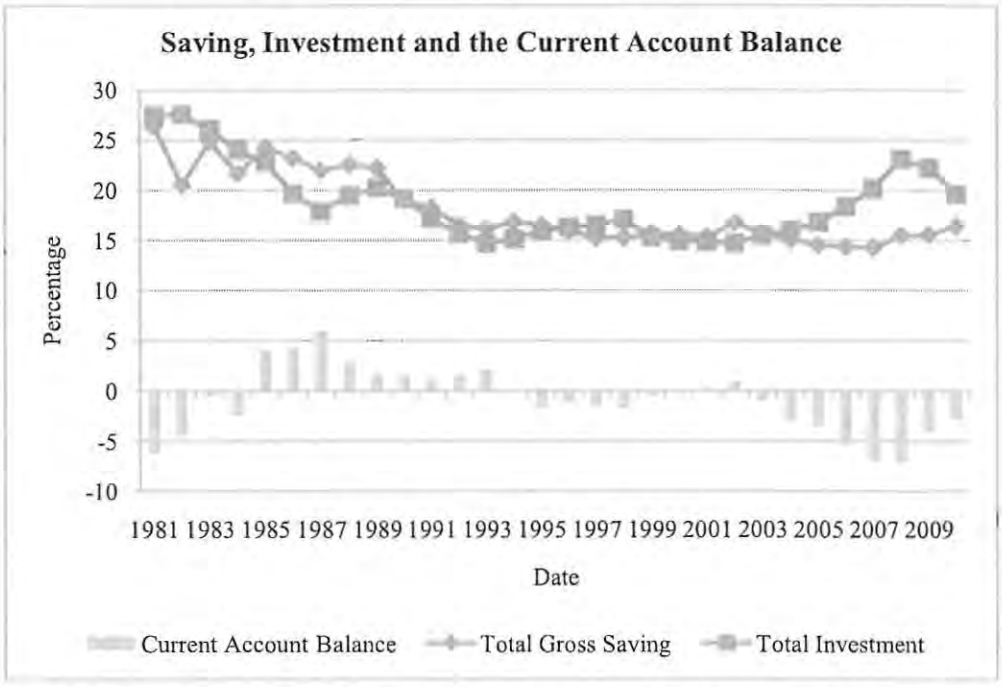

Figure 2.1: Total Gross Saving, Total Investment and the Current Account Balance (all as a Percentage of GDP)

The current account balance has been used as a proxy for foreign savings in empirical studies on savings (Edwards, 1996; Masson *et al.*, 1998; Agosin, 2001). This is due to the fact that foreign saving is a substitute for domestic saving at times of current account deficits. Although international capital flows can supplement domestic saving, the volatile nature of global markets restricts the availability of sustained cross-country capital inflows (Prinsloo, 2000: 1). Evidence has shown that only countries with high domestic saving can maintain a high domestic investment rate. As discussed in Chapter One, the Commission for Growth and Development (2008: 1) states that only thirteen high-growth economies (achieving an average growth rate of 7 percent per annum for twenty-five years or longer) have had simultaneously high saving and high investment rates. Specifically, these countries forewent present consumption in pursuit of higher future levels of income, thereby adopting a "future-orientation" (Commission for Growth and Development, 2008: 24).

Foreign capital inflows into South Africa are in the form of foreign direct investment, portfolio investment, and other investment. While foreign direct investment is stable and has the potential to provide long term sustainability to the domestic economy, portfolio investment may prove to be extremely volatile. These portfolio investments flow into the local bond and equity markets which are subject to rapidly changing investor sentiment. Foreign investors may decide to withdraw their funds from the local economy at any time. Due to the low level of saving in South Africa, in the first quarter of 2011, roughly 15.8 percent of the country's gross capital formation (investment) was financed via foreign capital inflows (South African Reserve Bank, 2011b: 12). This figure in comparison to the 14.6 percent share in the year 2010 as a whole shows an increase in such inflows.

2.8. GRAPHICAL ANALYSIS OF PRIVATE SAVING IN SOUTH AFRICA

This section briefly describes historical trends in the three components of national saving in South Africa over the period from 1981 to 2010. Figure 2.2 graphs total, government, corporate and household net saving figures in Rand millions while figure 2.3 graphs total, government, corporate, household, and private net saving as ratios of GDP. As stated in Chapter Two, net saving figures represent saving figures less depreciation.

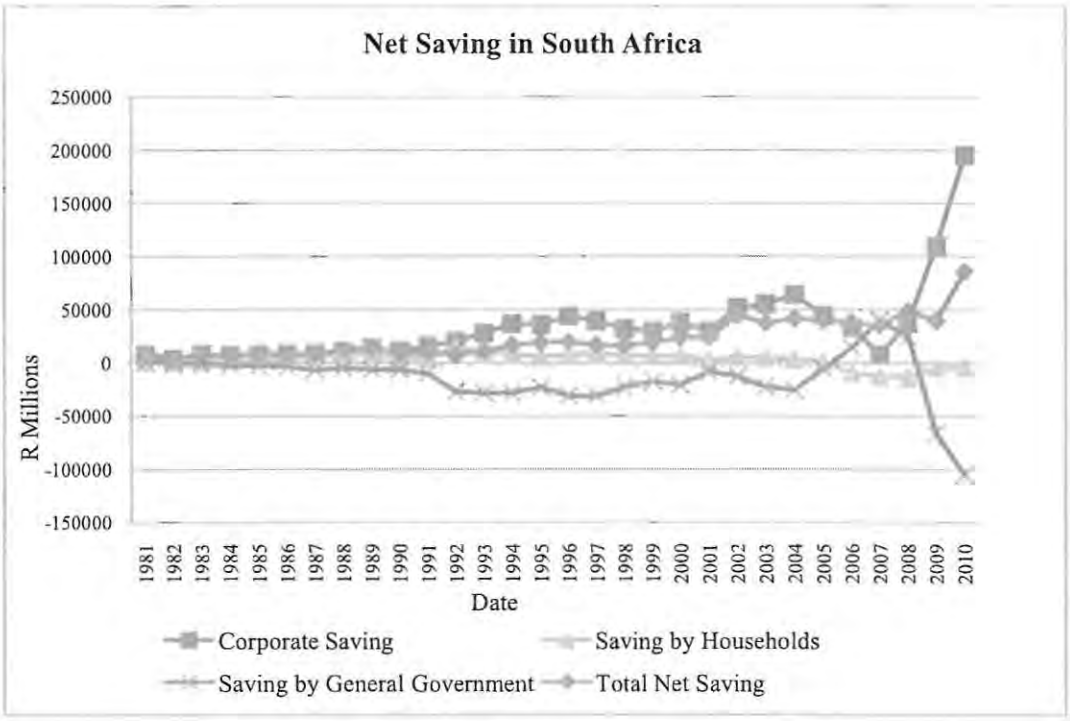

Figure 2.2: Net Saving in South Africa (South African Reserve Bank, 2011b)

The early 1980s was a time of (then) record high gold prices and given the importance of gold mining to GDP at that time, the economy boomed (Barr and Kantor, 1994; Prinsloo, 2000; Aron and Muellbauer, 2000b). Gold prices rapidly rose to record highs during this time before swiftly dropping again. According to Nattrass (1995: 857), the gold price averaged 613 dollars per ounce in 1980. While the US dollar price subsequently remained subdued, the Rand gold price later benefited from strong depreciation of the Rand (Nattrass, 1995: 857). Figure 2.3 clearly shows the substantial rise in corporate saving in 1981 as a result of increased profits generated from these high gold prices.

From 1984 to 1985, financial sanctions were applied against South Africa and public policy was aimed at ensuring high current account surpluses to fund resultant foreign capital outflows to repay debt. Corporations were forced to squeeze investment projects to ensure that funds were available to repay South Africa's foreign debt. Corporate saving therefore showed a steady rise over this period.

In 1994 sanctions were lifted and in 1995 the Financial rand was scrapped, giving South Africa access to foreign capital inflows. From 1996 until around 2007, corporate saving declined. The fall in corporate saving from 2004 to 2007 is surprising since this occurred at a time of high commodity

prices and increased economic growth. From 2008 to 2010, however, the reverse situation occurred. Specifically, corporate saving rose during a time of subdued economic growth.

The World Bank (2011b: 19) states that over the period from 1995 to 2007, improvement in macroeconomic stability in South Africa made corporations less risk averse and thus lowered their precautionary saving motive. Greater ease of access to global markets and thus global credit after the end of Apartheid sanctions alongside liberalization of exchange controls may also have made it cheaper for corporations to borrow as opposed to self-financing (World Bank, 2011b: 19).

In recent years, high economic growth has been associated with both high investment and low savings. Therefore, the question as to whether there has been a structural change in the behaviour of corporate saving is asked and is discussed in Chapter Six. The increase in corporate saving from 2007 may be attributed to the poor state of the global economy which continues. The global financial crisis affected the local economy and the global financial system. This is possibly why corporations are saving more. The World Bank (2011b: 16), supports this suggestion that corporations began to save more due to uncertainty as a result of the global financial crisis. Bank lending may well have contracted as banks became more conservative in lending (World Bank, 2011b: 16).

From 1981 to about 1992 (pre-1994), the government saving rate declined steadily. This provides evidence of a gradual worsening of the government fiscal balance. From 1990 to 1994, a significant worsening of government saving is evident and may be attributed to the general decline in control of the government fiscus during the political transition. From 1994 to about 2006 a steady rise in government saving, i.e. improvement in the government budget deficit and public investment was experienced. This shows the general improvement and regaining of control in the government fiscus after the introduction of the Growth, Employment and Redistribution strategy in 1986.

From 1982 to 1990 household saving displayed a steady decline before increasing until 1992. From 1993 until 2007, household saving again followed a significant downward trend. This study analyses household saving in an attempt to determine reasons for this steady decline. From 2007 until 2010, household saving increased substantially, but remains negative. This may be attributed to the recent global financial crisis, which caused a high amount of uncertainty within the macroeconomic environment. As such, household saving increased.

As stated in Chapter One, over the past decade, corporate saving and household saving appear to have moved in the same direction, thereby raising doubt over the validity of the hypothesis of households "piercing the corporate veil". This relationship is empirically examined in Chapter Five.

It is clear from figure 2.3 that private saving and total saving in South Africa are dominated by corporate saving and that private saving is thus the dominant component of aggregate saving in South Africa.

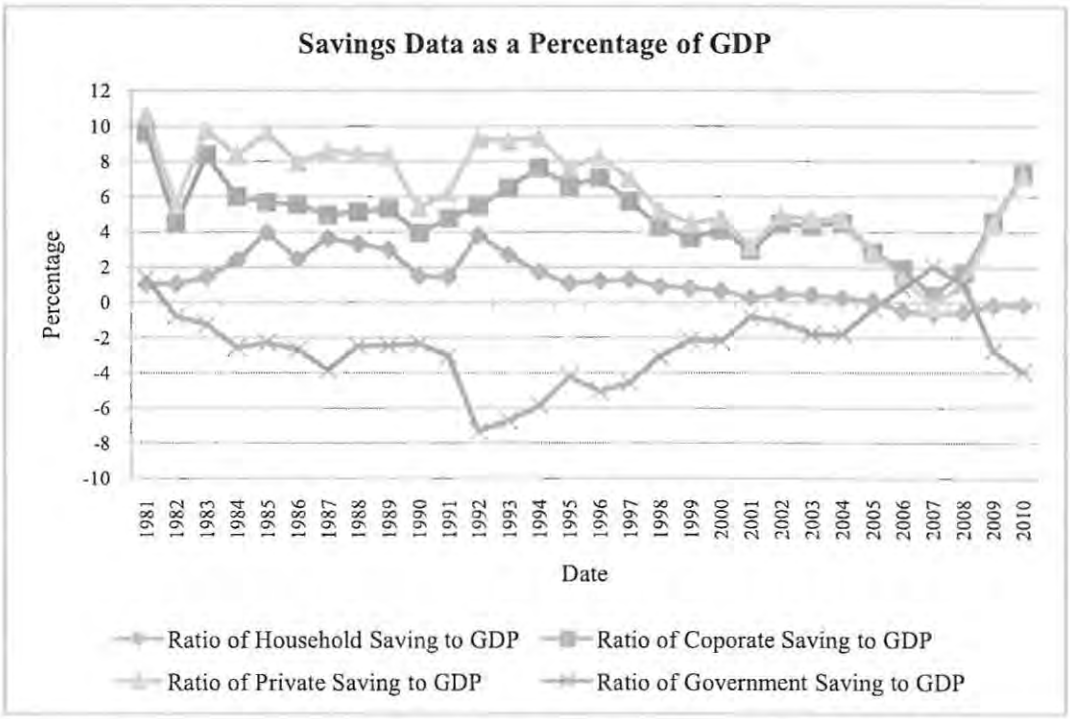

Figure 2.3: Savings in South Africa as a Percentage of Real GDP (South African Reserve Bank, 2011b)

2.9. CONCLUSION

This chapter began by defining saving. The context of saving in South Africa was presented, referring specifically to the two components of private saving, namely corporate and household saving. Intertemporal theories of consumption for household saving behaviour were also discussed. Corporate saving behaviour lacks an agreed upon theoretical model. As such, different studies' (Smith, 1963; Aron and Muellbauer, 2000b) interpretations of corporate saving behaviour were discussed.

In order to understand the significance of both corporate and household saving in South Africa, an analysis of the historical trends in private saving as well as government saving was undertaken. The graphical analysis clearly depicts recent trends in domestic saving in South Africa. In order for South Africa to achieve a sustainable level of economic growth in the future, domestic saving rates need to be stimulated. It was shown that South Africa depends on an unusually large amount of foreign capital inflows to fund higher investment levels. This is unsustainable and the Commission for Growth and Development (2008) emphasizes the need for higher domestic saving rates in South Africa to achieve higher economic growth.

The next chapter presents a discussion on the available theoretical and empirical literature on the determinants of private saving. The determinants discussed in Chapter Three are those which will be used in the empirical analysis section of this study.

CHAPTER THREE:

LITERATURE REVIEW ON THE DETERMINANTS OF PRIVATE SAVING

3.1. INTRODUCTION

This chapter provides a summary of the available literature on private saving behaviour including identifying the determinants of private saving that are used in the empirical analysis of this study. Each variable employed in the empirical section of this study is discussed. Some studies have already been conducted on savings in South Africa (Prinsloo, 2000; Aron and Muellbauer, 2000b; Harjes and Ricci, 2005), while other studies present evidence from other countries (Corbo and Schmidt-Hebbel, 1991; Edwards, 1996; Masson *et al.*, 1998; Loayza, Schmidt-Hebbel and Serven, 2000a; Loayza, Schmidt-Hebbel and Serven, 2000b). These studies all highlight the importance of private saving for successful economic performance and seek to determine ways in which private saving can be increased.

It is critical to understand the effect and nature of these determinants on private saving both in terms of enhancing sustainable economic growth as well as in implementing policies that will prove effective in raising the domestic level of private saving within an economy. Since South Africa is an extremely low saver (see Chapter Two), the results obtained from empirical studies may prove beneficial in finding ways to raise the private saving rate and consequently the domestic saving rate in the economy.

Also included in this chapter is a summary of the relationship between saving, investment and foreign capital inflows. In recent years, international financial markets repeatedly experienced sudden shifts in investor confidence and consequently in international capital flows. The Mexican Peso crisis of 1995, the East Asian crisis of 1998, the emerging market crisis of 2001 triggered by the terrorist attacks on the US, and the recent post-2008 global financial crisis having its genesis in the US credit markets, all saw large capital outflows from emerging economies even though in some cases these crises did not originate in the economies which saw significant capital outflows.

In South Africa, during each of these crises, large capital outflows occurred as emerging markets, as a group, were seen as risky investments. Investors demanded liquidity and removed their capital to

"safer" economies as a result. Loayza *et al.* (2000a: 394) emphasize how low saving rates coupled with large current account deficits can worsen the negative effects of such foreign capital reversals during times of crises. As discussed in Chapter Two, South Africa experiences large capital inflows into the domestic economy, specifically in the form of portfolio inflows into the local bond and equity markets. These foreign capital inflows are extremely high and fund an unusually high proportion of South Africa's gross capital formation. It is therefore vital to increase the level of saving in the domestic economy to reduce reliance in volatile foreign inflows. The World Bank (2011b: 11) states that given the low saving rates in South Africa, the return of high current account deficits, generally financed through volatile portfolio inflows, will become the chief cause for macroeconomic concern over the medium term.

This chapter is divided into the following sections: Section 3.2 introduces the list of determinants of private saving. Section 3.2.1 discusses the government budget balance as a determinant of private saving. The effect of economic and income growth on private saving is discussed in Section 3.2.2. Section 3.2.3 discusses certain demographic variables which should theoretically impact on private saving rates. The impact of financial liberalization on private saving is discussed in section 3.2.4, while the inflation rate as a determinant of private saving is discussed in section 3.2.5. Sections 3.2.6, 3.2.7 and 3.2.8 review literature on the effects of wealth, the foreign saving rate, and the real interest rate on private saving respectively. Section 3.2.9 discusses the impact of a commodity price index on private saving, while the effect of the investment rate on private saving is discussed in section 3.2.10. Finally, section 3.3 concludes this chapter.

3.2. DETERMINANTS OF PRIVATE SAVING

While this list of determinants of private saving is by no means complete, it aims to include those variables thought to be most significant in explaining corporate saving and household saving, and thus private saving, in South Africa. The variables discussed below are therefore believed to be the main determinants of private saving in South Africa and are included in the empirical analysis undertaken in this study.

3.2.1. THE GOVERNMENT BUDGET BALANCE

Barro (1988: 6) states that a decrease in government saving, i.e. a current budget deficit, leads to an offsetting increase in desired private saving. Thus, there is no change in total domestic saving. This

theory, termed Ricardian equivalence, joins both individuals' and the government's intertemporal budget constraints and "derives permanent income as net of the discounted value of government spending" (Loayza *et al.*, 2000a: 403). Thus, a permanent increase in the level of government saving is said to be completely offset by a resulting decrease in the level of private saving, yielding the overall level of domestic saving unaffected. The reason for this relationship is that when government deficits are high, private savers are aware that at some point in the future they will be required to pay higher taxes to fund higher levels of government debt. To smooth their permanent levels of consumption they therefore increase current saving or decrease current consumption in order to maintain future levels of consumption. Thus, *a priori,* a negative relationship is expected between the government budget balance and private saving.

According to Corbo and Schmidt-Hebbel (1991: 97), direct effects of fiscal policies on consumption, and thus private saving, work through government saving or the government budget deficit and its composition. If the conditions required for Ricardian equivalence are met, i.e. if the private sector is rational and forward-looking thereby satisfying Friedman's (1957) permanent income hypothesis and is willing and able to incorporate the intertemporal government budget constraint into its own, then an increase in government saving is exactly offset by an increase in private consumption, which results in a decrease in private saving. This is the case if the increase in government saving is done via a decrease in government spending (Corbo and Schmidt-Hebbel, 1991: 97). On the other hand, an increase in government saving does not influence private consumption if it occurs via higher taxation (Corbo and Schmidt-Hebbel, 1991: 97). As disposable income is decreased by the size of the amount of tax, the decrease in private saving already matches the increase in government saving.

Masson *et al.* (1998: 484) also note that a rise in the government deficit could have different effects on private saving depending on whether it is the result of an increase in government spending or a decrease in the level of taxation. An increase in the level of government spending may lower the amount of resources available to the private sector and thus have a negative impact on the level of private saving. Secondly, the composition of government spending may prove to be very important. Specifically, productive public investment "is not expected to require further taxes and should not generate a private saving response" (Masson *et al.*, 1998: 484). However, public investment which does not generate revenue for the government would require future taxes and may result in a private saving offset.

Consistent with this view, Loayza *et al.* (2000a: 403) state that international evidence shows that decreasing levels of government spending are a more effective way of increasing the level of domestic saving rather than by increasing taxes. According to Loayza *et al.* (2000a: 403), most empirical evidence internationally rejects a complete offset between government and private saving and instead finds this relationship to be only partial. Consequently, government saving, and thus fiscal policy, is an important direct and effective tool for policymakers to influence the domestic saving rate in an economy (Loayza *et al.*, 2000b: 180).

Loayza *et al.* (2000b: 167) conduct a panel data study on sixty-nine countries of which twenty are industrial countries and forty-nine are developing countries. They find that an increase in the government saving rate leads to a statistically significant decrease in the private saving rate (Loayza *et al.*, 2000b: 174). Specifically, "the private sector reduces its saving rate by 0.29 percentage points for each percentage point increase in the government saving rate within the same year the policy change occurs" (Loayza *et al.*, 2000b: 174). In the long-run, however, the degree of offset increases to 0.69 percentage points.

Loayza and Shankar (2000: 578) analyse the extent to which the private sector internalizes the government's budget constraint and thus the extent to which an increase in government saving is offset by an increase in private saving in India over the period from 1960 to 1995. They reject full Ricardian equivalence, yet still find a negative relationship between private and government saving rates (Loayza and Shankar, 2000: 584).

Masson *et al.* (1998: 489) include data for twenty-one industrial countries over the period from 1971 to 1993 and data for forty developing countries over the period from 1982 to 1993. A statistically significant and negative coefficient is found between private saving and the government budget balance for both developing and industrial countries. Overall, they find a substantial offset exists between changes in the government fiscal position and private saving that averages 75 percent and depends on whether the change results from changes in government expenditure or in taxation (Masson *et al.*, 1998: 497). The authors conclude that changes in the government fiscal position can have a substantial impact on domestic saving in both developing and industrial countries, especially when due to reductions in government expenditure (Masson *et al.*, 1998: 497).

Edwards (1996) analysed data from thirty-six countries covering the period from 1970 to 1992. He employed a model which suggests that fiscal policy will have an effect on consumption and saving

decisions (Edwards, 1996: 24). Edwards (1996: 32) found the coefficient of government saving to be statistically significant and negative. Although government saving will tend to crowd out private saving, this will not happen on a one-to-one basis. Strict Ricardian equivalence therefore does not hold. Specifically, an increase in government saving of 1 percentage point results in a decline in private saving of about 0.55 percentage points, yielding an increase in total national saving of 0.45 percentage points (Edwards, 1996: 40).

Corbo and Schmidt-Hebbel (1991) used data from thirteen countries to analyze macroeconomic consequences of higher levels of government saving and examined the extent to which a rise in government saving would be offset by a fall in private saving. In all of their estimations, Corbo and Schmidt-Hebbel (1991) found a degree of offset between government saving and private saving, although this too was not on a one-to-one basis as predicted by the Ricardian equivalence hypothesis. Specifically, they found that a $1 transitory increase in government saving decreased private saving by 16 to 50 cents when achieved via a decrease in current government expenditure. If the same increase in government saving occurred via increasing current taxes then private saving decreased on average between 48 to 65 cents (Corbo and Schmidt-Hebbel, 1991: 107). Corbo and Schmidt-Hebbel (1991: 107) conclude that the main source of the differential effect of a decrease in government expenditure arises from the effect of taxation increases on both current and permanent income levels.

Agosin (2001) examines the saving performance of the Chilean economy over the period from 1940 to 1996. He finds that increases in government saving have no long-run negative effects on corporate saving, and finds that in the short-run government saving actually crowds in corporate saving contrary to *a priori* expectations (Agosin, 2001: 512). Agosin (2001: 512), however, finds a trade-off between government and household saving which operates in the short-run only.

Prinsloo (2000: 10) too states that private saving and government saving levels are likely to be negatively correlated in South Africa. This is due to the fact that government saving and private saving move in opposing directions during phases of the business cycle. Specifically, Prinsloo (2000: 10) states that during a downswing in the economy, government tax revenue increases more slowly or may even decrease as the level of business activity falls. Government spending may simultaneously increase more rapidly as a result of deliberate spending policies aimed at enhancing and stabilizing aggregate domestic demand or due to an increase in social spending to assist the local economy (Prinsloo, 2000: 10). Therefore, government saving may be seen to fall during a downswing in the economy while private saving will increase. On the other hand, government saving may increase

during an upswing in the economy as the level of tax revenue increases and government expenditure slows down in relation to growth in GDP (Prinsloo, 2000: 10). This finding may provide evidence in favour of Ricardian equivalence. However, Prinsloo (2000) does not empirically test this relationship.

By including expected growth in the estimated household consumption function, Aron and Muellbauer (2000b: 538) find evidence which clarifies the channel through which fiscal policy is transmitted to household saving in South Africa. Specifically an increase in the level of government saving was found to decrease household saving out of personal income by raising income expectations, given current income as well as to the extent that it lowers real interest rates (Aron and Muellbauer, 2000b: 539).

Harjes and Ricci (2005) analyse private saving in South Africa over the period from 1970 to 2002. They find the government balance to cause a statistically significant and negative impact on private saving (Harjes and Ricci, 2005: 59). Since changes in the fiscal balance do affect private saving significantly, yet only around 50 percent is estimated to be offset, Harjes and Ricci (2005: 60) state that there is scope for the government to influence the overall level of saving in South Africa through its own saving behaviour. Harjes and Ricci (2005: 60) conclude that the offsetting effect of the fiscal balance occurs through both corporate and household saving. When Harjes and Ricci (2005: 59) used government saving instead of the general government balance in their empirical estimation, very similar results were obtained.

Schrooten and Stephan (2005) examine private saving rates in the European Union (EU) accession countries over the period from 1971 to 1994. Similarly, they find that the government impacts private saving "not only through certain policies that enhance growth, but also directly through its own saving behaviour" (Schrooten and Stephan, 2005: 304).

3.2.2. ECONOMIC AND INCOME GROWTH

A priori, a positive relationship is expected between economic growth and private saving (Kessler, Perelman and Pestieau, 1993; Morande, 1998). According to Schmidt-Hebbel and Serven (1999: 14), the strong positive relationship between saving rates and real per capita growth has been abundantly documented in cross-country empirical studies (Edwards, 1996; Masson *et al.*, 1998).

Following life cycle theory, income and GDP growth are expected to impact positively on private saving (Edwards, 1996: 22). When an economy is expanding, the level of workers' saving will

increase relative to retirees' dis-saving resulting in an increase in aggregate saving (Edwards, 1996: 22). Bosworth (1993, in Edwards, 1996: 22) states that there will also however be an effect moving in the opposite direction. Specifically, in an expanding economy, workers will foresee higher future income and will tend to increase current consumption thereby decreasing saving (Edwards, 1996: 22). This latter effect is in line with conclusions reached by Prinsloo (2000). According to Edwards (1996: 22), whether the positive effect or negative effect of income growth on private saving will dominate is largely an empirical matter.

Edwards (1996: 33) tests this relationship empirically and finds the rate of growth of per capita GDP to be statistically significant and positive thereby providing some support to the hypothesis that there exists a "virtuous cycle" that goes from "faster growth to increased savings to even higher growth".

Loayza *et al.* (2000a: 400) too state that in the life cycle model growth has an ambiguous effect on private saving, "depending on which cohorts benefit the most from income growth, how steep their earning profiles are, and the extent to which borrowing constraints apply". Although the relationship between economic growth and private saving may thus be ambiguous, Loayza *et al.* (2000a: 400) state that a strong positive association between private saving and growth has been obtained empirically in cross-country studies.

In their panel data study using combined data for developing and industrial countries, Masson *et al.* (1998: 491) find a positive and statistically significant relationship between GDP growth and private saving. Specifically, an increase in the GDP growth rate of 1 percentage point increases private saving by between 0.092 and 0.22 percentage points depending on the type of specification used. When Masson *et al.* (1998: 493) analyse separate panels for developing and industrial countries, the result changes slightly. Specifically, GDP growth is found to be weakly associated with private saving for industrial countries, but much more strongly and statistically significantly so for developing countries (Masson *et al.*, 1998: 493).

Loayza *et al.* (2000b: 173) find that as individuals become richer, or their incomes grow faster, their saving rate increases. An increase in income of 10 percentage points increases private saving by 0.47 percentage points. The estimated growth coefficient shows that an increase in the income growth rate by 1 percentage point results in an increase in private saving of 0.45 percentage points in the short-run (Loayza *et al.*, 2000b: 173). Loayza *et al.* (2000b: 173) note that they cannot tell whether the estimated coefficient effects are a result of permanent or temporary changes in these variables. They

conclude that policies aimed at spurring more rapid economic development are an indirect yet effective way of raising private saving rates (Loayza *et al.*, 2000b: 180).

Kessler *et al.* (1993) compare saving behaviour in a sample comprising seventeen countries of the Organisation for Economic Cooperation and Development (OECD) ranging over a period of twenty-four years. In their time series analysis, Kessler *et al.* (1993: 41) find a negative yet statistically insignificant relationship between GDP growth and saving, while in their cross-section analysis a positive and statistically significant relationship between GDP growth and saving is found. In a general model estimated, this relationship is found to be positive and statistically significant (Kessler *et al.*, 1993: 41).

Kraay (2000) analyses household saving in China over the period from 1978 to 1989. Separate models are estimated for rural and high-income households. Expected future income growth is found to be statistically significant and negative for rural households (Kraay, 2000: 559). This is as predicted by standard forward-looking models of consumption and saving. Specifically, a 1 percentage point decrease in expected future income growth results in slightly more than a 1 percentage point increase in household saving since households decrease consumption and increase saving due to the expectation of sluggish future income growth (Kraay, 2000: 559).

Carroll and Weil (1994) study the relationship between income growth and saving including both cross-country and household data of the US over the period from 1958 to 1987. In contradiction to findings of Kraay (2000), Carrol and Weil (1994: 180) find that at the aggregate level periods of high income growth are followed by periods of high saving, while among young households, those who expect faster income growth save more than those who expect slower income growth.

Dirschmid and Glatzer (2004) analyse household saving in Austria over the period from 1960 to 2002. They find a positive relationship between saving and income growth in both the short-run and the long-run (Dirschmid and Glatzer, 2004: 30). A coefficient of 0.61 is found in the short-run while a coefficient of 0.97 is found in the long-run. Thus if real income grows by 1 percentage point, saving will increase by 0.61 percentage points in the short-run and by approximately 1 percentage point in the long-run (Dirschmid and Glatzer, 2004: 30).

Prinsloo (2000: 9) graphs quarterly movements in the ratio of aggregate gross domestic saving in South Africa along with successive upswings and downswings in the economy's business cycle. In

general, the trend in South Africa is that the savings rate strengthens relative to GDP when the economy is in a downswing and conversely, the savings rate weakens relative to GDP when the economy is in an upswing (Prinsloo, 2000: 9). Although this is not expected *a priori,* the above discussion shows that this finding is unsurprising. Prinsloo (2000: 9) states the reason for this trend is that when the South African business cycle is in an upswing, households are optimistic as they feel more secure and are thus more likely to increase their current consumption thereby decreasing savings. On the other hand, when the South African economy is in a downswing, households are more cautious as lower income growth and a general lack of job security becomes more likely causing households to decrease current consumption and increase savings (Prinsloo, 2000: 9). Prinsloo (2000: 9) states that the behaviour of corporate saving reinforces the cyclical movements in private saving as it also improves relative to GDP when the South African business cycle is in a downswing and weakens relative to GDP when the South African business cycle is in an upswing. The results therefore yield a negative relationship between private saving and phases of the business cycle.

