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# THE CONTRIBUTION OF CORPORATE SAVINGS IN SOUTH AFRICA TO RECENT RECORD CURRENT ACCOUNT DEFICITS<sup>1</sup>

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## *Abstract*

*Recently South Africa recorded record current account deficits at a time of high commodity prices. A major contributor to these deficits was a lower level of corporate saving. Low domestic savings makes South Africa reliant on foreign capital inflows to fund higher investment levels and the resultant current account deficits. This paper seeks to identify reasons for the fall in corporate saving using econometric techniques to analyse the relationships between corporate saving and six explanatory macroeconomic variables. Significant variables identified are the real effective exchange rate, a commodity price index and a coincident business cycle indicator. The results show that these variables explain most of the variation in corporate saving, although they do not conform to a priori expectations.*

## 1. INTRODUCTION

THE BALANCE OF PAYMENTS consists of the capital account and the current account. The current account records the value of a country's merchandise trade (imports and exports), trade in services, as well as foreign transfer payments and receipts (Economist, 2008: 1). It will be shown below that the current account balance can also be expressed as the difference between a country's level of savings and investment. This paper examines the contribution of changes in especially corporate savings to the current account in South Africa.

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 may be obtained at these higher prices. One would expect that at such a time of record export prices, the aggregate savings rate of a commodity-producing country would also increase. This was the case for South Africa during the 1980's when high savings rates were recorded due to the gold price boom, (Aron and Muellbauer, 2000: 510). This was also the case in recent years for several commodity-producing countries; such as Chile, Canada and Brazil. Several emerging economies are currently experiencing current account surpluses. These include: China (7.2 percent of GDP), Russia (0.9 percent of GDP), Taiwan (9.6 percent of GDP), Argentina (2.0 percent of GDP) and Indonesia (0.9 percent of GDP) (Economist, 2009: 94). South Africa however, recorded a current account deficit of R169.2 billion (seasonally adjusted and annualised) in 2008 as a whole, which represents 7.4 percent of Gross Domestic Product (GDP) (South African Reserve Bank, 2009: 22). The question is

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asked why South Africa differed from other emerging economies, especially when the price of major exports (commodities) has been so high.

Over the period from 2004 to 2007 the level of corporate savings decreased substantially from R53 215 million to R14 914 million (South African Reserve Bank, 2009: 124). Total savings in South Africa also decreased over this period as corporate savings is the dominant component of total savings in South Africa. The question as to why such low levels of aggregate savings were recorded during a time of high global commodity prices is the focus of this paper. Such a low level of aggregate savings makes South Africa reliant on foreign capital inflows to fund the higher levels of investment that underpinned higher rates of growth from 2004 to 2007. These inflows were mainly into the local equity and bond markets and are therefore unstable and a problem for achieving sustained higher economic growth, which is vital for a developing country such as South Africa. An increase in the aggregate savings ratio will therefore ultimately enhance sustained economic growth by reducing the current account deficit.

Furthermore, South African economic policy is currently aimed at increasing the overall level of investment, including infrastructure investment (Hill, 2007: 1). If South Africa maintains its current low level of aggregate savings, the question as to how such investment opportunities are to be financed, such that they do not result in a further widening of the current account deficit, is asked.

This paper explores the theory of the current account in terms of savings and investment, and analyses the savings trends of South Africa. Aggregate savings are subdivided into government, corporate and household savings. This paper will focus specifically on corporate savings because it is the dominant component of aggregate savings as mentioned above. Specifically, the question: "Why did the level of corporate savings decrease in recent years?" is asked.

An econometric study will be conducted. This study will analyse the behaviour of certain macroeconomic variables and the effect that each of these have on corporate saving.

This paper is set out as follows: section two compares the recent trends in saving in South Africa to what was expected, whilst drawing on economic theory regarding the current account, savings and investment. Section three is a literature review. This section focuses on literature covering empirical studies on aggregate savings and investment behaviour in South Africa, specifically corporate saving. Section four presents the empirical study employed in this paper. This section analyses the relationships between corporate saving and the current account as well as corporate saving and six macroeconomic variables. The empirical findings and interpretation of these findings are presented in this section as well as a graphical analysis and a summary of a priori expectations. Section five is a discussion, offering an explanation for the recent trend experienced, as well as a summary of the results obtained, while section six concludes.

## 2. RECENT TRENDS IN SAVING IN SOUTH AFRICA

As above-mentioned, in recent years, the level of corporate saving decreased substantially. This occurred at a time of 'skyrocketing' global commodity prices. This occurrence goes against the theoretical expectation of what should have resulted.

## 2.1. *Economic theory on the current account, savings and investment*

In an open economy, domestic savings plus the trade balance must equal domestic investment:

$$S + (Z - X) = I \quad \dots (1)$$

By rearranging the above equation, it can further be shown that domestic savings less domestic investment equate exports less imports:

$$S - I = X - Z \quad \dots (2)$$

The current account balance is therefore shown to be equal to the difference between savings and investment, which is the definition this paper employs:

$$\text{Current Account} = S - I \quad \dots (3)$$

Where S is private and government saving, Z is imports, X is exports and I is investment by both the private and public sectors. Therefore, countries with large deviations of savings from investment will record large current account deficits or surpluses. More specifically, when domestic savings is greater than domestic investment, a current account surplus is recorded; while conversely, when domestic savings is less than domestic investment, a current account deficit is recorded.

Based on theoretical understandings, when commodity prices rise, one would expect the level of export earnings to increase. This in turn would cause corporate saving to increase as commodity-producing corporations are experiencing greater profits. As a result, the current account balance would improve. However, this was not the case for South Africa in recent years. When commodity prices rose, corporate savings were found to fall significantly, although higher export earnings were recorded.

On the other side of the equation; investment expenditure continues to rise at a time of economic upswing. Therefore, one would expect a deteriorating current account balance to be caused by this increase in investment expenditure. Furthermore, one would expect corporations to increase their amount of retained earnings (savings) in order to help pay for said investment expenditure and this rise in corporate savings should dampen some of the deterioration in the current account balance caused by rising investment. This, too, has not been the case in recent years in South Africa where rising private sector fixed investment has been accompanied by falling corporate savings.

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

### 3. LITERATURE REVIEW

#### 3.1. *Empirical studies on savings*

Several empirical studies have been conducted on the analysis of savings behaviour in South Africa. However, while there is a substantial amount of research done on household and government savings, there appears to have been much less research done on corporate savings.

Sachs and Larrain (1993: 109) define total private saving as being equal to the sum of corporate saving and household saving. They (Sachs and Larrain, 1993: 109) state that households ultimately own corporations and as a result, households are able to determine the level of private savings because households regard corporations as performing savings on their behalf (Sachs and Larrain, 1993: 110). When households allow their own saving to compensate for changes in corporate savings, it is said that households “pierce the corporate veil” (Sachs and Larrain, 1993: 110). Empirical work has been conducted on this concept and some studies have found that changes in the level of corporate saving induce a partial offsetting effect on household saving (Sachs and Larrain, 1993: 111).

Prinsloo (2000: 25) briefly discusses the belief that corporate and household savings are interrelated. He (Prinsloo, 2000: 25) too states that households are able to “pierce the corporate veil” and perceive corporate savings decisions essentially as savings decisions made on their behalf. Therefore, individuals “perceive” corporate savings as essentially a substitute for, or extension of, household savings (Prinsloo, 2000: 25). Prinsloo (2000: 25) makes this point to show and emphasize the fact that the composition of private savings in South Africa is not as important as the actual absolute level of private savings.

