Current Account Dynamics and Monetary Policy Transmission in South Africa

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Abstract

The debate on global current account imbalances has become more pronounced with the change in global monetary conditions following the 2008 financial crisis. Emerging markets are at a greater risk of being affected by these changes as they have weaker macroeconomic fundamentals and are less insulated against external shocks. This implies they are at a greater risk of adverse effects of normalisation of monetary policy as this may result in an outflow of capital. Despite these risks, there is a lack of investigation into the consequences of monetary policy for current account deficits in emerging economies. This study covers this gap by estimating SVAR models to analyse the effect of monetary policy on current account dynamics in South Africa. South Africa is used as an attractive emerging market case study because of the large current account deficit and dataset that has so far not been exploited to understand the external balance. The study analyses the effect of foreign and domestic monetary shocks on current account developments so as to determine whether changing global monetary policy warrants any intervention of the current account in emerging markets. The study goes further to analyse the channels through which monetary shocks are transmitted to the current account so as to determine how the savings investment gap is affected by monetary policy. Our main contribution is in providing an understanding of the relationship between the current account and monetary policy in emerging markets, and uncovering the effects of global monetary policy on emerging market current accounts. Our analysis shows that the current account is affected by global monetary shocks, with higher foreign interest rates resulting in a lower current account deficit, suggesting that the normalisation of US monetary policy could result in a sharp current account reversal.

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1 Introduction

External imbalances continue to get attention in international macroeconomics, particularly following the 2008 global financial crisis which increased the vulnerability of emerging markets to global shocks (e.g. Obstfeld & Rogoff 2009, Milesi-Ferretti & Blanchard 2009, Caballero, Farhi & Gourinchas 2006). More recently, the changes in global monetary policy, particularly quantitative easing and the move towards the normalisation of the United States monetary policy as part of the adjustment after the financial crisis, have raised concern about the macroeconomic stability of emerging market economies (EMEs) and their ability to adjust to macroeconomic shocks. This is more so in countries with relatively large current account deficits since these countries are prone to economic and financial sector instability caused by the volatility of capital flows that finance current account deficits (Claessens & Ghosh 2013). The gradual increase in global interest rates poses a risk of a decline or stop in capital flows to EMEs, putting deficit countries at the risk of a sharp reversal of current account deficits, which could have adverse consequences for growth. This risk is higher in EMEs due to increased volatility of capital flows and the exchange rate, with countries that allowed their currencies to appreciate, and current account deficits to widen before tapering being the ones likely to suffer the largest impact (Eichengreen & Gupta 2014). This change in global monetary conditions has renewed interest among researches about whether current account deficits in EMEs are sustainable, and raises questions about how current account deficits in these countries are affected by global monetary conditions, and the extent to which domestic monetary policy can be used to insulate the effects of exogenous shocks and achieve stable adjustment of the current account.

There are several existing studies that analyse the interaction between the current account and monetary policy variables such as the exchange rate and interest rate (e.g. Abbas, Bouhga-Hagbe, Fatás, Mauro & Velloso 2011, Lau, Baharumshah & Khalid 2006). Most of these studies are based on cross country data sets, but because panel results are generalised, literature tends to find conflicting results on the interaction of the current account with macroeconomic aggregates particularly in countries of different income levels (see Calderón, Chong & Zanforlin 2007, Chinn & Prasad 2003). The inconsistency in results suggests there is need for case studies that analyse the relationship between the current account and macroeconomic policy at a country specific level. The case studies that do exist however mostly focus on developed countries and either attempt to determine whether monetary policy intervention has any gains for current account sustainability (e.g. Lu 2009, Lu 2012), or try to determine the best monetary rule that can be implemented for smooth current account adjustment (e.g. Herz & Hohberger 2013, Di Giorgio & Nistico 2013, Ferrero, Gertler & Svensson 2008). In as much as an optimal monetary rule for current account stability is important, it is worth noting that these studies lack a clear understanding of the implications of monetary policy for the current account as they neglect the initial step of empirically narrowing down the monetary determinants of the current account before incorporating such determinants in a model that tries to explain the evolution of the current account with regards to monetary policy. Although other studies such as Kim & Roubini (2008) and Lane (2001) address this gap by analysing the effect of monetary shocks on current account fluctuations, these studies are based on developed countries and may not necessarily have policy relevance for lower income countries due to the varying behavioural patterns of the current account in countries of different income levels (see Calderón et al. 2007, Chinn & Prasad 2003).

The need to understand how the current account is influenced by monetary conditions, coupled with the lack of understanding of the monetary determinants of the current account in emerging markets motivate us to investigate the role of monetary policy in the stabilisation of the external balance. In addition, literature has not fully explored the implications of the changes in global monetary policy on the current account balances of emerging markets. By analysing the interaction of the current account and monetary policy, this study determines the effect of global and domestic monetary shocks on current account movements so as to identify current account determinants and provide a better understanding of the relationship between the current account and monetary variables. In addition to addressing the issue of the exposure and risks faced by EMEs to global monetary conditions, we also analyse the channels through which monetary shocks are transmitted to the current account. Understanding the transmission mechanism of monetary policy to the current account facilitates in the identification of monetary policy options for improving the savings-investment gap in high deficit countries. We contribute to literature in two ways in this paper. First, we contribute to the literature on monetary policy and the current account by analysing the effect of global monetary policy on the current account in emerging markets. This is an aspect that has been overlooked despite the changes in global monetary conditions which necessitate such an analysis. The second contribution is in providing a case study of South Africa, an emerging economy, that has developing country characteristics, a highly depreciated currency and a widening current account deficit which has been affected by global monetary conditions in comparison to similar emerging markets. South Africa also provides an impressive availability of time series data that has not been used extensively to analyse the dynamics of the current account (IMF 2013), and our study covers this gap.

In the next section, we discuss the approach used to define the current account in relation to monetary policy, and review developments in the current account and monetary policy literature. After reviewing recent developments in the current account literature, we move to describe the evolution of monetary policy in South Africa in section 3, and analyse how this has impacted the external balance. This is followed by a description of the chosen theoretical model in section 4. Section 5 discusses how the theoretical model leads to both the theoretical and empirical specifications of the model we will estimate, and how the model is identified. Section 6 discusses the data, while section 7 gives the estimation results, and finally, section 8 presents some conclusions.

2 Monetary Determinants of the Current Account

The current account can be described using alternate views such as the absorption approach, which describes the relationship between the current account and the levels of income and expenditure, the twin deficit approach which describes the relationship between the current account and fiscal balance, or the net foreign assets approach which describes the current account as the outcome of trade in goods, services and financial assets. Theories that explain the relationship between the current account and monetary policy stem from the monetary approach to the balance of payments (see Johnson 1972, Frenkel 2013). This approach explains changes in the country's external position to be a result of changes in the demand and supply of domestic currency, the creation of domestic credit and changes in domestic real income (Frenkel 2013). By assuming a fixed exchange rate, the monetary approach theorises that a balance of payments surplus or deficit is a result of disparities between money demand and money supply. However, one of the main criticisms of the monetary approach is that the fixed exchange rate assumption is one that most present day economies have departed from. This implies that by assuming balance of payments disequilibrium is a result of monetary flows, the theory fails to deal with the demand for assets which are denominated in different currencies, and are affected by fluctuating exchange rates when traded internationally (Rabin & Yeager 1982).