However, Prinsloo (2000: 9) points out some time periods that were exceptions to the above conclusions, notably when an economic upswing coincided (or was the result of) an increase in the gold price. During these times, the aggregate level of saving increased as an increase in the gold price caused the gold mining industry to experience larger profits thereby causing corporate saving to rise (Prinsloo, 2000: 9).

In contradiction to the conclusions reached by Prinsloo (2000), Aron and Muellbauer (2000b: 529) argue that *a priori,* when the South African business cycle is in an upswing one would expect the level of corporate saving to increase as profits are higher thereby allowing corporations to save a greater proportion of their revenue generated. Furthermore, Aron and Muellbauer (2000b: 529) state that when expected income growth rates are high, a greater level of corporate saving is expected since "investment will be particularly profitable".

Aron and Muellbauer (2000b: 538) conclude that the effects of a permanently higher growth rate on household saving in South Africa is likely to be small, due to the simultaneous existence of real interest rates and asset-to-income ratio effects. Harjes and Ricci (2005: 58) empirically analysed the effect of income growth on private saving in South Africa and found this variable to be insignificant, although a positive coefficient was found.

3.2.3. DEMOGRAPHIC VARIABLES

Demographic variables used to analyse private saving include the age structure of a population and the degree of urbanization. The life cycle hypothesis notes the importance of the age structure of a population (Masson *et al.*, 1998: 487). Loayza *et al.* (2000a: 401) reinforce this by stating that an important aspect of the life cycle hypothesis is "age-related consumer heterogeneity and the prediction that saving follows a hump-shaped pattern". This "hump-shaped" pattern refers to the fact that private saving is high at middle age and low at younger and older ages (Loayza *et al.*, 2000a: 401). Accordingly, if a large proportion of the population is of working age, the economy should have a high private saving rate. This is due to the need to save for future retirement years. Conversely, a low private saving rate will be experienced when the population reaches retirement age. This is because at retirement, dis-saving will take place as individuals consume a greater proportion of their income and attempt to maintain previous consumption patterns.

Empirical evidence consistent with the life cycle hypothesis suggests that an increase in younger- and older- age dependency ratios tends to decrease the level of private saving. Edwards (1996: 32) finds the coefficient of the age dependency ratio to be significantly negative, where the age dependency ratio represents the population younger than fifteen years old as well as the population older than sixty-five years old divided by the working age population. This suggests that demographic variables play an important role in explaining differences in private saving across time and between countries (Edwards, 1996: 32).

Loayza *et al.* (2000b: 174) find that the urbanization ratio, as well as the young- and old- age dependency ratios, each yield a statistically significant impact on private saving that is negative. The negative relationship between the urbanization ratio and private saving reflects a precautionary saving motive in the sense that rural residents will tend to save more of their income as they lack the "means to diversify away the high uncertainty of their mostly agricultural income" (Loayza *et al.*, 2000b: 174). The results obtained for the young- and old- age dependency ratios are consistent with the life cycle models of consumption.

Loayza and Shankar (2000: 586) find a negative relationship between private saving and the dependency ratio that is statistically significant in India. Thus, private saving rates are found to move in the same direction as the proportion of the working age population in the total population. The

expectation for India is that as the proportion of people aged 65 and above increases so the rate of private saving will decrease (Loayza and Shankar, 2000: 586).

The World Bank (2011b: 27) too includes demographic variables when analysing South African saving rates. Specifically, the old-age dependency ratio increased slightly over the period from 1995 to 2008, thereby causing a small fall of 0.3 percentage points in domestic saving, while the substantial decline in the young-age dependency ratio should have led to a significant increase in domestic saving (World Bank, 2011b: 27).

3.2.4. FINANCIAL LIBERALIZATION

The inclusion of a financial liberalization variable in empirical analysis has proven to be quite complex (Aron and Muellbauer, 2000b). Empirical studies have employed different indicators of financial liberalization as well as made use of proxy variables (Bayoumi, 1993; Masson *et al.*, 1998; Aron and Muellbauer, 2000b; Loayza *et al.*, 2000b; Harjes and Ricci, 2005; Schrooten and Stephan, 2005; World Bank, 2011b). Two commonly used proxy variables include the ratio of M2 to GDP (Loayza *et al.*, 2000b; Schrooten and Stephan, 2005; World Bank, 2011b) and the ratio of total outstanding consumer credit to GDP, since consumer credit is used to finance deviations of consumption from income (Bayoumi, 1993). The ratio of M2 to GDP is a measure of financial depth (Loayza *et al.*, 2000b). *A priori,* a negative relationship is generally expected, although this may change (discussed below).

According to Masson *et al.* (1998: 486), financial liberalization may have altered the effect of interest rates on private saving. Masson *et al.* (1998: 486) state that the effect of financial liberalization can work through at least two channels. Firstly, from a developmental perspective, increased financial development may provide greater outlets for financial saving, thereby increasing the saving rate in a country. Secondly, financial liberalization has increased the level of bank access providing individuals with greater access to bank credit (Masson *et al.*, 1998: 486). This is due to significant regulatory changes in the financial sector which have allowed banks to lend more freely to individuals. This may have a negative effect on the level of private saving. Financial liberalization may involve either of these two channels, "each of which will tend to increase the sensitivity of saving to interest rates" (Masson *et al.*, 1998: 486). Morande (1998: 219) too states that financial liberalization could have a positive or negative impact on private saving, depending on which of the two channels described dominates.

Loayza *et al.* (2000a: 404) define financial liberalization as representing liberalization of the interest rate, the elimination of credit ceilings, the removal of barriers to entry for foreign financial institutions, the development of capital markets, as well as greater, more effective prudential regulation and supervision. Initially and amongst financial market participants, it was believed that financial liberalization would encourage and thus stimulate domestic saving in an economy.

Edwards (1996: 29) includes the ratio of M2 to GDP in his analysis of financial liberalization on private saving and notes that it is a difficult variable to interpret. Specifically, if it is taken as a proxy for the depth and sophistication of the financial sector, a positive coefficient is expected, yet if it is taken as a measure of the extent to which different countries face a borrowing constraint, a negative coefficient is expected. Edwards (1996: 33) finds the coefficient of M2 to GDP to be statistically significant and positive, which suggests that countries with a deeper financial system tend to have higher private saving rates.

Loayza *et al.* (2000a: 404) state that analytically it is possible to separate the effect of financial liberalization on the level of private saving into a "direct, short-run impact, which is generally negative, and an indirect, long-run impact, which is generally positive". The direct, short-run impact on private saving occurs via price and quantity channels, where the price channel emphasizes the effect of higher interest rates on private saving levels and the quantity channel represents an increase in the supply of credit to individuals who were previously "credit constrained" (Loayza *et al.*, 2000a: 404, 405). In accordance with Aron and Muellbauer (2000b), this allows both households and smaller firms to utilize collateral more widely, thereby decreasing initial down-payments on loans for both housing and consumer durables.

Contrary to most studies, Loayza *et al.* (2000a: 404) note that, higher interest rates are generally an ineffective way of increasing the level of private saving. This suggests that the "negative income effect of higher interest rates tends to neutralize the positive intertemporal substitution effect" (Loayza *et al.*, 2000a: 405). In line with the quantity channel, a greater supply of credit is expected to decrease the level of private saving, as households are able to finance greater consumption at their current level of income. Loayza *et al.* (2000a: 405) find that a 1 percentage point increase in the ratio of private credit flows to income causes a decrease in the long-run level of private saving by 0.74 percentage points. Despite this, Loayza *et al.* (2000a: 405) state that the indirect positive effects of financial liberalization on the level of private saving should not be under-emphasized. Specifically, financial liberalization which occurs mainly through a strengthening of the domestic banking and

financial sector, improves the efficiency of the role of financial institutions in terms of their function as intermediaries. This improves the effectiveness of investment, which is critical for developing countries as it contributes to greater economic growth. Therefore, "it is mostly through faster income growth that financial liberalization will increase private saving rates in the long-run" (Loayza *et al.*, 2000a: 405).

Loayza *et al.* (2000b: 174) also use the ratio of M2 to gross national product (GNP) as an indicator of financial depth and find that this indicator has a small, statistically insignificant impact on private saving. A negative relationship is however found between the ratio of M2 to GNP and private saving.

Aron and Muellbauer (2000b) examine the effect of financial liberalization on private saving in South Africa by modeling corporate and household saving separately. Financial liberalization began in South Africa following the de Kock commission reports in 1978 and 1985, with the effect being a more market-oriented stance on monetary policy (Aron and Muellbauer, 2000b: 521). According to Aron and Muellbauer (2000b: 521), this saw the removal of interest and credit controls and a reduction in banks' liquidity ratios. Increased competition in the mortgage market, demutualization and takeovers consolidated stronger competition in the credit market. The use of pensions to provide additional collateral for housing loans, the rise of access bond accounts which allowed households to borrow up to a certain limit determined by the value of their housing collateral, and a relaxation in exchange controls were further developments. An important aspect of financial liberalization in South Africa was the fact that many households that were previously disadvantaged under the Apartheid regime were given access to bank credit post-1994. Thus, Aron and Muellbauer (2000b) expect a negative relationship between their indicator of financial liberalization and household saving in South Africa *a priori*.

Indirect and interaction effects of financial liberalization in South Africa include the fact that financial deregulation is likely to increase the propensity to spend directly by decreasing the required deposit when purchasing a house (Aron and Muellbauer, 2000b: 537). Another effect is that financial deregulation is likely to "increase the 'spendability' weights on illiquid assets, since both housing collateral and, to a lesser extent, pension collateral could be used for borrowing and hence for spending" (Aron and Muellbauer, 2000b: 519). Financial liberalization should decrease the percentage of credit-constrained household. With the increase in the percentage of households that are not credit-constrained, the real interest rate and expected real income growth will have larger effects on aggregate consumption, but the "effect of uncertainty may weaken if consumers anticipate

that they can borrow more easily in the event of a negative income shock" (Aron and Muellbauer, 2000b: 519). The final effect is that financial liberalization and income distribution may work together as access to credit is increased at lower income levels.

Aron and Muellbauer (2000b: 539) find that financial liberalization in South Africa causes corporate and household saving to move in opposite directions. Specifically, financial liberalization was found to decrease the level of household saving by a much greater amount than it increased the level of corporate saving. They state that financial liberalization has allowed households to substantially increase their levels of debt to income since the early 1980s (Aron and Muellbauer, 2000b: 512). Since household debt has its counterpart in corporate assets, especially assets of financial corporations, this may contribute to the relatively high corporate saving rate sustained at the beginning of the 1990s. Between 1983 and 1997, financial liberalization directly decreased household saving by approximately 21 percent (Aron and Muellbauer, 2000b: 524).

Prinsloo (2000: 19) too concludes that greater access to credit was a key factor impacting on saving in South Africa. Household spending increased as borrowing was made possible and households' use of consumer credit facilities relative to household disposable income increased significantly (Prinsloo, 2000: 19). *A priori*, a negative relationship is expected between increases in the level of household consumer credit and their level of saving (Prinsloo, 2000: 21).

Harjes and Ricci (2005: 55) use a simple measure of financial liberalization in South Africa which includes "the sum of several dummy variables that account for a number of elements of financial liberalization over the past two decades". They found a negative relationship between private saving and financial liberalization, with the effects of financial liberalization occuring primarily through household saving (Harjes and Ricci, 2005: 60). This confirms results obtained in previous studies (Masson *et al.*, 1998; Loayza *et al.*, 2000a; Loayza *et al.*, 2000b) and implies that financial liberalization has improved access to bank credit and has therefore led to a reduction in the level of saving. However, as financial development progresses and banking products and services become more accessible and more widespread, the long-run effect on private saving is uncertain as opportunities for both increased saving as well as increased borrowing will become apparent (Harjes and Ricci, 2005: 60).

The World Bank (2011b: 27) states that financial liberalization creates two effects on saving in South Africa. The income effect of financial liberalization tends to increase saving while the substitution

effect of financial liberalization tends to decrease saving causing the net effect to be uncertain. This is in accordance with Masson *et al.* (1998). The World Bank (2011b: 27) finds the negative substitution effect to dominate and thus finds a negative relationship between financial liberalization and saving. Specifically, the increase in real interest rates in South Africa caused saving to decrease by 1.3 percentage points (World Bank, 2011b: 27). The level of financial depth (measured by the ratio of M2 to GDP) remained practically unchanged over the period under study thereby having only a small impact on saving.

3.2.5. THE INFLATION RATE

Inflation has been used empirically as a proxy for macroeconomic uncertainty (Carroll and Summers, 1987; Kessler *et al.*, 1993; Edwards, 1996; Loayza *et al.*, 2000a; Boone, Girouard and Wanner, 2001; Schrooten and Stephan, 2005). The level of uncertainty may have a substantial effect on the level of private saving in an economy. Masson *et al.* (1998: 488) find that increases in inflation may result in increases in the nominal interest rate, which will result in increased household income and saving.

Greater uncertainty results in an increase in the level of saving since risk-averse individuals set resources aside as a precaution against potential adverse changes in income and other such factors (Loayza *et al.*, 2000a: 402). This links to the precautionary saving motive. Uncertainty may help to explain why consumption follows income closely in the case of younger consumers "who expect positive but uncertain future income growth", as their risk aversion "is at war with their impatience" (Carroll, 1991 in Loayza *et al.*, 2000a: 402). Uncertainty also explains why those in retirement choose to save a positive amount or dis-save a little as they face uncertainty regarding the length of their life as well as health costs and medical expenses. Thus, *a priori,* a positive relationship is expected between inflation and private saving.

Edwards (1996) includes the inflation rate in his analysis to capture the degree of macroeconomic stability and expects a negative relationship *a priori.* He finds the coefficient of inflation to be insignificant (Edwards, 1996: 34). In a general model employed, Kessler *et al.* (1993: 41) find a positive relationship between expected inflation and household saving. Thus an increase in future uncertainty results in an increase in household saving.

Morande (1998) examines private savings in Chile over the period from 1960 to 1995. A positive, statistically significant relationship is found between private saving and inflation although the coefficient obtained is low (Morande, 1998: 219).

Loayza *et al.* (2000b: 174) find the inflation rate and private saving rate to be positively related. A decrease in the level of inflation by 10 percentage points results in a decrease in private saving by more than 1 percentage point, which suggests that an increase in the level of macroeconomic uncertainty prompts individuals to save more out of current income as a precautionary motive (Loayza *et al.*, 2000b: 175).

After empirically examining corporate saving in South Africa, Aron and Muellbauer (2000b: 538) conclude that the increase in the inflation rate between the late 1960s and the late 1980s was a critical factor in explaining the increase in the share of corporate saving in net profits. However, with the decrease in inflation in the 1990s, the level of corporate saving was supported by high real interest rates and the liberalization of household credit markets (Aron and Muellbauer, 2000b: 538). The effect of inflation on corporate saving was found to be positive, indicating that higher inflation encourages corporations to retain earnings (Aron and Muellbauer, 2000b: 529).

Inflation was found also to increase the level of household saving in South Africa. Aron and Muellbauer (2000b: 539) attribute this to wealth effects and measured disposable income, "since measured interest income rises with higher nominal interest rates".

The World Bank (2011b: 27) too includes the inflation rate as a proxy for macroeconomic uncertainty in its empirical analysis of savings in South Africa. Risk-averse individuals who are faced with uncertain events and who are unable to perfectly insure risks due to incomplete financial markets accumulate assets to avoid suffering large adjustments in consumption. The World Bank (2011b: 26) analyses two sub-periods in South Africa; 1968 to 1994 and 1995 to 2008. The inflation rate fell in South Africa in the second sub-period thereby decreasing the need for precautionary saving. The model employed by the World Bank (2011b: 27) predicts that this effect would have caused national saving to be 1.3 percentage points lower over the second sub-period.

3.2.6. WEALTH

The life cycle theory postulates that the MPC out of wealth should equal the MPC out of transitory income and should thus be very small (Dornbusch *et al.*, 1999: 303). This is because spending out of

wealth, resembling spending out of transitory income, is dispersed over an individual's remaining years of life. According to Dornbusch *et al.* (1999: 303), the MPC out of wealth is used to relate changes in the value of assets to current consumption. By way of an example, increases in the value of the stock market will increase current consumption since changes in the value of the stock market can be substantially large in comparison to changes in income. Thus, even though the MPC out of wealth is small, the impact of a large change in the stock market multiplied by a small MPC may cause a considerable change in household consumption (Dornbusch *et al.*, 1999: 304).

The permanent income hypothesis states that consumption is proportional to permanent income (Froyen, 2005: 459). Dornbusch *et al.* (1999: 304) states that permanent income is the steady rate of consumption an individual can maintain over a lifetime, given the present level of wealth and income earned now and in the future. Thus, permanent income is the expected average of long-term income from both expected labour income (derived from human wealth) and expected earnings from asset holdings (financial wealth) (Froyen, 2005: 459). Since consumption is proportional to the total value of current assets, an increase in the value of these assets should see consumption increase, thereby causing a decrease in household saving. An important aspect of the permanent income hypothesis is that only permanent income influences consumption behaviour. Given this, *a priori,* a negative relationship is expected between an indicator of wealth and private saving.

Lettau and Ludvigson (2001: 815) examine the role of fluctuations in the ratio of consumption to wealth for predicting stock returns using US stock market data. In terms of the "smoothing" of consumption over lifetimes, Lettau and Ludvigson (2001: 817) state that when excess returns are expected to increase in the future, forward-looking individuals will react by increasing consumption out of current asset wealth and labour income. Consumption will therefore rise above its common trend. Similarly, when excess returns are expected to decrease in the future, individuals will react by decreasing consumption out of current asset wealth and labour income (Lettau and Ludvigson, 2001: 817). Thus consumption will fall below its common trend.

Masson *et al.* (1998: 488) analyse the effect of financial wealth on private saving and suggest a negative relationship should be found in a life cycle model since it increases the amount of resources available for consumption. In their panel data study, which combines both industrial and developing countries, Masson *et al.* (1998: 491) find the wealth variable to be statistically significant and to increase private saving. When separately analysing industrial and developing countries, Masson *et al.*

(1998: 494) find the coefficient of the wealth variable to be positive and significant for industrial countries and negative but insignificant for developing countries.

Boone *et al.* (2001) examine the effects of financial deregulation on wealth across different countries. Boone *et al.* (2001: 6) state that financial deregulation should affect consumption through housing wealth effects as it allows a greater number of households to become homeowners and thus increases the amount they are able to borrow on the back of higher collateral values. This impact should enhance the targeted level of consumption (Boone *et al.*, 2001: 6). Accordingly, an increase in wealth corresponds to an increase in income, implying a progressive increase in the level of consumption (Boone *et al.*, 2001: 6).

De Serres and Pelgrin (2002) examine private saving rates between fifteen OECD countries over the period from 1970 to 2000. In those countries where a decrease in household saving was experienced, a simultaneous increase in households' financial net worth was recorded (de Serres and Pelgrin, 2002: 7). Thus, the decrease in household saving was attributed to a significant increase in household's financial wealth. Theoretically, this would be the case if households viewed the increase in assets (stock prices) as a permanent increase in wealth, thereby leading to a decrease in saving as discussed above (de Serres and Pelgrin, 2002: 7).

In a study of annual regional saving rates in the United Kingdom (UK) from 1971 to 1988, Bayoumi (1993) included regional real house prices and real national share prices as a proxy for wealth (Bayoumi, 1993: 1435). *A priori,* a negative relationship was expected between wealth and household saving. Bayoumi (1993: 1440) found that an increase in wealth caused by higher real values of houses and shares caused saving to decrease approximately 5 percentage points during the 1980s.

Barr and Kantor (1994) discuss the changing pattern of savings in South Africa over the period from 1970 to 1991. According to Barr and Kantor (1994: 66), if consumption is a function of wealth as opposed to disposable incomes (as the permanent income hypothesis and life cycle theory of consumption suggest), then increases in household wealth created from home ownership and from growth in the value of retirement funds would significantly encourage greater consumption expenditure thereby causing a decrease in household saving. As a result, the level of household saving in South Africa was found to decrease as a result of increased returns on the stock exchange and increased house prices (Barr and Kantor, 1994: 66).

Aron and Muellbauer (2000b: 515) construct a series for a range of personal assets at market value to analyse wealth effects on household saving in South Africa. They find evidence of two wealth effects: "liquid assets minus debt appear to be about twice as spendable as illiquid assets, the components of which have similar degrees of spendability," where illiquid assets consist of housing assets, directly held illiquid financial assets, and pension assets (Aron and Muellbauer, 2000b: 524). Aron and Muellbauer (2000b: 521) find that in the 1980s there was a substantial decrease in households' holdings of liquid assets relative to non-property income, which coincided with a decrease in the household saving rate as well as an adjustment to saving in pension and retirement funds offering greater returns to those on liquid assets.

Since the 1980s, pension wealth relative to income has increased in South Africa (Aron and Muellbauer, 2000b: 521). However, Aron and Muellbauer (2000b: 521) conclude that although pension wealth is the biggest asset, its growth has been offset by the decrease of housing wealth relative to income during their study period. Post-2000, house prices rose rapidly in South Africa. This may mean that the effect of housing wealth on private saving has increased dramatically. Thus, this study includes a house price index in South Africa to determine if housing wealth has impacted on private saving.

3.2.7. THE FOREIGN SAVING RATE

The Commission for Growth and Development (2008: 3) states that foreign saving represents an imperfect substitute for domestic saving (including government saving) to finance the investment required of a booming economy. The current account expressed as a ratio of GDP has been used as a proxy for foreign saving in many empirical studies (Corbo and Schmidt-Hebbel, 1991; Edwards, 1996; Masson *et al.,* 1998; Loayza *et al.,* 2000a; Loayza *et al.,* 2000b; Schrooten and Stephan, 2005). Corbo and Schmidt-Hebbel (1991: 99) state that foreign saving impacts on private consumption, and thus private saving, when it is a (partial) substitute for private saving in a regime of binding foreign resource constraints. According to Fry (1980: 317) "it is rational economic behaviour to react to an increase in foreign saving inflows by consuming more in the present as well as in the future". *A priori,* a negative relationship is expected between the current account balance (deficit) and private saving (Loayza *et al.,* 2000b).

Loayza *et al.* (2000b: 166) state that the current account deficit is an uncertain explanatory variable since it is "jointly determined with saving in countries and / or at time periods characterized by

unrestricted access to net foreign lending, and is exogenously determined otherwise" (Loayza *et al.*, 2000b: 177). They find that a worsening of the current account deficit, which is equivalent to an increase in the level of foreign saving, is partially offset by a decrease in private saving; specifically, the offset coefficient is 33 percent in the short-run and 60 percent in the long-run (Loayza *et al.*, 2000b: 177). These results confirm the view that foreign saving represents a substitute for domestic saving, especially domestic private saving, and therefore can be said to crowd out domestic saving. Morande (1998) conducts an empirical study on private saving in Chile over the period from 1960 to 1995. Morande (1998: 216) too finds that foreign saving crowds out private saving, although the coefficient obtained is below one.

Edwards (1996: 34) found the current account balance to be statistically significant and positive in all estimations. The estimated coefficient was however less than one indicating that increases in foreign saving crowd out private saving in a ratio that is less than one-to-one (Edwards, 1996: 34). Corbo and Schmidt-Hebbel (1991: 104) find foreign saving to have a major and consistently positive effect on private consumption across their sample of thirteen developing countries. Specifically, foreign saving is found to partially substitute private saving such that an increase in $1 in the current account deficit results in an increase in private consumption by an average of 42 cents (Corbo and Schmidt-Hebbel, 1991: 104).

Masson *et al.* (1998: 488) examine the effects of foreign saving on private saving. Specifically, foreign saving becomes a "potential exogenous determinant of national saving when foreign borrowing is rationed," which is often the case in developing countries (Masson *et al.*, 1998: 488). Masson *et al.* (1998: 498) conclude that the level of foreign saving negatively affects private saving in developing countries. Although this offsetting relationship is quite substantial, it only partially suggests that foreign saving increases the level of domestic investment.

Agosin (2001: 511) finds that in the long-run foreign saving is a perfect substitute for corporate saving in Chile. While corporations may find themselves constrained in their access to foreign saving in the short-run, this was not found to be the case in the long-run (Agosin, 2001: 511).

3.2.8. THE REAL INTEREST RATE

According to Prinsloo (2000: 16), an increase in the after-tax real interest rate will cause an increase in the rate of return on accumulated saving, which increases the opportunity cost of current

consumption. Therefore, household saving should increase with an increase in the real interest rate (Prinsloo, 2000: 16). However, "the future income expected from this higher rate of return on saving may encourage current consumption" (Prinsloo, 2000: 16). These are the substitution and income effects which work in opposing directions yielding the effect of real interest rates on saving ambiguous (Masson *et al.*, 1998; Prinsloo, 2000; Loayza *et al.*, 2000b). Therefore one cannot determine, *a priori*, the net effect of a change in the real interest rate on the level of household saving with certainty (Prinsloo, 2000: 16).

Masson *et al.* (1998: 485) too state that the effect of interest rates on consumption is ambiguous due to the offsetting substitution and income effects. The income effect reflects the fact that the private sector is a "net creditor in financial assets" (Masson *et al.*, 1998: 485). Human wealth, defined by Masson *et al.* (1998: 485) as "discounted future labour income", is far greater than financial wealth for a given individual and is negatively related to the interest rate. This suggests that the substitution effect should dominate. However, individuals may respond primarily to current income as opposed to planning their lifetime consumption (Masson *et al.*, 1998: 486). Empirically, Masson *et al.* (1998: 493) find that the real interest rate has a significant, positive effect for developed countries, but an insignificant, negative effect for developing countries. The results obtained are not very robust and Masson *et al.* (1998: 493) state that the difference in results obtained for developed and developing countries may be a result of differences in financial liberalization.

Loayza *et al.* (2000b: 174) find that the real interest rate is negatively related to the private saving rate. Specifically, in the short-run, an increase in the real interest rate of 1 percentage point results in a decrease in private saving of approximately 0.25 percentage points (Loayza *et al.*, 2000b: 174).

Edwards (1996: 33) uses the real interest rate as a proxy to capture "the extent of development of the financial market, the severity of the borrowing constraint and the degree of financial repression". The coefficient of the real interest rate was however found to be insignificant in all estimations (Edwards, 1996: 34).

Loayza and Shankar (2000: 586) find the effect of the real interest rate on saving in India to change significantly depending on the measure of saving used. Specifically, the real interest rate is positively associated with private saving rates once these have been adjusted for inflation-related capital losses and augmented to include consumer durables (Loayza and Shankar, 2000: 588). This result indicates that the substitution effect of interest rate changes is larger and thus the income effect is smaller when

applied to consumption of durables with respect to other forms of saving (Loayza and Shankar, 2000: 588).

Dirschmid and Glatzer (2004: 31) find a positive relationship between the real interest rate and household saving in Austria. Specifically, an increase of 1 percentage point in the real interest rate causes the saving rate to increase by approximately 0.69 percentage points in the short-run and by as much as 1.16 percentage points in the long-run. Dirschmid and Glatzer (2004: 31) therefore conclude that households postpone present consumption to the future by increasing saving.

Harjes and Ricci (2005: 52) too conclude that the effect of real interest rates on saving is ambiguous due to the income and substitution effects. The income effect refers to the fact that an increase in the real interest rate makes individuals wealthier thereby incentivizing individuals to consume more and save less. The substitution effect, however, refers to the fact that an increase in the real interest rate will increase the return on saving, thereby incentivizing individuals to postpone current consumption and save more. Harjes and Ricci (2005: 60) found the effect of the real interest rate on private saving to be insignificant in South Africa over the period from 1970 to 2002, although a negative relationship was found. Corbo and Schmidt-Hebbel (1991: 104) too find the coefficient of the real interest rate to be negative and statistically insignificant.

Aron and Muellbauer (2000b: 537) find that real interest rates have a direct, negative impact on consumption, which is due to "the mix of substitution, income, and user-cost-of-durables effects predicted by economic theory". Specifically, given income and growth, Aron and Muellbauer (2000b: 539) found higher real interest rates to positively affect both corporate and household saving.

3.2.9. A COMMODITY PRICE INDEX

In recent years, global commodity prices have risen to record highs. Theoretically this should prove to be beneficial for many commodity-producing countries, such as South Africa, since greater export earnings should be obtained at these higher prices. Higher commodity prices for commodity exporters reflect an improvement in the terms of trade. One would expect that at such a time of record export prices, the aggregate domestic saving rate of a commodity-producing country would increase. This was the case for South Africa during the 1980s when high saving rates were recorded due to the gold price boom (Aron and Muellbauer, 2000b; Barr and Kantor, 1994). This was also the case in recent years for several commodity-producing countries; such as Chile, Canada and Brazil. According to

data obtained from the World Bank (2011a), over the period from 2005 to 2007, the current account balance expressed as a ratio of GDP in each year was 1%, 5% and 5% respectively for Chile, 2%, 1% and 1% respectively for Canada and 2%, 1% and 0% respectively for Brazil. Evidently, current account surpluses were maintained in these countries during the commodity price boom due to increased export earnings. In contrast, South Africa experienced current account deficits over this period. Thus, *a priori,* a positive relationship is expected between private saving and a commodity price index.

Loayza *et al.* (2000b: 173) include a terms of trade variable in their analysis and find that in the short-run a 10 percent improvement in the terms of trade increases private saving by 0.74 percentage points thereby yielding a positive relationship between these two variables.

In studying the determinants of private saving in South Africa, it is therefore important that a commodity price index is included in the analysis, since the production and export of certain primary commodities, for example gold and platinum, play a critical role in domestic economic activity (Harjes and Ricci, 2005: 48). Specifically, Harjes and Ricci (2005: 48) state that international price movements for these commodities will tend to affect the overall profits generated in the mining and related sectors and may thus generate profits that can be saved. *A priori*, Harjes and Ricci (2005: 55) expect a positive relationship to exist between a commodity price index and private saving, especially given the large number of commodity producers in South Africa and their relative weight in domestic production.

Harjes and Ricci (2005) find commodity prices are indeed a very important factor in explaining movements in the level of private saving in South Africa. They find a highly statistically significant coefficient to exist, which is positively related to private saving; specifically, an increase in real commodity prices of 10 percent results in an increase in the ratio of saving to gross national disposable income (GNDI) by slightly more than two thirds of 1 percentage point (Harjes and Ricci, 2005: 59). Harjes and Ricci (2005: 60) conclude that the effect of commodity prices as measured via a commodity price index occurs primarily through corporate saving.

3.2.10. THE INVESTMENT RATE

According to Fry (1980: 317) saving and investment are both determined by the rate of economic growth. Increased economic growth increases the saving rate which then releases resources required

to sustain growth levels through higher investment (Fry, 1980: 317). If investment is low, both growth and saving levels fall; while increases in investment ensure increased saving. Therefore, domestic saving and investment ratios are generally strongly and positively correlated in empirical analysis and as such a positive relationship is expected *a priori* (Morande, 1998: 203).