Aron and Muellbauer (2000: 513) find the concept of households “piercing the corporate veil” to be somewhat incomplete and propose three main reasons to support this. Firstly, if households are able to observe corporate budget constraints perfectly, then dividend income would be expected to have no direct effect on a consumption model after taking into account the wealth effect. Secondly, it is highly unlikely for corporations to behave in the exact manner that households would have them behave in terms of savings behaviour. Finally, factors such as financial liberalisation, changing terms of trade, changes in government saving behaviour, and lower real interest rates, may cause household and corporate savings levels to be positively related and thus move in the same direction (Aron and Muellbauer, 2000: 513).

Turner (1986: 3) uses the savings-investment (S-I) approach to the current account to conduct an empirical study on seven major countries, including analysis of certain macroeconomic differences between these countries. It is suggested that savings and investment depend principally on income, interest rates and the exchange rate (Turner, 1986: 5). Turner (1986: 42) found that S-I balances reveal intertemporal decisions and constraints. Intertemporal decisions refer to the fact that decisions made in the current time period affect any decisions that are made in the future time period. Examples of such decisions include investment decisions of corporations as well as savings and investment decisions of households. In savings decisions by households, the decision to save from income in the current time period not only affects the level of current consumption, but also affects the level of future consumption, as current saving permits the household to consume more at some future date. In this regard it becomes

increasingly more likely that considerable differences between countries will endure, as differences in consumption and savings preferences exist.

Turner (1986: 42) further presents a development stages theory, which shows that as countries develop, various stages in S-I balances are experienced. Low savings are evident at an early stage of development as income is relatively low (Turner, 1986: 42). Consequently, it is natural for a developing country to import capital thereby running a current account deficit. However, as income and the capital stock increase, the need to import capital decreases and the current account moves into a surplus (Turner, 1986: 42). Contrary to Turner's (1986) analysis however, in the case of China and many Southeast Asian countries, current account surpluses were experienced along with high levels of investment at very low levels of per capita income.

### 3.2. *Aggregate savings and investment behaviour in South Africa*

Over the past few years, South Africa has recorded low levels of aggregate savings (South African Reserve Bank, 2009: 124). As above-mentioned, this low level of aggregate savings became increasingly evident at a time when global commodity prices reached record highs. Importantly, both household and corporate savings declined in recent years, so that there was no evidence of offsetting behaviour. If the veil was "pierced", it was in favour of lower private savings.

Masson, Bayoumi and Samiei (1998: 486) state that financial liberalisation may have a substantial effect in both decreasing and increasing aggregate savings in South Africa: firstly, it provides greater consumer access to bank credit, thereby decreasing aggregate savings as individuals increase consumption levels; and secondly, it provides a mechanism, through financial development for saving, thereby increasing aggregate savings.

Prinsloo (2000: 9) shows how aggregate savings in South Africa varies along with successive upswings and downswings in the business cycle. In general, the trend 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). Prinsloo (2000: 9) states that 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) found the same to be likely for corporate saving as well.

However, Prinsloo (2000: 9) does point out some 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 savings increased because of an increase in the gold price thereby causing the gold mining industry to experience larger profits and corporate savings to rise (Prinsloo, 2000: 9).

a. *Corporate Savings*

The analysis conducted by Turner (1986: 22) suggests that an important area whereby the exchange rate is able to influence directly aggregate domestic savings is via the profitability of the corporate sector. This is because a weaker real exchange rate raises the profitability of producing tradable goods and services, i.e. export goods (Turner, 1986: 22). Thus, Turner (1986: 47) concludes that both savings and investment are highly dependent on the exchange rate.

Aron and Muellbauer (2000: 526, 527) analyse the determinants of corporate saving and note that the literature on corporate saving generally lacks an agreed-upon theoretical model. The determinants identified include the role of dividend changes as well as tax changes (Aron and Muellbauer, 2000: 526). Aron and Muellbauer (2000: 526) find that the average level of corporate savings can increase through an increase in corporate profits, as well as through an increase in the profit share of national income. Aron and Muellbauer (2000: 528, 529) analyse and confirm two taxation effects on corporate savings, which are related to “piercing the corporate veil”. These include: 1) an increase in personal tax rates on dividends increases the level of corporate savings, and 2) an increase in inflation encourages corporations to retain earnings, given a lack of a capital gains tax. Therefore, Aron and Muellbauer (2000: 531) conclude that there is evidence in support of the corporate sector saving on behalf of households.

Aron and Muellbauer (2000: 529) further state that one would expect the level of corporate savings to increase when funds are difficult to acquire as a result of higher real interest rates and access to foreign finance being denied. This is because of the fact that corporate savings are mainly conducted in order to finance investment opportunities (Aron and Muellbauer, 2000: 529). They (Aron and Muellbauer, 2000: 529) also state that a higher level of corporate savings is expected when income growth rates have increased because investment opportunities have consequently become more profitable. When the South African business cycle is in an upswing, Aron and Muellbauer (2000: 529) explain that one would expect the level of corporate savings to increase, as profits are higher thus allowing corporations to save a greater proportion of their income. This contradicts the conclusions reached by Prinsloo (2000: 9).

In a chapter written by Harjes and Ricci (2005: 48), recent trends in the private saving (household and corporate) rate of South Africa are analysed. Harjes and Ricci (2005: 48) focus on measures for fiscal policy, commodity prices, inflation, interest rates, and income-related measures as determinants of private saving. In empirical studies, the use of inflation is often able to incorporate price uncertainty and macroeconomic stability (Harjes and Ricci, 2005: 57). Inflation may also include the effects of the precautionary savings motive (Harjes and Ricci, 2005: 57). Harjes and Ricci (2005: 59) found a positive relationship to exist between private saving and a commodity price index, a negative relationship between the general government balance and private saving, and a negative relationship between financial liberalisation and private saving. They (Harjes and Ricci, 2005: 60) found the statistical strength of variables such as real income, the inflation rate and the real interest rate, to be insignificant in explaining private saving.

In recent times, both corporate and household saving rates fell. Therefore, the “piercing the corporate veil” hypothesis seems not to hold. Households may only “pierce the corporate veil” if they desire a lower level of aggregate savings, which is not impossible due to higher asset prices, i.e. house prices and equities.

The next section covers the empirical study conducted in this paper.

#### 4. EMPIRICAL STUDY

This study briefly analyses the relationship between corporate saving and the current account balance and then focuses on the analysis of the relationships between corporate saving and six macroeconomic variables. The a priori expectations are initially presented followed by an interpretation of the results obtained. Finally, a discussion and conclusion will be given based on the empirical findings.

##### 4.1. *Corporate saving and the current account*

A simple regression is run between corporate saving and the current account using the following equation:

$$\ln(\text{CA}/\text{GDP})_t = \beta_0 + \beta_1 \ln(\text{CS}/\text{GDP})_t + u_t \quad \dots (1)$$

Where  $\ln(\text{CA}/\text{GDP})$  is the natural logarithm of the ratio of the current account balance to GDP and  $\ln(\text{CS}/\text{GDP})$  is the natural logarithm of the ratio of corporate saving to GDP.