To address these weaknesses, approaches to understanding the current account have evolved over time and consider the balance of payments as a consequence of international trade in goods, services and assets, which all affect the behaviour of consumption and income, not just the movement of money. This concept is encompassed in Obstfeld & Rogoff (1995)'s Intertemporal Approach to the Current Account which identifies changes in the real economy that are responsible for balance of payments disequilibrium, making the balance of payments an outcome of trade in goods and services between countries. The Intertemporal Approach demonstrates that countries are able to smooth consumption against specific shocks by lending and borrowing in international capital markets, and consequently, the current account is determined by domestic and foreign interest rates in the lending and borrowing process, and the prevailing exchange rate in the trade of assets. This notion regards the current account as a monetary phenomenon explained by interest rates and exchange rates, and suggests that monetary policy may have implications for current account management.

Some empirical works study the relationship between monetary aggregates and the trade balance and focus on analysing whether the J-Curve exists for developed countries, i.e., whether depreciation of the exchange rate worsens the trade balance in the short run but improves it in the long run. An example of such an analysis is provided by Ivrendi & Guloglu (2010) who analyse the relationship between monetary policy shocks, the exchange rate and the trade balance in Australia, New Zealand, Canada, Sweden and UK, and find that in all countries except the UK, a contractionary monetary policy shock improves the trade balance, with no evidence of the J-Curve effect in any country. The findings demonstrates the importance of interest rates and monetary policy decisions in the determination of the current account, and are in line with similar findings by Prasad & Gable (1998). The analysis on the impact of monetary variables, and particularly the exchange rate, can be extended to an analysis of the current account, not just the trade balance, so as to examine the impact of monetary shocks on the current account (e.g Lee & Chinn 2006). Lee & Chinn (2006) find that permanent monetary shocks have very small and insignificant effects on the current account, with models that differentiate between tradeables and non-tradeables potentially performing better than models that do not differentiate. Contrary to these studies that disprove the J-Curve hypothesis though, several other studies find the J-Curve to still hold in some developed countries, and show that the trade balance, and in some instances the current account, first deteriorates after a depreciation, before improving (e.g Koray & McMillin 1999, Lane 2001, Nadenichek 2006). The lack of consensus on exchange rate effects is due to a number of factors which include the characteristics and macroeconomic fundamentals of a country, the conduct of monetary policy and the implications of monetary policy for the exchange rate, and the improper identification of monetary policy shocks which may result in puzzles (see Kim & Roubini 2000).

The issue of properly identifying monetary policy shocks is explored in Kim (2001a) and Kim (2001b) who argue that monetary shocks are better identified in an open economy when the ability to differentiate between money demand and money supply shocks is demonstrated and structural contemporaneous restrictions are imposed. Both studies analyse the impact of monetary policy on the trade balance or current account and macroeconomic aggregates and find that expansionary monetary policy worsens the United States trade balance before it improves after a year. Kim (2001b) focuses on the trade balance in the US, whilst Kim (2001a) focuses on the effect of monetary shocks on the trade balance in France, Italy and the UK. An interesting finding from these studies is the importance of world interest rates in the determination of the trade balance, and the transmission of monetary shocks through spillover effects from the foreign to the domestic economy. These studies highlight the significant impact that foreign monetary policy may have on the current account balance, and motivate an analysis of the impact of global monetary policy on the current account balances in emerging markets, since macroeconomic fundamentals are affected differently by economic shocks, depending on the income level of a country. Despite emerging markets facing a greater risk from changes in global monetary policy, the studies that so far exist have tended to focus on developed countries, with little attention paid to the consequences of unconventional monetary policy[1] for developing countries.

An exception to the lack of studies on developing countries is the study by Ncube & Ndou (2013) who analyse the link between monetary policy, the exchange rate and the trade balance in South Africa. The authors investigate whether expansionary monetary policy shocks affect South Africa's trade balance through an expenditure switching effect or an income absorption effect. An expenditure switching effect occurs when contractionary monetary policy results in higher interest rates, which increase capital inflows and appreciate the nominal exchange rate. This implies that imports become cheaper and exports become relatively more expensive. As a result, by increasing the amount of imports and reducing the amount of exports, the trade balance deteriorates. Consequently, the monetary channels through which the trade balance can be affected are the exchange rate and interest rate shocks under the expenditure switching effect. On the other hand, an income absorption effect occurs when contractionary monetary policy reduces real GDP, thereby reducing imports and improving the trade balance (see Ncube & Ndou 2013, Kim 2001a). This also implies that through the rate of consumption in the economy, interest rate shocks also affect the trade balance.

Whilst Ncube & Ndou (2013) analyse how the exchange rate affects the trade balance, focus on the trade balance alone precludes an analysis of how savings and investment components are affected by monetary policy, and how monetary policy affects the overall external balance. This aspect is relevant because savings and investment components are crucial for determination of the current account in South Africa, particularly given the volatility of capital flows which is affected by monetary policy. We extend Ncube & Ndou (2013)'s study in several ways. First, we extend the analysis to the current account by analysing how monetary shocks affect the current account and analyse which monetary shocks are more important for determination of the current account. We also go further to analyse the channels through which monetary shocks are transmitted to the current account, and such an analysis facilitates with the appropriate monetary policy design for current account stability. Lastly,

[1] Unconventional monetary policy refers to monetary policy is used to stimulate economic growth following a crisis, e.g., quantitative easing.

we examine role of global monetary conditions in shaping current account developments. This is essential for small open economies like South Africa which are affected by exogenous shocks and the change in global monetary conditions, and contributes to the literature on the consequences of quantitative easing and normalisation prospects for emerging markets.

The studies in the preceding discussion use various estimation methods to determine the effects of monetary shocks on the current account. These methods range from panel data methods for cross country studies, to new open economy macroeconomic (NOEM) models. In as much as panel data methods explain current account determinants for a general set of economies, and are able to control for endogeneity and simultaneity bias by employing GMM and the Sargan and Arellano-Bond specification tests (e.g. Calderon, Chong & Loayza 2002, Calderón et al. 2007), the results are generalised for the group of countries examined and this masks country level dynamics, (e.g. Lau et al. 2006, Kim & Lee 2008, Abbas et al. 2011).

Due to the need to uncover the underlying relationship between the current account and macroeconomic variables at a country level, the relationship between the current account and the exchange rate also tends to be modelled in new open economy macroeconomic (NOEM) models such as in Bergin (2006), Cavallo & Ghironi (2002) and Lane & Milesi-Ferretti (2002). These studies develop macroeconomic models that explain the relationship between the current account or net foreign assets and the exchange rate, and show that deviations from uncovered interest parity (UIP) are strongly related to shifts in the current account, and in some instances, explain current account movements more than they explain the exchange rate. Whilst new open economy models (NOEM) focus the analysis to country level studies that predict the exchange rate and the current account, these models are normally outperformed by Structural VAR (SVAR) models (see Bergin 2006). Consequently, most empirical studies that analyse country specific current account dynamics use SVAR models (see Hoffmann 2003, Corsetti & Muller 2006, Lee & Chinn 2006, Kano 2008, Kim & Roubini 2008). The prominent use of SVAR models in analysing macroeconomic determinants of country level current account balances, and their general outperformance of NOEMs motivates the application of SVAR models in this paper. The SVAR models are used to analyse the effect of global and monetary shocks on the current account, and the results are tested for robustness using different variable specifications and identifying restrictions.