In an open economy, domestic saving and investment rates may move substantially independently of each other. This is because the global pool of savings may be used to fund local investment projects, which occurs in the form of foreign capital inflows. In terms of the correlation between domestic saving and investment, Feldstein and Horioka (1980) discuss two opposing views. The first states that in a world of perfectly mobile capital there is no relationship between domestic saving and investment in a country, while the second states that if portfolio preferences and institutional rigidities hinder the flow of capital between countries in the long-run, increases in the level of domestic saving will result in increases in the level of domestic investment (Feldstein and Horioka, 1980: 327). In this second case domestic saving and investment are said to be highly correlated.

Empirical results provide evidence in support of this second view to the extent that international differences in domestic saving rates correspond closely to differences in domestic investment rates (Feldstein and Horioka, 1980: 328). Feldstein and Horioka (1980) showed that in reality domestic saving and investment are highly correlated and found that for a cross-section of twenty-three industrialised countries, over the period from 1965 to 1986, the higher the saving rate of a country, the higher was the investment to GDP ratio. According to the World Bank (2011b: 16), South Africa's saving and investment rates have been highly correlated; over the period from 1960 to 2010, a positive correlation coefficient of 0.72 was found.

Feldstein and Horioka (1980: 328) conclude that their finding is not inconsistent with the existence of large international capital flows of long term portfolio and direct investments. Specifically, foreign direct investment takes place to "enhance trade positions or to take advantage of special knowledge" and therefore will not be sensitive to "differences in saving rates or relative capital intensities" (Feldstein and Horioka, 1980: 328). The extent to which some foreign portfolio and direct investment is made in search of higher yields is limited drastically by institutional hurdles which may exist as well as portfolio preferences.

According to the World Bank (2011b: 16), high rates of investment require proportionate domestic saving although it is not necessary that investment be financed through domestic saving if the country has access to external financing.

Investment and economic growth have empirically been shown to be strongly positively correlated. According to Harjes and Ricci (2005: 48), growth models, at least temporarily, forecast a positive response of economic growth to investment. As discussed above, investment needs saving, which may come from either domestic or foreign sources. While foreign saving can fund domestic investment, it is important that domestic saving increases in the long-run since an economy should not and cannot rely on foreign saving. The Commission for Growth and Development (2008) states that there is no record of a country sustainably growing rapidly without also having a high level of domestic saving. Thus, the additional increases in domestic saving are important to finance higher economic growth levels in South Africa.

3.3. CONCLUSION

This chapter summarized those factors discussed in the literature that are considered statistically significant in determining private saving. Variables discussed included the government budget deficit, the rate of economic or income growth, demographic variables such as the young- and old-age dependency ratios and the urbanization ratio, an indicator of financial liberalization, the inflation rate, an indicator for household wealth, the rate of foreign saving, the real interest rate, a commodity price index and the rate of investment.

It was shown that while there is considerable international support for the *a priori* expectations of the impact of these variables on savings, the results were sometimes mixed. This is partially explained by the conflicting *a priori* expectation of, for example, the impact of real interest rates and economic growth rates on private saving as well as the impact of wealth on private saving. The use of different indicators of financial liberalization employed in empirical studies may also cause conflicting *a priori* expectations. It is therefore important to test these variables against private saving empirically in order to achieve a more conclusive result.

The next chapter presents the econometric methodology and analytical framework used in this study to model both corporate and household saving to establish the channels through which the individual variables impact on private saving in South Africa.

CHAPTER FOUR:

ECONOMETRIC METHODOLOGY AND ANALYTICAL FRAMEWORK

4.1. INTRODUCTION

This chapter examines the determinants of private saving in South Africa based on the variables identified in the literature and discussed in previous chapters. The data and any proxy variables to be used in the empirical research are presented, highlighting any data limitations encountered during this process. The econometric methodology to be used to achieve the goals and objectives of this study as outlined in Chapter One is described.

Separate models for corporate saving and household saving are estimated in accordance with the methodology followed by Aron and Muellbauer (2000b) and Agosin (2001). This is because there are some factors, such as lower real interest rates, which may cause household saving and corporate saving to move in the same direction, while other factors such as financial liberalization, changing terms of trade, or a shift in government saving behaviour, may cause household saving and corporate saving to move in opposite directions (Aron and Muellbauer, 2000b: 512). According to Aron and Muellbauer (2000b: 512), "the changing composition of private saving could have multiple causes and merit specific policy responses". While some authors (Poterba, 1987; Sachs and Larrain, 1993; Barr and Kantor, 1994; Aron and Muellbauer, 2000b) have hypothesized that households are able to "pierce the corporate veil", thereby implying that the compositional changes in private saving are irrelevant since corporate saving and household saving offset each other, the evidence regarding this hypothesis is inconclusive. Therefore, it is necessary to empirically examine those factors driving corporate saving separate from those factors driving household saving (Aron and Muellbauer, 2000b: 513). It is for these reasons that this study estimates separate models of corporate saving and household saving.

The nature of the data used allows for the determination of long-run equilibrium relationships between several variables. The Johansen (1988) and Johansen and Juselius (1990) test for cointegration is used as it provides an analysis of variables deemed statistically significant in explaining relative changes in both corporate saving and household saving and allows for the

estimation of long-run equilibrium relationships between identified variables. This is important as South Africa needs to grow its economy. According to the World Bank (2011b: 11), South Africa aims to raise potential GDP growth to between 6 and 7 percent per annum. The current low level of saving (see Chapter Two) needs to be addressed in order to achieve such a growth rate. The Commission for Growth and Development (2008) and the World Bank (2011b) show that fast growing emerging market economies exhibit high levels of both investment and savings. This was discussed in Chapter One, where emphasis was placed on the fact that South Africa's saving rate falls far short of that exhibited in these fast growing economies.

The World Bank (2011b: 17) shows that South Africa's saving and investment rates were highly correlated over the period from 1960 to 2010, yielding a correlation coefficient of 0.72. In order for South Africa to achieve higher growth levels (through increased investment expenditure), domestic saving needs to be enhanced as foreign capital inflows have proven to be volatile and unsustainable in the longer term. Since private saving is the dominant component of domestic saving in South Africa, it is necessary to analyse the two components of private saving to suggest ways of stimulating the domestic saving rate. By focusing on corporate saving and household saving separately, this study aims to identify significant long-run relationships within each of these components of private saving.

This chapter is set out as follows: Section 4.2 presents the data as well as proxy variables used in the econometric analysis for each of the corporate and household saving models. Section 4.3 discusses two different types of cointegration tests commonly used in empirical analysis. A discussion of the descriptive statistics obtained in the first part of the econometric analysis is presented in section 4.4. Section 4.5 provides the analytical framework for the Johansen method of cointegration employed in this study. In this section, tests for stationarity, Vector Autoregression (VAR) and cointegration are discussed in detail. Section 4.6 discusses impulse response functions and variance decomposition while section 4.7 discusses block exogeneity and Granger causality tests. Finally, section 4.8 concludes this chapter and introduces Chapter Five – the empirical results chapter.

4.2. THE DATA AND PROXY VARIABLES

This section describes the data and proxies used in the corporate saving model and the household saving model. Data limitations are also discussed. An important aspect of time series analysis is graphical analysis. As such, graphs of each of the variables identified in the literature and used in the empirical analysis are presented and briefly discussed.

The data are obtained from the South African Reserve Bank's online download facility, Thomson Datastream, and ABSA Home Loans[3]. The period under study is from 1981Q1 to 2010Q4 providing 120 observations in total. This period was chosen to include as many observations as possible, which is important for the estimation of robust results. Furthermore, in the early 1980s high gold prices were recorded. As a result the mining industry, and thus a significant number of South African corporations, was able to retain large windfall profits (Aron and Muellbauer, 2000b: 510). At this time, the private saving rate increased significantly due to the large increases in corporate saving. Based on this, one would expect that at a time of rising commodity prices (as is the case presently) corporate saving would increase because of windfall profits being recorded. It is therefore necessary to include 1981 as the start date of the analysis in order to capture the effects of this significant event in South African history.

4.2.1. CORPORATE SAVING

Corporate saving data are only available in an annual frequency from the South African Reserve Bank. Quarterly corporate saving data was therefore derived using available quarterly data from the South African Reserve Bank for gross saving (total), household saving, and government saving. Annual depreciation data was assumed to be unchanged for each quarter, allowing for the calculation of quarterly corporate saving data as the residual.

For the corporate saving function, corporate saving is expressed as a ratio of GDP (CS_GDP) and is used as the dependent variable. Key macroeconomic variables identified in the literature include a commodity price index (COMPI) (Harjes and Ricci, 2005), the real interest rate (REAL_PRIME) (Masson *et al.*, 1998; Loayza *et al.*, 2000a; Loayza *et al.*, 2000b; Harjes and Ricci, 2005; World Bank, 2011b), the inflation rate (CPI) (Loayza *et al.*, 2000a; Loayza *et al.*, 2000b; Aron and Muellbauer, 2000b; Harjes and Ricci, 2005; World Bank, 2011b), the national budget balance (GOVBUDGET) expressed as a ratio of GDP (to capture Ricardian equivalence, if any) (Masson *et al.*, 1998; Loayza *et al.*, 2000a; Loayza *et al.*, 2000b; Aron and Muellbauer, 2000b; Harjes and Ricci, 2005), foreign saving (CA_GDP) (Masson *et al.*, 1998; Loayza *et al.*, 2000a; Loazya *et al.*, 2000b), real GDP (REAL_GDP), a measure of financial liberalization (M2_GDP) (Bayoumi, 1993; Masson *et al.*, 1998; Prinsloo, 2000; Aron and Muellbauer, 2000b; Loayza *et al.*, 2000a; Harjes and Ricci, 2005; World Bank, 2011b), and the level of gross fixed capital formation of private business enterprises as a ratio of GDP (GFCF_GDP) (World Bank, 2011b). The natural logarithms of COMPI, M2_GDP and

[3] Jacques du Toit of ABSA Home Loans provided the author with the ABSA House Price Index.

REAL_GDP were used in the empirical analysis. Appendix 1 provides a detailed description of the data and their origin[4].

The commodity price index used is the Thomson Reuters commodity price index obtained from Thomson Datastream and the real prime interest rate is the nominal quoted prime overdraft rate in South Africa adjusted for consumer price inflation over the previous twelve months.

Thus, the corporate saving function is represented by the following function:

$$CS/GDP = f(CA/GDP, COMPI, REAL\ GDP, GFCF/GDP, REAL\ PRIME, GOV\ BUDGET, M2/GDP, CPI) \quad \ldots (4.1)$$

According to Harjes and Ricci (2005: 57), inflation "is used as a proxy for price uncertainty and macroeconomic stability and may capture the effects of the precautionary saving motive". The current account balance expressed as a ratio of GDP is used as a proxy for foreign saving, where a current account surplus represents negative foreign saving and a current account deficit represents positive foreign saving (Masson *et al.*, 1998: 489).

Aron and Muellbauer (2000b) employ an indicator of financial liberalization in their household saving model. "This indicator is proxied by a linear spline function and the parameters are estimated, subject to cross-equation restrictions, from a joint estimation of the household consumption and debt equations" (Aron and Muellbauer, 2000a: 1). Bayoumi (1993: 1435) used the ratio of total outstanding consumer credit to GDP as a proxy for financial deregulation because consumer credit is used to finance deviations of consumption from income. This is a useful proxy as it measures the extent to which consumers utilize credit markets to smooth out consumption expenditure over time (Bayoumi, 1993: 1435). The financial liberalization variable used by Harjes and Ricci (2005) "is the sum of several dummy variables that account for a number of elements of financial liberalization" occurring over the past two decades in South Africa (Harjes and Ricci, 2005: 55). Such occurrences include the removal of interest rate ceilings, decreases in reserve requirements, the opening of international markets, and the removal of credit controls (Harjes and Ricci, 2005: 55). Other empirical studies (Loayza *et al.*, 2000b; World Bank, 2011b) employ the ratio of M2 to GDP to measure financial depth and therefore as a proxy for financial liberalization.

[4] Variables in brackets represent names of data used in empirical analysis.

Due to the complexity of the technique employed by Aron and Muellbauer (2000a, 2000b), this study used a proxy to measure the effects of financial liberalization in South Africa. This proxy follows Loayza *et al.* (2000b) and the World Bank (2011b) and is the ratio of M2 to GDP. While the proxy employed by Bayoumi (1993) may well have been used, more studies (Edwards, 1996; Loayza *et al.*, 2000b; Schrooten and Stephan, 2005; World Bank, 2011b) have used the ratio of M2 to GDP in empirical analysis and as such it was the preferred measure since comparisons can be made between results obtained in this study and other studies.

4.2.1.1. *A priori* Expectations

With equation (4.1) kept in mind, the *a priori* expectations of each of the variables on corporate saving will now be discussed. *A priori,* one would expect a negative relationship to exist between corporate saving and the proxy for foreign saving, i.e. the current account balance expressed as a ratio of GDP. Improvement in the current account balance equates to negative foreign saving and as such an increase in domestic corporate saving. Conversely, deterioration in the current account balance equates to positive foreign saving and as such a decrease in domestic corporate saving.

For reasons discussed in section 3.2.9, a positive relationship is expected between the commodity price index and corporate saving. This is especially so since South Africa is a commodity producing country. As mentioned in section 4.2.1, inflation is used to proxy macroeconomic uncertainty and may capture the precautionary saving motive. Consequently, *a priori,* a positive relationship is expected between corporate saving and inflation. As the level of macroeconomic uncertainty increases, corporations should increase their level of saving as a buffer stock.

The relationship between corporate saving and real GDP has been argued to be both positive and negative (Prinsloo, 2000; Aron and Muellbauer, 2000b). This study uses real GDP to capture the South African economic business cycle. Prinsloo (2000: 9) discusses the relationship between savings and GDP and states that when the economy is in a downswing, the saving rate strengthens relative to GDP while the saving rate weakens relative to GDP when the economy is in an upswing (see section 3.2.2). Thus, Prinsloo (2000: 9) concludes that *a priori,* a negative relationship exists between saving and the phases of the business cycle, but notes that there are some exceptions to this, such as the gold price boom experienced in the early 1980s. In contrast, Aron and Muellbauer (2000: 529) explain that when the South African business cycle is in an upswing, one would expect the level of corporate saving to increase due to higher profits being recorded, allowing a greater proportion of saving out of

revenue (see section 3.2.2). This yields *a priori,* the expectation of a positive relationship between corporate saving and real GDP.

Most empirical studies (Kessler *et al.,* 1993; Edwards, 1996; Masson *et al.,* 1998; Morande 1998; Loayza *et al.,* 2000b) conclude that a positive relationship is expected between economic growth and private saving. Given these opposing arguments, this study expects a positive relationship between real GDP and corporate saving since at a time of higher economic growth, a greater proportion of retained earnings is expected. Furthermore, in line with conclusions reached by Masson *et al.* (1998), the positive impact of economic growth on private saving may be more pronounced for developing economies, such as South Africa.

A priori, a positive relationship is expected between corporate saving and the level of gross fixed capital formation (investment) of private business enterprises. This is because corporations are expected to retain earnings to fund a proportion of their investment (see section 3.2.10).

The literature (Masson *et al.,* 1998; Loayza *et al.,* 2000a, 2000b) discusses two effects of the real interest rate on private saving, namely the substitution effect and the income effect (see section 3.2.8). The relationship between the real interest rate and corporate saving, and thus the *a priori* expectation, is determined by which of these two effects dominates and could be either positive or negative respectively.

A hypothesis commonly referred to in the literature (Loayza and Shankar, 2000; Agosin, 2001) as Ricardian equivalence explains the relationship between the government budget balance and private saving (see section 3.2.1). *A priori,* a negative relationship is expected between these two variables since government saving offsets private and thus corporate saving. Although Ricardian equivalence is a common theme in empirical studies on household saving, this study tests for Ricardian equivalence in the corporate saving model to determine if it is applicable to corporate saving. Should a significant coefficient be obtained, a negative relationship is expected *a priori.*

A priori, a negative relationship is expected between corporate saving and the indicator of financial liberalization, the ratio of M2 to GDP. Financial liberalization has improved the sophistication of the financial sector in South Africa and as such, has removed borrowing constraints previously faced by corporations. Moreover, corporations can now acquire funds more easily in both domestic and foreign capital markets (see section 3.2.4).

4.2.1.2. Graphical Analysis

This section presents the graphical plots of corporate saving against each of the variables included in the corporate saving model. This is important in analysing past trends between corporate saving and each of the variables included in the empirical analysis.

Figure 4.1 graphs corporate saving and gross fixed capital investment (GFCF_GDP) (investment) of private business enterprises (as ratios of GDP) as well as real GDP. There are periods, such as from 1981Q1 to 1982Q1 and from 1993Q3 to 1994Q3, where corporate saving and real GDP growth moved in the same direction. In recent years such as 2007Q4 to 2008Q3 and 2009Q2 to 2010Q1, corporate saving and real GDP moved both in opposite directions as well as in the same direction. Overall, there appear to be periods where corporate saving and gross fixed capital formation move in the same direction, while there are other periods where they appear to move in opposite directions. Theoretically, saving and investment should move in the same direction (see Chapter Two). Since South Africa is heavily reliant on foreign capital inflows, this may cause a distortion in the positive relationship expected between saving and investment.

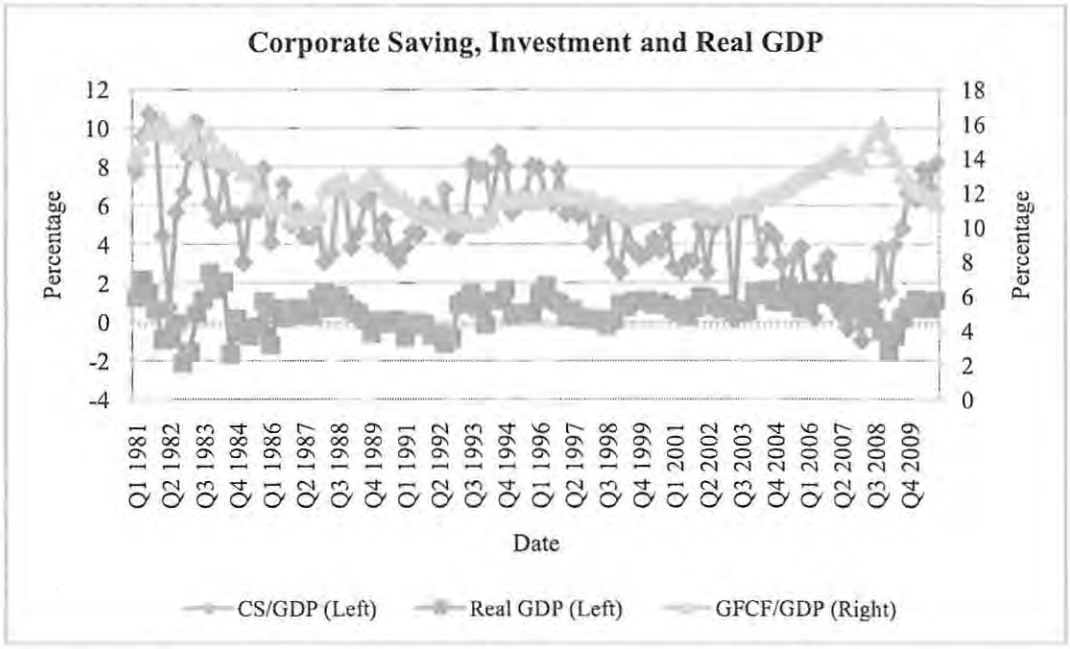

Figure 4.1: Corporate Saving and Investment (both expressed as ratios of GDP), and Real GDP

Figure 4.2 plots corporate saving and the government budget balance, both expressed as ratios of GDP. Graphically, a negative relationship appears to exist between these two variables, such that a worsening of the government budget balance, i.e. a greater deficit or smaller surplus, results in an increase in corporate saving. Conversely, an improvement in the government budget balance, i.e. a smaller deficit or greater surplus, results in a decrease in corporate saving. The literature (Masson *et al.*, 1998; Loayza and Shankar, 2000; Loayza *et al.*, 2000a; Agosin, 2001) defines this offsetting relationship as Ricardian equivalence. Graphically, this hypothesis appears to hold for corporate saving in South Africa.

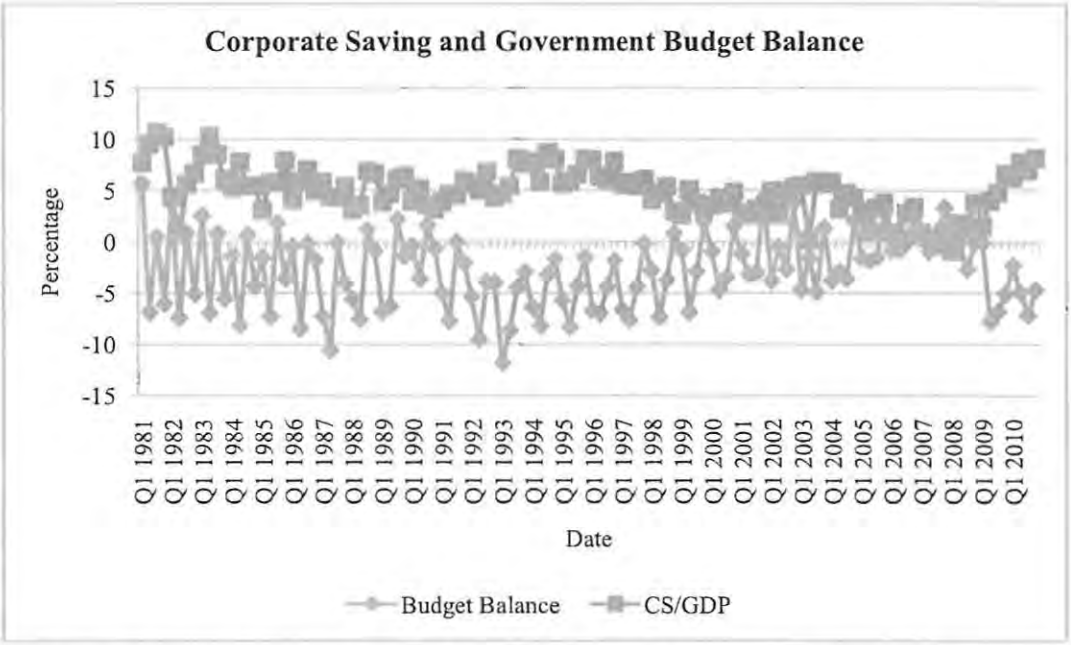

Figure 4.2: Corporate Saving and the National Government Budget Balance (both expressed as ratios of GDP)

Figure 4.3 graphs the real prime interest rate (percent) against corporate saving expressed as a ratio of GDP. The relationship between these two variables appears to be inconclusive as there are periods where a negative relationship is evident, such as the period from 1982Q1 to 1983Q1, while there are periods where a positive relationship exists such as the period from 2004Q3 to 2005Q2. The literature (Masson *et al.*, 1998; Aron and Muellbauer, 2000b; World Bank, 2011b) states that the impact of real interest rates on corporate saving could occur in one of two forms – a substitution effect and an income effect (see section 3.2.8) hence this ambiguous result is unsurprising.

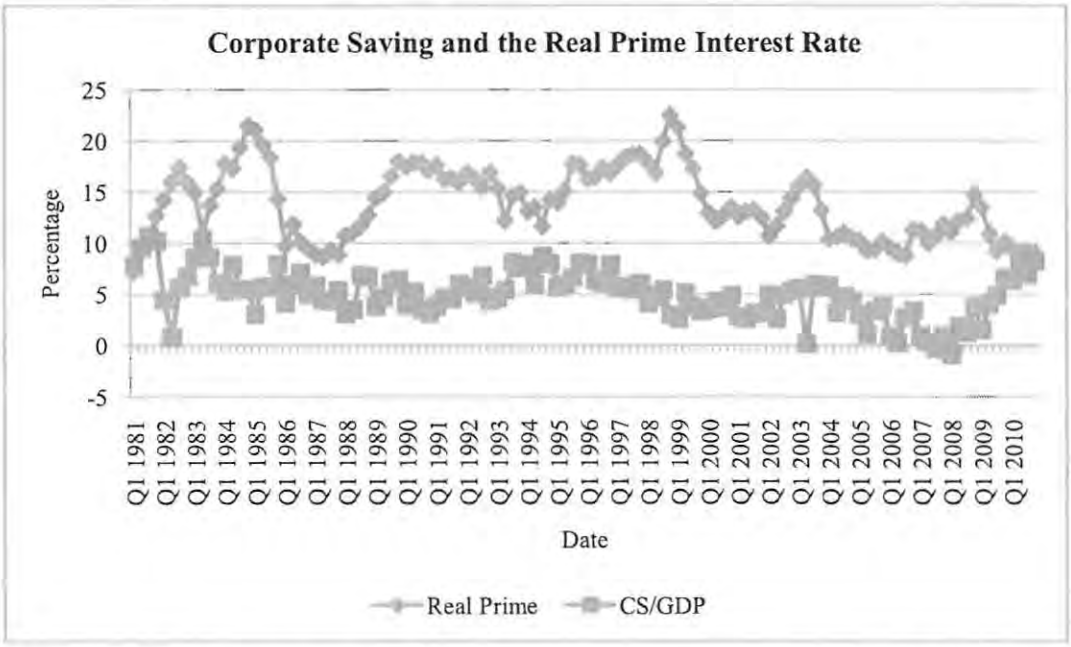

Figure 4.3: Corporate Saving (expressed as a ratio of GDP) and the Real Prime Interest Rate

The literature (Masson *et al.*, 1998; Loayza *et al.*, 2000; Agosin, 2001) suggests the use of the current account balance as a proxy for foreign saving. Figure 4.4 shows the data for corporate saving and the current account balance in South Africa as percentages of GDP. There are periods such as from 1987Q2 to 1989Q1 and from 2008Q1 to 2010Q4 where these variables move in the same direction as well as periods such as from 1981Q1 to 1982Q2 where they move in opposite directions. Where these variables move in the same direction, it suggests that improvement in the current account balance, i.e. a decrease in the deficit or an increase in the surplus, results in an increase in corporate saving, while deterioration of the current account balance, i.e. an increase in the deficit or a decrease in the surplus, results in a decrease in corporate saving. *A priori,* a negative relationship is expected between corporate saving and the current account balance such that foreign saving generally substitutes domestic saving (Edwards, 1996: 25).

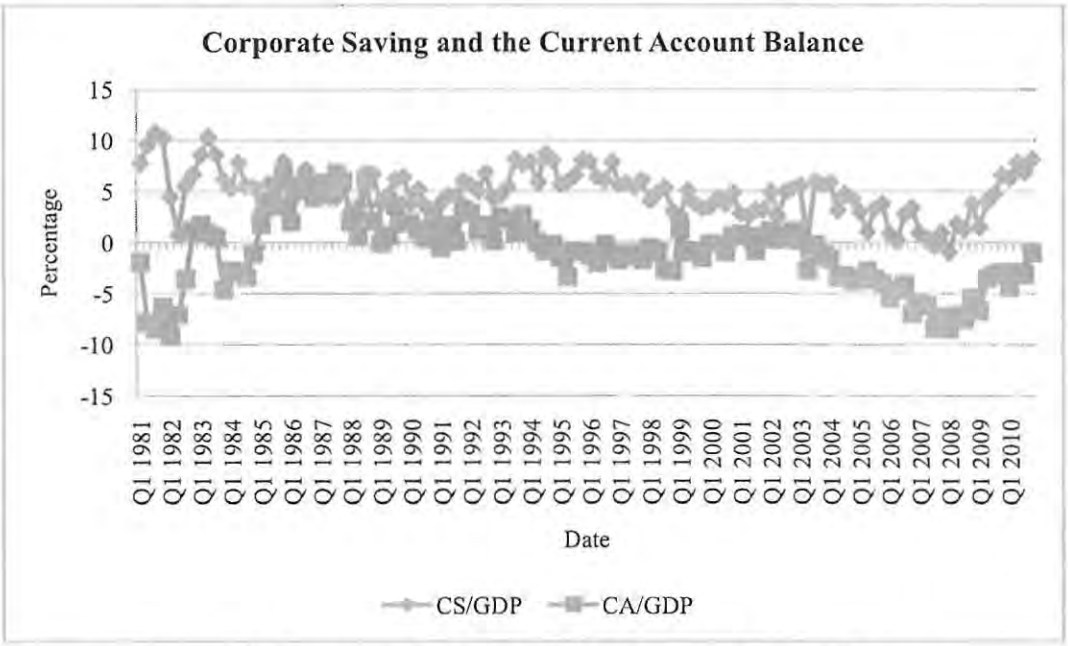

Figure 4.4: Corporate Saving and the Current Account Balance (both expressed as a ratios of GDP)

Figure 4.5 graphs corporate saving and a commodity price index. As discussed in section 4.2.1.1, *a priori,* at a time of rising commodity prices, greater corporate saving should take place since higher export earnings and corporate profits are recorded. This should be the case especially for a commodity producing country like South Africa. This relationship is not entirely clear from the graph as there are periods where corporate saving and the commodity price index move both in the same direction as well as in opposite directions. There is, however, a clear negative relationship over the period from 2007Q1 to 2009Q1, which does not conform to *a priori* expectations.

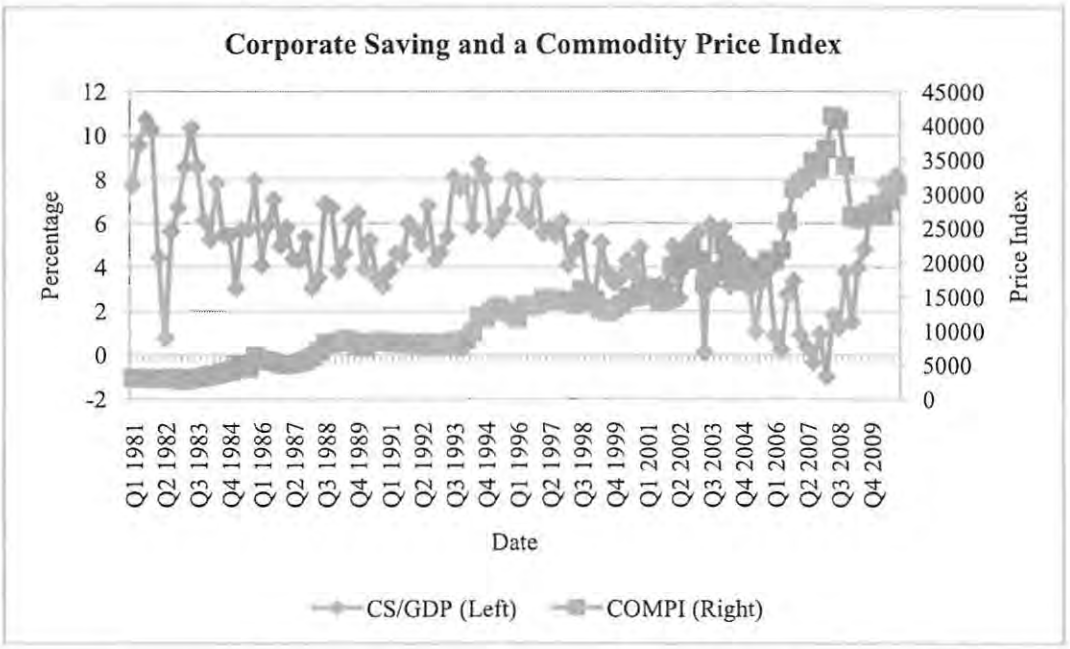

Figure 4.5: Corporate Saving (expressed as a ratio of GDP) and a Commodity Price Index

Figure 4.6 graphs corporate saving and inflation. *A priori* a positive relationship is expected between these two variables. During times of greater macroeconomic uncertainty, corporations are expected to save more as a result. The graph does not clearly depict a positive relationship between these two variables. While there are some periods where a positive relationship is seen, there are also periods where a negative relationship is seen. Since the beginning of the current global financial crisis, corporate saving in South Africa is seen to have risen dramatically, which may well be due to the uncertain macroeconomic environment experienced globally.