*Table 1: Regression of Corporate Saving on the Current Account Balance*

Dependent Variable	Explanatory Variables		F-statistic	F-statistic (Prob)	R-squared	DW statistic
	$\beta_0$	$\beta_1$				
$\ln(\text{CA}/\text{GDP})$	C -1.914203 (0.0028)	$\ln(\text{CS}/\text{GDP})$ 1.220879 (0.0019)	11.73555	0.001852	0.288091	1.270426

p-values in brackets

It is necessary to estimate the above equation to show the significance of the relationship between corporate saving and the current account balance. A priori, one would expect a positive relationship between corporate saving and the current account balance. Thus, when corporate saving increases, the current account balance improves (increases). This means that the current account deficit will improve or the surplus will strengthen. Conversely, when corporate saving decreases, the current account balance worsens (decreases), thereby widening the deficit or deteriorating the surplus. This is what resulted in recent years in South Africa.

The regression results show that there is a positive relationship between the current account balance and corporate saving and that this relationship is significant at the 1% level. The R-squared shows that 29 percent of the variation in the ln of the current account balance can be explained by variation in the ln of corporate saving. This is acceptable as clearly changes in investment would also be an important determinant of the current account balance.



## 4.2. Corporate saving and six macroeconomic variables

### 4.2.1. Description of empirical technique

The macroeconomic variables used in this study include a commodity price index (COMPI)<sup>1</sup>, the inflation rate (INFL), as measured by the consumer price index (CPI), gross fixed capital formation (GFCF) of both financial and non-financial corporations<sup>2</sup>, expressed as a ratio of GDP, the real effective exchange rate (REER) of the rand<sup>3</sup>, the prime overdraft rate (PRIME) and a coincident business cycle indicator (CI)<sup>4</sup>. The dependent variable is the ratio of corporate saving, to nominal GDP (CS/GDP). See Appendix A for a description of the collection of data.

Some limitations were encountered during the collection of data. See Appendix B for a discussion on these limitations experienced and the effect they have on this study.

The first step in the analysis is to determine whether or not the variables are stationary. The unit root test is conducted to determine the order of integration of the variables, and hence their levels of stationarity. These stationarity tests are conducted using the Dickey-Fuller (DF) unit root test or the Augmented Dickey-Fuller (ADF) unit root test (Gujarati, 2003: 814-817).

A corporate savings function is defined as follows:

$$CS/GDP = f(\text{COMPI}, \text{CI}, \text{INFL}, \text{GFCF}/\text{GDP}, \text{REER}, \text{PRIME}) \quad \dots (2)$$

Where CS/GDP is the level of corporate saving expressed as a ratio of GDP and GFCF/GDP is the level of gross fixed capital formation also defined as a ratio of GDP, as explained above.

Due to the fact that there are seven variables analysed in this study (including CS/GDP), it is necessary to create five models each including three variables. This is important as the strength and accuracy of the Engle-Granger (EG) test for cointegration is diminished when there exists more than three variables included in a regression. The commodity price index is used throughout each of the five models as the author believes that this is an important variable in explaining the behaviour of corporate saving and that there is a direct relationship between these two variables. The following five models are estimated:

$$\text{Model A:} \quad \ln(\text{CS}/\text{GDP})_t = \beta_0 + \beta_1 \ln(\text{COMPI})_t + \beta_2 \ln(\text{CI})_t + u_t \quad \dots (3)$$

$$\text{Model B:} \quad \ln(\text{CS}/\text{GDP})_t = \beta_0 + \beta_1 \ln(\text{COMPI})_t + \beta_2 \ln(\text{INFL})_t + u_t \quad \dots (4)$$

$$\text{Model C:} \quad \ln(\text{CS}/\text{GDP})_t = \beta_0 + \beta_1 \ln(\text{COMPI})_t + \beta_2 \ln(\text{GFCF}/\text{GDP})_t + u_t \quad \dots (5)$$

$$\text{Model D:} \quad \ln(\text{CS}/\text{GDP})_t = \beta_0 + \beta_1 \ln(\text{COMPI})_t + \beta_2 \ln(\text{PRIME})_t + u_t \quad \dots (6)$$

$$\text{Model E:} \quad \ln(\text{CS}/\text{GDP})_t = \beta_0 + \beta_1 \ln(\text{COMPI})_t + \beta_2 \ln(\text{REER})_t + u_t \quad \dots (7)$$

Once the results of all five of the estimated regressions are obtained, the next step in this study is to test for cointegration. According to Gujarati (2003: 822), two variables are said to be cointegrated if they have a long run, or equilibrium relationship between them. If cointegration exists, then the regression results will not be spurious<sup>5</sup>. There are several tests available to test for cointegration, however this paper uses the EG or Augmented EG (AEG) tests. The residuals from each model are subjected to a DF or ADF unit root

test (Gujarati, 2003: 823). This will determine whether or not cointegration exists. Five residual series are obtained due to there being five models in this study.

If there is cointegration in the long run, there may however be disequilibrium in the short run. An Error Correction Model (ECM) is used to correct for this disequilibrium. Therefore, the ECM allows for analysis of both short run disequilibrium and the long run equilibrium or stable relationship. An important feature of the ECM is that it allows the researcher to determine the speed of adjustment back to the long run equilibrium (Gujarati, 2003: 825). The coefficient of the lagged residual term indicates this speed of adjustment (Gujarati, 2003: 825). The ECM of each of the five models is of the following form:

$$\Delta \ln(\text{CS}/\text{GDP})_t = \alpha_0 + \alpha_1 \Delta \ln(\text{COMPI})_t + \alpha_2 \Delta \ln(\text{X})_t + \alpha_3 \text{ResidX}_{t-1} + \epsilon_t \quad \dots(8)$$

Where X represents the different explanatory variables: CI, GFCF/GDP, Prime and REER, and ResidX represents the different residual series that were obtained for each separate model. It is expected that the coefficient of the residual term,  $\alpha_3$ , is negative.

Appendix C gives a detailed description of the econometric techniques employed.

#### 4.2.2. *Graphical analysis*

Figure 1 shows the trend over the period from 1978 to 2008 of the different components of aggregate saving in South Africa. From this graph, it is evident that the level of corporate saving decreased substantially over the period from 2004 to 2007. This occurred at a time when global commodity prices rose dramatically. It can be seen that over the period from 1978 to 1980, corporate saving increased substantially. The literature (Aron and Muellbauer, 2000 and Prinsloo, 2000) concludes that this occurred as a result of the gold price boom experienced in the early 1980s. The latest Reserve Bank Quarterly Bulletin shows that corporate saving has increased over the first two quarters of 2009 during a period when commodity prices fell sharply (South African Reserve Bank, 2009: 12). This is not shown in the graph, which shows only annual data.

Figure 2 shows the natural logarithm of all the macroeconomic variables used in this study. The relationships between corporate saving and each variable can be graphically analysed. In general, it would appear that from the period from 1978 to around 1997; when commodity prices rose, corporate savings rose and vice versa. There are, however, exceptions for example from 1983 to 1984, corporate savings fell while commodity prices rose and from 1990 to 1992, corporate savings rose while commodity prices fell. From around 1998 to 2008, this trend appears to have changed such that when commodity prices rose, corporate savings fell and vice versa.

One can see that the trend for the relationship between corporate saving and the real effective exchange rate is both positive and negative at different times over the period. The relationship between corporate saving and the coincident indicator appears to be negative. There exists a negative relationship between corporate saving and gross fixed capital formation as well as between corporate saving and the prime overdraft rate. Finally, the relationship between corporate saving and inflation appears to be both positive and negative at times over the period shown.

These relationships will be discussed in detail below.