The estimation is applied to a case study of South Africa, a developing country with a relatively high current account deficit and an inflation targeting monetary policy framework, which affects the current account through the variation in the interest rate as a monetary policy tool. Given the sparse research on the relationship between monetary policy and the current account, particularly in emerging markets which are likely to be negatively impacted by the change in global monetary conditions, we contribute to the literature on the effects of monetary policy for current account dynamics in developing countries. The paper has implications for the design of macroeconomic policy targeted at managing external imbalance, and provides insight into the possible risks of normalisation of foreign monetary policy, and consequences of domestic monetary policy for the current account. To understand the nature of domestic monetary policy, we move to analyse monetary policy developments in South Africa, and their relation to changes in the current account balance.

3 Current Account and Monetary Policy Developments in South Africa

South Africa's persistent current account deficit has arguably been a result of domestic interest rates which are relatively higher than global averages and attract capital flows that finance the deficit (Smit, Grobler & Nel 2014). In line with relatively high interest rates, high exchange rate volatility has also resulted in fluctuations of imports and exports, and has resulted in an unstable current account position. This variation in exchange rates and interest rates for the period covered in this study (1985 - 2012) has been a result of the various monetary regimes which have consequently affected the current account position and trade outcomes.

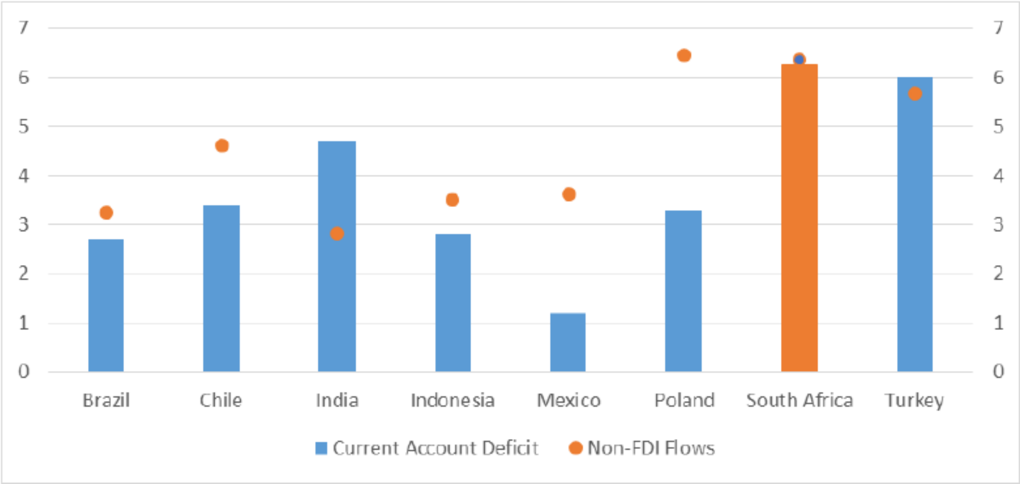
The first phase of monetary policy for the period reviewed in this study involved a system of flexible money supply targeting from 1986, and used the discount rate to influence short term interest rate changes. Money targeting was mostly influenced by the De Kock Commission which aimed to review exchange rate and monetary policy in a bid to regulate the financial market (see Aron & Muellbauer 2002). In line with the recommendations of the De Kock Commission, which encouraged implementation of more market oriented monetary and fiscal policy, and the dual exchange rate system which came into effect, the SARB introduced monetary targeting which was in place until 1998. This ran concurrently with the debt standstill from 1985 to 1989. The end of the debt standstill resulted in a recovery of economic growth and a large outflow of capital, which resulted in exchange rate depreciation, and a current account surplus from increased export competitiveness for the most period until 1994 (see Aziakpono & Wilson 2015). The increased capital flows consequently made money targeting more challenging, and as a result, the SARB developed an approach which combined money supply guidelines with a set of indicators for various economic aggregates such as the exchange rate, output gap, balance of payments, and fiscal stance (Aron & Muellbauer 2002).

The end of apartheid in 1994 ushered in financial liberalisation which resulted in increased openness of the capital account due to the liberalisation of exchange controls and unification of the dual exchange rates. This increased the inflow of foreign capital, resulting in a deficit of the current account financed by capital inflow. As the changes in money supply became less reliable indicators of underlying inflation, money targeting was abandoned, with inflation targeting being adopted in February 2000. Under inflation targeting, the primary objective of the SARB is price stability, with secondary objectives of financial stability and economic growth. However, one main pitfall of inflation targeting is that it reduces flexibility when dealing with exogenous shocks (see Ncube & Ndou 2013), which motivates the need to analyse the response of the current account to various shocks under the inflation targeting framework, and determine the best response to monetary shocks for a sustainable current account position.

A major implication of the change in monetary regimes is the influx of short term capital flows due to interest rate variations, particularly with contractionary monetary policy under inflation targeting. High interest rates attract foreign capital flows, which in turn finance the current account deficits, especially when domestic interest rates are considerably higher than world interest rates. In South Africa, relatively high interest rates have increased short term capital flows at the expense of foreign direct investment (FDI), with FDI being 44% lower in the first half of 2012 compared to the same period in 2011 (GrantThorton 2012). This has resulted in a current account deficit that is heavily financed by volatile short term capital (see figure 1), posing a greater risk of current account reversal in the event of an outflow of capital. Apart from the consequences of high interest rates on the current account, the fluctuation of the exchange rate has also had an impact on the country's export competitiveness, and in addition to a current account deficit of 6.4 % of GDP in the third quarter of 2013 (SARB 2014) and increased inflow of short term capital, the rand has been one of the most volatile currencies amongst major emerging markets (see figure 2).

The effect of variations in the interest rate and exchange rate implies that monetary policy has considerable consequences for the current account, and raises the need to understand how the current account is affected by monetary shocks. This is useful in determining whether monetary policy can be used for current account management, and helps weigh implications of global monetary conditions on the current account in South Africa. The analysis also helps to determine how advisors should best respond to exogenous shocks in the inflation targeting framework in order to attain a sustainable current account balance. Before the analysis is carried out however, it is essential to describe the theoretical framework that guides our selection of monetary variables that determine the current account. This framework is discussed in the section that follows.

Figure 1: Reliance on Non-FDI Flows to Finance the Current Account Deficit (in % of GDP, 2012)



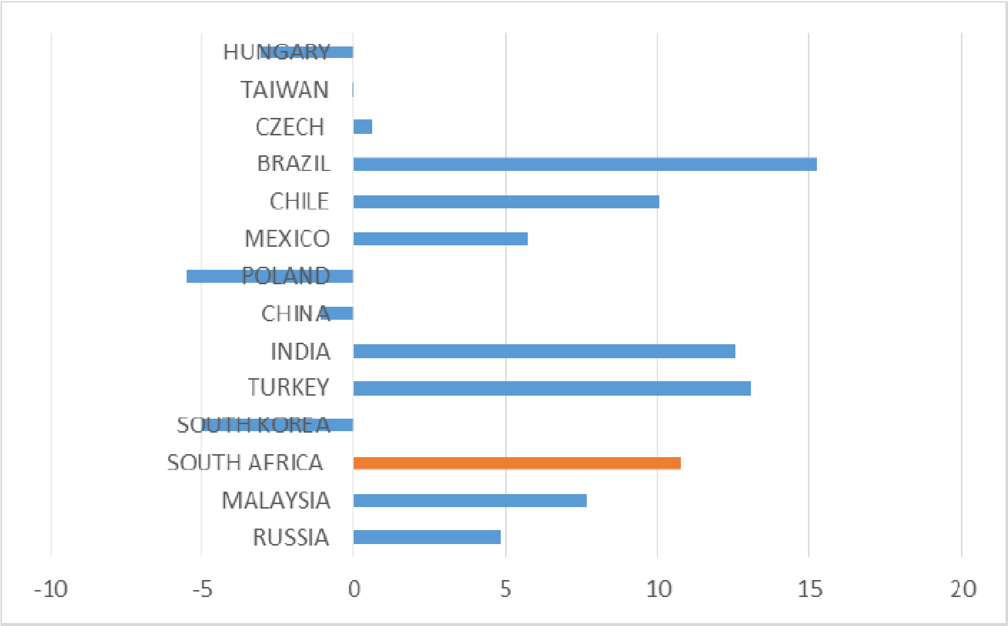
Source: Author's compilations using data from IMF (2015)

4 Theoretical Framework

The framework used in this paper describes the theoretical link between the current account and monetary policy, and closely follows the Intertemporal Approach to the Current Account by Obstfeld & Rogoff (1995). The approach is built on the premise that expectations about productivity growth, exchange rates, relative interest rates and other macroeconomic aggregates affect savings and investment decisions. Since the current account in the intertemporal approach is the result of savings and investment decisions made by the residents of a nation, we focus on the factors that affect the savings investment relationship, and the impact of monetary variables on this relationship.