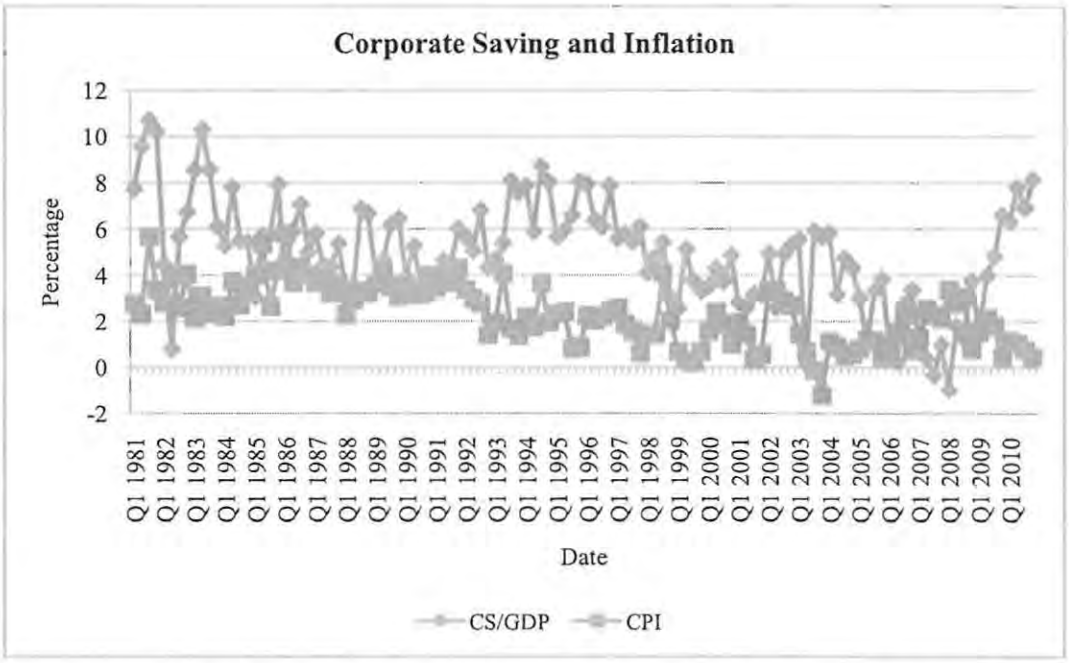

Figure 4.6: Corporate Saving (expressed as a ratio of GDP) and Inflation

Although it is not completely clear from figure 4.7, in general, a negative relationship between corproate saving and M2, both expressed as ratios of GDP, exists. This conforms to *a priori* expectations. Financial liberalization has played an important role in the development of the South African economy (Aron and Muellbauer, 2000b). One of the implications for corporate saving has been the removal of borrowing constraints and thus the greater ease of access to credit from both domestic and foreign sources. Evident in figure 4.7 is the negative relationship between these two variables during periods in the 1990s.

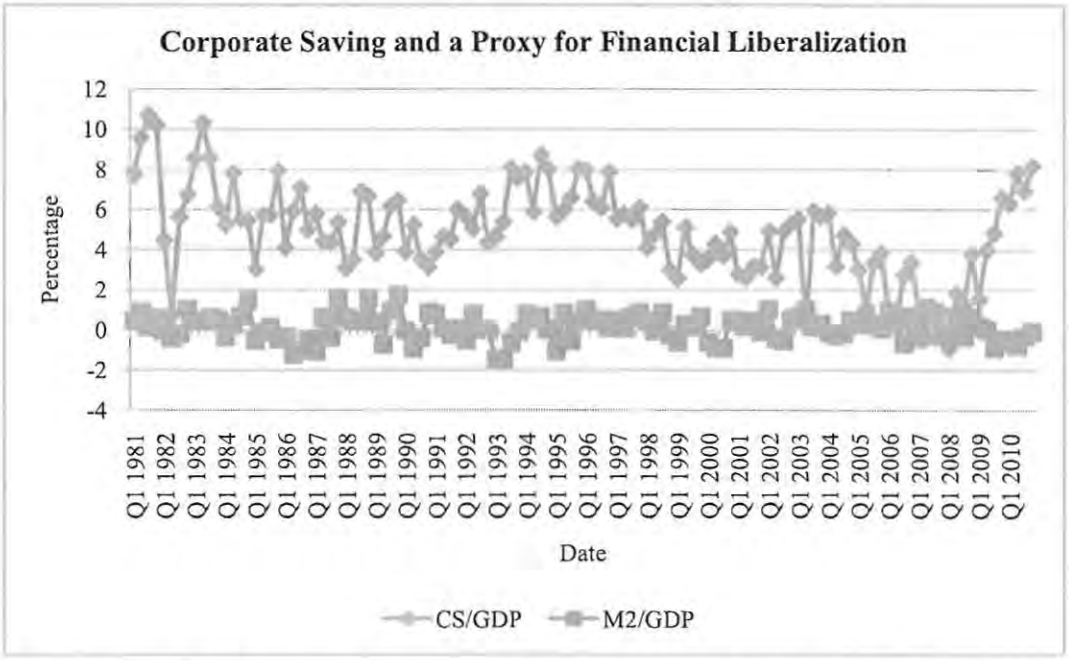

Figure 4.7: Corporate Saving and M2 (both expressed as ratios of GDP)

4.2.2. HOUSEHOLD SAVING

For the household saving function, where household saving expressed as a ratio of GDP (HS_GDP) is the dependent variable, key macroeconomic variables identified in the literature include the level of corporate saving as a ratio of GDP (CS_GDP) (to capture the hypothesis of households "piercing the corporate veil", if any), a measure of financial liberalization (M2_GDP)[5] (Bayoumi, 1993; Masson *et al.*, 1998; Prinsloo, 2000; Loayza *et al.*, 2000a; Aron and Muellbauer, 2000b; Harjes and Ricci, 2005; World Bank, 2011b), a proxy variable for household wealth[6] (WEALTH) (Aron and Muellbauer, 2000a), real GDP (REAL_GDP) (Harjes and Ricci, 2005; World Bank, 2011b), the real interest rate

[5] The proxy for financial liberalization is discussed in the corporate saving model in section 4.2.1.
[6] The ABSA House Price index is used as a proxy for household wealth.

(REAL_PRIME) (Masson *et al.*, 1998; World Bank, 2011b), the national budget balance (GOVBUDGET) expressed as a ratio of GDP (to capture Ricardian equivalence, if any) (Masson *et al.*, 1998; Loayza *et al.*, 2000a; Loayza *et al.*, 2000b; Aron and Muellbauer, 2000b; Harjes and Ricci, 2005), and the inflation rate (CPI) (Loayza *et al.*, 2000a; Loayza *et al.*, 2000b; Aron and Muellbauer, 2000b; Harjes and Ricci, 2005; World Bank, 2011b)[7]. The natural logarithms of M2_GDP, REAL_GDP and WEALTH were used in the empirical study. Appendix 1 provides a detailed description of the data and their origin.

The ABSA house price index is a nominal house price index obtained from ABSA Home Loans, which was adjusted for inflation and, as in the corporate saving model, the real prime interest rate is the nominal quoted prime overdraft rate in South Africa adjusted for consumer price inflation over the previous 12 months.

Thus, the household saving function is represented by the following function:

$$HS/GDP = g(CS/GDP, M2/GDP, WEALTH, REAL\ GDP, REAL\ PRIME, GOVBUDGET, CPI) \quad \ldots (4.2)$$

This study sought also to include both the old-age dependency ratio and the young-age dependency ratio for South Africa in the empirical analysis. The old-age dependency ratio is defined as the ratio of people over sixty-five years of age to the working age population, while the young-age dependency ratio is defined as the ratio of people aged fifteen years or less to the working age population (World Bank, 2011b: 27). The summation of the old- and young- age dependency ratios should, *a priori,* have a negative effect on private saving. This is due to the fact that if there are a large number of inactive individuals relative to those in their productive years, aggregate savings will be low (Edwards, 1996: 21). Unfortunately, this data is only available in an annual frequency from the World Bank Databank. In preliminary analysis, problems such as autocorrelation were experienced when including the data after performing quarterly interpolation, in addition to the fact that low-to-high frequency interpolation is not very accurate. Thus, these variables were excluded from the empirical analysis. Since these ratios do not vary significantly between periods, they are more important in explaining saving differences between countries than changes in saving in a particular country over a relatively short period. Since this study is not a panel data study, the

[7] Variables in brackets represent names of data used in empirical analysis.

significance of the results obtained in the household saving model should not be significantly hampered by the exclusion of these two dependency ratios.

4.2.2.1. *A priori* Expectations

A priori, a negative relationship is expected between household saving and corporate saving. This follows the hypothesis of households "piercing the corporate veil" and as such conducting saving decisions based on corporate saving decisions (see Chapter Two). Financial liberalization refers to such events as "interest rate liberalization, elimination of credit ceilings, easing of entry for foreign financial institutions, development of capital markets, and enhanced prudential regulation and supervision" (Loayza *et al.,* 2000a). A negative relationship is therefore expected, *a priori,* between household saving and the proxy for financial liberalization since the more financially liberal an economy, the more negative the impact on household saving.

The literature (Masson *et al.,* 1998; Aron and Muellbauer, 2000b) finds conflicting results for the effect of wealth on saving. In some instances, an increase in wealth positively affects household saving, while the converse is also found. The life cycle theory states that the MPC out of wealth should be small, although an increase in wealth will cause consumption to increase, thereby causing a fall in household saving (see section 3.2.6) (Dornbusch *et al.,* 1999: 303). If households view the increase in asset prices as a permanent increase in wealth, a decrease in saving may be experienced (de Serres and Pelgrin, 2002: 7). *A priori,* this study expects a negative relationship between household saving and the proxy for household wealth. Furthermore, although Masson *et al.* (1998: 494) find the coefficient of wealth to be insignificant in their empirical analysis, a negative relationship is found for developing countries.

A positive relationship between household saving and real GDP is expected *a priori* since higher real GDP translates into higher national income and thus, an increase in household saving. As discussed in section 4.2.1.1, the relationship between household saving and the real interest rate may be positive or negative due to the substitution and income effects (see section 3.2.8). Thus, the *a priori* expectation of real interest rates on household saving is ambiguous.

A priori, a negative relationship is expected between the government budget balance and household saving. This captures the Ricardian equivalence hypothesis. This hypothesis "combines consumers'

and the government's intertemporal budget constraints and derives permanent income as net of the discounted value of government spending" (Loayza *et al.*, 2000a: 402, 403).

As in the corporate saving model, inflation is included to capture the effects of macroeconomic uncertainty on household saving in South Africa. As such, a positive relationship is expected *a priori* (see section 3.2.5).

4.2.2.2. Graphical Analysis

This section shows graphs of household saving against each of the variables included in the household saving model. This is important in analysing past trends between household saving and each of the variables included in the empirical analysis.

Figure 4.8 plots household saving, corporate saving and real GDP. It appears that household saving and real GDP are usually negatively related, such as the period from 1982Q1 to 1984Q2, although there are periods where these two variables appear to be positively related, such as from 1995Q3 to 1997Q3. Household saving and corporate saving appearing to be negatively related is in accordance with the hypothesis of households "piercing the corporate veil".

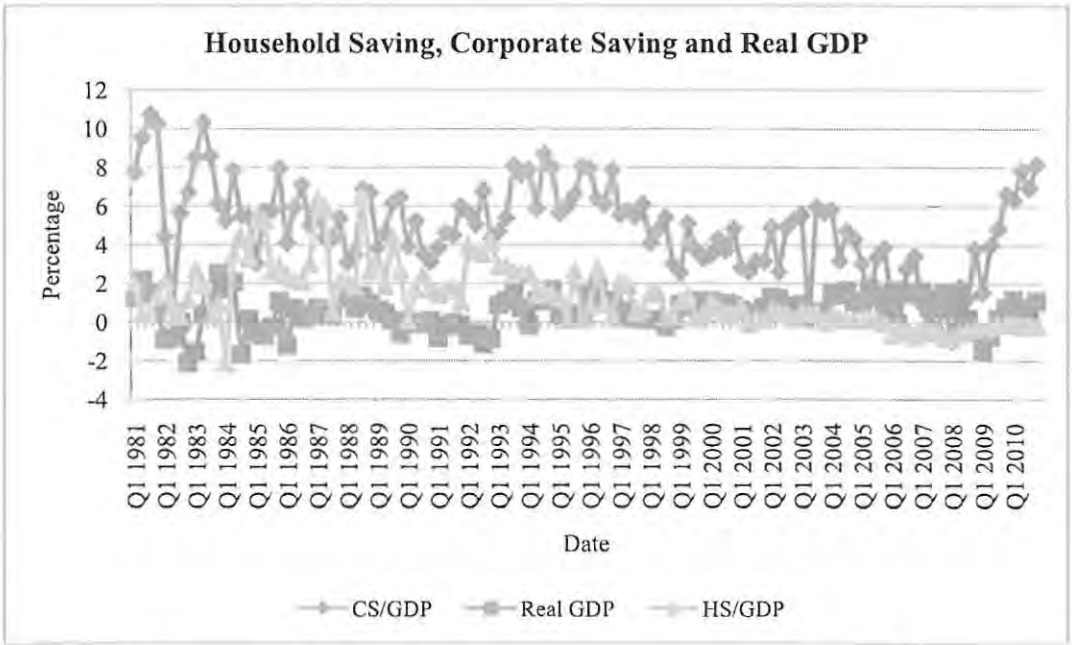

Figure 4.8: Household Saving and Corporate Saving (both expressed as ratios of GDP) and Real GDP

Figure 4.9 graphs household saving and the real prime interest rate. Again, there are times when these two variables appear to move in the same direction as well as times when they appear to move in opposite directions. This is unsurprising as the *a priori* relationship is ambiguous.

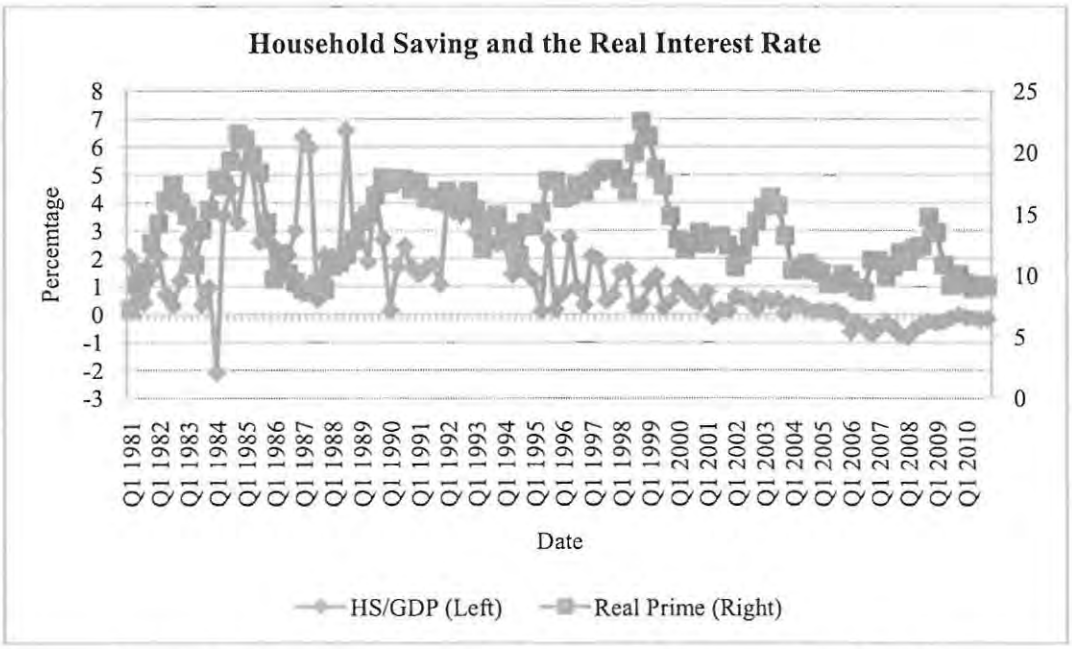

Figure 4.9: Household Saving (expressed as a ratio of GDP) and the Real Prime Interest Rate

Figure 4.10 plots household saving and M2 as percentages of GDP and the yearly percentage change in the ABSA house price index. The yearly percentage change in the ABSA house price index is to allow a clearer depiction of the relationship between household saving and this indicator of household wealth. As discussed in section 4.2.1, M2 expressed as a ratio of GDP is used as a proxy for financial liberalization or financial depth. Having greater access to credit and other banking facilities is believed to negatively impact on household saving. The graph does not exhibit a clear relationship. There are however times when a negative relationship is depicted such as from 1987Q4 to 1988Q3 and from 1992Q2 to 1994Q1, which conforms to *a priori* expectations. The ABSA house price index is used as a proxy for household wealth. The graph shows evidence of episodes of a positive relationship between household saving and household wealth as well as episodes of a negative relationship between these two variables. Thus, the evidence of a negative relationship between household saving and wealth conforms to *a priori* expectations.

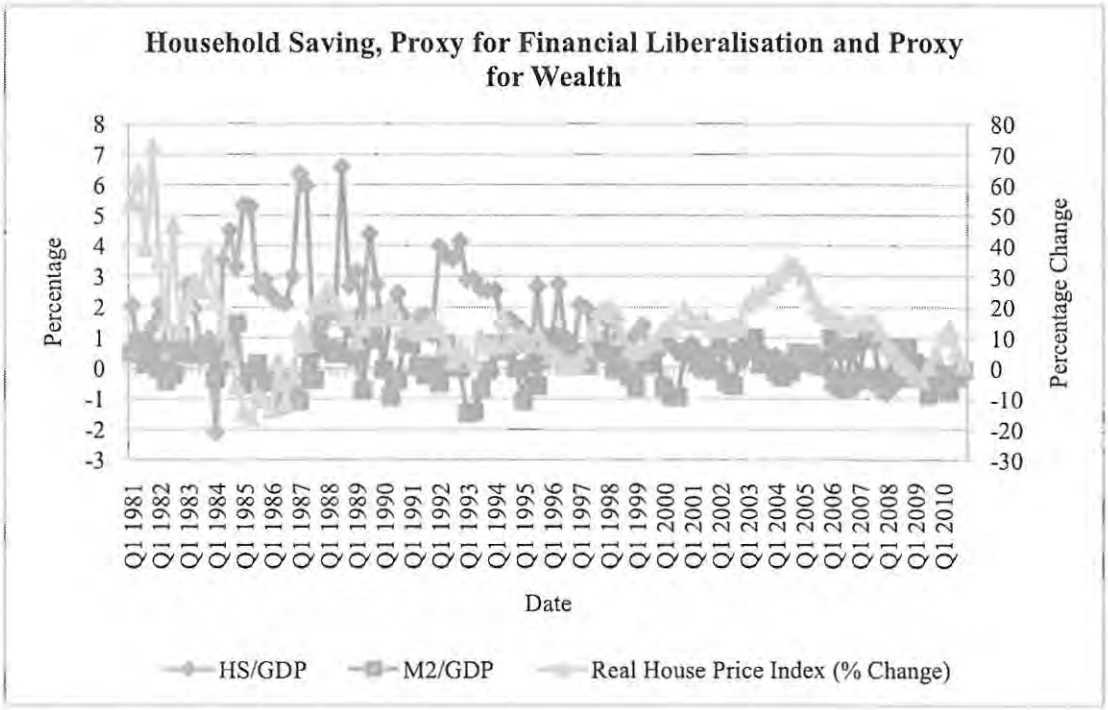

Figure 4.10: Household Saving and M2 (both expressed as ratios of GDP) and the Percentage Change in the ABSA Real House Price Index

Figure 4.11 graphs household saving and the government budget balance as ratios of GDP to seek evidence of Ricardian equivalence. The theory of Ricardian equivalence asserts that there exists a negative relationship between household saving and the government budget balance (see section 3.2.1). Thus *a priori,* a negative relationship is expected. Although this is not entirely clear from the graph, there are periods where a negative relationship appears between these two variables such as from 1995Q2 to 2000Q4.

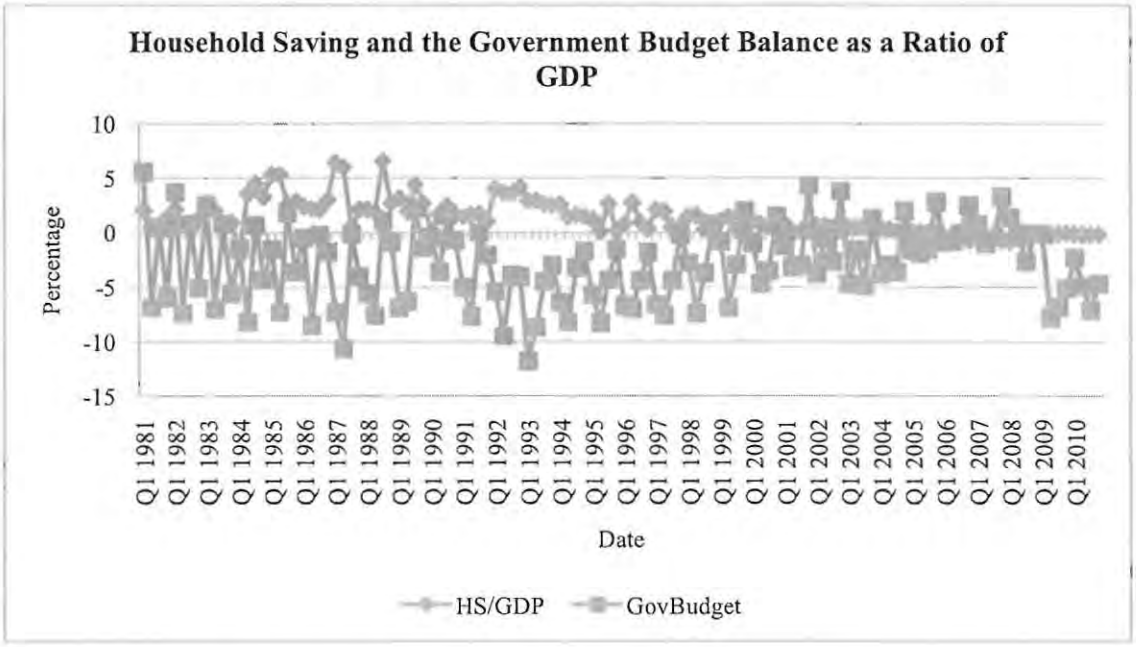

Figure 4.11: Household Saving and the National Government Budget Balance (both expressed as ratios of GDP)

Figure 4.12 graphs household saving as a ratio of GDP and inflation. *A priori,* a positive relationship is expected between these two variables. There are periods where a positive relationship is evident such as in the early 1980s as well as in the 1990s. However, there are also periods where a negative relationship is evident such as from 2007Q1 to 2009Q1.

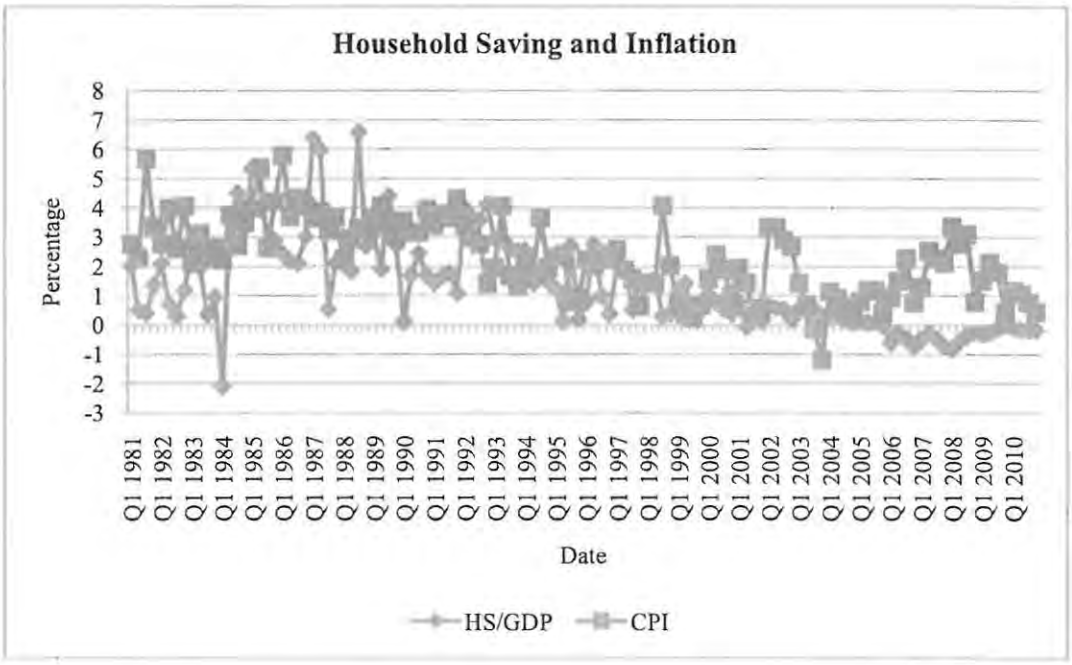

Figure 4.12: Household Saving (expressed as a ratio of GDP) and Inflation

4.3. COINTEGRATION METHODS

There are two common methods used to test for cointegration, namely the Engle and Granger (1987) as well as the Johansen (1998) and Johansen and Juselius (1990) method. Each of these methods has different steps. The Engle and Granger method estimates a simple regression using ordinary least squares (OLS), obtains the residuals from this regression, and then conducts Dickey-Fuller (DF) or Augmented Dickey-Fuller (ADF) unit root tests on the residuals obtained from the estimated regression (Gujarati, 2003: 823). According to Alexander (2008: 235), the Johansen procedure seeks the linear combination that is most stationary, whereas the Engle and Granger test finds the linear combination that has the minimum variance. Brooks (2008: 367) states that one of the major drawbacks of the Engle and Granger (1987) method is that it can only estimate up to one cointegrating relationship between the variables. In contrast, the Johansen VAR method allows for

the examination of there being more than one linearly independent cointegrating relationship (Brooks, 2008: 367). Some additional differences between these two methods of cointegration include the fact that the Johansen procedure is more informative than the Engle and Granger procedure since it finds all possible cointegrating relationships, the fact that the Johansen procedure is generally employed for economic and financial problems since there exist many variables in the system, as well as the fact that it is difficult to determine which variable should be the dependent variable in the Engle and Granger procedure (Alexander, 2008: 238).

Another problem with the Engle and Granger (1987) method identified by Enders (2004: 348) is that the method relies on a two-step estimator; the first step involves generating the residual series while the second step involves the use of these generated residuals to estimate a regression. As a result, any error introduced in the first step may be carried through to the second step (Enders, 2004: 348).

Given the limitations of the Engle and Granger method and the general acceptability of the Johansen method, this study adopts the latter.

4.4. DESCRIPTIVE STATISTICS

Before proceeding with the Johansen method of cointegration, the descriptive statistics of each of the variables included in this study are analysed. These descriptive statistics include the mean, median, maximum value, minimum value, standard deviation, skewness, kurtosis and the Jarque-Bera (JB) statistic with their associated probability values.

The median is a measure of "central tendency which is more robust to errors or unusually extreme data points than is the mean" (Pindyck and Rubinfeld, 1998: 47). For an even number of observations, as is the case in both the corporate saving and household saving models, the median is generally calculated to be the average of the two middle observations. The skewness statistic provides useful information regarding the symmetry of a probability distribution (Pindyck and Rubinfeld, 1998: 47). For all symmetric probability distributions, including the normal distribution, the skewness statistic is equal to zero (Gujarati, 2003: 253). Kurtosis measures the thickness of the tails of a probability distribution (Pindyck and Rubinfeld, 1998: 47). For all normal distributions, kurtosis is equal to three (Gujarati, 2003: 253). When kurtosis is greater than three, the tails of the distribution are larger than those in a normal distribution, while kurtosis that is less than three exhibits tails that are thinner than those in a normal distribution (Pindyck and Rubinfeld, 1998: 47).

The null hypothesis of the JB test for normality states that the residuals are normally distributed (Gujarati, 2003: 148). The JB test statistic is thus a useful measure to test whether a data series approximates the normal distribution (Pindyck and Rubinfeld, 1998: 47). In asymptotic samples, the JB test statistic follows the χ^2 distribution with two degrees of freedom. Accordingly, if the probability value obtained from the JB test statistic is sufficiently low, rejection of the null hypothesis that the residuals are normally distributed will result (Gujarati, 2003: 148). Rejection of the null hypothesis means that the value of the test statistic is very different from zero; while failure to reject the null hypothesis means that the value of the test statistic is close to zero (Gujarati, 2003: 148, 149). The JB test incorporates the calculation of the skewness and kurtosis measures of the residuals. According to Kennedy (2003: 382), the JB test statistic is thus easy to compute, asymptotically independent of other common diagnostic tests conducted on residual series, and intuitively appealing.

4.5. JOHANSEN COINTEGRATION FRAMEWORK

This section describes the framework of the Johansen method. The first step in the Johansen method is the identification of the order of integration of each of the variables employed in the corporate and household saving models. This is conducted using unit root tests and stationarity tests. It is important to determine the level of stationarity of time series variables as it allows for forecasting as well as reduces the likelihood of spurious regressions (Enders, 2004: 2). Furthermore, The Johansen method of cointegration is only valid if the variables are integrated of the same order (Hondroyiannis, 2004: 464). According to Boone *et al.* (2001), a necessary condition for variables to cointegrate in a long-run relationship is that they are integrated of order 1, i.e. $I(1)$.

Next, an unrestricted vector autoregression (UVAR) model is estimated. The number of cointegrating vectors is determined by conducting the trace test and maximum eigenvalues test. Once the number of cointegrating vectors have been identified, estimation of a VECM is conducted. This step describes the short- and long- run relationships between the dependent variable (corporate and household saving) and the explanatory variables included in each model.

The final steps involve tests on the residual series obtained from the VECM to ensure that they are white noise, an analysis of the impulse response functions, as well as an interpretation of the variance decompositions. Granger causality and block exogeneity tests are conducted to determine causal relationships within the cointegrated system.

These steps are described in the following sections. The aim is to provide an econometric description of each of the tests and their expected results required for estimation of a well-specified VECM using the Johansen method.