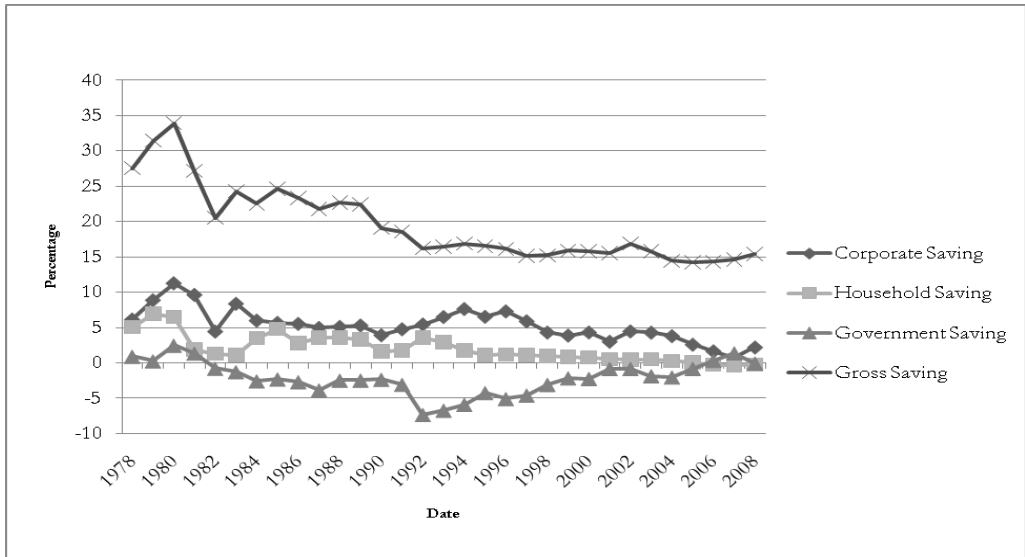


Figure 1: Components of Gross Saving Expressed as a Percentage of GDP over the Period 1978-2008

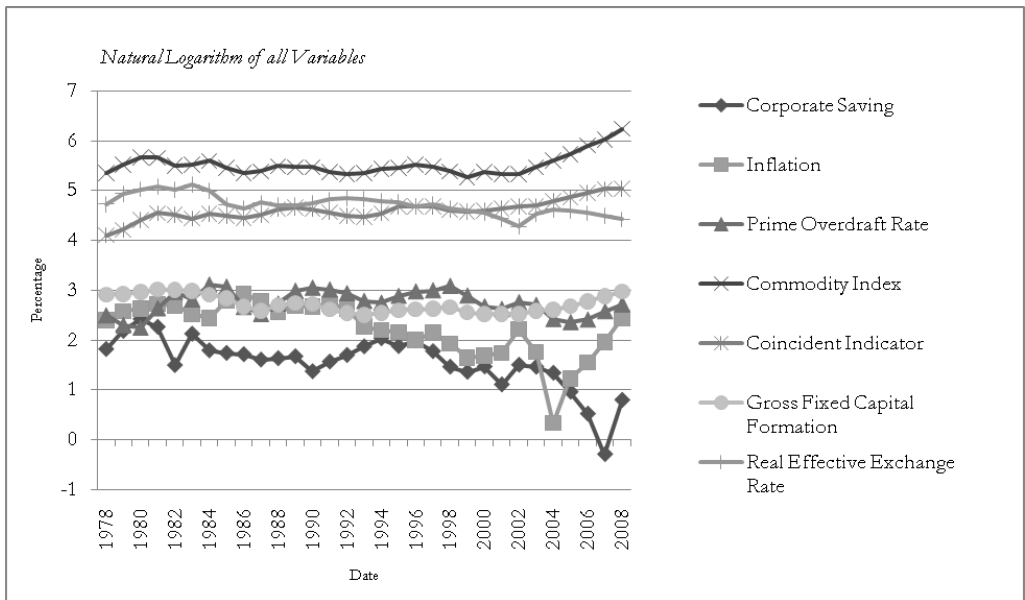


Figure 2: Corporate Saving, Inflation, Prime Overdraft Rate, Commodity Index, Coincident Indicator, Gross Fixed Capital Formation and Real Effective Exchange Rate for the Period 1978-2008

#### 4.2.3 *A priori expectations*

It has been pointed out that during times of high commodity prices, it is expected that the level of corporate savings should increase because of larger profits being realised. This is especially the case for commodity producing countries, like South Africa, since these profits are a result of an increase in the level of exports. This was the experience when the gold price rose in the early 1980s. However, recently this was not the case for

South Africa and the variables used in this study attempt to determine whether the 2004 to 2007 period is exceptional and whether any of the variables tested will provide reasons why this is so. The a priori expectations of the effects of each of these variables on corporate saving are discussed next.

a. *Coincident Business Cycle Indicator*

The coincident business cycle indicator is an indicator which is used to indicate the phase of the business cycle. When the South African economy is in an upswing, one would expect corporate savings to increase as a result of higher profits being generated alongside higher economic growth. Conversely, when the South African economy is in a downswing, one would expect the level of corporate savings to decrease as profits decline. This relationship is not supported by Prinsloo (2000) who argues that in times of economic upswing corporations (and households) are generally optimistic and decrease savings (see section 3.2). This paper nevertheless expects, a priori, a positive relationship between the coincident indicator and the level of corporate savings, which is in agreement with those conclusions reached by Aron and Muellbauer (2000: 529).

b. *Inflation*

During times of inflationary pressure, one would expect corporate saving to increase. When prices rise, it is expected that the interest rate will increase so as to counter the negative effects of inflation. As a result, one would expect corporations to increase savings as they will receive a higher return on their deposits. Harjes and Ricci (2005: 57) state that inflation may include the effects of the precautionary savings motive. Therefore, a positive relationship is expected to exist between corporate saving and inflation. The converse is also true in that if there is low inflation, corporate saving should decrease at the lower rate of interest.

c. *Gross Fixed Capital Formation*

The level of gross fixed capital formation of financial and non-financial corporations measures corporate investment. According to theoretical Keynesian macroeconomics, one would expect that when the level of investment increases, either the level of savings will increase, or the current account balance will worsen (see section 2.1). In order to fund any increases in investment, it is necessary to ensure that either the level of domestic savings must increase, or foreign capital inflows must increase. However, this expectation may be ambiguous or incomplete in reality, especially in countries which are highly dependent on foreign capital inflows to fund such higher levels of investment. This may prove to be the case for South Africa since it is a country which is highly dependent on foreign capital inflows (South Africa Reserve Bank, 2009: 28). From the point of view of corporations, one would expect them to increase their retained earnings (savings) at a time of rising investment, to at least keep that part of their increased investment, which is funded from internal savings, constant. Therefore, theoretically one would expect a positive relationship to exist between corporate savings and gross fixed capital formation.

d. *Prime Overdraft Rate*

The relationship between the prime overdraft rate and corporate saving is somewhat ambiguous. It is possible that there exist two opposing effects on saving: an income effect and a substitution effect (Harjes and Ricci, 2005: 52). An increase in the real interest rate may induce firms to save more as they expect a higher return on their saving. Aron and Muellbauer (2000: 529) state that corporate savings are expected to increase when finance is difficult to acquire due to higher real interest rates. On the other hand, an increase in the real interest rate makes investment opportunities more costly, thereby increasing the cost of indebtedness of firms. Thus the relationship between corporate saving and the prime overdraft rate depends on the relative sizes of the income and substitution effects. This result is often reflected in empirical studies (Harjes and Ricci, 2005: 53).