The Intertemporal Approach to the Current Account is based on the assumption of a small open economy that produces a single composite good and has a representative household, with the current account measured by the accumulation of net foreign assets A_{t+1}. In the following equations, r_t is the net interest rate, A_t is a consumption indexed bond, $R_{t,s}$ the discount factor for consumption at date s, C, G, I and Y are consumption, government spending, investment and output respectively. CA_t remains the current account, $\widetilde{r}_t$ is the permanent level of variable r_t, and σ is the elasticity of substitution which is greater than zero. In this model, there is only one traded asset in the economy, a consumption indexed bond that pays a net interest of r_t and has a discount factor at date s given by $R_{t,s}$, and households maximise utility (equation 1) subject to the intertemporal budget constraint (equation 2).

Figure 2: Exchange Rate Depreciation in Selected EMEs: May-December 2013



Source: Author's compilations using data from The World Bank (2015)

$$\mathbf{U}(\mathbf{C}) = \frac{C^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} \tag{1}$$

$$(1+r_t)A_t = \sum_{s=t}^{\infty} R_{t,s}(C_s + G_s + I_s + Y_s) + \lim_{s\to\infty} R_{t,s}A_{s+1} \tag{2}$$

We derive optimal consumption and substitute this into the budget constraint such that we derive optimal consumption at date t given by equation 3

$$\mathbf{C}_t = \frac{(1+r_t)A_t + \sum_{s=t}^{\infty} R_{t,s}(Y_s - G_s - I_s)}{\sum_{s=t}^{\infty} R_{t,s}(\beta^{s-t}/R_{t,s})^{\sigma}} \tag{3}$$

To derive the current account identity from equation we use equations 3 and 2 to demonstrate the current account becomes a function of the interest rate on the accumulation of net assets, income, government spending and investment. The current account is measured by the deviation of these variables from their permanent level $\widetilde{X}_t$, and as a result, the current account in period t is given by equation 4.

$$CA_t = (r_t - \widetilde{r}_t)A_t + (Y_t - \widetilde{Y}_t) - (G_t - \widetilde{G}_t) - (I_t - \widetilde{I}_t) + \left[1 - \frac{1}{(\widetilde{\beta/R})^{\sigma}}\right](\widetilde{r}_t A_t + \widetilde{Y}_t - \widetilde{G}_t - \widetilde{I}_t) \tag{4}$$

The Fundamental Current Account Equation (equation 4) holds a number of inferences about monetary policy and the determination of the current account. First, the approach suggests that the exchange rate, though not explicitly modelled in the framework, affects the current account through the trade in assets between the domestic and foreign economies. This is reflected in the net foreign assets A_{t+1}. The relationship between the real effective exchange rate and the current account can be two way. First, an increase in the real effective exchange rate (depreciation) increases the purchasing power of domestic residents, thereby increasing real consumption expenditure on both domestic and foreign goods, and the relative value of assets held by the residents. This reduces the rate of savings and increases the marginal propensity to consume, whilst at the same time increasing export competitiveness. The effect of depreciation on the current account deficit depends on whether the increase in the marginal propensity to consume (which worsens the current account) is stronger than the increased export competitiveness (which improves the current account). However, due to the need to smooth consumption, after a depreciation, residents normally opt to increase investment abroad as opposed to consumption, leading to a current account improvement (Kim & Roubini 2008). On the other hand, an appreciation of the real exchange rate reduces export competitiveness and makes imports cheaper, worsening the current account deficit.

Equation 4 also suggests that global shocks do not affect current account dynamics since all countries are affected and adjust in a similar manner, thus only domestic variables feature in the equation. However, the difference between domestic and foreign interest rates affects the rate of capital flow, so this study posits the notion that foreign monetary shocks do in fact affect the current account. This notion is investigated by analysing the response of the current account to foreign interest rates, and facilitates in determining how the current account position is affected by the changes in global monetary policy. This follows similar studies (e.g. Kim 2001a, Kim 2001b) that assume that the current account and its components are affected by shocks from both domestic and global monetary policy.

The interest rate is also used as an indicator of monetary policy stance in this study, since it is the SARB's policy tool of choice in the inflation targeting framework (SARB 2014). When analysing the direct impact of domestic interest rates on the savings-investment gap, there are two channels through which the interest rate affects private savings; i.e., the substitution effect and the income effect. Under the substitution effect, an increase in the real interest rate acts as an incentive to increase private savings and reduce consumption, which reduces the current account deficit as the savings-investment gap narrows. Alternatively, an increase in the real interest rate appreciates the exchange rate and increases imports if demand is relatively elastic, implying the current account deficit widens (Simmons 1997). Consequently, if the effect on imports is larger, the current account deficit widens, and if the substitution effect is greater, the current account position improves. By analysing the channels through which monetary shocks are transmitted to the current account, this study will determine which of these two effects hold for South African consumers.

The theoretical relationships between the variables discussed above narrow down the monetary variables that affect the current account to the interest rate and exchange rate, and paves way for analysing the impact of monetary aggregates on the current account. We use monetary shocks generated through the real effective exchange rate and the REPO rate to proxy domestic monetary shocks, and the US interest rate to proxy global monetary shocks. However, even though the theoretical model outlined above implies that the current account is determined by GDP and monetary variables, it suggests no clear empirical specification of the model. It has become common to circumvent this problem in empirical literature by allowing the most general specification of the current account to be estimated using a VAR approach as the variables that explain he current account are endogenous. Theoretical restrictions are used to improve the precision of estimates and reduce the forecast error variance in the model identification (e.g. Kim & Roubini 2000, Christiano, Eichenbaum & Evans 1999). However, to adequately capture monetary shocks, we draw from an ISLM framework where the economy is characterised by a goods market and money market. Drawing from this framework is useful for dealing with the monetary puzzles in literature that often arise when the response of variables to monetary shocks contradicts theoretical expectations due to weaknesses in the identification scheme (see Kim & Roubini 2000).