4.5.1. Stationarity Tests

The nature of the data employed in the empirical analysis is time series data. According to Greene (2000: 528), a time series model generally describes the path of a variable, y_t, in terms of contemporaneous factors, x_t, disturbances, ϵ_t, and lagged dependent variables, y_{t-1}. This can be shown as:

$$y_t = \beta_1 + \beta_2 x_t + \beta_3 y_{t-1} + \epsilon_t \quad \ldots (4.3)$$

The time series is a single occurrence of some random event (Greene, 2000: 528). The disturbances are assumed to be independently generated between different time series. The following assumptions are applicable:

$$E[\epsilon_t] = 0, \quad \ldots (4.4)$$

$$Var[\epsilon_t] = \sigma^2, \text{ and} \quad \ldots (4.5)$$

$$Cov[\epsilon_t, \epsilon_s] = 0 \text{ for } t \neq s \quad \ldots (4.6)$$

Accordingly, the distribution of ϵ_t is covariance stationary or weakly stationary (Greene, 2000: 528). Stated differently, a discrete stochastic time series is white noise if each value in the sequence has a mean of zero, a constant variance, and is uncorrelated with all other realisations (Enders, 2004: 50).

The first step therefore required to estimate a well-specified VAR model is to determine the level of stationarity of each of the time series variables in order to determine their orders of integration. Engle and Granger (1987: 252) define integration as "a series with no deterministic component which has a stationary, invertible, autoregressive moving-average (ARMA) representation after differencing d times, is said to be integrated of order d, denoted $x_t \sim I(d)$". The order of integration can be determined using unit root tests and a stationarity test.

There are a number of unit root tests that can be employed; examples include the DF, the ADF, and the Phillips-Perron (PP) unit root tests, and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS)

stationarity test. This study used the ADF and PP unit root tests, as well as the KPSS stationarity test. The joint use of unit root tests is important in ensuring the robustness of results. Thus, this study engaged in confirmatory data analysis (Brooks, 2008: 331).

The ADF unit root test is an extension of the DF unit root test. The basic objective of the DF unit root test is to examine the null hypothesis that $\Phi = 1$ in equation (4.7) below (such that the test for $\Phi = 1$ is the same as a test of $\psi = 0$ since $\Phi - 1 = \psi$), against the one-sided alternative hypothesis of $\Phi < 1$ (Brooks, 2008: 327). Thus:

$$\Delta Y_t = \psi y_{t-1} + u_t \quad \ldots (4.7)$$

If $\psi = 0$, the time series has a unit root and is non-stationary (Enders, 2004: 181). Critical to the DF unit root test is that it assumes that the error terms are independent and have a constant variance (Enders, 2004: 190).

Dickey and Fuller (1979) considered three different regression equations when testing for the presence of a unit root. One regression equation is a pure random walk model, another includes an intercept term, while the third includes both an intercept and a deterministic trend or linear time trend (Enders, 2004: 181). The DF unit root test thus involves estimating one or more of the three different regression equations using ordinary least squares (OLS) in order to obtain the estimated value of ψ and the related standard errors (Enders, 2004: 181). The null hypothesis (H_0) tested stipulates that the time series has a unit root and that it is therefore non-stationary, while the alternative hypothesis (H_1) stipulates that the time series is stationary (Brooks, 2008: 327). A set of critical values was derived by Dickey and Fuller (1979) to test the above hypothesis that $\Phi = 1$ using a Monte Carlo approach (Greene, 2000: 782). According to Enders (2004: 182), the appropriate critical values depend on sample size.

An important advantage of the ADF unit root test is that it can accommodate higher order autoregressive processes in the error term (Greene, 2000: 784). The ADF unit root test essentially "augments" the original unit root test by including p lags of the dependent variable, thus (Brooks, 2008: 329):

$$\Delta y_t = \psi y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + u_t \quad \ldots (4.8)$$

According to Brooks (2008: 329) the lags absorb any dynamic structure present in the dependent variable to ensure that u_t is not autocorrelated. The same critical values used in the DF unit root test are used in the ADF unit root test. Like the DF unit root test, an important element of the ADF unit root test is to select an appropriate lag length. According to Enders (2004: 191), too few lags means that the residuals in the regression equation do not behave akin to white noise processes, while too many lags reduces the power of the test to reject the null of a unit root. This is because the increased number of lags requires the estimation of additional parameters and a loss of degrees of freedom (Enders, 2004: 191). The econometric software package used (EViews) in this study automatically selected an optimal lag length for each time series variable based on the frequency of the data used.

The PP unit root test follows the same hypotheses as those of the ADF unit root test. The null hypothesis is that the series is non-stationary (H_0: $y_t \sim I(1)$) and the alternative hypothesis is that the series is stationary (H_1: $y_t \sim I(1)$) (Brooks, 2008: 331). The PP unit root test uses nonparametric statistical methods to correct for serial correlation in the error term without including lagged difference terms of the regressand as in the case of the ADF unit root test (Gujarati, 2003: 818). Thus, the PP unit root test incorporates an automatic correction to the DF unit root test to allow for autocorrelated residuals (Brooks, 2008: 330). According to Enders (2004: 229), if the residual series of a unit root process is heterogeneous or weakly dependent, the PP unit root test can be employed.

Kwiatkowski, Phillips, Schmidt and Shin (1992: 161) employ a parameterization providing a reasonable representation of both stationary and non-stationary variables which leads to a test of the hypothesis of stationarity. A components representation is used in which the time series under study is written as the sum of a determininstic trend, a random walk, and a stationary error (Kwiatkowski *et al.*, 1992: 161). According to Kwiatkowski *et al.* (1992: 161), the null hypothesis of trend stationarity relates to the hypothesis that the variance of the random walk equals zero. Therefore, in contrast to the ADF unit root test, the null hypothesis under the KPSS stationarity test is that the series is stationary (H_0: $y_t \sim I(0)$), while the alternative hypothesis is that the series is non-stationary (H_1: $y_t \sim I(1)$) and is thus integrated of some higher order, d (Brooks, 2008: 331). The KPSS stationarity test is intended to complement unit root tests such as the DF and ADF unit root tests (Kwiatkowski *et al.*, 1992: 176).

4.5.2. Vector Error Correction (VEC) Modelling

Enders (2004: 320) states that the "equilibrium theories involving non-stationary variables require the existence of a combination of the variables that is stationary". According to Engle and Granger (1987: 275), if each component of a vector of time series, x_t, is stationary only after differencing has been conducted, but a linear combination, $\acute{\alpha}x_t$, need not be differenced, then the time series, x_t, is cointegrated of order (1,1) with cointegrating vector, α. Brooks (2008: 337) states that if there were no cointegration there would be no long-run equilibrium relationship between the variables. Consequently, the series could deviate without bound. No cointegration would therefore occur since all linear combinations of the series would be non-stationary and there would be no constant mean to be frequently returned to (Brooks, 2008: 337). Therefore, a feature of cointegration is that the variables may deviate from long-run equilibrium in the short-run. As such, if a cointegrated system is to return to long-run equilibrium, the movements of at least some of the variables need to respond to the magnitude of the disequilibrium (Enders, 2004: 328).

An error correction model (ECM) may be used to correct for this deviation from long-run equilibrium. In an ECM, the short-run dynamics of the variables in the cointegrated system are affected by deviations from equilibrium (Enders, 2004: 329). In the case of there being more than two variables included in the analysis, a VECM can be used. This will be the case in this study.

In the context of this study, if two variables are non-stationary but their linear combination is stationary, i.e. are cointegrated, then it suggests that the two variables move together and impact on one another. Consequently, policies aimed at increasing the corporate saving and household saving rates should focus on the variables identified in the empirical analysis as statistically significant in explaining the behaviour of and impacting on both corporate saving and household saving.

The Johansen method developed by Johansen (1988) and Johansen and Juselius (1990) examines cointegration in general multivariate systems where there exist at least two integrated variables (Alexander, 2008: 235). Under this approach and after conducting unit root tests on each of the variables employed in the system, estimation of a well-specified UVAR model is required (Greene, 2000: 795). Brooks (2008: 350) states that if there are a number of variables, g, under consideration that are considered cointegrated, a VAR model with p lags containing these variables could be estimated as:

$$y_t = \beta_1 y_{t-1} + \beta_2 y_{t-2} + \ldots + \beta_p y_{t-p} + u_t \quad \ldots (4.9)$$

In the Johansen approach, this VAR model needs to be transformed into a VECM of the following form (Brooks, 2008: 350):

$$\Delta y_t = \Pi y_{t-p} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \ldots + \Gamma_{p-1} \Delta y_{t-(p-1)} + u_t \quad \ldots (4.10)$$

Where $\Pi = (\sum_{i=1}^{k} \beta_i) - I_g$ and $\Gamma_i = (\sum_{j=1} \beta_j) - I_g$.

The VAR model in equation (4.10) contains a number of g $I(1)$ variables on the left-hand side and $p - 1$ lags of the dependent variable (that are generally $I(1)$) on the right-hand side. Each dependent variable has a Γ matrix attached to it (Brooks, 2008: 350). The Johansen method is essentially an examination of the Π matrix, which is the long-run coefficient matrix. Thus, cointegrating relationships depend significantly on the property of the Π matrix (Wang, 2003: 19). In equilibrium, all of the Δy_{t-i} coefficients will be zero and setting the error terms, u_t, to their expected value of zero will make $\Pi y_{t-k} = 0$ (Brooks, 2008: 350). If all elements of the Π matrix equal zero, then equation (4.10) is a traditional VAR model in first differences and there is no error correction representation (Enders, 2004: 330).

Equation (4.10) is a general model where the number of lagged first differences is selected such that the residuals are not autocorrelated. (Alexander, 2008: 236). The error terms should thus be white noise (Enders, 2004: 364). It is critical to determine an optimal lag length using the frequency of the data employed as well as the information criteria generated in the econometric software package. Enders (2004: 363) states that the optimal lag length can be chosen using the multivariate generalisations of the Akaike information criterion (AIC) or the Schwarz Bayesian criterion (SBC). If the error terms are not white noise, the specified lag length may not be optimal.

In cointegration tests using more than two variables, there may exist more than one cointegrating vector (Greene, 2004: 347). Accordingly, this study aims to identify r cointegrating relationships among the variables for both the corporate and household saving models respectively. Algebraically:

$$\Pi = \alpha\hat{\beta} \text{ and } 0 < r < k \quad \ldots (4.11)$$

Equation (4.11) shows that there exist r cointegrating vectors, $\beta' y_t$, which are stationary series in level terms and α and β are mutually $(k \times r)$ matrices, having rank r (Wang, 2003: 19). The stationarity of $\beta' y_t$ means that there exists a long-run relationship among y_t (Wang, 2003: 19). Stated differently, the number of long-run cointegrating vectors, r, is given by the rank of $\alpha\beta'$, where α and β are full column rank matrices of dimension $(k \times r)$ (Todani, 2007: 684). If there are r cointegrating vectors then Π is defined as the product of these two matrices, α and β', of dimension $(g \times r)$ and $(r \times g)$ respectively (Brooks, 2008: 352). The β matrix denotes the cointegrating vectors, while the matrix α contains the amount of each cointegrating vector entering into each equation of the VECM (Brooks, 2008: 352). Thus, the cointegrating vector β contains long-run parameters, while the matrix α contains adjustment parameters that distinguishes disequilibrium correction (Todani, 2007: 684).

In addition, an important aspect of cointegration is that it demands coefficient restrictions in a VAR model and as such a VECM is a restricted form of a general VAR model (Enders, 2004: 333).

The rank of the Π matrix is determined from the trace test and maximum eigenvalue test, stated as:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n} ln\,(1-\hat{\lambda}_i) \qquad \ldots (4.12)$$

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

Where $\hat{\lambda}_i$ is the estimated values of the characteristic roots (eigenvalues) obtained from the estimated Π matrix, and T is the number of usable observations (Enders, 2004: 353). The rank of a matrix is equal to the number of its characteristic roots, i.e. its eigenvalues, that are different from zero (Brooks, 2008: 350). The trace statistic is a joint test that tests the null hypothesis that the number of distinct cointegrating vectors is less than or equal to r against a general alternative hypothesis (Enders, 2004: 353). The maximum eigenvalue statistic tests the null hypothesis that the number of cointegrating vectors is r against the alternative hypothesis of $r + 1$ cointegrating vectors (Enders, 2004: 353). Johansen and Juselius (1990) provide the critical values required for these two test statistics (Brooks, 2008: 351). If the test statistic is greater than the critical value from Johansen's tables, then the null hypothesis that there are r cointegrating vectors is rejected in favour of the alternative that there are $r + 1$ cointegrating vectors for the trace test or more than r cointegrating vectors for the maximum eigenvalue statistic (Brooks, 2008: 352). Testing is conducted in a sequence until the null hypothesis is no longer rejected and r cointegrating vectors are found.

The next step is to analyse the normalised cointegrating vector(s) as well as to analyse the speed of adjustment coefficients (Enders, 2004: 365). Normalisation involves setting one or more of the coefficient values equal to unity in each of the identified cointegrating equations, i.e. each vector is distinguished by being normalised on a different variable (Greene, 2000: 794). This will depend on the number of cointegrating equations identified, via the trace test and maximum eigenvalue test statistics, in the cointegration system. In this study normalisation was done on corporate saving and household saving in the two models respectively in order to make them the dependent variable of the main equation in each model. In the case of there being more than one cointegrating vector in each of the corporate saving and household saving models, a related equation will be identified and specified. For example, normalisation on real GDP will result in the estimation of a business cycle equation, which is expected to be closely related to each of the corporate saving and household saving equations.

As discussed in section 4.5.1, an essential aspect of cointegration is to ensure that tests are conducted on the residuals to avoid misspecification of the data and to ensure that they are white noise. In this study, diagnostic tests include the test for residual normality, serial correlation and heteroscedasticity. Restrictions are also imposed on the α's to determine whether variables are endogenous or weakly exogenous using the χ^2 statistics (Enders, 2004: 372). The null hypothesis of the weak exogeneity test is that the variable is weakly exogenous. Thus, rejection of the null hypothesis yields the conclusion that the variable is endogenous. If some variable does not respond to the discrepancy from long-run equilibrium leaving all other variables in the system to do all of the adjustment, that variable is said to be weakly exogenous (Enders, 2004: 334). Accordingly, if the speed of adjustment parameter is zero, the variable is weakly exogenous. Enders (2004: 368) states that the practical importance is that a weakly exogenous variable "does not experience the type of feedback that necessitates the use of a VAR".

4.6. IMPULSE RESPONSE FUNCTIONS AND VARIANCE DECOMPOSITION

Impulse responses and variance decompositions can be used to obtain information concerning the interactions between the variables employed in a VECM (Enders, 2004: 338). According to Enders (2004: 339), the results of the variance decompositions and the shapes of the impulse response functions can indicate whether or not all dynamic responses of the variables conform to economic theory.

Gujarati (2003: 853) states that impulse response functions trace out the responsiveness of the dependent variables in a VAR system to a unit shock in the error terms for each of the variables in each equation. The effects on the VAR model are documented over time (Brooks, 2008: 299). Provided that the system is stable, the shock to the error term should gradually taper off toward zero and should not be non-decaying or explosive (Enders, 2004: 339). In the context of this study, the sign, magnitude and persistence of responses of each of the variables employed in the VAR model to shocks of these same variables included in the VAR model will be analysed. This study graphically examines the response of variables to Cholesky one standard deviations.

According to Hoover (2006: 75), in a structural VAR model, the reduced-form errors are generally inter-correlated; distinct shocks for each equation require that they be orthogonalised. The Cholesky decomposition is the method used to identify the "shocks" to normalise the system. Specifically, such a transformation makes the covariance matrix of the error terms diagonal and establishes a hierarchy among the variables to the extent that higher ordered variables work through to lower ordered variables (Hoover, 2006: 75). This does not however work in the opposite direction. As such, an innovation in the first equation may have instantaneous effects on the second to last variables, but not on the first one, while an innovation in the last equation affects only the last variable instantaneously and not any of the other variables (Lütkepohl, 2006: 502). Consequently, different causal orders have different implications for impulse response functions (Hoover, 2006: 75).

Variance decompositions provide the proportion of the movements of the dependent variables that are a result of their own shocks as opposed to shocks of other variables (Brooks, 2008: 300). Shocks to one variable will directly affect that variable as well as be transmitted to other variables in the VAR model since a VAR model has a dynamic structure (Brooks, 2008: 300). In this study, the proportion of the variation in both corporate saving and household saving is measured against movements in the variables employed in each model. This will give an indication of whether each variable employed in each model is exogenous or endogenous to the model at hand, i.e. corporate saving model or household saving model.

4.7. BLOCK EXOGENEITY AND GRANGER CAUSALITY TESTS

Although regression analysis focuses on the dependence of one variable on other variables, it does not necessarily imply causation. In fact, Granger (1980: 329) warned that an observed relationship does not necessitate causality between the variables. Granger (1969: 428) states that "Y_t is causing X_t

if we are better able to predict X_t using all available information than if the information apart from Y_t had been used". Thus, there exists causality from one variable to another. In its simplest form, Granger causality refers to a correlation between the current value of one variable and past values of other variables (Brooks, 2008: 298). Lütkepohl (2006: 498) states that a variable is causal for another times series variable if the information in the former variable is helpful for predicting the latter variable.

Since a VAR model includes many lags of variables, it is probable that it will be difficult to determine which sets of variables have significant effects on each dependent variable and which do not (Brooks, 2008: 297). As a result, tests are conducted which restrict all of the lags of a particular variable to zero. According to Enders (2004: 284), a block exogeneity test is useful for identifying whether or not to include an additional variable in the VAR model. The block exogeneity test is a multivariate generalisation of the Granger causality test. The joint hypotheses are tested using an *F*-test since each individual set of restrictions involves parameters drawn from only one equation (Brooks, 2008: 297). Evaluation of the significance of variables in a VAR model occurs on the basis of a joint test on all of the lags of a specific variable in an equation, as opposed to an examination of individual coefficient estimates (Brooks, 2008: 297). Specifically, the test is to determine whether lags of one variable Granger cause any of the other variables in the VECM model (Enders, 2004: 284).

4.8. CONCLUSION

This chapter described the data and proxy variables used in the empirircal analysis of this study. The *a priori* expectations of the relationships between each depedent variable (corporate saving and household saving in each of the saving models respectively) and each of the variables included in these models was presented. It is important to establish *a priori* expectations before proceeding with the empirical analysis.

The framework of the Johansen cointegration method was described in this chapter as it provides a sophisticated method for analysing long-run relationships in time series data. This is important for private saving in South Africa. An analysis of key macroeconomic determinants may provide substantial insight for policy recommendations aimed at increasing the private saving rate in South Africa, via an analysis of both corporate and household saving. Thus, the next chapter presents the empirical results obtained in each of the corporate and household saving models.

CHAPTER FIVE:

EMPIRICAL RESULTS

5.1. INTRODUCTION

This chapter empirically assesses the determinants of private saving in South Africa. Separate models are estimated for household saving and corporate saving (see Chapter Four). As discussed in Chapter Four, the Johansen (1988) and Johansen and Juselius (1990) cointegration method is employed to determine long-run relationships, while VECMs are employed to verify short-run adjustments. The importance of these results is to provide explanations for South Africa's low level of private saving.

This chapter is divided into the following sections: Section 5.2 presents the descriptive statistics and correlation matrices of both the corporate saving and household saving model variables. Section 5.3 tabulates and interprets the results obtained from the respective unit root tests and stationarity test conducted on each of the variables included in both the corporate saving model and the household saving model. Section 5.4 proceeds with the Johansen cointegration analysis. Specifically, section 5.4.1 presents the results obtained for the corporate saving model and section 5.4.2 presents the results obtained for the household saving model. Within sections 5.4.1 and 5.4.2 are sections covering the selection of the optimal lag length, estimation of the VECM, interpretation of the VECM results, weak exogeneity tests, VECM residual diagnostics, impulse response functions and variance decompositions, as well as block exogeneity and Granger causality tests. Section 5.5 concludes this chapter and introduces Chapter Six.

5.2. DESCRIPTIVE STATISTICS AND CORRELATION MATRICES

This section examines the descriptive statistics for each of the variables included in this study as well as the correlation matrix used to identify the coefficient of correlation between each of the variables employed in both the corporate and household saving models. The descriptive statistics for all of the variables included in this study are examined next, while separate correlation matrices are examined for the corporate and household saving model variables.

The descriptive statistics include the mean, median, maximum value, minimum value, standard deviation, skewness, kurtosis and the JB statistic with their associated probability values. Table 5.1

shows the descriptive statistics for the variables included in this study. These variables include the ratio of corporate saving to GDP (CS_GDP), the ratio of household saving to GDP (HS_GDP), inflation (CPI), a commodity price index (COMPI), the ratio of the current account balance relative to GDP (CA_GDP), real GDP (REAL_GDP), the ratio of gross fixed capital formation of private business enterprises to GDP (GFCF_GDP), the ratio of the government budget balance to GDP (GOVBUDGET), the real prime overdraft rate (REAL_PRIME), a proxy for financial liberalization (M2_GDP), and an indicator of household wealth (WEALTH)[8].

The JB normality test is useful as it determines whether or not a data series approximates the normal distribution (Pindyck and Rubinfeld, 1998: 47). At the 1% level of significance, the null hypothesis for the JB statistic is rejected for HS_GDP, REAL_GDP, and GFCF_GDP while the null hypothesis is rejected for CPI and WEALTH at the 5% significance level. These results lead to the conclusion that HS_GDP, CPI, REAL_GDP, GFCF_GDP, and WEALTH are not normally distributed. The null hypothesis of the JB statistic is not rejected for CS_GDP, COMPI, CA_GDP, GOVBUDGET, REAL_PRIME, and M2_GDP, thereby implying that these variables are normally distributed. Thus, those variables that failed to reject the JB statistic approximate the normal distribution.

Table 5.1: Descriptive Statistics for Variables Included in this Study

	Mean	*Median*	*Maximum*	*Minimum*	*Std. Dev.*	*Skewness*	*Kurtosis*	*Jarque-Bera*
CS_GDP	4.9545	5.0699	10.7271	-0.9609	2.3127	-0.0982	3.0453	0.2030
HS_GDP	1.3088	0.7782	6.5724	-2.1016	1.6093	1.0557	4.0881	28.2118***
CPI	49.8098	46.7500	112.8000	7.4300	31.1993	0.3301	1.9702	7.4820**
COMPI	9.3004	9.4680	10.6318	7.8930	0.7196	-0.2490	2.2055	4.4061
CA_GDP	-0.9467	-0.8000	6.8000	-9.2000	3.5314	-0.1783	2.8260	0.7876
REAL_GDP	14.0265	13.9550	14.4356	13.7635	0.2058	0.6643	2.1127	12.7630***
GFCF_GDP	12.2353	11.7855	16.1677	10.1331	1.5699	0.8433	2.6747	14.7521***
GOVBUDGET	-2.8817	-2.9000	5.6000	-11.8000	3.5572	-0.0368	2.3730	1.9926
REAL_PRIME	13.8821	13.6046	22.4733	7.2337	3.4774	0.2151	2.1304	4.7069
M2_GDP	3.8305	3.8042	4.2020	3.4896	0.1946	0.2218	2.0361	5.6297
WEALTH	4.2781	4.1435	5.9554	2.6066	0.9907	0.2886	1.8848	7.8832**

*** & ** indicate significance at the 1% level and 5% level of significance respectively

[8] For the remainder of this chapter, the results obtained from all of the tests conducted in both the corporate and the household saving models, as well as the discussions based thereon, will be presented using the names indicated in brackets to refer to the different variables included in the analysis.

5.2.1. Corporate Saving Model

Table 5.2 tabulates the correlation matrix for the variables employed in the corporate saving model. Variables that are negatively correlated with CS_GDP include CPI, COMPI, REAL_GDP, GFCF_GDP, GOVBUDGET, and M2_GDP. Those variables that are positively correlated with CS_GDP include the CA_GDP and REAL_PRIME.

Table 5.2: Correlation Matrix for Corporate Saving Model Variables

	CS_GDP	*CPI*	*COMPI*	*CA_GDP*	*REAL_GDP*	*GFCF_GDP*	*GOVBUDGET*	*REAL_PRIME*	*M2_GDP*
CS_GDP	1.0000	-0.4372	-0.4922	0.3042	-0.4955	-0.0276	-0.2417	0.0739	-0.5443
CPI	-0.4372	1.0000	0.9510	-0.4793	0.9752	-0.0668	0.1347	-0.3375	0.9534
COMPI	-0.4922	0.9510	1.0000	-0.3790	0.9212	-0.1877	0.1338	-0.2457	0.9327
CA_GDP	0.3042	-0.4793	-0.3790	1.0000	-0.5528	-0.6170	-0.2024	0.1489	-0.4990
REAL_GDP	-0.4955	0.9752	0.9212	-0.5528	1.0000	0.0909	0.2061	-0.4070	0.9535
GFCF_GDP	-0.0276	-0.0668	-0.1877	-0.6170	0.0909	1.0000	0.2348	-0.0759	0.0055
GOVBUDGET	-0.2417	0.1347	0.1338	-0.2024	0.2061	0.2348	1.0000	-0.0694	0.1950
REAL_PRIME	0.0739	-0.3375	-0.2457	0.1489	-0.4070	-0.0759	-0.0694	1.0000	-0.2096
M2_GDP	-0.5443	0.9534	0.9327	-0.4990	0.9535	0.0055	0.1950	-0.2096	1.0000

After examining the correlation matrix of the variables included in the corporate saving model (see table 5.2), it was decided that the inflation variable, CPI, would be excluded from further analysis since it is highly correlated with COMPI (0.9510), REAL_GDP (0.9752) and M2_GDP (0.9534). The commodity price index, real GDP and the proxy for financial liberalization may all prove to be important determinants of corporate saving in South Africa and as such, it was necessary for these variables to remain a part of the corporate saving model. Furthermore, the effect of macroeconomic uncertainty, which is what the inflation variable should capture, may be captured by the real GDP variable. It is for these reasons that inflation was the variable excluded from further analysis.

5.2.2. Household Saving Model

The correlation matrix for the variables included in the household saving model is presented in table 5.3. Those variables that are negatively correlated with HS_GDP include CPI, M2_GDP, REAL_GDP, GOVBUDGET, and WEALTH. Variables that are positively correlated with HS_GDP include CS_GDP and REAL_PRIME.

Table 5.3: Correlation Matrix for Household Saving Model Variables

	HS_GDP	*CPI*	*CS_GDP*	*M2_GDP*	*REAL_GDP*	*GOVBUDGET*	*REAL_PRIME*	*WEALTH*
HS_GDP	1.0000	-0.6425	0.3154	-0.6133	-0.6567	-0.2843	0.2540	-0.6450
CPI	-0.6425	1.0000	-0.4372	0.9534	0.9752	0.1346	-0.3375	0.9862
CS_GDP	0.3154	-0.4372	1.0000	-0.5443	-0.4955	-0.2417	0.0739	-0.4934
M2_GDP	-0.6133	0.9534	-0.5443	1.0000	0.9535	0.1950	-0.2096	0.9676
REAL_GDP	-0.6567	0.9752	-0.4955	0.9535	1.0000	0.2061	-0.4070	0.9787
GOVBUDGET	-0.2843	0.1346	-0.2417	0.1950	0.2061	1.0000	-0.0694	0.1708
REAL_PRIME	0.2540	-0.3375	0.0739	-0.2096	-0.4070	-0.0694	1.0000	-0.3369
WEALTH	-0.6450	0.9862	-0.4934	0.9676	0.9787	0.1708	-0.3369	1.0000

As was the case in the corporate saving model, it was decided that the inflation variable, CPI, be excluded from further analysis due to its high correlation with M2_GDP (0.9534), REAL_GDP (0.9752), and WEALTH (0.9862). The indicator of financial liberalization, real GDP and proxy for wealth may all prove to be important determinants of household saving in South Africa and as such it was necessary for these variables to remain a part of the household saving model. Furthermore, and as was discussed in section 5.2.1, the effect of macroeconomic uncertainty on household saving, which should be captured by the inflation variable, may be captured by the real GDP variable. It is for these reasons that inflation was excluded from further analysis.

5.3. UNIT ROOT TESTS AND ANALYSES

This section presents and discusses the unit root tests and stationarity test conducted on each of the variables included in this study to determine orders of integration. The ADF and PP unit root tests and the KPSS stationarity test were used in order to ensure robustness of results (see Chapter Four). Kwiatkowski *et al.* (1992: 176) state that by testing both the unit root hypothesis and the stationarity hypothesis, one is able to distinguish between time series that appear to be stationary, time series that appear to have a unit root, and time series for which the data are not sufficiently informative to be sure whether they are stationary or integrated of some order.

The results of the unit root and stationarity tests conducted on the variables included in this study are shown in table 5.4. The results indicate that CS_GDP, COMPI, CA_GDP, REAL_GDP, GFCF_GDP, REAL_PRIME, M2_GDP, and WEALTH are all $I(1)$ across each of the different tests conducted.

The results are however contradictory for HS_GDP and GOVBUDGET across the different tests, but on average HS_GDP is $I(1)$ and GOVBUDGET is $I(0)$.

Table 5.4: ADF, PP and KPSS Tests on Variables Included in this Study

	ADF			PP			KPSS		
Variable	Level	First Differences	Order	Level	First Differences	Order	Level	First Differences	Order
CS_GDP	-2.6359	-6.8081***	I(1)	-1.2974	-16.3383***	I(1)	0.6423**	0.0471	I(1)
HS_GDP	-2.5853	-12.5711***	I(1)	-4.9969***	-46.4475	I(0)	1.0245***	0.2424	I(1)
COMPI	-2.8742	-10.0067***	I(1)	-3.0379	-9.9781***	I(1)	0.4121***	0.0281	I(1)
CA_GDP	-2.6475	-14.4988***	I(1)	-3.2882	-14.8859***	I(1)	0.4769**	0.0473	I(1)
REAL_GDP	-1.9459	-6.2423***	I(1)	-1.2657	-6.3063***	I(1)	0.3075***	0.0535	I(1)
GFCF_GDP	-2.7213	-10.2311***	I(1)	-2.0037	-10.3122***	I(1)	0.2329***	0.0695	I(1)
GOVBUDGET	-2.1995	-5.1439***	I(1)	-11.7162***	-43.4683	I(0)	0.2501	0.1165	I(0)
REAL_PRIME	-0.5148	-8.9264***	I(1)	-0.5970	-8.9025***	I(1)	0.1664**	0.0384	I(1)
M2_GDP	-2.9136	-8.6363***	I(1)	-2.7574	-8.6417***	I(1)	1.2216***	0.0606	I(1)
WEALTH	-2.6498	-3.6928**	I(1)	-1.9046	-12.7148***	I(1)	0.2112**	0.0752	I(1)

*** & ** indicate significance at the 1% level and 5% level of significance respectively

Since the order of integration of all of the variables included in each of the corporate saving and household saving models have been determined, the steps involved in the Johansen method of cointegration are undertaken. A linear combination of variables that are $I(1)$ may be cointegrated and are thus $I(0)$ (Granger, 1987, Brooks, 2008). According to Hall (1990: 319), the variables included in the Johansen method of cointegration are usually $I(1)$, although some variables that are $I(0)$ may be included. Thus, the implementation of the Johansen procedure for each of the corporate and household saving models is appropriate in this study.