A reason why this relationship may be ambiguous is due to the following: a rise in interest rates increases the return on corporate savings and vice versa. However, an increase in the interest rate causes a decrease in investment expenditure, thus because of the positive relationship expected between corporate saving and investment (gross fixed capital formation), this increase in the interest rate causes a decrease in corporate saving, i.e. opposite effects. The converse occurs when the interest rate decreases. Therefore, what happens to corporate saving depends on which of these effects is greater.

e. *Real Effective Exchange Rate*

A priori, one would expect a negative relationship to exist between the real effective exchange rate of the rand and corporate saving (Turner, 1986). When the REER increases (strengthens) domestic goods and services become more expensive, thereby resulting in a loss in profitability for corporations as the level of exports decrease and hence corporate saving decreases. Therefore, a higher (stronger) REER index should result in a decrease in corporate saving. Conversely, when the REER decreases (weakens) domestic goods and services become cheaper, thereby leading to a rise in corporate profitability as the level of exports rise and import competition falls. This allows corporations to save more. Therefore, a lower (weaker) REER index should result in an increase in corporate saving. Also, for commodity producers (like those in South Africa), a decrease in the REER represents an increase in their Rand earnings and profitability due to the fact that their prices are in American dollars. Thus a fall in the REER is the same as an increase in commodity prices for these commodity producers and their savings should increase.

The next section analyses these relationships using econometric techniques.

4.2.4 *Empirical findings & interpretation of results*

a. *Analysis and Interpretation of ADF Unit Root Test Results*

Table 2 contains the results of the unit root tests conducted on the variables in the study.

Table 2: Unit Root Tests on Variables  
Augmented Dickey-Fuller Unit Root Tests

Variable	Level Terms		First Difference		Second Difference	
	t-statistic	Probability	t-statistic	Probability	t-statistic	Probability
Ln(CS/GDP)	-3.248219	0.0945	-6.378190*	0.0000		
Ln(COMPI)	0.843716	0.8876	-3.035786*	0.0037		
Ln(CI)	-3.780205**	0.0325	-4.720406*	0.0040		
Ln(INFL)	-1.613822	0.0991	-1.526097	0.1167	-8.521434*	0.0000
Ln(GFCF/GDP)	-1.802761	0.3718	-2.760894*	0.0075		
Ln(Prime)	-2.890600	0.0592	-5.219091*	0.0000		
Ln(REER)	-3.480705	0.0605	-4.676051*	0.0000		

\*\* Stationary at the 5% level of significance

\* Stationary at the 1% level of significance

The ADF unit root tests were used to test for stationarity and to determine whether or not the variables contained a unit root. As can be seen from Table 2, all of the variables are stationary at first difference and are thus integrated of order one, denoted by I(1). This means that in level terms these variables contain a unit root. The only variable that is non-stationary at both level terms and first difference is inflation. This variable is however stationary at second difference and is thus integrated of order two, denoted by I(2).

b. *Analysis and Interpretation of Regression Results*

Table 3 contains the results of the estimated regressions that were run for each of the five models given above. These estimated regressions show the long run relationships between the dependent variable and the explanatory variables.

Table 3: Five Models of Corporate Savings as a Ratio of GDP

Model	Dependent Variable	Explanatory Variables			F-statistic	F-statistic (Prob)	R-squared	DW statistic
		$\beta_0$	$\beta_1$	$\beta_2$				
A	Ln(CS/GDP)	C	Ln(COMPI)	Ln(CI)	19.10119	0.000006	0.577055	1.288872
		11.30015 (0.0000)	-0.162743 (0.6938)	-1.920781 (0.0001)				
B	Ln(CS/GDP)	C	Ln(COMPI)	Ln(INFL)	9.489014	0.000714	0.403977	1.130522
		7.455156 (0.0015)	-1.203580 (0.0030)	0.334354 (0.258)				
C	Ln(CS/GDP)	C	Ln(COMPI)	Ln(GFCF/GDP)	12.39904	0.000139	0.469678	1.413942
		8.474671 (0.0001)	-2.046778 (0.0000)	1.608610 (0.0042)				
D	Ln(CS/GDP)	C	Ln(COMPI)	Ln(Prime)	5.695245	0.008409	0.289169	0.900228
		9.602596 (0.0022)	-1.392233 (0.0028)	-0.131767 (0.7250)				
E	Ln(CS/GDP)	C	Ln(COMPI)	Ln(REER)	24.56061	0.000001	0.636935	1.644105
		0.280732 (0.9036)	-1.140801 (0.0005)	1.603725 (0.0000)				

p-values in brackets

For all of the models there exists a negative relationship between the dependent variable, corporate savings, and the commodity price index. This does not conform to a priori expectations as discussed in Section 4.2.3A above. Specifically, Harjes and Ricci (2005: 59) found a positive relationship between private saving and commodity prices. However, the regression results suggest that when commodity prices increase, the level of corporate savings decreases and when commodity prices decrease, the level of corporate savings increases. These results do however confirm the actual recent relationship between corporate saving and commodity prices: when commodity prices rose

substantially, from 2003 to 2007, corporate savings fell significantly. Furthermore, in all cases, except for Model A, the commodity price index is significant at the 1% level as is evident from the p-values obtained. The average value obtained for the commodity price index is -1.19. Therefore, when the commodity price index falls by 1 percent, corporate saving is expected to rise by 1.19 percent.

As can be seen from the regression results of Model A, the coincident indicator is highly significant at the 1% level as it has a very low p-value. The results show that there exists a negative relationship between corporate saving and the coincident indicator. This conforms to the conclusions reached by Prinsloo (2000) as discussed in section 3.2, but is contrary to the a priori expectation that during economic upswings, corporations will invest and save more, and the conclusions reached by Aron and Muellbauer (2000: 529) as discussed in section 4.2.3B. This suggests that, in contrast to what was expected, during economic downswings, corporations are likely to save more. Conversely, during economic upswings, corporations are likely to save less. Therefore, from the recent downturn in the global and local economies it can be expected that corporate saving will increase. In the first and second quarters of 2009, corporate saving (as a ratio of GDP) increased from 13.3 percent in quarter one to 14.1 percent in quarter two (South African Reserve Bank, 2009: 12). Thus, the results obtained confirm the current, actual pattern of corporate saving in South Africa: during economic downswings, corporate saving will increase.

Overall, the regression of Model A is significant at the 1% level. According to the R-squared figure, 57.7 percent of the variation in the ln of corporate saving can be explained by variations in the ln of the commodity price index and the ln of the coincident indicator and the relationship is positive.

The inflation variable is insignificant at both the 1% and 5% levels as can be seen by the high p-value obtained in the estimated regression of Model B. These results conform to those obtained by Harjes and Ricci (2005: 60) who also found inflation to be insignificant (see section 3.2a). As a result of this statistical insignificance, the inflation variable is rejected as being a significant variable in explaining the behaviour of corporate saving.

The results for Model B show that the overall regression is significant at the 1% level. The R-squared figure states that 40.4 percent of the variation in the ln of corporate saving can be explained by variations in the ln of the commodity price index and the ln of inflation.

As can be seen from the results obtained for Model C, there exists a positive relationship between gross fixed capital formation (investment) of corporations and corporate saving. This does conform to a priori expectations (see section 4.2.3D) that corporations will save to fund investment opportunities. Furthermore, gross fixed capital formation is significant at the 1% level. The R-squared obtained in the Model C regression suggests that 47 percent of the variation in the ln of corporate saving is explained by the variation in the ln of the commodity price index and the ln of gross fixed capital formation. Overall, Model C is significant at the 1% level.