5 The Model

5.1 Theoretical Specification

To implement the empirical specification, we follow the model by Kim & Roubini (2008), but limit our focus to the effects of monetary shocks on the current account and their transmission to current account components. Our identification scheme is also closely in line with Kim (2001b) who extend the closed economy identification of monetary policy to an open economy. We use VAR models to isolate the exogenous component of shocks, with the economy described by the structural equation below;

$$G(L)y_t = e_t \tag{5}$$

We focus on the effects of both foreign and domestic monetary shocks on the current account, and as a result, we use a 5 variable VAR in this paper where y_t in equation 5, is the nx1 data vector given by US interest rates that proxy foreign monetary policy, output to capture business cycle fluctuations, the current account deficit, domestic interest rates in South Africa, and the exchange rate. $G(L)$ is the matrix polynomial in the lag operator, and e_t is a vector of serially uncorrelated structural disturbances. The structural model is based on the reduced form model below

$$y_t = B(L)y_t + u_t \quad \text{where var}(\text{u}_\text{t}) = \Sigma \tag{6}$$

We recover structural parameters by assuming two matrices G_0 with contemporaneous coefficients and $G^0(L)$ without contemporaneous coefficients in structural form such that

$$G(L) = G_0 + G^0(L) \tag{7}$$

This establishes a relationship between the structural and reduced form residuals given by

$$e_t = G_0 U_t \qquad \text{where } \Sigma = G_0^{-1} \Lambda G_0^{-1} \tag{8}$$

We use theoretically founded restrictions on the contemporaneous coefficients to recover structural parameters by normalising n diagonal elements to 1s in G_0 and imposing at least $\frac{n(n+1)}{2}$ contemporaneous restrictions on the matrix of contemporaneous coefficients. We then use these restrictions to apply a generalised structural VAR approach to the model.

5.2 Econometric Specification and Identification

To recover structural parameters from the reduced form equation, we use the theoretical model described above to formulate the empirical specification of the 5-variable VAR. Our choice of monetary variables that affect the current account is based on the fundamental current account equation (equation 4) and its implications for monetary variables on the current account. We illustrate the empirical specification of the model where *usrate* is the US interest rate, *lgdp* is output, *cad* is the current account deficit, *repo* is the domestic interest rate, and *reer* is the real effective exchange rate[2]. The specification of the model is

[2] We use this data set for illustrative purposes. However, in the empirical analysis we conduct a battery of experiments using alternative specifications with both nominal and real monetary variables.

given below.

$$\begin{aligned}
u\,\mathrm{srate}_t &= \alpha_1+\sum_{i=1}^{m}\beta_{1i}u\,\mathrm{srate}_{t-i}+\sum_{i=1}^{m}\gamma_{1i}\lg dp_{t-i}+\sum_{i=1}^{m}\delta_{1i}cad_{t-i}+\sum_{i=1}^{m}\phi_{1i}rir_{t-i}+\sum_{i=1}^{m}\psi_{1i}lreer_{t-i}+\varepsilon_{1t}\\
\lg dp_t &= \alpha_2+\sum_{i=1}^{m}\beta_{2i}u\,\mathrm{srate}_{t-i}+\sum_{i=1}^{m}\gamma_{2i}\lg dp_{t-i}+\sum_{i=1}^{m}\delta_{2i}cad_{t-i}+\sum_{i=1}^{m}\phi_{2i}rir_{t-i}+\sum_{i=1}^{m}\psi_{2i}lreer_{t-i}+\varepsilon_{2t}\\
cad_t &= \alpha_3+\sum_{i=1}^{m}\beta_{3i}u\,\mathrm{srate}_{t-i}+\sum_{i=1}^{m}\gamma_{3i}\lg dp_{t-i}+\sum_{i=1}^{m}\delta_{3i}cad_{t-i}+\sum_{i=1}^{m}\phi_{3i}rir_{t-i}+\sum_{i=1}^{m}\psi_{3i}lreer_{t-i}+\varepsilon_{3t}\\
rir_t &= \alpha_4+\sum_{i=1}^{m}\beta_{4i}u\,\mathrm{srate}_{t-i}+\sum_{i=1}^{m}\gamma_{4i}\lg dp_{t-i}+\sum_{i=1}^{m}\delta_{4i}cad_{t-i}+\sum_{i=1}^{m}\phi_{4i}rir_{t-i}+\sum_{i=1}^{m}\psi_{4i}lreer_{t-i}+\varepsilon_{4t}\\
lreer_t &= \alpha_5+\sum_{i=1}^{m}\beta_{5i}u\,\mathrm{srate}_{t-i}+\sum_{i=1}^{m}\gamma_{5i}\lg dp_{t-i}+\sum_{i=1}^{m}\delta_{5i}cad_{t-i}+\sum_{i=1}^{m}\phi_{5i}rir_{t-i}+\sum_{i=1}^{m}\psi_{5i}lreer_{t-i}+\varepsilon_{5t}
\end{aligned}$$

where $E(\varepsilon_{it})=0;\ \ E\left(\varepsilon_{it}\varepsilon_{it}^{'}\right)=I;$ and $E\left(\varepsilon_{it}\varepsilon_{is}^{'}\right)=0 \quad \forall\, t\neq s$

We apply this model by estimating a number of models with nominal variables, real variable and alternatively specified variables to compare the effect of various monetary variables on the current account.

The model uses the generalised non-recursive method that imposes restrictions to identify the structural components of the error terms and the equation below summarises the identification scheme used.

$$\begin{bmatrix} e_{lu\,\mathrm{srate}} \\ e_{\lg dp} \\ e_{cad} \\ e_{rir} \\ e_{reer} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ g_{21} & 1 & 0 & 0 & 0 \\ g_{31} & g_{32} & 1 & g_{33} & 0 \\ g_{41} & 0 & 0 & 1 & 0 \\ g_{51} & g_{52} & g_{53} & g_{54} & 1 \end{bmatrix} \begin{bmatrix} u_{l\,\mathrm{srate}} \\ u_{\lg dp} \\ u_{cad} \\ u_{rir} \\ u_{reer} \end{bmatrix} \tag{9}$$

$e_{lu\,\mathrm{srate}}$, $e_{\lg dp}$, e_{cad}, e_{rir} and e_{reer} are the structural disturbances which are foreign monetary policy shocks, output/ real GDP shocks, current account deficit shocks, domestic monetary policy shocks, and exchange rate shocks. $u_{lu\,\mathrm{srate}}$, $u_{\lg dp}$, u_{cad}, u_{rir} and u_{reer} are the residuals for the reduced form equations. The first line of restrictions in equation 9 shows the effect of global / foreign monetary policy which is considered to be exogenous to South Africa since South Africa is modelled as a small open economy, and does not have the capacity to affect world variables. The foreign interest rate thus captures exogenous monetary policy changes and their effects on the current account. The second line controls for the effects of business cycle fluctuations on the current account based on the assumption that output is not contemporaneously affected by other variables in the system, following Kim & Roubini (2000). This equation is used to show the goods market in the ISLM framework. Line 3 shows the current account deficit, which is contemporaneously affected by foreign and domestic monetary policy, but not the exchange rate. This assumption is made to analyse interest rate effects on the current account. Line 4 shows the real interest rate which is used to proxy the effects of domestic monetary policy on the current account. Since the main objective of monetary policy under the inflation targeting framework is to keep inflation within the band, we assume the real interest rate is not contemporaneously affected by other domestic variables in the model as well. This identification is supported by the relatively lower weight that the SARB places on output and exchange rate stabilisation compared to inflation (see Ortiz & Sturzenegger 2007). In addition, output may only affect the interest rate at later periods, not within the quarter. Lastly, the exchange rate equation describes the equilibrium in the financial market. All variables are assumed to have contemporaneous effects on the exchange rate since it is a forward looking asset price (see Kim & Roubini 2000, Kim & Roubini 2008).