5.4. JOHANSEN COINTEGRATION ANALYSIS

The Johansen cointegration method was carried out to determine whether or not there are any long-run equilibrating relationships between the dependent variables (CS_GDP and HS_GDP in each of the corporate saving and household saving models respectively) and the explanatory variables included in each model for the South African case. As mentioned in Chapters Three and Four, an understanding of the behaviour of corporate saving and household saving is critical if South Africa is to achieve sustained higher economic growth in the future.

From this point forward, the results obtained from the corporate saving model will be presented separately to those results obtained from the household saving model. While a brief description of

each test (estimation of the VECM, weak exogeneity tests, impulse response functions and variance decomposition, as well as block exogeneity and Granger causality tests) and its importance will be presented in the first set of results, i.e. in the corporate saving model, this will not be repeated in the second set of results, i.e. in the household saving model. This is to avoid repetition.

5.4.1. CORPORATE SAVING MODEL

5.4.1.1. Selection of Optimal Lag Length

The estimation of the VAR model and subsequent VECM models are highly sensitive to the lag length specified (Kennedy, 2003: 331). The selection of an appropriate lag length is therefore critical to the estimation of a well-specified UVAR model (see Chapter Four). Enders (2004) and Lütkepohl (2006) stress the importance of selecting an optimal lag length to ensure that the residuals are white noise and states that the AIC, SBC and Hannan-Quinn (HQ) information criteria may be used to assist in the selection process. Accordingly, the VAR lag order selection criteria were examined to assist in determining an optimal lag length. Hall (1990: 32) states that a low lag length may result in serial correlation while a high lag length may create a small sample effect. The results obtained from the different VAR lag order selection criteria are presented in Appendix 2 for the corporate saving model.

Since conflicting lag lengths were obtained from each information criterion, an iterative process was used, whereby serial correlation was tested for at each lag length to determine the optimal lag length where serial correlation was removed. This is also in accordance with the approach of Hondroyiannis (2004). Specifically, the smallest selected VAR lag length was chosen and then increased until the results obtained showed a good set of residual diagnostic results[9]. It was found that a higher lag length ensured the removal of autocorrelation among the residuals, while a lower lag length gave evidence of autocorrelation among the residuals as cautioned by Hall (1990). This was especially the case within the first four lags. As a result, an optimal lag length of six lags was selected.

Table 5.5 shows the results obtained from the autocorrelation test conducted on the residuals obtained in the UVAR. The null hypothesis specifies that there is no serial correlation at lag order *h*. Failure to reject the null hypothesis therefore means that there is no autocorrelation among the residuals. It can be seen from table 5.5 that there is some evidence of autocorrelation among the residuals at the 5%

[9] The Lagrange Multiplier (LM) test of no autocorrelation is the most important residual test. As such, in terms of residual diagnostic tests, results are shown from only this test for the VAR model.

level of significance for lag one only. For all other lag lengths however, there is no evidence of autocorrelation as the LM-statistics fail to reject the null hypothesis.

Table 5.5: VAR Residual Serial Correlation LM Tests

Lags	LM-statistic	Probability
1	91.3069	0.0141
2	75.4262	0.1554
3	66.6697	0.3853
4	87.8770	0.0255
5	71.0526	0.2545
6	67.5132	0.3580
7	58.3926	0.6742
8	80.0322	0.0851
9	64.8343	0.4474
10	66.7782	0.3818
11	74.8801	0.1660
12	57.0790	0.7176

5.4.1.2. Trace and Maximum Eigenvalue Test Statistics

The trace and maximum eigenvalue test statistics were used to determine the number of cointegrating vectors to be estimated in the VECM[10]. Using a lag interval of 1 to 6, a tabulation of a summary of the results obtained from the trace test statistic and the maximum eigenvalue test statistic is presented in Appendix 3.

The number of cointegrating vectors was selected using the 5% level of significance. The specification employed in this study included an intercept and no trend since the corporate saving function is assumed to be a linear function of each of the variables included in the corporate saving model. Also, very few of the variables included in the corporate saving model exhibited a trend, thereby ruling out the inclusion of a trend in the test type specification. As such, no trend was included in the empirical estimation. According to the maximum eigenvalue test statistic, one cointegrating vector is present, while the trace test statistic suggests that four cointegrating vectors are present. This study followed the maximum eigenvalue test statistic. Since only one cointegrating vector was found to be present, there was no need to impose any restrictions on the various

[10] The cointegration test was experimented with including a number of different lags, each yielding different cointegrating equations. Only the results that fit the corporate saving model best at the best chosen lag length are presented here.

coefficients in the corporate saving model. The dependent variable in the cointegrating vector was CS_GDP since an analysis of the determinants of corporate saving is required.

5.4.1.3. Estimation of VECM

The next step involved estimation of the VECM, where normalisation was conducted on CS_GDP to make it the dependent variable in the corporate saving model. Table 5.6 and table 5.7 present the results obtained from the estimated VECM.

Table 5.6: Cointegrating Vector Estimates

Cointegrating Equation	**Equation 1**
CS_GDP_{t-1}	**1**
$COMPI_{t-1}$	**-1.9812** (0.7556) [2.62195]
CA_GDP_{t-1}	**-0.7589** (0.0816) [9.3015]
$M2\_GDP_{t-1}$	**-42.8751** (4.0251) [10.6520]
$REAL\_GDP_{t-1}$	**35.3159** (6.0259) [-5.8607]
$GFCF\_GDP_{t-1}$	**-1.2312** (0.1698) [7.2499]
$GOVBUDGET_{t-1}$	**-0.2016** (0.0636) [3.1728]
$REAL\_PRIME_{t-1}$	**0.2957** (0.0981) [-3.0140]
Constant	**-297.8250**
R^2	0.7237
AIC	3.5799
SBC	4.7867

NOTE: Figures in round brackets denote standard errors and figures in square brackets denote t-statistics

Table 5.7: Vector Error Correction Estimates

Error Correction	D(CS_GDP)	D(COMPI)	D(CA_GDP)	D(M2_GDP)	D(REAL_GDP)	D(GFCF_GDP)	D(GOVBUDGET)	D(REAL_PRIME)
Equation 1	-0.7231 (0.2018) [-3.5828]	0.0077 (0.0137) [0.5627]	-0.8959 (0.2209) [-4.0557]	-0.0051 (0.0037) [-1.3786]	-0.0005 (0.0009) [-0.5676]	-0.0913 (0.0569) [-1.6058]	0.4926 (0.3054) [1.6127]	-0.1723 (0.2021) [-0.8527]

NOTE: Figures in round brackets denote standard errors and figures in square brackets denote t-statistics

5.4.1.4. Interpretation of VECM Results

A statistically significant and negative relationship was found between the commodity price index and the ratio of corporate saving to GDP. This relationship is statistically significant at the 1% level.

Although the actual coefficient of COMPI is -1.98, given its functional form, its coefficient is -0.0198, since COMPI is in natural logarithms. Thus, the result indicates that when COMPI increases by 1 percent, CS_GDP decreases by 0.0198 percentage points. This result does not conform to *a priori* expectations (Barr and Kantor, 1994; Loayza *et al.*, 2000b; Harjes and Ricci, 2005). When commodity prices rise, one would expect the level of retained earnings (corporate saving) to rise as a result, especially for corporations in a commodity producing country like South Africa. The degree of offset between these two variables is however quite small. One of the reasons for this unexpected result may be due to the inclusion of data up to the year 2010. This is discussed further in Chapter Six.

The relationship between corporate saving and the current account balance, both expressed as ratios of GDP, was found to be statistically significant at the 1% level and negative. This does conform to *a priori* expectations, since foreign saving represent an imperfect substitute for domestic saving to finance the investment levels required of a booming economy (Commission for Growth and Development, 2008). An increase in CA_GDP of 1 percentage point results in a decrease in CS_GDP of 0.76 percentage points. This negative relationship is of particular importance for the South African case since the economy is hugely dependent on foreign capital inflows to fund higher investment levels and suggests that corporations are able to access foreign savings to fund higher investment levels rather than saving internally. The Commission for Growth and Development (2008) emphasized the fact that higher economic growth must be backed by higher domestic saving rates (see Chapter One).

The ratio of M2 to GDP was used as a proxy for financial liberalization. The negative coefficient of M2_GDP was found to be statistically significant at the 1% level. This conforms to *a priori* expectations (Masson *et al.*, 1998; Aron and Muellbauer, 2000b) and suggests that an improvement in the sophistication of the financial sector in South Africa lowers corporate borrowing constraints. It suggests that corporations are able to acquire funds more easily in capital markets, making the need to save out of corporate profits no longer a top priority. The coefficient of M2_GDP is -42.88, but since the natural logarithm of M2_GDP is employed, the interpretation of this coefficient is different given its functional form. Specifically, a 1 percent increase in M2_GDP results in a decrease in CS_GDP of 0.4288 percentage points. Thus, an offsetting effect of financial liberalization on corporate saving in South Africa appears to exist. It has been noted that in the short-run the effect of

financial liberalization on private saving rates would be negative, however, in the long-run, this relationship should become positive (Loayza *et al.*, 2000b).

Real GDP was included in the empirical analysis to show the effect of economic growth on corporate saving in South Africa. The positive result obtained conforms to *a priori* expectations and is statistically significant at the 1% level (Kessler *et al.*, 1993; Carroll and Weil, 1994; Dirschmid and Glatzer, 2004). The coefficient of REAL_GDP is 35.32, but since the natural logarithm of REAL_GDP is used, the interpretation is different given its functional form. Specifically, when REAL_GDP increases by 1 percent, CS_GDP increases by 0.3532 percentage points. A rise in the level of economic growth therefore impacts positively on corporate saving in South Africa. This result does not confirm the conclusions reached by Prinsloo (2000), but does confirm those conclusions reached by Aron and Muellbauer (2000b). When the economy is in an upswing, corporations see fit to retain earnings, perhaps due to greater profits being earned at a time of rising economic growth rates as well as planned corporate investment rising in response to increased sales. On the other hand, when the economy is in a downswing, corporations do not save. This may be due to a fall in profits being recorded due to falling economic growth rates, thereby resulting in a squeeze in liquidity. Corporations may simply not have the capacity to retain profits during times of decreasing economic growth. These results do not however confirm what is currently happening (see figure 4.1). This may be due to the fact that the current downswing is a banking crisis and as such corporations have felt it necessary to save in order to internally fund their investment.

A negative relationship was found between gross fixed capital formation (investment) of private business enterprises and corporate saving, both expressed as ratios of GDP. This result does not conform to *a priori* expectations and is statistically significant at the 1% level (Feldstein and Horioka, 1980; Fry, 1980; Harjes and Ricci, 2005). One of the motivations behind corporations saving is to fund higher investment levels. Feldstein and Horioka (1980) showed that the positive relationship between saving and investment remains valid even in a world of international capital mobility (see Chapter Three). However, the results obtained suggest that when GFCF_GDP increases by 1 percentage point, CS_GDP decreases by 1.23 percentage points. One of the reasons for this negative relationship may be attributed to the negative relationship found between corporate saving and the current account balance. Since corporations view foreign saving as an imperfect substitute for saving, the need to save internally in order to fund higher investment expenditure may no longer be required.

The negative relationship found between corporate saving and the government budget balance, both expressed as ratios of GDP, is statistically significant at the 1% level. The literature (Corbo and Schmidt-Hebbel, 1991; Masson *et al.*, 1998; Loayza *et al.*, 2000a) extensively discusses the theory of Ricardian equivalence, which is expected to hold for household saving and thus private saving (see Chapter Three). Since corporate saving is the dominant component of private saving in South Africa, this study sought to test whether Ricardian equivalence applies to corporate saving. The result obtained shows that when GOVBUDGET increases, i.e. improves, by 1 percentage point, CS_GDP falls by 0.20 percentage points. Although this result rules out the existence of strict Ricardian equivalence in the corporate sector in South Africa, the offsetting result is substantial. It means that the aggregate level of saving between these two sectors would increase by 0.80 percentage points for a 1 percentage point improvement in the fiscal balance. Thus, partial Ricardian equivalence appears to hold for corporate saving in South Africa. The full extent on private saving changes when the impact of Ricardian equivalence on household saving (see section 5.4.2.4) is included.

The relationship between the real prime overdraft rate in South Africa and corporate saving expressed as a ratio of GDP was found to be positive and statistically significant at the 1% level. The literature (Edwards, 1996; Masson *et al.*, 1998; Prinsloo, 2000; Loayza and Shankar, 2000) concludes that the *a priori* relationship between these two variables is ambiguous, yielding it an empirical matter. The existence of a substitution effect and an income effect are at war and dominance of one effect over the other will yield either a positive or negative relationship respectively. The results suggest that a 1 percentage point increase in REAL_PRIME positively impacts on CS_GDP by 0.30 percentage points. This suggests that higher interest rates provide an incentive for corporations to save more, which may be due to the higher cost of capital experienced at higher interest rates. Ogaki, Ostry and Reinhart (1995: 1) state that an increase in real interest rates in developing economies should encourage domestic saving and expand the supply of credit available to domestic investors, which will enable the economy to grow more rapidly.

Table 5.7 presents the adjustment parameters (α's) obtained in the VECM. The adjustment parameters represent short-run values and therefore characterise disequilibrium correction (Todani, 2007: 684). Of importance is the sign on the coefficient of D(CS_GDP) and its significance since this coefficient shows the short-run correction value of corporate saving to the long-run equilibrium value. As such, 72 percent of the adjustment back to the long-run equilibrium takes place in the first quarter, thereby implying that the estimated VECM represents an acceptable model of corporate

saving since most of the adjustment from the short-run disequilibrium to the long-run equilibrium level takes place in the first quarter. Moreover, since α is statistically significant and negative, there is indeed an error-correcting mechanism in the corporate saving model.

5.4.1.5. Weak Exogeneity Tests

The next step made use of the adjustment matrix to determine whether the variables included in the corporate saving model were weakly exogenous or endogenous. Table 5.8 presents the results obtained from the weak exogeneity tests.

Table 5.8: VECM Weak Exogeneity Tests

Variables	χ^2	Conclusion
D(CS_GDP)	15.7237***	Endogenous
D(COMPI)	0.4516	Weakly Exogenous
D(CA_GDP)	20.0872***	Endogenous
D(M2_GDP)	2.8999*	Endogenous
D(REAL_GDP)	0.5303	Weakly Exogenous
D(GFCF_GDP)	3.4673*	Endogenous
D(GOVBUDGET)	3.6561*	Endogenous
D(REAL_PRIME)	0.9744	Weakly Exogenous

***, ** & * represent rejection of the null hypothesis of weak exogeneity at the 1%, 5% and 10% levels of significance respectively

From table 5.8, it can be seen that COMPI, REAL_GDP, and REAL_PRIME are all weakly exogenous variables, while CS_GDP, CA_GDP, M2_GDP, GFCF_GDP and GOVBUDGET are all endogenous variables. Those variables identified as being endogenous to the model are error-correcting to the corporate saving relation and as such they adjust to disequilibrium in corporate saving as shown by their significant adjustment parameters (Todani, 2007: 689). Of significance is the high endogeneity of CS_GDP since this confirms that CS_GDP is indeed part of the cointegrating equilibrium relationship and thus justifies the normalisation on CS_GDP (dependent variable). This is important due to the fact that CS_GDP is the main variable of interest within the corporate saving model. On the other hand, those variables identified as being weakly exogenous do not adjust to disequilibrium and are therefore not error-correcting. Although they impact significantly on corporate saving in the cointegrating vector, they do not, however, correct for short-run disequilibrium.

5.4.1.6. VECM Residual Diagnostics

The next steps involved in the Johansen method of cointegration include a test for serial correlation on the residuals in the VECM, a residual normality test, and a test for heteroscedasticity. These tests are conducted to ensure that the residuals in the VECM are white noise. A residual graph is also analysed.

The VEC residual serial correlation LM test failed to reject the null hypothesis of no serial correlation at different lag lengths. Thus, the residuals in the VECM provide evidence of a white noise process. The JB test statistic obtained in the residual normality test failed to reject the null hypothesis that the residuals are multivariate normal at each component level, except at component three, thereby concluding that the residuals are multivariate normal. Furthermore, the joint JB test for residual normality also failed to reject the null hypothesis that the residuals are multivariate normal, thereby concluding that the residuals are indeed multivariate normal. The VEC residual heteroscedasticity test showed that there is no heteroscedasticity in the VECM. The results of these tests are presented in Appendix 4.

The cointegrating graph obtained from the cointegrating vector as well as the residual graphs obtained from each variable included in the corporate saving model are presented in Appendix 5. The cointegrating graph shows that over time the cointegrating vector moves around the zero axis. Although deviations do occur, the cointegrating vector is bound together confirming the presence of cointegration among the variables included in the corporate saving model. This too confirms that a long-run corporate saving function exists in the case of South Africa. The residual graphs depict the fact that the residual series for each of the variables included in the corporate saving model are indeed white noise. It is evident from the residual graphs that the error terms deviate around the zero axis and are thus stationary, which is consistent with the results obtained from the JB test for residual normality.

5.4.1.7. Impulse Response Functions and Variance Decomposition

The impulse response functions as well as the table of the variance decomposition for CS_GDP are shown in Appendix 6. According to Gujarati (2003: 853), the impulse response functions trace out the responsiveness of the dependent variables in a VAR system to a unit shock in the error terms for each of the variables in the equation. It should be noted that the results obtained from both the

impulse response functions and the variance decompositions are affected by the ordering of the variables as well as the lag length employed, since the Cholesky approach was used (see Chapter Four).

The response of CS_GDP to both its own innovations as well as innovations of the variables included in the corporate saving model is both positive and negative at times. Specifically, the response of CS_GDP to its own shocks is the highest relative to shocks from other variables and is positive. It would seem that CS_GDP responds quickly to innovations in M2_GDP, REAL_PRIME, COMPI, CA_GDP, GOVBUDGET and REAL_GDP. The impulse response functions shown in Appendix 6 for the corporate saving model include six lags[11]. It is not clear from the impulse response functions that a new long-run equilibrium level is eventually reached.

According to Brooks (2008: 300), variance decompositions provide the proportion of the movements of the dependent variables that are a result of their own shocks as opposed to shocks of other variables. At lag one, for CS_GDP, 100 percent of the change in CS_GDP is entirely attributed to changes in CS_GDP itself and is in no way altered by shocks from any of the other variables included in the model. With an increase in the number of lags included, a decreasing proportion of the variation in CS_GDP is attributed to its own shocks, while an increasing proportion of the variation in CS_GDP is attributed to shocks to other variables included in the model. For example, at a lag length of five, 64.16% of the variation in CS_GDP is attributed to its own shocks, with the remainder of the variation in CS_GDP attributed as follows; COMPI (3.54%), CA_GDP (4.70%), M2_GDP (12.39%), REAL_GDP (3.37%), GFCF_GDP (1.66%), GOVBUDGET (5.47%) and REAL_PRIME (3.37%). Generally, as the lag length is increased, so the variation in CS_GDP that is attributed to its own shocks is reduced, while the variation attributed to shocks to the other variables is increased. However, the largest proportion of the variation in CS_GDP is attributed to its own shocks.

5.4.1.8. Block Exogeneity and Granger Causality Tests

The results obtained from pair-wise Granger causality tests are shown in Appendix 7. Pair-wise Granger causality tests are important since for a vector of economic series to have an attainable equilibrium, there must be some causation between them in order to provide the necessary dynamics (Granger, 1988: 203). Granger (1988: 204) states that when a set of series are $I(1)$ and cointegrated,

[11] When a lower lag length was included, the depiction of the impulse response functions showed the response of CS_GDP to each of the variables in reaching a new long-run equilibrium much quicker. However, a lower lag length gave evidence of autocorrelation.

causation could be present, but may not be detected by certain testing procedures used. However, from the pair-wise Granger causality tests conducted, it would seem that at the 10% level of significance, the null hypothesis that COMPI does not Granger cause CS_GDP is rejected, thereby concluding that COMPI does Granger cause CS_GDP.

At the 10% level, the null hypothesis that CS_GDP does not Granger cause CA_GDP is rejected, thereby concluding that CS_GDP does Granger cause CA_GDP. This shows evidence of reverse causation between CS_GDP and CA_GDP, since it is expected that the current account balance should negatively affect corporate saving in South Africa. However, since the current account balance represents the difference between savings and investment, it is unsurprising that the largest component of domestic saving in South Africa should impact on the current account balance.

At the 1% level, the null hypothesis that M2_GDP does not Granger cause CS_GDP is rejected, thereby concluding that M2_GDP does Granger cause CS_GDP. This provides evidence in favour of financial liberalization affecting corporate saving in South Africa. Since financial liberalization has played an important part in the development of the South African economy, it is unsurprising that M2_GDP impacts on CS_GDP.

The null hypotheses that GOVBUDGET does not Granger cause CS_GDP and that CS_GDP does not Granger cause GOVBUDGET are statistically significant at the 1% level, thereby rejecting both of these hypotheses. This too suggests evidence of two-way causation between CS_GDP and GOVBUDGET in South Africa. Thus, Ricardian equivalence is emphasized. At the 10% level, the null hypothesis that GFCF_GDP does not Granger cause CS_GDP is rejected, concluding that investment of private business enterprises in South Africa does influence corporate saving.

Finally, the pair-wise Granger causality test shows that the null hypotheses that REAL_GDP does not Granger cause CS_GDP as well as that CS_GDP does not Granger cause REAL_GDP are rejected at the 10% and 5% levels respectively. This provides evidence of two-way causation between these two variables, which is important for a developing economy such as South Africa. As discussed in Chapter One, savings are required to fund higher levels of investment in order to achieve economic growth. The literature (Carroll and Summers, 1991; Edwards, 1996; Schmidt-Hebbel and Serven, 1999; Loayza *et al.*, 2000b) extensively discusses the direction of causation between these two variables and mixed conclusions are reached.

The results from the VEC Granger causality and block exogeneity Wald tests are also presented in Appendix 7. These tests test bilaterally whether the lags of the excluded variable affect the endogenous variable, D(CS_GDP). At the 1% level, both D(CA_GDP) and D(GOVBUDGET) are significant, thereby rejecting the null hypothesis that lagged coefficients of both D(CA_GDP) and D(GOVBUDGET) are significantly different from zero. As in the pair-wise Granger causality tests, the result obtained for D(CA_GDP) is unsurprising given the definition of the current account balance in terms of saving and investment. Given Ricardian equivalence, the result obtained for D(GOVBUDGET) is also unsurprising. Consequently, D(CA_GDP) and D(GOVBUDGET) are found to be exogenous. At the 5% level, D(REAL_GDP), D(REAL_PRIME) and D(M2_GDP) all reject the null hypothesis that the lagged coefficients of each of these variables are significantly different from zero. This yields the conclusion that these three variables are also exogenous.

The joint block exogeneity test shows that the χ^2 test statistic is significant at the 1% level, thereby yielding the conclusion that the lags of all of the variables included in the corporate saving model affect the endogenous variable, D(CS_GDP). This reinforces the presence of a corporate saving model in South Africa.

5.4.2. HOUSEHOLD SAVING MODEL

5.4.2.1. Selection of Optimal Lag Length

As discussed above (section 5.4.1.1), the estimation of the VAR model and subsequent VECM models are highly sensitive to the lag length specified. As was the case in the corporate saving model, the smallest selected VAR lag length was chosen and then increased until the results obtained showed a good set of residual diagnostic results[12]. It was found that a higher lag length ensured the removal of autocorrelation among the residuals, while a lower lag length gave evidence of autocorrelation, especially within the first four lags. As a result, an optimal lag length of six lags was selected. The results obtained from the different VAR lag order selection criteria are presented in Appendix 2 for the household saving model.

Table 5.9 shows the results obtained from the autocorrelation test conducted on the residuals obtained in the UVAR. It is clear from table 5.9 that overall there is no autocorrelation among the residuals in the estimated UVAR model as the LM-statistics fail to reject the null hypothesis at the 1% level of

[12] As was the case in the corporate saving model, the LM test of no autocorrelation is the most important residual test. Accordingly, in terms of residual diagnostic tests, results are only shown from this test for the VAR model.

significance. However, at a lag length of five, the LM-statistic fails to reject the null hypothesis of no autocorrelation.

Table 5.9: VAR Residual Correlation LM Tests

Lags	LM-statistic	Probability
1	48.7338	0.4838
2	55.6437	0.2390
3	41.8076	0.7572
4	58.2171	0.1724
5	78.8093	0.0044
6	52.8955	0.3262
7	38.4401	0.8613
8	52.0248	0.3570
9	38.4792	0.8602
10	61.6851	0.1059
11	65.6951	0.0557
12	60.2623	0.1299

5.4.2.2. Trace and Maximum Eigenvalue Test Statistics

The trace and maximum eigenvalue test statistics were then used to determine the number of cointegrating vectors present in the VECM[13]. Using a lag interval of 1 to 6, a tabulation of a summary of the results obtained from the trace test statistic and maximum eigenvalue statistic is presented in Appendix 3.

The number of cointegrating vectors was selected using the 5% level of significance. Unlike the corporate saving model, more than one cointegrating vector was found under each of the specifications employed. An intercept and no trend was the estimation procedure assumed in this study since household saving is assumed to be a linear function of the variables included in the household saving model. Furthermore, since very few of the variables exhibited a trend, a trend was not included in the estimation of the cointegrating vectors. According to both the maximum eigenvalue test statistic and the trace test statistic, two cointegrating vectors were present in the VECM, thereby requiring a number of r^2 restrictions to be imposed on various coefficients in the household saving model in order to exactly identify the cointegrating vectors estimated. As a result, four restrictions were imposed on the cointegrating vectors (see table 5.10).

[13] As was the case in the corporate saving model, it is to be noted that the cointegration test was experimented with including a number of different lags, each yielding different cointegrating equations. Only the results that fit the household saving model best at the best chosen lag length are presented here.

5.4.2.3. Estimation of VECM

The dependent variable in the first cointegrating vector is HS_GDP since an analysis of the determinants of household saving is required. Therefore, the first cointegrating vector was normalised on HS_GDP while M2_GDP was restricted to zero. M2_GDP was restricted to zero since it was found to be weakly exogenous in the household saving model (see table 5.12). Although other variables were also found to be weakly exogenous, restriction of M2_GDP to zero yielded the most significant number of coefficients in the household saving model. From a theoretical point-of-view, M2_GDP was decided upon to have the least direct impact on HS_GDP. This is because the impact of financial liberalization may work through a number of channels, including the interest rate and real GDP, thereby causing an indirect impact on household saving (Aron and Muellbauer, 2000b). Ogaki *et al.* (1995: 1) discuss the fact that a financial liberalization program aimed at increasing real interest rates should cause an increase in saving.

A second equation had to be specified. This enabled the specification of a business cycle equation. The second cointegrating vector was therefore normalised on REAL_GDP. Since household saving varies with successive upswings and downswings of the business cycle as implied by the life-cycle and permanent income hypotheses, it is assumed that the household saving equation is related to the real GDP equation[14]. An interpretation of the results obtained in the first cointegrating vector follows.

Table 5.10 and table 5.11 show the results obtained from the estimated VECM.

[14] This study is mainly interested in the analysis and interpretation of the first cointegrating vector since the aim is to analyse the determinants of household saving in South Africa

Table 5.10: Cointegrating Vector Estimates

Cointegrating Equation	Equation 1	Equation 2
HS_GDP$_{t-1}$	**1**	**0**
REAL_PRIME$_{t-1}$	**-0.2081** (0.0446) [4.6671]	**-0.0233** (0.0035) [6.7441]
CS_GDP$_{t-1}$	**-0.3628** (0.0922) [3.9339]	**0.0562** (0.0082) [-6.8681]
GOVBUDGET$_{t-1}$	**-0.3901** (0.0779) [5.0105]	**0.0127** (0.0047) [-2.6842]
M2_GDP$_{t-1}$	**0**	**2.7633** (0.3060) [-9.0305]
REAL_GDP$_{t-1}$	**-5.3487** (2.9569) [1.8089]	**1**
WEALTH$_{t-1}$	**-0.4966** (0.5918) [0.8391]	**-0.3192** (0.0576) [5.5465]
Constant	**82.0789**	**4.8925**
R^2	0.6056	0.6161
AIC	3.3312	3.4981
SBC	4.4180	4.5842

NOTE: Figures in round brackets denote standard errors and figures in square brackets denote t-statistics

Table 5.11: Vector Error Correction Estimates

Error Correction	D(HS_GDP)	D(REAL_PRIME)	D(CS_GDP)	D(GOVBUDGET)	D(M2_GDP)	D(REAL_GDP)	D(WEALTTH)
Equation 1	-1.0370 (0.2997) [-3.4606]	-0.9836 (0.3256) [-3.0208]	-0.2340 (0.3320) [-0.7048]	-0.0184 (0.5096) [-0.0362]	0.0002 (0.0055) [0.0412]	-0.0010 (0.0016) [-0.5910]	-0.0020 (0.0081) [-0.2512]
Equation 2	-9.0899 (3.5362) [-2.5705]	-4.2752 (3.8426) [-1.1126]	15.0310 (3.9177) [3.8367]	-12.8072 (6.0137) [-2.1297]	0.1366 (0.0644) [2.1210]	0.02192 (0.0187) [1.1719]	0.0455 (0.0950) [0.4789]

NOTE: Figures in round brackets denote standard errors and figures in square brackets denote t-statistics

5.4.2.4. Interpretation of VECM Results

A negative relationship was found between household saving expressed as a ratio of GDP and the real prime overdraft rate in South Africa. This relationship is statistically significant at the 1% level. The literature (Edwards, 1996; Masson *et al.*, 1998; Loayza and Shankar, 2000; Loayza *et al.*, 2000a) discusses the fact that the relationship between private saving and the real interest rate is ambiguous due to the substitution and income effects. As a result, the relationship between these two variables is an empirical matter. Therefore, this finding conforms to *a priori* expectations. The negative relationship found implies that the income effect dominates the substitution effect. Prinsloo (2000: 16) states that the future income stream expected from a higher rate of return on saving may raise current consumption levels of households thereby decreasing household saving. Specifically, an increase in REAL_PRIME of 1 percentage point results in a decrease in HS_GDP of 0.21 percentage points. This result is opposite to that found in the corporate saving model where a positive

relationship was found between corporate saving as a ratio of GDP and the real prime overdraft rate in South Africa. When summing the effects of REAL_PRIME on the two components of private saving however, a positive, yet small relationship is found.

The relationship between household saving and corporate saving, both expressed as ratios of GDP, was found to be negative and statistically significant at the 1% level. This result conforms to *a priori* expectations and provides evidence of the existence of households in South Africa "piercing the corporate veil" (Sachs and Larrain, 1993; Prinsloo, 2000; Aron and Muellbauer, 2000; Agosin, 2001). Specifically, a 1 percentage point increase in CS_GDP on average results in a 0.36 percentage point decrease in HS_GDP. To an extent, households appear to view corporate saving as saving conducted on their behalf. This is the result of households "owning" corporations via their shareholdings. Although the offsetting relationship between corporate saving and household saving is not very large, it is statistically significant thereby providing evidence of the existence of households "piercing the corporate veil" in South Africa.