The prime overdraft rate and corporate savings are negatively related, as can be seen from the regression results obtained for Model D. This suggests that when the interest rate rises, corporate saving decreases and vice versa. The prime overdraft rate is however insignificant at both the 1% and 5% levels as can be seen by the high p-value obtained.

These results also conform to those of Harjes and Ricci (2005: 60), who too found the real interest rate to be insignificant in explaining private saving behaviour.

The overall regression of Model D is significant at the 1% level. The R-squared shows that 29 percent of the variation in the ln of corporate saving is explained by the variation in the ln of the commodity price index and the ln of the prime overdraft rate.

Finally, the real effective exchange rate is significant at the 1% level as can be seen by its p-value obtained from the regression results of Model E. The results show that there is a positive relationship between the real effective exchange rate and corporate savings. This result does not conform to a priori expectations (see section 4.2.3F). A Granger Causality test will be conducted to determine the direction of causality between corporate saving and the REER.

The overall regression of Model E is significant at the 1% level. Furthermore, the R-squared obtained shows that 69% of the variation in the ln of corporate savings can be explained by variation in the ln of the commodity price index and the ln of the real effective exchange rate. This result conforms to those conclusions reached by Turner (1986). Turner (1986: 47) concludes that S-I balances are “highly dependent on the exchange rate”.

*c. Analysis and Interpretation of EG Cointegration Test Results*

Table 4 shows the results obtained from the EG cointegration test.

*Table 4: Engle-Granger Cointegration Test  
Unit Root Test on the Residuals of Each Model in Level Terms*

Model	t-statistic	R-squared	DW statistic
A	-4.592938*	0.442385	1.859531
B	-3.757582	0.343396	1.737186
C	-4.339111**	0.410886	1.750479
D	-4.217998**	0.397874	1.701930
E	-4.434711**	0.403248	1.811283

\*Stationary at the 1% level of significance

\*\*Stationary at the 5% level of significance

Critical values are -4.44, -3.83 and -3.51 at the 1%, 5% and 10% levels respectively

The ADF critical values generated by Eviews are not applicable to the EG test for cointegration. This is due to the fact that the estimated  $\mu_t$  are based on the estimated cointegrating parameter,  $\beta_2$  (Gujarati, 2003: 823). Consequently, Engle and Granger calculated these critical values, which can be seen at the base of Table 4.

The results of the EG cointegration test for Model A show that the residual series is stationary in level terms and is thus I(0). This means that there is cointegration between the variables in the model and that the original regression results will not be spurious. Thus, the residual series obtained does not have a unit root. As a result, an error correction model will be run.

From the results of Model B, it can be seen that the residual series is non-stationary in level terms. Therefore there is no cointegration between the variables in the model and the original results may be spurious. Several options exist to correct for this finding<sup>6</sup>.

For Models C, D and E, the EG cointegration test results show that the residual series of these models are stationary in level terms at the 5% level. Therefore, there is cointegration between the variables in the models and the original regression results will not be spurious. An error correction model will be run for these models.



d. *Analysis and Interpretation of ECM Results*

Table 5 shows the results of the ECMs estimated to correct for disequilibrium in the short run.

*Table 5: Error Correction Model*

Model	Dependent Variable	Parameters				R-Squared	F-statistic	DW statistic
		$\alpha_0$	$\alpha_1$	$\alpha_2$	$\alpha_3$			
A	D(ln(CS/GDP))	C -0.018657 (0.7628)	D(ln(COMPI)) 0.597659 (0.4997)	D(ln(CI)) -1.180064 (0.2872)	ResidA -0.604771 (0.0046)	0.414454	6.134324	1.835901
C	D(ln(CS/GDP))	C -0.065317 (0.3163)	D(ln(COMPI)) 0.977667 (0.2692)	D(ln(GFCF/GDP)) -1.016364 (0.4096)	ResidB -0.434937 (0.0213)	0.336373	4.392887	1.843634
D	D(ln(CS/GDP))	C -0.050571 (0.4672)	D(ln(COMPI)) 0.578643 (0.4309)	D(ln(Prime)) -0.324960 (0.3981)	ResidD -0.242732 (0.1626)	0.202851	2.205412	1.828021
E	D(ln(CS/GDP))	C -0.041562 (0.5095)	D(ln(COMPI)) 0.196089 (0.7685)	D(ln(REER)) 1.101113 (0.0952)	ResidE -0.716127 (0.0022)	0.366599	5.016074	1.809220

p-values in brackets

The sign of the lagged residual term,  $\alpha_3$ , is negative for all of the above models. This means that the dependent variable,  $\Delta\ln(\text{CS}/\text{GDP})$ , is below its equilibrium value. The fact that the coefficient of  $\alpha_3$  is nonzero in all cases means that the models are not in equilibrium. Therefore, for Model A, 60.5 percent of the adjustment back to the long run equilibrium takes place each year. In Model C, 43.5 percent of the adjustment back to long run equilibrium will take place each year. For Model D, 24.3 percent of the adjustment back to long run equilibrium will take place in one year and finally, for Model E, 71.6 percent of the adjustment back to long run equilibrium takes place each year.

e. *Analysis and Interpretation of Granger Causality Test*

A Granger Causality test is run for corporate saving and the REER. This is because, although the results obtained show a significant relationship between these two variables, the sign of the REER does not conform to a priori expectations. Consequently, the author wanted to determine whether or not it is corporate saving that determines the REER as opposed to the REER determining the behaviour of corporate savings, as shown in the corporate savings function above.

Table 6 shows the results of the Granger Causality test conducted at one lag.

*Table 6: Pairwise Granger Causality Test*

Null Hypothesis	F-statistic	Probability
ln(REER) does not Granger Cause ln(CS/GDP)	0.69537	0.4117
ln(CS/GDP) does not Granger Cause ln(REER)	3.58274	0.0691

The above results show that at the 10% level of significance, the null hypothesis can be rejected and one can conclude that the ln of corporate saving does Granger Cause the ln of the REER. Therefore, at this level, corporate saving provides statistically significant information about future values of the REER (and not the other way around). This result may not be substantial however, as it is only significant at the 10% level.

The results obtained reflect several interesting conclusions. All of the models estimated are statistically significant at the 1% level (as can be seen from the probability of the F-statistic), which means that the variables used in this study play an important role in determining the behaviour of corporate saving.

## 5.2 Corporate saving and dividend payouts

The negative relationship obtained between corporate saving and the commodity price index confirms the recent behaviour of these variables, specifically over the period from 2004 to 2007. This negative relationship was substantial. Previous studies (Harjes and Ricci, 2005 and Aron and Muellbauer, 2000) found there to be a positive relationship, which is what one would expect a priori. This negative relationship may be attributed to changes in the level of dividend payouts of corporations.

Figure 3 shows dividends as a percentage of gross operating surplus and the dividend cover<sup>7</sup> of corporations (both financial and non-financial) over the period 1995 to 2008. There is a clear negative relationship between these two variables. Thus, when the dividend payout ratio (cover) decreases, the amount of dividends paid out to shareholders increases, and vice versa. Figure 4 shows the trends for corporate saving and dividends, both as a percentage of gross operating surplus. The graph shows the data for both financial and non-financial corporations from the period 1995 to 2008. It is evident that in recent years dividend payments rose as a share of gross operating surplus, until 2008, when they fell. Therefore, indicating a negative relationship between these two variables. The author concludes that changes in the dividend behaviour of corporations have been responsible for decreasing corporate saving rates during the commodity price boom (economic upswing). Why might this be the case? Because optimism and a sense of euphoria during an economic upswing cause corporations to believe that they are able to pay out a greater proportion of their earnings in the form of dividends. It is possible for both dividends and savings to rise at a time of rising earnings. The key to this explanation 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.