6 Data

These restrictions are applied to a model of South Africa using quarterly data from the third quarter of 1985 to the last quarter of 2012. The starting point of 1985:03 corresponds with the start of the dual exchange rate, so the sample covers two exchange rate regimes, the dual and the free float. A dummy variable is included to cater for the switch to a free floating exchange rate/financial liberalisation in the second quarter of 1995, with 1 indicating the floating exchange rate from 1995:Q2 to 2012:Q4, and zero the dual exchange rate regime. Seasonal dummy variables are also included to cater for seasonality of GDP, and a dummy variable is used to control for the impact of the 2008 financial crisis. The US interest rate ($LUSRATE$) is measured by the log of the monetary policy related interest rate of the United States and is obtained from the IMF's international financial statistics (IFS). Output ($LGDP$) is measured by the log of gross domestic product. The current account deficit (CAD) is defined by the ratio of the current account balance to GDP in percentage terms. Values greater than zero indicate a deficit and those less than zero, a surplus. This conversion is for ease of interpretation since South Africa's current account balance has an average deficit for the period under study, hence interpretation of results is in terms of a current account deficit. The domestic real interest rate (RIR) is based on the REPO rate used in monetary policy formulation. The real interest rate is found by subtracting inflation from the REPO rate, and the measure of inflation used is the percentage point change of the consumer price index (CPI). The real effective exchange rate of the rand ($LREER$) is based on the average for the period of 20 trading partners using trade in manufactured goods, and the variable is measured in logs. The REPO rate is obtained from the IFS, whilst all other domestic variables for South Africa are obtained from SARB. Using the real interest rate and real effective exchange rate to proxy monetary shocks follows other studies that investigate the impact of monetary shocks on the current account (e.g. Bergin 2006, Lee & Chinn 2006, Lu 2009, Kim & Roubini 2008).

Apart from analysing the effect of global and domestic monetary shocks on the current account, the study also seeks to analyse how monetary shocks are transmitted to the current account, and to do this various current account components are used. Components include the trade balance ($TBAL$) which is measured as a percentage of GDP, the ratio of household savings to disposable income ($HSAV$), which is used to infer how monetary policy affects the decision of households to save, and the ratio of final household consumption to GDP ($HCONS$), which is used to infer households' consumption smoothing behaviour. Components used to analyse the the transmission of monetary shocks to the savings investment gap include net savings by the general government as a percentage of GDP ($GSAV$) and gross investment by the general government ($GINV$).

7 Results

7.1 Effects of Monetary Policy Shocks on the Current Account

Using the discussed variables and identification strategy, we focus on the main objective of analysing the relationship between the current account balance and monetary policy, and use the model to examine the effect of global and domestic monetary shocks on the current account. The descriptive statistics from the baseline model with the data vector $\{LUSRATE, LGDP, CAD, RIR, LREER\}$ are shown in table 1. These show a maximum current account deficit of 6.8% of GDP and a maximum domestic interest rate of 15.09%. The standard deviations show the most variation in the current account deficit, and in the domestic real interest rate, which could be a result of the use of interest rates as a policy tool in the inflation targeting framework.

Table 1: Descriptive Statistics

	MEAN	STD. DEV	MIN	MAX
LUSRATE	1.1735	1.0065	-1.3613	2.2836
LGDP	14.0956	0.2189	13.8091	14.4931
CAD	0.9373	3.4403	-8.4	6.8
RIR	2.9249	4.4459	-9.4107	15.0889
LREER	4.6089	0.1459	4.1582	4.8218

Table 2: Correlation Coefficients

	LUSRATE	LGDP	CAD	RIR	LREER
LUSRATE	1.0000				
LGDP	-0.7496	1.0000			
CAD	-0.4546	0.8263	1.0000		
RIR	0.0845	-0.0611	0.3029	1.0000	
LREER	0.3236	-0.5844	-0.4325	-0.1283	1.0000

In table 2, there is high correlation between the current account deficit and LGDP, but LGDP is kept in the model to control for business cycle fluctuations. The domestic interest rate and current account deficit are positively correlated, suggesting that an increase in interest rates worsens the current account deficit, whilst the foreign interest rate and current account deficit are negatively correlated, suggesting that an increase in the foreign interest rate improves the current account. The exchange rate and current account deficit are negatively correlated, suggesting an appreciation (increase in LREER) could lead to an improvement of the current account position, which contradicts theoretical expectations and is further investigated in the analysis. as theoretically expected.

An unresolved issue that arises in the estimation of the SVAR model is whether to estimate using levels or first differences. This is a question that has been discussed in literature, with articles weighing the implications of non-stationary multivariate analysis, vis-a-vis a VAR model with stationary variables. Enders (2010), together with Sims, Stock & Watson (1990) present the argument that a differenced multivariate model gets rid of information that could otherwise be used to explain the relationship between variables and could introduce distortions in the results. Their central motivation is that, if the purpose of the analysis is to investigate the relationship between variables through impulse response functions and variance decompositions as opposed to parameter estimates, the data should mimic the true data generation process and should not be differenced. Other authors (e.g. Toda & Yamamoto 1995, Yamada & Toda 1998) argue that unit roots matter if the focus of the research is on testing the hypothesis expressed as coefficient restrictions, which essentially is the purpose of an SVAR model through the imposition of theoretically founded restrictions. The main concerns with non-stationary models are spurious relations between variables, and biased estimates. Toda & Phillips (1993) show that when the random walk is accounted for in tests, the estimates are not biased, suggesting the need to ensure stationarity in order to attain unbiased estimates. The authors also discuss how tests that suggest asymptotic properties hold for large scale non stationary VARs may be misleading, and suggest the use of bootstrapping methods to control for the presence of nuisance parameters in these tests. Sims & Uhlig (1991) however argue that these bootstrapping techniques are of little practical value, and suggest the need to take account of the unit roots.

Table 3: Stationarity Tests using ADF Method and Phillips-Perron

ADF

	Levels		1st Difference	
	Intercept	Intercept + Trend	Intercept	Intercept + Trend
LUSRATE	0.8265	0.5139	0.0000	0.0000
LGDP	0.9962	0.5698	0.0001	0.0002
CAD	0.7400	0.0942	0.0000	0.0000
RIR	0.4363	0.8253	0.0000	0.0000
LREER	0.2617	0.2464	0.0000	0.0000

PHILLIPS-PERRON

	Levels		1st Difference	
	Intercept	Intercept + Trend	Intercept	Intercept + Trend
LUSRATE	0.8584	0.6361	0.0000	0.0000
LGDP	0.9980	0.7748	0.0001	0.0001
CAD	0.2613	0.0000	0.0000	0.0000
RIR	0.3729	0.7985	0.0000	0.0000
LREER	0.2389	0.2027	0.0000	0.0000

Note: H_0 - Series has a unit root.
Table records P-values of each test

Considering the pros and cons of stationary and non stationary VARs, we weigh the two options with the consequences of differencing the data being the loss of information, and the consequences of non-stationary data being biased estimates and spurious regressors. We proceed by using stationary data for the purposes of obtaining the asymptotic properties of unbiased estimates, and avoid spurious regressors. To circumvent the loss of information, we explore the difference stationary and trend stationary properties of the data in the structural VAR models. Results from stationarity tests conducted using the Augmented Dickey-Fuller (ADF) method and the Phillips-Perron (PP) method (table 3) show that all variables have unit roots at 1% and 5% levels of significance [3]. As a result, since the variables are I(1), we proceed to test for cointegration, but there appears to be no long run relationship between the variables. Other empirical models on the current account provide no evidence of a cointegrating relationship in current account models (e.g. Kano 2008, Kim & Roubini 2008), and there is no theoretical foundation that would suggest the existence of a cointegrating relationship, so we proceed to estimate a stationary SVAR.