The ratio of the government budget balance to GDP was found to impact negatively on household saving also expressed as a ratio of GDP. This offsetting relationship was found to be statistically significant at the 1% level and conforms to *a priori* expectations. There is therefore also evidence of Ricardian equivalence at the household level in South Africa. Specifically, when GOVBUDGET increases, i.e. improves, by 1 percentage point, HS_GDP decreases by 0.39 percentage points. This implies that households' and government's intertemporal budget constraints are linked. As a result, households view increases in government budget deficits as increases in future taxes. Thus, households will increase their current level of saving to be able to meet higher tax payments in the future. The literature (Corbo and Schmidt-Hebbel, 1991; Masson *et al.*, 1998; Loayza *et al.*, 2000a) states that this offsetting relationship is affected by whether or not the government increases expenditure to invest in productive investments, which will generate their own future income stream, or if the expenditure will go into unproductive projects (or consumption) which will most likely require higher future taxes. Evidently, South African households still view the increased investment expenditure as requiring higher future taxes on their part.

When the offsetting relationship of 0.39 at the household level is combined with the 0.20 at the corporate level discussed in section 5.4.1.4 above, the results suggest that a partial offset for Ricardian equivalence exists in South Africa. This has important implications for the effectiveness of

policies aimed at boosting total saving in South Africa through counter-cyclical fiscal policy and is discussed in Chapter Six.

A negative relationship was found between real GDP and the ratio of household saving to GDP. This relationship is statistically significant at the 10% level and does not conform to *a priori* expectations. The coefficient of REAL_GDP is 5.35, but since REAL_GDP is expressed in natural logarithms, its interpretation is different given its functional form. Specifically, a 1 percent increase in REAL_GDP results in a 0.535 percentage point decrease in HS_GDP. When the economy is in an upswing, households tend to decrease their level of saving. This may be due to the fact that households foresee a continuation of rising economic growth and as such increase consumption expenditure thereby decreasing saving. Conversely, when the economy is in a downswing, household saving is found to increase. The fall in economic activity may be capturing the effects of macroeconomic uncertainty. As such, during economic downswings, households become more cautious of their future income levels and therefore save more. This conclusion is in accordance with those reached by Prinsloo (2000), but contradicts most empirical findings on the relationship between economic growth and household saving (Kessler *et al.*, 1993; Edwards, 1996; Morande, 1998). This result is also opposite to that found between corporate saving as a ratio of GDP and real GDP in the corporate saving model. However, after adding the effect of REAL_GDP on both HS_GDP and CS_GDP, a positive relationship is found for private saving in South Africa.

Finally, a negative relationship was found between the proxy for household wealth, i.e. the ABSA house price index in real terms, and the ratio of household saving to GDP. This relationship was not found to be statistically significant yet does conform to *a priori* expectations (Dornbusch *et al.*, 1999; Lettau and Ludvigson, 2001). Since the WEALTH variable is in natural logarithms, the interpretation thereon is different given its functional form. Specifically, when WEALTH increases by 1 percent, HS_GDP decreases by 0.49 percentage points. A rise in household wealth is expected to decrease household saving since it increases the amount of resources available for consumption (see Chapter Three).

Table 5.11 presents the adjustment parameters (α's) obtained in the VECM. For the household saving VECM, of importance is the sign on the coefficient of D(HS_GDP) and its significance. This coefficient shows the short-run correction value of household saving to the long-run equilibrium value. Specifically, 104 percent of the adjustment back to long-run equilibrium takes place in the first quarter. This suggests that the estimated VECM represents an acceptable model of household saving

in South Africa. Moreover, since α is negative and statistically significant, there is indeed an error-correcting mechanism in the household saving model.

5.4.2.5. Weak Exogeneity Tests

The next step is to use the adjustment matrix to determine whether the variables included in the household saving model are weakly exogenous or endogenous. Table 5.12 presents the results obtained from the weak exogeneity tests.

Table 5.12: VECM Weak Exogeneity Tests

Variables	χ^2	Conclusion
D(HS_GDP)	10.8242***	Endogenous
D(REAL_PRIME)	9.7737***	Endogenous
D(GOVBUDGET)	0.0010	Weakly Exogenous
D(CS_GDP)	0.5635	Weakly Exogenous
D(REAL_GDP)	0.4363	Weakly Exogenous
D(WEALTH)	0.0834	Weakly Exogenous
D(M2_GDP)	0.0020	Weakly Exogenous

*** & ** represent rejection of the null hypothesis of weak exogeneity at the 1% and 5% levels of significance respectively

From Table 5.12, it can be seen that GOVBUDGET, CS_GDP, REAL_GDP, WEALTH, and M2_GDP are all weakly exogenous variables, while HS_GDP and REAL_PRIME are both endogenous variables. Endogeneity of HS_GDP confirms that this variable is part of the cointergating equilibrium relationship as well as justifies the normalisation on this variable (dependent variable), which is important since it is the main variable of interest in the household saving model. Those variables identified as being endogenous to the model are error-correcting to the household saving relation and as such adjust to disequilibrium in household saving as shown by their significant adjustment parameters (Todani, 2007: 689). On the other hand, those variables identified as being weakly exogenous do not adjust to disequilibrium and are therefore not error-correcting. Although they impact significantly on household saving in the cointegrating vector, they do not however correct for short-run disequilibrium.

5.4.2.6. VECM Residual Diagnostics

As conducted in the corporate saving model, the next steps involved in the Johansen method of cointegration include a residual test for autocorrelation in the VECM, a residual normality test, and a residual test for heteroscedasticity. The residual graphs are depicted in Appendix 5.

The VEC residual serial correlation LM test failed to reject the null hypothesis of no serial correlation at different lag lengths, except at lag five. Thus, on average, the residuals in the VECM are white noise. The JB statistic obtained in the residual normality test failed to reject the null hypothesis that the residuals are multivariate normal at each component level yielding the conclusion that the residuals are indeed multivariate normal. The joint JB test of residual normality also failed to reject the null hypothesis that the residuals are multivariate normal. The VEC residual heteroscedasticity test showed that there is no heteroscedasticity in the VECM. The results of these tests are presented in Appendix 4.

The graphs obtained for the two cointegrating vectors as well as the coefficient residual graphs are shown in Appendix 5. The cointegrating graphs, which depict the two cointegrating vectors obtained in the household saving model, show that over time the cointegrating vectors move around the zero axis. Although deviations do occur, the cointegrating vectors are bound together confirming the presence of cointegration among the variables included in the household saving model, thereby confirming the existence of a long-run household saving function in South Africa.

The coefficient residual graphs depict the fact that the residual series for each of the variables included in the household saving model are indeed white noise. It is evident from the residual graphs that the error terms deviate around the zero axis and are therefore stationary as is expected in the Johansen method. These residual graphs reinforce the results obtained from the JB residual normality tests.

5.4.2.7. Impulse Response Functions and Variance Decomposition

The impulse response functions as well as the table tabulating the variance decomposition for HS_GDP are shown in Appendix 6. The impulse response functions were estimated using the Cholesky approach (see Chapter Four). The response of HS_GDP to both its own innovations as well as innovations from the other variables included in the household saving model is both positive and negative at times. Specifically, the response of HS_GDP to its own innovations is the highest, which

is expected, and is positive. It would seem that HS_GDP responds quickly to innovations of all of the other variables. The impulse response functions shown in Appendix 5 for the household saving model include six lags[15]. After twenty periods, the impulse response functions do not clearly show the attainment of a new long-run equilibrium level, although it is evident that most of the variables move back to their original equilibrium.

The variance decomposition for household saving is shown in Appendix 6. At the first lag and for HS_GDP, 100 percent of the change in HS_GDP is entirely attributed to changes in HS_GDP itself and is in no way altered by shocks from any of the other variables included in the model. With an increase in the number of lags included, a decreasing proportion of the variation in HS_GDP is attributed to its own shocks, while an increasing proportion of the variation in HS_GDP is attributed to shocks to other variables included in the model. For example, at a lag length of five, 65.07% of the variation in HS_GDP is attributed to its own shocks, with the remainder of the variation in HS_GDP attributed as follows; REAL_PRIME (6.21%), GOVBUDGET (11.13%), CS_GDP (2.06%), REAL_GDP (1.37%), M2_GDP (5.77%), and WEALTH (8.39%). Generally, as the lag length is increased, so the variation in HS_GDP attributed to its own shocks is reduced, while the variation attributed to shocks to the other variables is increased.

An interesting feature of the variance decomposition of HS_GDP is the proportion of the variation in HS_GDP attributed to the variation in GOVBUDGET. As the lag length increases, an increasing proportion of the variation is attributed to variation in GOVBUDGET. For example, at lags ten, fifteen and twenty, 13.35%, 16.68% and 17.48% of the variation in HS_GDP is attributed to shocks to GOVBUDGET respectively. This may reinforce the significant impact of GOVBUDGET on HS_GDP in South Africa and thus the presence and persistence of Ricardian equivalence. However, and as should be the case, the largest proportion of the variation in HS_GDP is attributed to its own shocks.

5.4.2.8. Block Exogeneity and Granger Causality Tests

The results obtained from pair-wise Granger causality tests are shown in Appendix 7. The results obtained show that at the 10% level, the null hypothesis that HS_GDP does not Granger cause

[15] As was the case in the corporate saving model, when a lower lag length was included, the depiction of the impulse response functions showed the response of HS_GDP to each of the variables in reaching a new long-run equilibrium much sooner. However, a lower lag length gave evidence of autocorrelation.

GOVBUDGET is rejected. This provides evidence of reverse causation from household saving to the government budget balance, which is not what is expected given Ricardian equivalence.

At the 1% level, the null hypotheses that REAL_GDP, M2_GDP and WEALTH do not Granger cause HS_GDP are rejected. This suggests that real GDP, the proxy for financial liberalization and the indicator of household wealth all impact on household saving in South Africa. Specifically, the inclusion of lagged values of these variables will have a significant impact on household saving.

The results from the VEC Granger causality and block exogeneity Wald tests are also presented in Appendix 7. These tests bilaterally test whether the lags of the excluded variable affect the endogenous variable, D(HS_GDP). At the 5% level, both D(REAL_PRIME) and D(GOVBUDGET) reject the null hypothesis that lagged coefficients of each of these variables are significantly different from zero and are therefore said to be exogenous. At the 10% level, D(M2_GDP) also rejects the null hypothesis that the lagged coefficients are significantly different from zero and is thus also exogenous.

The joint block exogeneity test shows that the χ^2 test statistic is significant at the 5% level, thereby yielding the conclusion that the lags of all of the variables included in the household saving model affect the endogenous variable, D(HS_GDP). This reinforces the presence of a household saving model in South Africa.

5.5. CONCLUSION

This chapter presented the empirical evidence obtained from the Johansen cointegration method for both the corporate saving and household saving models. In the corporate saving model, COMPI and GFCF_GDP did not conform to *a priori* expectations, while the rest of the variables included in the model did conform to *a priori* expectations. In the household saving model, REAL_GDP did not conform to *a priori* expectations, while the rest of the variables included in the model did conform to *a priori* expectations.

Some differences in the signs obtained on the coefficients of variables included in both the corporate saving and household saving models were found. In the corporate saving model, a negative relationship was found between corporate saving and real GDP, while in the household saving model, a positive relationship was found between household saving and real GDP. Prinsloo (2000) concludes that a negative relationship is expected between private saving and real GDP. Other authors

(Edwards, 1996; Loayza *et al.*, 2000b; Aron and Muellbauer, 2000b), however, conclude that a positive relationship is expected between these two variables. The difference in signs obtained in the corporate saving model and the household saving model suggests that the overall impact of a change in economic growth is less for private saving in South Africa. Specifically, when the positive relationship of real GDP on corporate saving is added to the negative relationship of real GDP on household saving, the overall impact of real GDP on private saving in South Africa is positive.

The coefficient of the real prime overdraft rate showed a negative relationship in the household saving model and a positive relationship in the corporate saving model. This result is however unsurprising since the literature (Edwards, 1996; Masson *et al.*, 1998; Loayza *et al.*, 2000b; Dirschmid and Glatzer, 2004) emphasizes the fact that the relationship between private saving and the real interest rate is ambiguous and is thus an empirical matter. When adding the two coefficients obtained in the corporate saving and household saving models, the overall effect of the real prime overdraft rate in South Africa on private saving was found to be positive. This suggests that the substitution effect dominates the income effect of real interest rates on private saving in South Africa.

Since all of the variables included in the corporate saving model were found to be statistically significant, it would suggest that each of the variables included in the corporate saving model are important for achieving higher corporate saving rates in South Africa. While for the household saving model, the real prime overdraft rate, the government budget balance and corporate saving, both expressed as ratios of GDP, were all statistically significant thereby suggesting that these variables are important for achieving higher household saving rates in South Africa[16].

The next chapter analyses the implications of these results for increasing the private saving rate in South Africa. For example, since the government budget balance was found to impact significantly on both corporate saving and household saving, this has important policy implications for South Africa. Other such policy recommendations and implications are also discussed in the next chapter.

[16] The variables that are deemed important for achieving higher future corporate and household saving rates and thus private saving rates in South Africa are discussed in greater detail in Chapter 6.

CHAPTER SIX:

FINDINGS, CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1. INTRODUCTION

The motivation for this study is the fact that South Africa has a very low aggregate domestic saving rate. Since private saving represents the dominant component of aggregate saving in South Africa, it was necessary to empirically assess the determinants of private saving. This was achieved by separately analysing models of corporate and household saving. Aron and Muellbauer (2000b) have warned that such low saving rates in South Africa may perpetuate a low growth trap. As discussed in Chapter One, the Commission for Growth and Development (2008) states that in order for an economy to achieve an annual growth rate of 7 percent per annum or more, a domestic saving rate of between 20 and 25 percent per annum of GDP is required. Several high-growth emerging market economies have succeeded in achieving this. Of most importance is the fact that the Commission for Growth and Development (2008: 54) states that there is "no case of a sustained high investment path not backed up by high domestic savings".

For a developing economy to grow, a high level of investment is required. In order to finance said investment, a sufficient level of savings is required. Feldstein and Horioka (1980) established this positive relationship between domestic saving and investment, whereby high investment levels need to be reinforced by high saving rates. In an open and developing economy, foreign saving may be used as a substitute for domestic saving. However, historical evidence has shown that foreign capital inflows – especially foreign portfolio inflows – are highly volatile and subject to investor sentiment. South Africa has been found to rely on an unusually high amount of foreign capital inflows (Ahmed, Arezki and Funke, 2005). The Mexican peso crisis of 1995, the East Asian crisis of 1998, the emerging market economies crisis of 2001, and the latest global financial credit crisis, have all shown how funds are swiftly removed from emerging economies in favour of "safe-haven" developed economies during uncertain times. Thus, while some of the needed investment may be funded via foreign capital inflows, a high level of domestic saving is still required.

An example of an emerging economy successfully switching from reliance on foreign capital inflows to high domestic saving to achieve economic growth is Chile. Like South Africa, Chile initially relied on foreign capital inflows to fund higher investment levels and thus stimulate and achieve economic

growth. Even though foreign capital inflows aided in the development of the Chilean economy, domestic saving rates increased dramatically. Morande (1998: 202) states that the national saving rate represented 6 percent of GDP per annum in the early 1980s but rose significantly in the 1990s to around 25 to 26 percent of GDP per annum. According to Morande (1998: 202), the increased level of domestic saving in Chile provided the funds required for investment and eventually growth as well as substituted for foreign saving, which are highly volatile as evidenced by the Mexican peso crisis (Morande, 1998: 202). The substantial increase in the national saving rate reduced the reliance of the Chilean economy on foreign capital inflows.

This chapter is divided into the following sections: Section 6.2 summarizes the common results obtained from both the corporate saving model and the household saving model. Section 6.3 provides an alternative explanation of the low corporate saving levels evident in South Africa in recent years, while section 6.4 discusses some policy recommendations aimed at raising the level of private saving in South Africa. Finally, section 6.5 concludes this chapter.

6.2. SUMMARY OF FINDINGS

Most of the results obtained from both the corporate saving and the household saving models conform to *a priori* expectations. Common to both the corporate saving and the household saving models is the negative relationship found between the dependent variables (corporate saving and household saving, both expressed as ratios of GDP) and the government budget balance also expressed as a ratio of GDP. This negative relationship between private saving and the government budget balance provides evidence of Ricardian equivalence in South Africa. It is important to note that this relationship was found to be statistically significant in both the corporate saving and household saving models. Evidence is therefore found of the private sector internalizing the behaviour of the public sector in terms of intertemporal budget constraints. According to Loayza *et al.* (2000a), the reason for this relationship is that when government deficits are high, private savers are aware that they will be required to pay higher future taxes to fund higher levels of government debt. Conversely, an increase in government saving is directly offset by an increase in private consumption in anticipation of lower future taxes, thereby resulting in a decrease in private saving.

A negative relationship was found between household saving expressed as a ratio of GDP and real GDP, while a positive relationship was found between corporate saving expressed as a ratio of GDP and real GDP. The overall impact of real GDP on private saving is however positive, which conforms

to *a priori* expectations (Edwards, 1996; Aron and Muellbauer, 2000b; Loayza *et al.*, 2000b). Specifically, a 1 percent increase in real GDP was found to increase private saving by 0.30 percentage points. This positive relationship found overall between private saving and real GDP in South Africa suggests that an upswing in economic activity results in an increase in the level of national income in South Africa, which ensures an increase in private saving rates. This may be attributed to the fact that greater earnings are being recorded as economic activity grows and a greater proportion of profits may be retained. Both Smith (1963) and Aron and Muellbauer (2000b) conclude that corporate saving is expected to increase with an increase in growth rates since investment opportunities become more profitable and corporations retain earnings to fund part of this increased investment.

Evidence of households "piercing the corporate veil" was found in the empirical analysis on South Africa. This suggests households view corporate saving decisions as essentially being conducted on their (the owners via pension funds) behalf. Although in recent years in South Africa both corporate and household saving rates were found to fall and rise simultaneously, the empirical findings suggest that in the long-run, this hypothesis is valid. Consequently, the impact on total savings of a rise in corporate saving is partially offset by a fall in household saving.

6.3. CORPORATE SAVING AND DIVIDEND PAYOUTS

Although the negative relationship empirically found between corporate saving as a ratio of GDP and a commodity price index does not conform to *a priori* expectations, it does reflect the observed behaviour of these two variables in recent years, especially over the period from 2004 to 2007 and from 2008 to 2010, where the offsetting relationship between these two variables was substantial (see figure 4.5). In previous studies (Aron and Muellbauer, 2000b; Harjes and Ricci, 2005) that analysed the relationship between private saving and a commodity price index in South Africa, a positive relationship was concluded. However, this study finds the relationship to be negative. This may be attributed to the observed changes in the level of dividend payouts of corporations in recent years.

Figure 6.1 shows dividends of financial and non-financial corporations as a percentage of gross operating surpluses and the dividend "cover" (ratio of gross operating surplus to dividends paid) of both financial and non-financial corporations over the period from 1995 to 2010. There is a clear negative relationship between these two variables. This is expected as each expression is the inverse of the other. When the amount of dividends paid out to shareholders increases the dividend payout ratio (cover) decreases, and vice versa. Figure 6.2 shows the series for corporate saving of financial and

non-financial corporations as well as dividends of financial and non-financial corporations, both expressed as percentages of gross operating surpluses. Also shown in figure 6.2 is the GDP growth rate in real terms. Figure 6.2 covers the period from 1995 to 2010. As is evident, dividend payments increased as a share of gross operating surplus from 1995 to 2001. From 2001 to 2003 dividend payments decreased. From 2003 to 2007 they began to increase again, until 2008 when they decreased. In 2010, dividend payments remained at a decreased level.

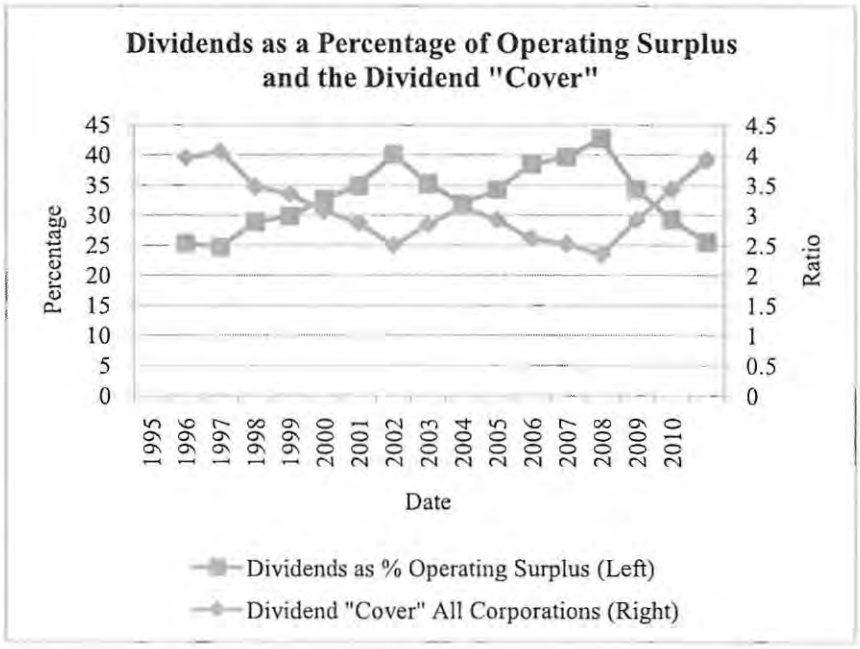

Figure 6.1: Dividends and Dividend "Cover" (South African Reserve Bank, 2011a)

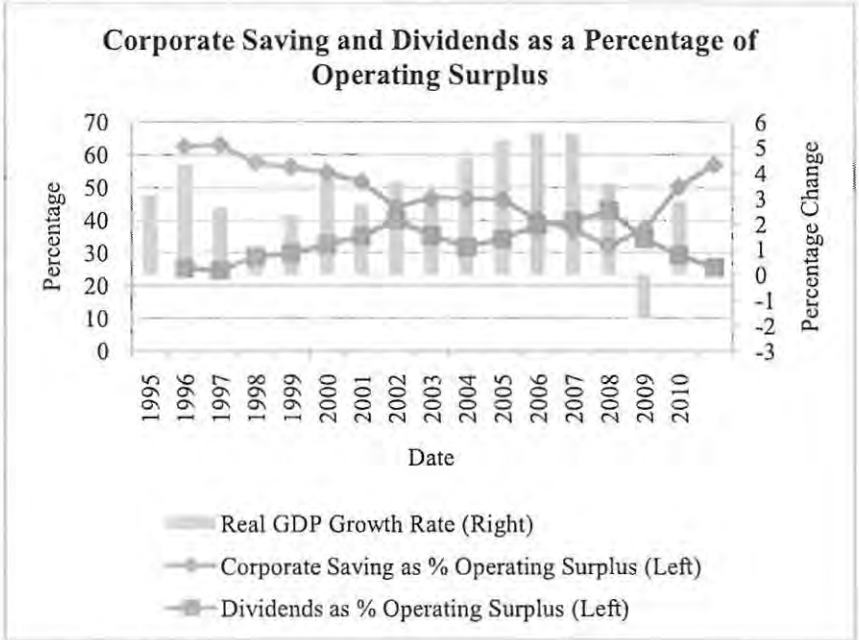

Figure 6.2: Corporate Saving and Dividends (South African Reserve Bank, 2011a)

A negative relationship between corporate saving and dividends is thus evident. It is important to note that during a time of rising GDP growth, (2003 to 2007), which represented a good time to save, corporate saving decreased and dividend payouts increased (see figure 6.2). Similarly, during a time of falling GDP growth, (2007 to 2009), which represented a bad time to save, corporate saving increased and dividend payouts decreased (see figure 6.2). Importantly, dividend payouts rose in recent years even as the economy grew quite rapidly and commodity prices boomed. Thus corporate savings fell as a share of corporate profits as well as of GDP. Declining corporate savings were therefore a result of changed corporate saving behaviour and not falling corporate profits. This is not what is expected *a priori* between corporate saving and both rising and falling GDP growth respectively. It is also contrary to the positive relationship between corporate saving and GDP growth determined in this study for the time period from 1981 to 2010.

This study concludes that changes in the dividend behaviour of corporations represent a structural change in corporate dividend policy and was responsible for decreasing corporate saving rates during the commodity price boom (economic upswing). Why might this be the case? One possibility, consistent with Prinsloo (2000), is that optimism and a sense of euphoria during an economic upswing cause corporations to believe that they are able to sustainably pay out a greater proportion of their earnings in the form of dividends. The second possibility is that financial liberalization and the

improved access of corporate to foreign savings post-1994 encouraged corporations to fund an increased proportion of their investment out of debt rather than retained earnings. Such behaviour is encouraged by the fact that interest earned on corporate savings is taxed, while interest paid on debt is an expense that is subtracted from taxable earnings. The result is that corporations altered their proportion of dividend payouts (dividend cover); hence dividend payouts increased faster than earnings growth causing the level of corporate saving to fall.

From 2008 to 2010, dividends fell and corporate saving increased significantly. The explanation here seems to work in the opposite direction too. Given the recent financial recession (economic downswing) a great amount of uncertainty exists in global financial markets. As such both financial and non-financial corporations alike are more cautious and pessimistic regarding the current macroeconomic environment as well as the future. Consequently, corporations began to save as a result of this increased level of uncertainty. This saving was further encouraged by concerns that corporations might not have easy access to domestic and foreign credit to fund their investment given the uncertainty regarding the soundness of the global financial system.

This finding therefore explains the negative relationship found between corporate saving and the commodity price index. When export earnings rose as a result of higher commodity prices, corporations increased their dividend payout ratios, paying out a larger proportion of profits as dividends as opposed to retaining them as savings. As a result, dividend payouts increased faster than earnings growth. This explains the substantial decline in corporate saving in recent years when commodity prices rose and the economy grew rapidly, as well as the substantial increase in corporate saving currently being experienced.

6.4. POLICY RECOMMENDATIONS

A negative relationship was found between corporate (and thus private) saving and gross fixed capital formation of private business enterprises in South Africa. As discussed in Chapter Five, this is not what is expected *a priori*. Concurrent levels of higher domestic saving and investment are required in order to boost economic growth as emphasized by the Commission for Growth and Development (2008) and the World Bank (2011b). In order for South Africa to accelerate its level of domestic growth, stimulation to both saving and investment needs to be undertaken. Specifically, higher growth in South Africa requires higher levels of both public and private investment, and these need to be funded by higher savings if South Africa is not to be too dependent on foreign capital inflows. The

negative relationship found may be attributed to the unusually large dependence of South Africa on foreign capital inflows. Thus, investment levels may rise alongside lower domestic saving levels. As emphasized by the Commission for Growth and Development (2008), this is unsustainable in the long-run.

As stated above, South Africa currently depends on an unusually high amount of foreign capital inflows to fund investment expenditure. These have proven time and again to be extremely volatile (Ahmed *et al.,* 2005). An increase in the level of foreign direct investment (FDI) in South Africa may stimulate economic growth allowing for increased aggregate saving and thus further investment expenditure. In a panel data study, Ahmed *et al.* (2005: 15) found the South African economy to be less open than its major competitors. Further trade liberalization may therefore improve the attractiveness of South Africa to FDI (Ahmed *et al.,* 2005: 15). This may stimulate economic growth in South Africa required for increased investment and also domestic saving.

In line with the World Bank (2011b: 28), a "mutually reinforcing" process of increased savings and faster economic growth are important for the South African economy. The results of this study find a positive relationship between real GDP and private saving in South Africa via the summation of the effects of real GDP on both corporate and household saving. This suggests increases in saving are likely to occur alongside periods of economic growth. The World Bank (2011b: 29) states that the importance of having high saving rates alongside higher economic growth rates is evident in countries such as China, Chile and India. As such, a need for productivity-led growth is required (World Bank, 2011b: 29). This increase in economic growth will be achieved via increased investment expenditure, thereby raising domestic saving rates. A "virtuous cycle" is thus evident (Loayza *et al.,* 2000b).

The results obtained in this study show that an increase in government saving, i.e. improvement of the budget balance, decreases private saving, but by a smaller effect. This means an increase in government saving will contribute to the higher saving required in South Africa. Eyraud (2009: 17) states that this increase in government saving needs to occur by containing public consumption (expenditure) growth as opposed to raising taxes since an increase in taxes would offset the level of private saving even more (see Chapter Three). The increase in government saving would have a partial offsetting impact on private sector saving, but would raise the overall level of saving in South Africa. According to Strydom (2007), "a sustained reversal of the dis-saving (of government) will be an important contribution towards national saving" in South Africa. This suggests the use of counter-cyclical fiscal policy as a direct measure aimed at increasing the level of aggregate domestic saving in

South Africa to support investment rates sufficient for high growth in South Africa. The recommendation of counter-cyclical fiscal policy is also suggested by the Commission for Growth and Development (2008) and the World Bank (2011b), as well as the International Panel of Advisors (2008) and the New Growth Path Framework of the Economic Development Department (2010).

6.5. CONCLUSION

In recent times high commodity prices occurred alongside higher economic growth. Yet at the same time, low domestic saving rates were recorded. As a result, South Africa experienced an increased reliance on foreign capital inflows, especially in the form of foreign portfolio inflows to fund a larger current account deficit. One of the reasons for the fall in domestic saving may be the increased role of financial liberalization in South Africa. Financial liberalization has increased the availability of credit in South Africa and has reduced borrowing constraints previously faced by both corporations and households.

These low domestic saving rates at a time of strong economic growth were caused by lower private savings. This was contrary to the findings of this and previous studies that private savings are positively related to changes in real GDP. It is unclear whether this was an exception to the norm, or whether they represent early evidence of a structural change in private saving behaviour. Evidence that it might represent a structural change is suggested by the fact that corporate and household saving both rose when the economy slowed in 2008 and 2009 - again, contrary to what the findings of this study would have predicted. Moreover, this study found a negative relationship between commodity prices and corporate saving. This is the opposite of what previous studies had found, suggesting the extension of the time period analysed to include the most recent period has altered the relationship.

If there has indeed been a structural change in corporate and thus private saving behaviour then pick-ups in economic activity may in future be accompanied by much larger increases in the current account deficit as investment rises and saving simultaneously falls. An increase in government saving through an improvement in the government budget balance is therefore a necessary requirement to increasing the overall level of domestic saving in South Africa. Fiscal policy must become counter-cyclical to avoid the development of excessive current account deficits during periods of more rapid economic growth, rising investment and (possibly) falling saving.

Furthermore, FDI needs to be encouraged so as to reduce the reliance of the South African economy on foreign capital inflows into the local bond and equity markets, since these have proven to be highly volatile.