This finding also explains the negative relationship found between corporate saving and the commodity price index. When export earnings rose because of an increase in commodity prices, corporations increased their dividend payout ratios thus paying out a substantial amount of profits as opposed to retaining a portion alongside these dividend payouts. As a result, dividend payouts increased faster than earnings growth, as above-mentioned. Hence, the substantial decline in the level of corporate saving in recent years.

Tables 7 and 8 confirm the above discussion.

*Table 7: Regression of Dividends, a Commodity Price Index and a Coincident Business Cycle Indicator on Corporate Saving*

Dependent Variable	Explanatory Variables				F-statistic	F-statistic (Prob)	R-squared	DW statistic
	$\beta_0$	$\beta_1$	$\beta_2$	$\beta_3$				
ln(CS)	C 9.749565 (0.0000)	ln(Dividend) -0.682523 (0.0000)	ln(COMPI) 0.209526 (0.1146)	ln(CI) -0.972882 (0.0023)	264.7227	0.000000	0.987565	2.543949

p-values in brackets

Table 8: Regression of Corporate Saving, a Commodity Price Index and a Coincident Business Cycle Indicator on Dividends

Dependent Variable	Explanatory Variables				F-statistic	F-statistic (Prob)	R-squared	DW statistic
	$\beta_0$	$\beta_1$	$\beta_2$	$\beta_3$				
ln(Dividend)	C	ln(CS)	ln(COMPI)	ln(CI)	113.9201	0.000000	0.971572	2.470139
	13.40437 (0.0000)	-1.389565 (0.0000)	0.240460 (0.2156)	-1.223358 (0.0120)				

p-values in brackets

Dividends and corporate savings are expressed as ratios of the level of gross operating surplus of both financial and non-financial corporations. The results analyse data from 1995 to 2008 since the earliest data available for dividends and the gross operating surplus of financial and non-financial corporations is only available from 1995.

The results from table 7 show that both dividends and the coincident indicator are significant at the 1% level, as seen by their low p-values. The relationship between corporate saving and dividends is negative, which confirms the discussion above. When dividends increase as a share of gross operating surplus, the level of corporate saving decreases, and *vice versa*. Overall, the regression is highly significant at the 1% level, as can be seen from the probability of the F-statistic. The R-squared figure suggests that 98.8 percent of the variation in the ln of corporate saving can be explained by the simultaneous variation in the ln of dividends, the ln of the commodity price index and the ln of the coincident indicator.

The results from table 8 show that corporate saving is significant at the 1% level and the coincident indicator is significant at the 5% level. There exists a negative relationship between both corporate saving and the coincident indicator, and dividends, which too confirms the above discussion. The overall regression is significant at the 1% level and according to the R-squared figure, 97.2 percent of the variation in the ln of dividends can be explained by the simultaneous variation in the ln of corporate saving, the ln of the commodity price index and the ln of the coincident indicator. Hence, the above results show that the changes seen in figure 4 are also related to commodity prices and the business cycle.

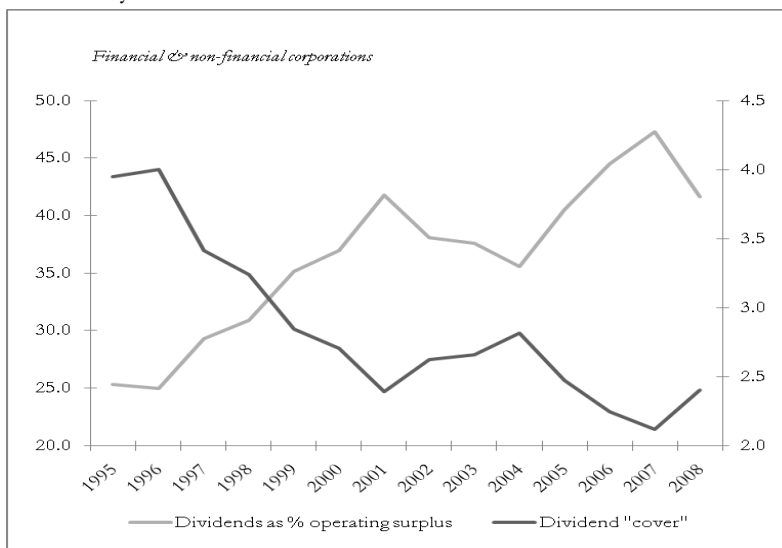


Figure 3: Dividends as a Percentage of Gross Operating Surplus and the Dividend "Cover" of Corporations over the Period 1995-2008

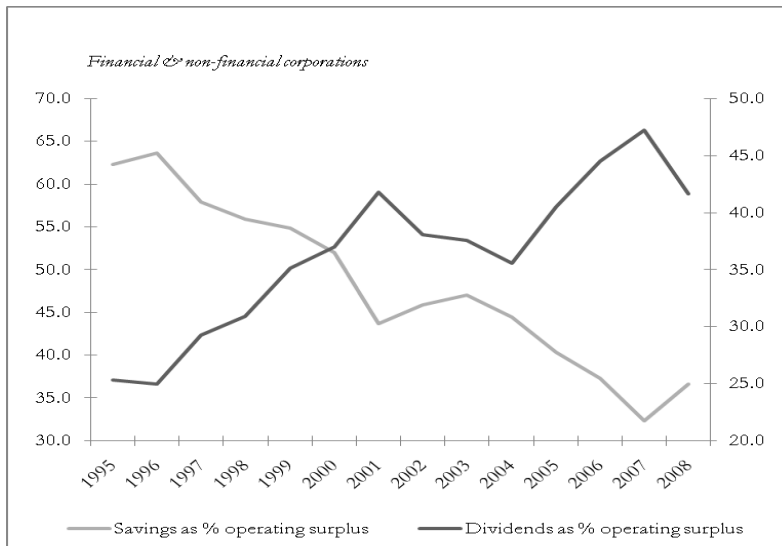


Figure 4: Corporate Savings and Dividends as a Percentage of Gross Operating Surplus over the Period 1995-2008

### 5.3 Summary of results

The coincident indicator reveals that there is a negative relationship between corporate saving and the phase of the business cycle. This result conforms to the conclusion reached by Prinsloo (2000: 9), but does not conform to conclusions reached by Aron and Muellbauer (2000: 529). According to the results obtained, it should be expected then that during recessionary times, the level of corporate saving will increase and a country will run a smaller current account. This has been the case for South Africa. This may be because during recessionary times, there is a sense of caution in the economy and corporations feel the need to save in order to sustain themselves through such bad times. Conversely, when the economy is in a boom, corporations are optimistic and feel that such good times will prevail. As a result, they fail to save thereby causing corporate saving to decrease.

The results conclude that there is a positive relationship between inflation and corporate saving, although the inflation variable used in this study proved statistically insignificant in explaining corporate saving behaviour and there was found to be no cointegration in Model B, thus suggesting that the results may be spurious. Due to this, the author dismissed the inflation variable in explaining corporate saving.

The positive relationship between corporate saving and gross fixed capital formation conforms to a priori expectations. The results show that over the period under study, when corporate saving increased, gross fixed capital formation increased too. One would expect that the worsening of the current account deficit would be attributed to rising investment, yet corporate saving was found to decrease.