A shortcoming of unit root tests however is that they are often criticised for having weak power, and it is often difficult to differentiate between difference and trend stationary variables. To deal with this, we also test for trends in the data to determine if the series are trend stationary. Trend stationarity is tested in two ways; first, we regress the variable of

[3] Current account components also have unit roots, with the exception of gross investment which is stationary in levels.

Table 4: Stationarity Tests on Detrended Variables

	Time trend		HP Filtered Cycle	
	ADF	PP	ADF	PP
LUSRATE	0.9073	0.9239	0.0000	0.0539
LGDP	0.7018	0.6140	0.0038	0.0421
CAD	0.7400	0.2613	0.0000	0.0000
RIR	0.4363	0.3729	0.0001	0.0000
LREER	0.2617	0.2389	0.0022	0.0012

Note: Tests conducted with intercept
Table records P-values of each test

interest on a time trend, and test stationarity of the detrended residuals that result. This facilitates in determining whether the series has a deterministic trend. Second, we use the Hodrick-Prescott (HP) filter to extract the stochastic trend from the data, and test for stationarity of the resulting detrended cyclical series. These results are reported in table 4 and show that the data are trend stationary when the HP filter is used. Consequently, we compare inferences of the difference stationary model to inferences of the trend stationary model before analysing the transmission of monetary shocks to current account components, and we proceed to use the HP filtered series as this gives us more stable and significant models.

Before proceeding to estimate the VAR models, it is important to ensure selection of the appropriate lag length. This is done by using the Likelihood Ratio (LR) test, the Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and the Hannan-Quinn Information Criterion (HQ). Ng & Perron (2005) and Liew (2004) demonstrate that the lag length is affected by sample size, with the AIC, and FP performing better when the sample size is less than 60. In general, the SC and HQ tend to pick smaller lag lengths whilst the AIC over estimates. This shows the need to use all 5 criteria for consistency in choosing the most suitable lag length. Table 5 reports the lag length selection criteria for the baseline differenced model, with an optimal lag length of 1 selected. Apart from ensuring selection of the optimal lag length, it is also important to test the overidentifying restrictions to ensure that the model is properly identified. Results for the Likelihood test for overidentifying restrictions are reported in table 6 and show that we fail to reject the identification restrictions used at the 10%, 5% and 1% levels of significance.

Given that the overidentifying restrictions are valid, equation 10 reports the estimated structural parameters for the VAR system in the differenced model. The signs of these coefficients show that an increase in the foreign interest rate reduces domestic output but improves the

Table 5: Lag Length Selection

Lag	LR	FPE	AIC	SC	HQ
0	-	1.30e-08	-3.97*	-3.21	-3.66
1	101.57*	7.11e-09*	-4.58	-3.19*	-4.01*
2	34.57	7.83e-09	-4.49	-2.47	-3.67
3	29.18	9.04e-09	-4.36	-1.71	-3.28
4	19.74	1.16e-08	-4.13	-0.85	-2.80

*indicates lag order selected by the criterion

Table 6: Likelihood Test for Overidentifying Restrictions in the Differenced Model

LogLikelihood	Chi-Square	P-Value
263.3936	0.1856	0.6666

H_0: Overidentifying restrictions are valid

current account and appreciates the exchange rate through an outflow of capital. An increase in output worsens the current account deficit, which could be due to higher import requirements, whilst a widening of the current account deficit depreciated the exchange rate as theoretically expected. A lower domestic interest rate also improves the current account, which could also be indicative of capital outflow with relatively lower domestic interest rates.

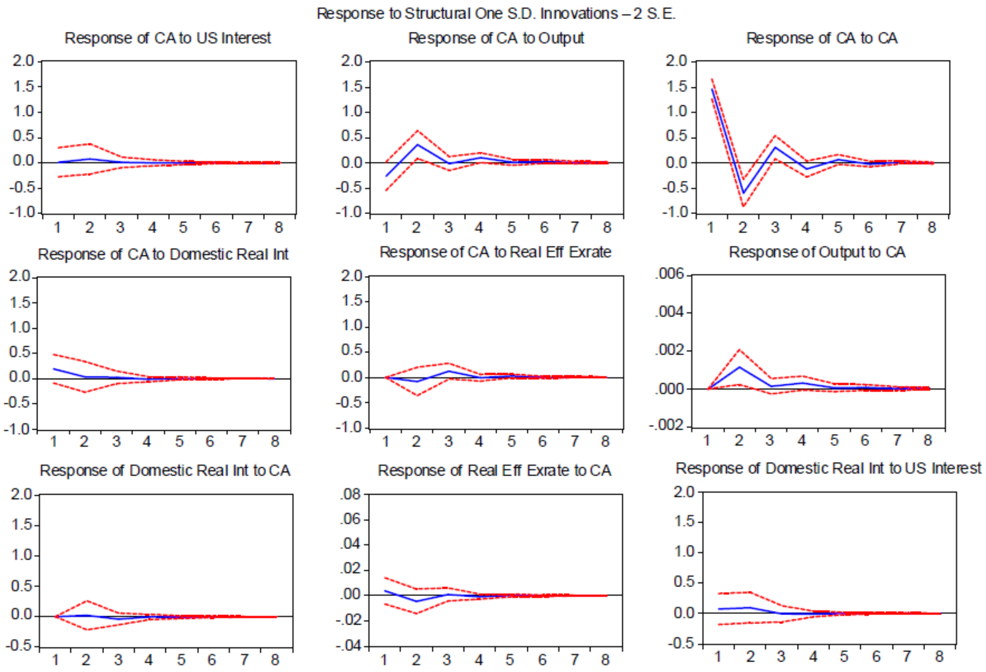
$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -0.0051 & 1 & 0 & 0 & 0 \\ -0.2462 & 52.7992 & 1 & -0.1444 & 0 \\ -0.5311 & 0 & 0 & 1 & 0 \\ -0.0624 & 2.01940 & -0.0025 & 0.0055 & 1 \end{bmatrix} \begin{bmatrix} lu\,\mathrm{srate} \\ \lg dp \\ cad \\ rir \\ lreer \end{bmatrix} = G(L) \begin{bmatrix} lu\,\mathrm{srate} \\ \lg dp \\ cad \\ rir \\ lreer \end{bmatrix} + \begin{bmatrix} e_{lu\,\mathrm{srate}} \\ e_{\lg dp} \\ e_{cad} \\ e_{cad} \\ e_{lreer} \end{bmatrix} \tag{10}$$

After identifying the model, the next step involves analysing the effect of monetary shocks on the current account through the use of impulse response functions and variance decompositions, where the impulse response functions show the effects of a shock to one endogenous variable on the other variables in the system[4]. Figure 3 shows the effect of monetary shocks on the current account and the response of macroeconomic aggregates to current account deficit shocks when the model is first differenced.

From figure 3, a positive shock to the US interest rate, which is used to proxy foreign/global monetary policy shocks worsens the current account deficit in South Africa. This impact is shown in row 1 of column 1. The shock lasts for 6 quarters with a percentage increase in world

[4] We follow Kim & Roubini (2008) and report only the IRFs that are essential for the analysis. As a result, we do not report the full set of IRFs.