APPENDICES

APPENDIX 1:

A.1. DETAILED DESCRIPTION OF DATA AND ITS ORIGIN

Chapter Four discusses the derivation of a quarterly corporate saving series as a residual from total saving, household saving, government saving and annual depreciation data. All of the saving data was obtained from the South African Reserve Bank in a quarterly frequency. The ratio of the current account balance to GDP was obtained from the South African Reserve Bank. The commodity price index was obtained from Thomson Datastream and is the Reuters Commodity Index. The consumer price index (CPI) was obtained from Thomson Datastream. It includes all urban areas and is linked and rebased (2008=100). The GDP series was obtained from the South African Reserve Bank and is real GDP. The level of gross fixed capital formation (investment) is of private business enterprises and was obtained from the South African Reserve Bank. The nominal prime interest rate was obtained from Thomson Datastream. To get the real prime interest rate, the Fisher equation was applied to the nominal interest rate using the CPI. The government budget balance is the national government deficit / surplus expressed as a percentage of GDP and was obtained from the South African Reserve Bank. M2, expressed as a ratio of GDP, was used as a proxy for financial liberalization / financial depth. The M2 series was obtained from Thomson Datastream, while the GDP series was obtained from the South African Reserve Bank. The ABSA House Price Index was used as a proxy for household wealth. This series was obtained from Jacques du Toit of ABSA Home Loans.

APPENDIX 2:

A.2. VAR LAG ORDER SELECTION CRITERIA

A.2.1. Corporate Saving Model

Variables included in the corporate saving model are CS_GDP, CA_GDP, COMPI, REAL_GDP, GFCF_GDP, GOVBUDGET, M2_GDP, and REAL_PRIME. The optimal lag length was selected based on the results obtained from the VAR lag order selection criteria shown in table A.1, where LR is the sequential modified LR test statistic (each test at the 5% level), FPE is the final prediction error,

AIC is the Akaike information criterion, SC is the Schwarz information criterion and HQ is the Hannan-Quinn information criterion.

Table A.1: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-944.4243	N/A	0.0034	17.0076	17.2018	17.0863
1	-95.9435	1560.599	2.78e-09	2.9990	4.7466*	3.7081
2	10.0712	179.8463	1.33e-09	2.2487	5.5498	3.5881*
3	60.9247	79.0046	1.76e-09	2.4835	7.3379	4.4531
4	166.1928	148.5031	9.15e-10	1.7466	8.1544	4.3464
5	236.2805	88.8612	9.45e-10	1.6378	9.5992	4.8680
6	316.1611	89.8657	8.88e-10	1.3543	10.8690	5.2147
7	391.0536	73.5551	1.02e-09	1.1598	12.2279	5.6505
8	502.0855	93.1875*	7.14e-10*	0.3199*	12.9415	5.4409

* indicates the lag order selected by the criterion

A.2.2. Household Saving Model

Variables included in the household saving model are HS_GDP, CS_GDP, REAL_GDP, GOVBUDGET, WEALTH, M2_GDP, and REAL_PRIME. The optimal lag length was selected based on the results obtained from the VAR lag order selection criteria shown in table A.2.

Table A.2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-696.8915	N/A	0.0007	12.5695	12.7394	12.6384
1	61.4415	1408.333	2.14e-09	-0.0972	1.2621*	0.4543
2	169.2919	186.8123	7.57e-10	-1.1481	1.4005	-0.1140*
3	206.1923	59.3041	9.63e-10	-0.9320	2.8059	0.5846
4	294.1322	130.3396	5.04e-10*	-1.6274	3.2999	0.3718
5	347.0333	71.7943*	5.10e-10	-1.6970*	4.4196	0.7847
6	394.9621	59.0552	5.89e-10	-1.6779	5.6281	1.2864
7	435.1798	44.4802	8.28e-10	-1.5203	6.9750	1.9265
8	486.9399	50.8771	1.02e-09	-1.5704	8.1143	2.3590

* indicates the lag order selected by the criterion

APPENDIX 3:

A.3. TRACE TEST AND MAXIMUM EIGENVALUE TEST STATISTICS

A.3.1. Corporate Saving Model

Table A.3: Unrestricted Cointegration Rank Tests

Null Hypothesis (H_0)	Alternative Hypothesis (H_1)	Maximum Eigenvalue Test Statistic	Maximum Eigenvalue 95% Critical Value	Trace Test Statistic	Trace 95% Critical Value
$r = 0$	$r \geq 1$	98.8813**	52.3626	254.8152**	159.5297
$r \leq 1$	$r \geq 2$	46.1637	46.2314	155.9339**	125.6154
$r \leq 2$	$r \geq 3$	39.7098	40.0776	109.7702**	95.7537
$r \leq 3$	$r \geq 4$	29.9331	33.8769	70.0605**	69.8189

** indicates significance at the 5% level of significance

A.3.2. Household Saving Model

Table A.4: Unrestricted Cointegration Rank Tests

Null Hypothesis (H_0)	Alternative Hypothesis (H_1)	Maximum Eigenvalue Test Statistic	Maximum Eigenvalue 95% Critical Value	Trace Test Statistic	Trace 95% Critical Value
$r = 0$	$r \geq 1$	64.7221**	46.2314	169.9337**	125.6154
$r \leq 1$	$r \geq 2$	43.0914**	40.0776	105.2116**	95.7537
$r \leq 2$	$r \geq 3$	26.5617	33.8769	62.1202	69.8189
$r \leq 3$	$r \geq 4$	17.6001	27.5843	35.5585	47.8561

** indicates significance at the 5% level of significance

APPENDIX 4:

A.4. VECM RESIDUAL DIAGNOSTIC TESTS

A.4.1. Corporate Saving Model

Table A.5: VEC Residual Serial Correlation LM Tests

Lags	LM-statistic	Probability
1	63.8371	0.4822
2	66.6670	0.3854
3	62.8893	0.5158
4	81.0030	0.0742
5	69.4934	0.2978
6	53.1688	0.8309
7	63.8702	0.4811
8	77.1521	0.1252
9	56.7451	0.7283
10	55.0645	0.7794
11	83.4918	0.0514
12	75.1595	0.1605

Table A.6: VEC Residual Normality Test Orthogonalization Cholesky (Lutkepohl)

Component	Jarque-Bera	Df	Probabiliy
1	1.9086	2	0.3851
2	0.1357	2	0.9344
3	8.7716	2	0.0125
4	1.3172	2	0.5176
5	2.4199	2	0.2982
6	3.0181	2	0.2211
7	2.5536	2	0.2789
8	1.2819	2	0.5268
Joint	21.4065	16	0.1634

Table A.7: VEC Residual Heteroscedasticity Test (No Cross Terms, Only Levels and Squares)

Joint Test		
Chi-Squared	Df	Probability
3526.015	3528	0.5063

A.4.2. Household Saving Model

Table A.8: VEC Residual Serial Correlation LM Tests

Lags	LM-statistic	Probability
1	56.0780	0.2267
2	61.2949	0.1118
3	58.5236	0.1654
4	57.7099	0.1843
5	94.9420	0.0001
6	46.1593	0.5890
7	36.9624	0.8969
8	50.1012	0.4295
9	38.2313	0.8667
10	41.9088	0.7536
11	62.4532	0.0939
12	53.0725	0.3201

Table A.9: VEC Residual Normality Test Orthogonalization Cholesky (Lutkepohl)

Component	Jarque-Bera	Df	Probabiliy
1	1.6471	2	0.4389
2	0.8554	2	0.6520
3	0.5138	2	0.7735
4	3.4837	2	0.1752
5	1.3004	2	0.5220
6	1.1456	2	0.5639
7	2.0411	2	0.3604
Joint	10.9871	14	0.6871

Table A.10: VEC Residual Heteroscedasticity Test (No Cross Terms, Only Levels and Squares)

Joint Test		
Chi-Squared	Df	Probability
2494.557	2464	0.3289

APPENDIX 5:

A.5. COINTEGRATING AND RESIDUAL GRAPHS

A.5.1. Corporate Saving Model

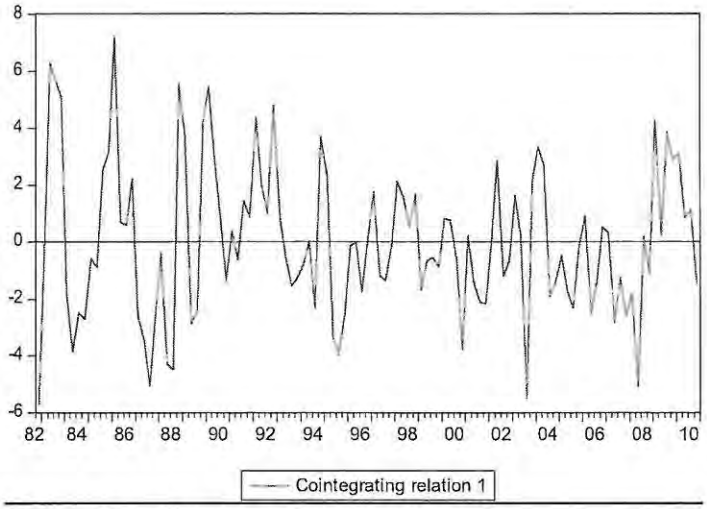

Figure A.1: Cointegrating Graph

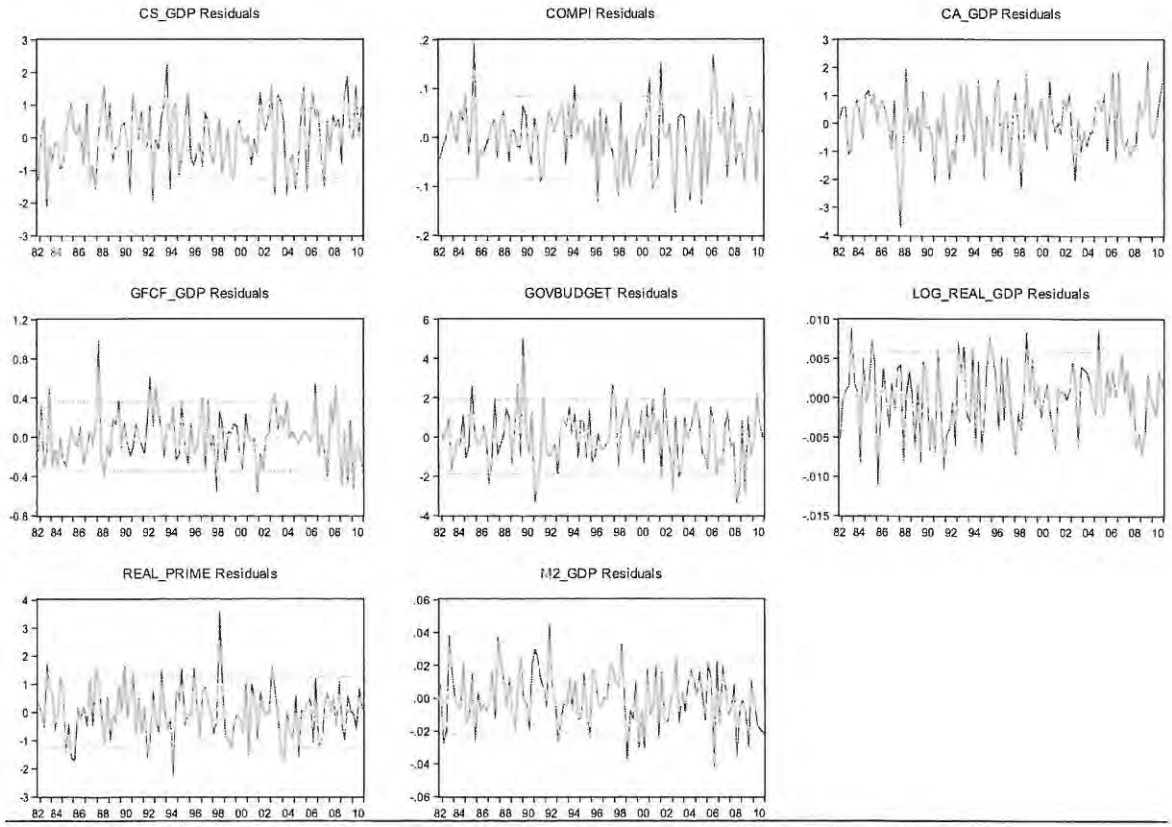

Figure A.2: Residual Graphs

A.5.2. Household Saving Model

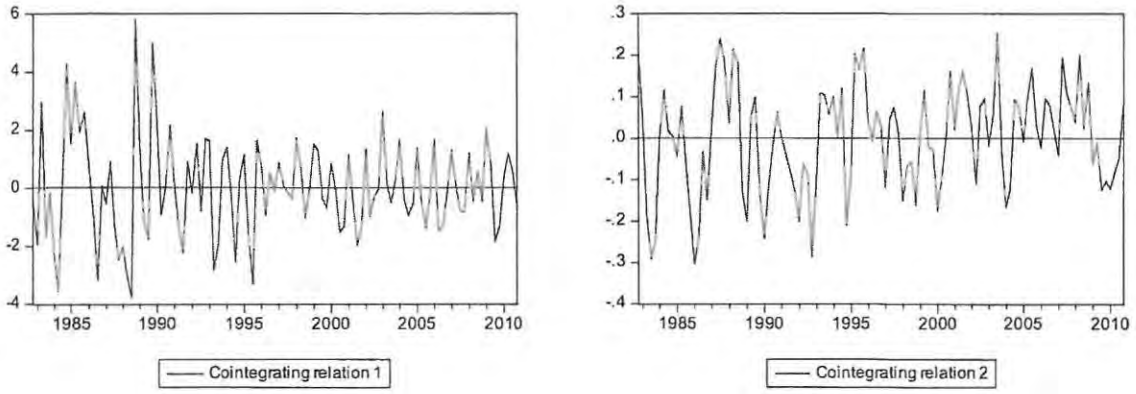

Figure A.3: Cointegrating Graphs

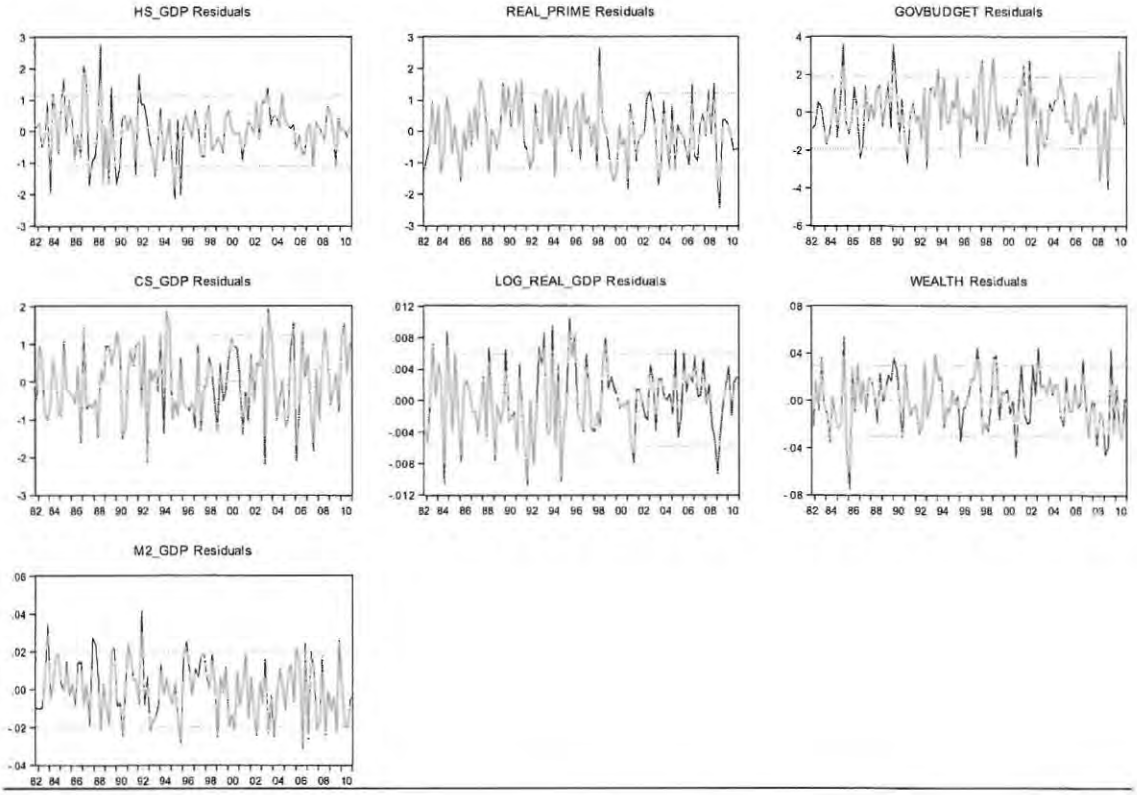

Figure A.4: Residual Graphs

APPENDIX 6:

A.6. IMPULSE RESPONSE AND VARIANCE DECOMPOSITION

A.6.1. Corporate Saving Model

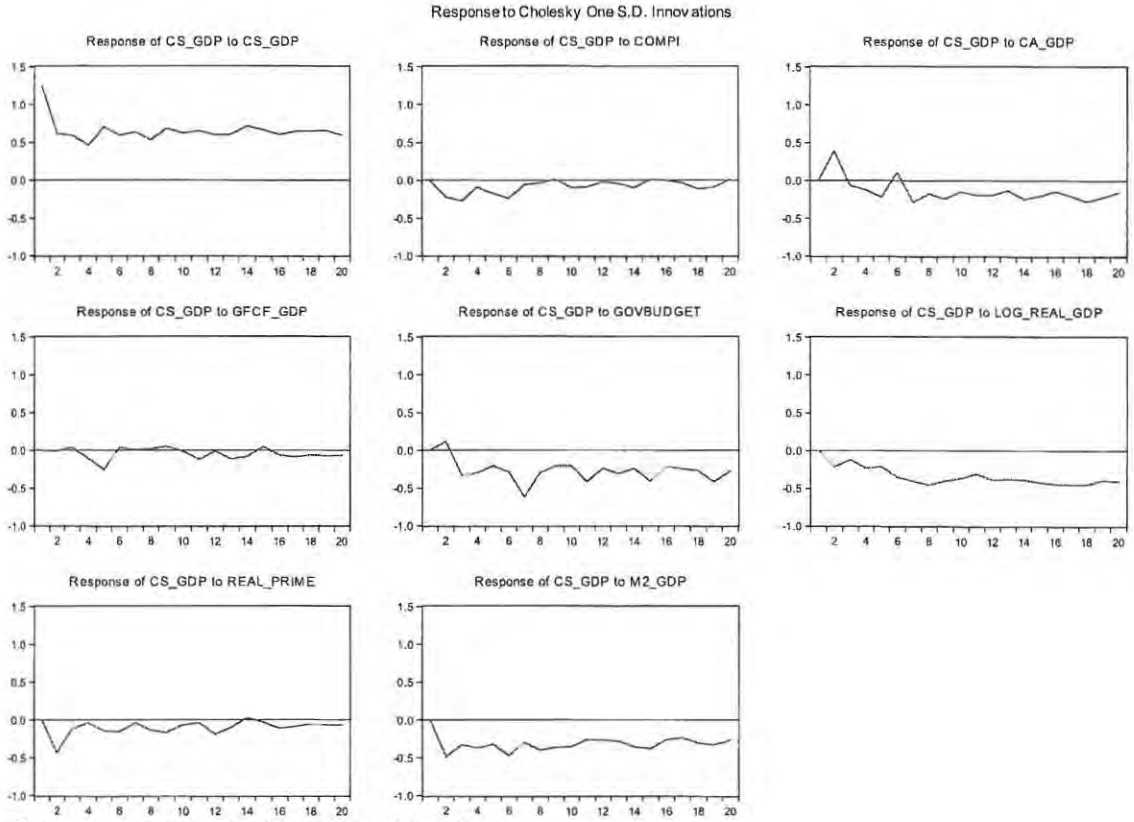

Figure A.5: Impulse Response Functions

A.6.1.2. Variance Decomposition

Table A.11: Variance Decomposition of CS_GDP

Period	Standard Error	CS_GDP	COMPI	CA_GDP	M2_GDP	REAL_GDP	GFCF_GDP	GOVBUDGET	REAL_PRIME
1	1.2469	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.6169	74.0064	1.8930	5.8947	8.9543	1.7025	0.0049	0.5194	7.0249
3	1.8161	69.4948	3.8182	4.7956	10.2867	1.7669	0.0476	3.7673	6.0229
4	1.9565	65.4695	3.5149	4.4906	12.4700	2.9074	0.3477	5.5723	5.2277
5	2.1634	64.1639	3.5385	4.6979	12.3941	3.3730	1.6609	5.4694	4.7023
6	2.3570	60.4799	4.0112	4.1799	14.3868	5.0329	1.4226	6.0971	4.3896
7	2.5862	56.3415	3.3836	4.6890	13.2802	6.7154	1.1820	10.7448	3.6635
8	2.7352	54.2324	3.0438	4.6094	14.0209	8.7380	1.0597	10.7804	3.5154
9	2.8919	54.0953	2.7238	4.7980	14.0507	9.7395	0.9783	10.1516	3.4628
10	3.0143	54.0959	2.6085	4.6632	14.2703	10.4449	0.9017	9.7836	3.2318
11	3.1473	53.9302	2.4682	4.6598	13.7457	10.5363	0.9722	10.7097	2.9778
12	3.2578	53.7177	2.3066	4.6823	13.4938	11.2381	0.9082	10.5281	3.1252
13	3.3677	53.5433	2.1791	4.5216	13.3039	11.7889	0.9632	10.6841	3.0160
14	3.5023	53.7220	2.0877	4.6553	13.3168	12.1381	0.9470	10.3371	2.7960
15	3.6394	53.0958	1.9338	4.6305	13.3968	12.5832	0.8929	10.8719	2.5951
16	3.7355	53.0121	1.8357	4.5372	13.1762	13.3565	0.8807	10.6498	2.5519
17	3.8390	53.0035	1.7442	4.5690	12.8522	13.9930	0.8831	10.4891	2.4659
18	3.9533	52.7021	1.7262	4.8057	12.7058	14.5028	0.8574	10.3575	2.3424
19	4.0699	52.3252	1.6808	4.8404	12.6276	14.6213	0.8425	10.8282	2.2340
20	4.1548	52.2546	1.6139	4.7860	12.5283	14.9916	0.8361	10.8245	2.1650

A.6.2. Household Saving Model

A.6.2.1. Impulse Response Functions

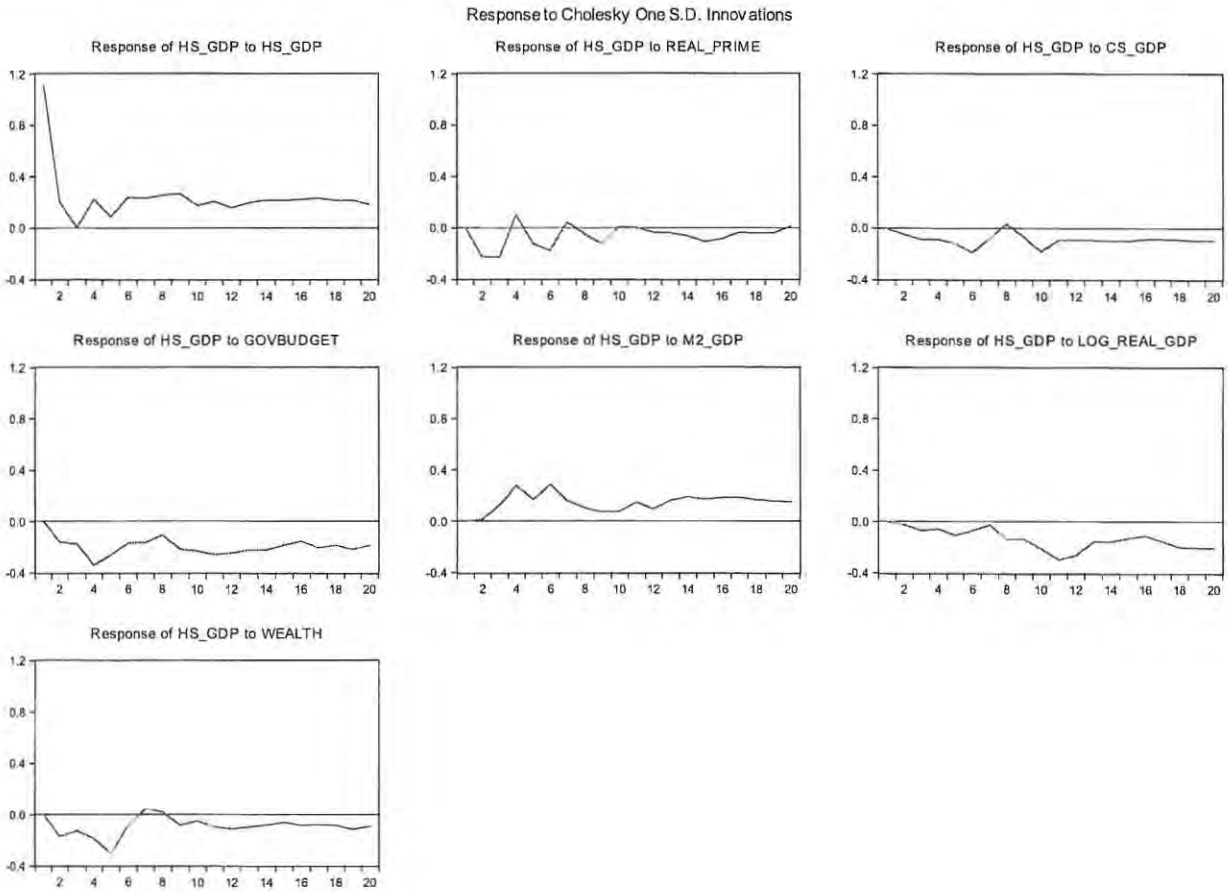

Figure A.6: Impulse Response Functions

A.6.2.2. Variance Decompositions

Table A.12: Variance Decomposition of HS_GDP

Period	Standard Error	HS_GDP	REAL_PRIME	CS_GDP	GOVBUDGET	M2_GDP	REAL_GDP	WEALTH
1	1.1082	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.1733	92.2576	3.6678	0.2162	1.7355	0.0071	0.0435	2.0723
3	1.2261	84.4830	6.7040	0.8212	3.5183	1.0138	0.4708	2.9889
4	1.3432	73.1844	6.1799	1.3160	9.0749	5.1008	0.7467	4.3973
5	1.4286	65.0658	6.2072	2.0633	11.1343	5.7678	1.3668	8.3948
6	1.5130	60.5073	6.9041	3.5477	11.0290	8.6020	1.6059	7.8040
7	1.5512	57.7837	6.6642	3.7118	11.5186	9.2141	1.5910	7.5167
8	1.5863	59.7568	6.4661	3.5790	11.4901	9.1536	2.3474	7.2070
9	1.6384	58.6895	6.6163	3.5890	12.4208	8.7178	2.9487	7.0179
10	1.6889	56.3304	6.2296	4.7062	13.3522	8.3219	4.3679	6.6919
11	1.7578	53.3680	5.7515	4.7413	14.3762	8.1651	7.1357	6.4621
12	1.8099	51.1310	5.4618	4.7913	15.3444	7.8682	8.9254	6.4779
13	1.8530	49.8922	5.2545	4.8739	16.0095	8.1639	9.3547	6.4513
14	1.9004	48.7838	5.0935	4.9795	16.5142	8.6324	9.6682	6.3286
15	1.9401	48.0450	5.1843	5.1065	16.6812	8.9766	9.8317	6.1748
16	1.9761	47.6077	5.1477	5.1303	16.6429	9.4390	9.8779	6.1345
17	2.0187	46.9512	4.9799	5.1420	16.9404	9.7790	10.1653	6.0423
18	2.0590	46.2157	4.8235	5.1661	17.0490	9.9299	10.8344	5.9813
19	2.1029	45.3610	4.6565	5.2214	17.3500	9.9645	11.4126	6.0340
20	2.1384	44.6095	4.5063	5.2825	17.4844	10.0474	12.0477	6.0222

APPENDIX 7:

A.7. GRANGER CAUSALITY AND BLOCK EXOGENEITY TESTS

A.7.1. Corporate Saving Model

Table A.13: Pair-Wise Granger Causality Tests

Null Hypothesis	Obs	F-Statistic
COMPI does not Granger Cause CS_GDP	118	2.8401*
CS_GDP does not Granger Cause COMPI	118	0.9339
CA_GDP does not Granger Cause CS_GDP	118	1.4250
CS_GDP does not Granger Cause CA_GDP	118	2.8809*
M2_GDP does not Granger Cause CS_GDP	118	7.0675***
CS_GDP does not Granger Cause M2_GDP	118	1.8648
REAL_GDP does not Granger Cause CS_GDP	118	2.6411*
CS_GDP does not Granger Cause REAL_GDP	118	3.9869**
GFCF_GDP does not Granger Cause CS_GDP	118	2.6146*
CS_GDP does not Granger Cause GFCF_GDP	118	0.6164
GOVBUDGET does not Granger Cause CS_GDP	118	12.2662***
CS_GDP does not Granger Cause GOVBUDGET	118	11.9370***
REAL_PRIME does not Granger Cause CS_GDP	118	1.0192
CS_GDP does not Granger Cause REAL_PRIME	118	1.9424

***, ** & * represent significance at the 1%, 5% & 10% levels of significance respectively

Table A.14: VEC Granger Causality / Block Exogeneity Wald Tests

Excluded	Chi-Squared	df
D(COMPI)	3.4784	6
D(CA_GDP)	18.7477***	6
D(M2_GDP)	12.7456**	6
D(REAL_GDP)	13.4381**	6
D(GFCF_GDP)	10.0034	6
D(GOVBUDGET)	17.5712***	6
D(REAL_PRIME)	15.8265**	6
All	96.23055***	42

***, ** & * represent significance at the 1%, 5% & 10% levels of significance respectively

A.7.2. Household Saving Model

Table A.15: Pair-Wise Granger Causality Tests

Null Hypothesis	Obs	F-Statistic
REAL_PRIME does not Granger Cause HS_GDP	118	1.2861
HS_GDP does not Granger Cause REAL_PRIME	118	0.8212
CS_GDP does not Granger Cause HS_GDP	118	0.8588
HS_GDP does not Granger Cause CS_GDP	118	1.5286
GOVBUDGET does not Granger Cause HS_GDP	118	0.4520
HS_GDP does not Granger Cause GOVBUDGET	118	2.8660*
M2_GDP does not Granger Cause HS_GDP	118	7.9149***
HS_GDP does not Granger Cause M2_GDP	118	1.5567
REAL_GDP does not Granger Cause HS_GDP	118	9.6640***
HS_GDP does not Granger Cause REAL_GDP	118	5.9943***
WEALTH does not Granger Cause HS_GDP	118	11.3465***
HS_GDP does not Granger Cause WEALTH	118	1.7996

***, ** & * represent significance at the 1%, 5% & 10% levels of significance respectively

Table A.16: VEC Granger Causality / Block Exogeneity Wald Tests

Excluded	Chi-Squared	df
D(REAL_PRIME)	15.8380**	6
D(CS_GDP)	2.0517	6
D(GOVBUDGET)	13.7852**	6
D(M2_GDP)	11.2592*	6
D(REAL_GDP)	6.5563	6
D(WEALTH)	4.1959	6
All	51.91216	36

***, ** & * represent significance at the 1%, 5% & 10% levels of significance respectively

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