The results show that there exists a negative relationship between corporate saving and the prime overdraft rate. However, this variable was found to be statistically insignificant in explaining corporate saving behaviour.

The real effective exchange rate has shown to be a very important variable in analysing corporate saving behaviour as it is highly significant. The exchange rate determines what export prices will be in Rand terms. One would expect the REER to strengthen alongside rising commodity prices. This conclusion agrees with Turner (1986: 47). The results show a positive relationship to exist between corporate saving and the REER, where a negative relationship is expected a priori. Thus, a Granger Causality test was conducted to determine the direction of causality between these two variables. The results show that  $\ln$  of corporate savings does not Granger Cause the  $\ln$  of the REER and vice versa. The rise in the REER may be the result of an even larger rise in commodity prices and as a result, that rise in commodity prices may cause both the REER and the level of corporate saving to rise, such that the relationship between corporate saving and the REER is positive.

## 6 CONCLUSION

This paper set out to analyse the effects of certain macroeconomic variables on the behaviour of corporate saving in South Africa. When corporate saving decreases, this results in a widening of the current account deficit, as corporate saving is the dominant component of aggregate saving in South Africa. As a result, the country depends largely on foreign capital inflows to fund investments, which is unsustainable.

It has been shown how, in previous years, South Africa was able to achieve high levels of real aggregate savings. While South Africa depends largely on profits generated from its manufacturing, mining and financial sectors; during times of commodity price booms, the South African economy needs to be able to and should increase its level of aggregate savings. This is essential to finance further investment opportunities and to maintain or decrease the current account deficit. It is important that South Africa does not depend solely on foreign capital inflows to finance investment opportunities. This is because such inflows may prove to be unreliable and thus unstable. Foreign investors may decide to remove funds from the country at any point in time. This may be because of a number of factors; two of which may be political shocks or an increase in the level of uncertainty.

The negative relationship between corporate saving and the commodity price index has been attributed to the rise in dividend payouts of corporations. While corporations may feel a sense of euphoria and optimism during economic upswings (specifically as a result of greater export earnings due to rising commodity prices), thus rewarding shareholders and paying out large amounts of dividends, it is vital that corporations still retain a certain amount and save out of such export earnings. If corporations increase dividend payouts in line with earnings growth, then both savings and dividends would rise; proving to be far more sustainable in the long run for the South African economy.

As a developing country, South Africa is determined to achieve sustainable economic growth. Thus, there is a need for policy-makers to be able to understand and critically evaluate the domestic savings and investment behaviour conducted by both the private and public sectors of South Africa in order to stimulate the domestic economy.

## APPENDICES

### *Appendix A: Data Collection*

Some of the data for this study was obtained from the South African Reserve Bank's online statistical queries download facility, while some was obtained from Thomson DataStream. The data collected from the South African Reserve Bank includes corporate saving, gross fixed capital formation, consumer price inflation (CPI), GDP, and the coincident indicator. The commodity price index, prime overdraft rate, and real effective exchange rate of the rand were obtained from Thomson DataStream. The inflation measure, prime overdraft rate and real effective exchange rate of the rand were converted into annual data as corporate saving data is only obtainable in an annual frequency. The data was obtained for the period 1978 to 2008 and was recorded in annual frequencies<sup>8</sup>. The data was placed in a table in Microsoft Excel and was then transformed by taking the natural logarithm of the absolute values of the data obtained. This was done to correct for heteroscedasticity, or to reduce the likelihood thereof. All of the econometric results were conducted using the statistical software package, Eviews.

### *Appendix B: Limitations*

A number of limitations were encountered during the collection and analysis of the data. Firstly, corporate savings data is only obtainable in annual frequencies from the South African Reserve Bank. As a result of this limitation, annual data had to be used thereby yielding fewer observations than would have been preferred. Secondly, to ensure a sufficient amount of observations, the analysis begins in 1978 and ends in 2008. During this time South Africa underwent a number of structural/regime shifts, including the end of Apartheid in 1994. The end of Apartheid reopened South Africa to foreign capital inflows and therefore made possible the running of prolonged current account deficits. These shifts are not accounted for in the econometric analysis. Thirdly, the author would have liked to test the relationship between corporate saving and the gross operating surplus of financial and nonfinancial corporations. This was not possible due to the fact that the South African Reserve Bank's database only has records of gross operating surplus figures from 1995.

### *Appendix C: Description of Empirical Econometric Technique Employed*

Firstly, a unit root test is conducted on the variables used in the regression models. This is important as any empirical analysis assumes that the underlying time series is stationary. If this is not the case then it is necessary to transform the time series into a stationary time series. The autocorrelation function (ACF) and correlogram<sup>9</sup> may be used to determine whether or not a variable is stationary, however unit root tests are conducted instead to ensure greater accuracy. According to Gujarati (2003: 805), if a non-stationary time series has to be differenced  $d$  times to make it stationary, then that time series is denoted by  $Y(t) \sim I(d)$  and is said to be of order  $d$ . The Dickey-Fuller (DF) or Augmented DF tests are used. These tests will determine the order of integration of the variables.

Once the regressions have been estimated, the next step is to test for cointegration. Cointegration requires the regression of a unit root time series onto another unit root time series (Gujarati, 2003: 822).

If there is cointegration between the variables in the long run, there may however be disequilibrium in the short run. In order to run the EG or AEG test for cointegration, it is necessary to obtain the residual series of each of the regression models. Therefore, the next step is to run an ECM. According to Gujarati (2003: 824), one can regard the error term in the original regression as the “equilibrium error”. This error term connects the short run behaviour to its long run value (Gujarati, 2003: 824). Therefore, the ECM corrects for disequilibrium. Gujarati (2003: 825) further states that “an important theorem, the Granger representation theorem, states that if two variables Y and X are cointegrated, then the relationship between the two can be expressed as ECM”.

The econometric tests were conducted using version 6.0 of the Eviews statistical package.

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#### NOTES

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<sup>1</sup> The Commodity Price Index used was obtained from Thomson DataStream and is the Thomson Reuters Equal Weight Continuous Commodity Index.

<sup>2</sup> The South African Reserve Bank records gross fixed capital formation (GFCF) for both financial and non-financial corporations as categorised by “type of organisation”. This paper analyses the sum of these.

<sup>3</sup> The Real Effective Exchange Rate (REER) is defined as “the weighted average of a country’s currency relative to an index of other major currencies adjusted for the effects of inflation” (Investopedia, 2009: 1).

<sup>4</sup> The coincident indicator is an indicator which varies directly with, and at the same time, to a related economic trend, thereby providing information about the current state of the economy (Investorwords, 2009: 1).

<sup>5</sup> Spurious correlation refers to the situation in which correlation is found to be present between the ratios of variables regardless of the fact that the original variables are uncorrelated (Gujarati, 2003: 422). A spurious regression could exist if the time series are non-stationary, even if the sample size is very large (Gujarati, 2003: 806).

<sup>6</sup> Due to limitations, this paper does not attempt to correct for this.

<sup>7</sup> The dividend cover is defined as the ratio between a company’s earnings and the net dividend paid out to shareholders (Finance Glossary, 2009: 1). In this paper it is the ratio of the gross operating surplus of financial and non-financial corporations to their dividend payments.

<sup>8</sup> Due to the frequency of the data being used in this study, the author was unable to include the current year (2009).

<sup>9</sup> For a definition see Gujarati (2003: 808).