Figure 3: Impulse Response Functions for the Differenced Model



interest rates clearly raising the current account deficit by at most 0.07 percentage points[5]. Theoretically, an increase in the foreign interest rate relative to the domestic interest rate should result in an outflow of capital from South Africa and improve the current account. However in this case, domestic monetary policy is responsive to foreign monetary policy (row 3, column 3), such that when the foreign interest rate increases, the domestic interest rate increases as well by 0.07pp, resulting in capital inflow in South Africa from this feedback effect, which consequently worsens the current account. This suggests that the impact of foreign monetary on the current account is relative to the stance of domestic monetary policy. In response to output shocks, the current account position improves when there is a positive shock to GDP, as per theoretical expectations. The response of the current account to domestic monetary policy, proxied by the domestic interest rate in row 2, column 1 shows that the current account deficit worsens by 0.19pp in response to a contractionary monetary policy shock. In response to the appreciation of the real effective exchange rate (increase in $LREER$), the current account deficit first slightly improves before worsening by 0.12pp, indicating a J-Curve effect. The results in quarter 3 (row 2, column 2) are in line with studies based on the United States that find that a depreciation of the exchange rate improves the current account position (e.g. Kim & Roubini 2008), and in this case , an appreciation worsens the current account by 0.12pp.

The impulse response functions in the preceding discussion provide the total effect of the

[5]Recall, an increase in the impulse response of the current account is a worsening of the deficit since negative values show a current account surplus and positive values show a current account deficit.

shocks on variables, and the variance decompositions showing the contribution of each shock to the current account deficit are shown in table 7, with each column showing the percentage contribution of the relevant shock to variation in the current account.

Table 7: Structural Variance Decomposition of the Differenced Model

Horizon/Shocks	LUSRATE	LGDP	CAD	RIR	LREER
1	0.0082	3.0599	95.2902	1.6484	1.61E-30
4	0.1895	7.3261	90.3782	1.3466	0.7595
8	0.1908	7.3433	90.3378	1.3437	0.7849
12	0.1908	7.3435	90.3370	1.3737	0.7850

The variance decompositions show that the current account is mostly explained by own shocks which account for 90% of the variation, and output shocks which account for about 7% of the variation. Monetary shocks appear to play a small role as indicated by the short life span of the shocks and the low contribution in the variance decompositions. As a result, to fully confirm this relationship, we fully investigate the impact of monetary shocks on the differenced model by using alternative specifications of nominal monetary variables, and find that the response of variables to monetary shocks remains similar to the baseline differenced model, and in some instances, variable response to shocks becomes even smaller. Figure 10 in the appendix shows one of the impulse response functions from these experiments with the differenced model, with little response to some shocks.

To ensure that these small responses are not driven by the loss of information from differencing to attain stationarity, we proceed to analyse the impact of monetary shocks in the same manner as discussed above, but in this case, using the detrended series obtained from the HP filter. Analysing the detrended model helps to ensure that the model is not misspecified by assuming the wrong form of stationarity, since tests in table 4 do reveal the possibility of trend stationarity. Table 8 reports the lag length selection criteria for the detrended model, with an optimal lag length of 2 selected. Using 2 lags, the same restrictions as in the differenced model are placed on the VAR model, with the validity of the overidentifying restrictions reported in table 9. The model restrictions are not rejected, and the structural coefficients are reported in equation 11.

Table 8: Lag Length Selection Detrended Model

Lag	LR	FPE	AIC	SC	HQ
0	-	5.83e-07	-0.17	0.59	0.14
1	519.88	3.93e-09	-5.17	-3.79*	-4.61
2	87.95*	2.39e-09*	-5.67*	-3.66	-4.86*
3	28.97	2.77e-09	-5.54	-2.90	-4.47
4	32.93	3.01e-09	-5.48	-2.22	-4.16

*indicates lag order selected by the criterion

Table 9: Test for Overidentifying Restrictionsn in the Detrended Model

LogLikelihood	Chi-Square	P-Value
333.9307	2.380812	0.1228

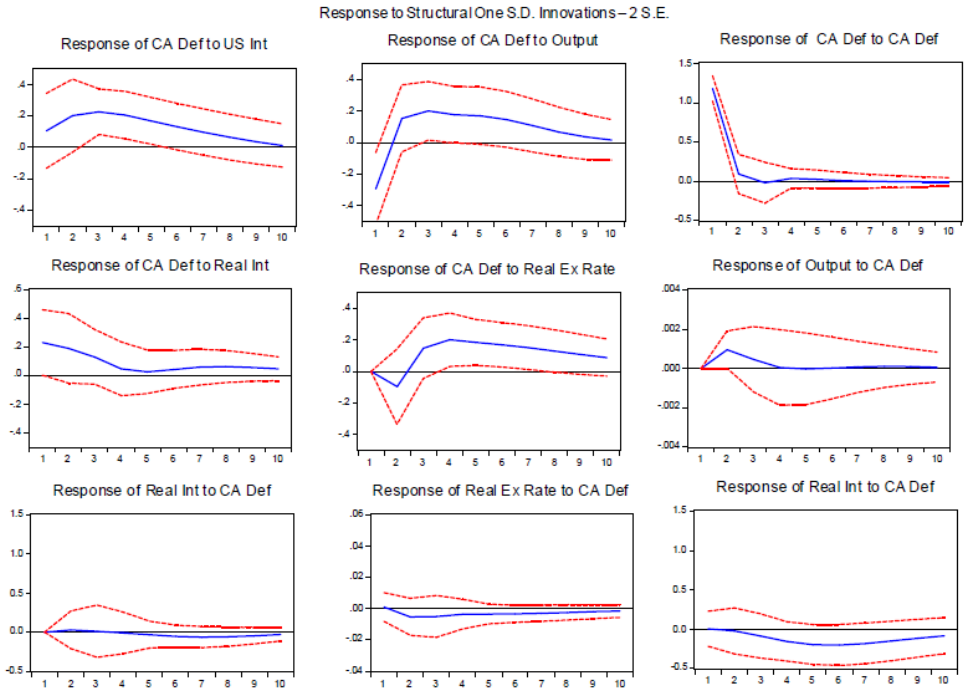
H_0: Overidentifying restrictions are valid

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -0.0067 & 1 & 0 & 0 & 0 \\ -1.2697 & 65.7319 & 1 & -0.1984 & 0 \\ -0.0360 & 0 & 0 & 1 & 0 \\ -0.0644 & 2.0503 & -0.0008 & 0.0039 & 1 \end{bmatrix} \begin{bmatrix} lu\,\mathrm{srate}\_T \\ \lg dp\_T \\ cad\_T \\ rir\_T \\ lreer\_T \end{bmatrix} = G(L) \begin{bmatrix} lu\,\mathrm{srate}\_T \\ \lg dp\_T \\ cad\_T \\ rir\_T \\ lreer\_T \end{bmatrix} + \begin{bmatrix} e_{lu\,\mathrm{srate}\_T} \\ e_{\lg dp\_T} \\ e_{cad\_T} \\ e_{cad\_T} \\ e_{lreer\_T} \end{bmatrix} \tag{11}$$

The impulse response functions from the detrended model (figure 4), show the effect of monetary shocks on the current account, where each variable y_t_DT shows the detrended cyclical series.

From figure 4, a positive shock to the US interest rate (row1, column 1) clearly worsens the current account deficit in South Africa by at most 0.23pp in the third quarter. As with the differenced model, the effect of foreign monetary policy on the current account is relative to the response of domestic monetary policy, implying that the current account deficit worsens when the foreign interest rate increases, because domestic monetary authorities respond by raising interest rates as well. This suggests the need to address external imbalances given the change in global monetary conditions. The results are in line with Kano (2008) who analyses the effect of global shocks on the current account. Kano (2008) finds that global shocks (world interest rate shocks) widen the current account deficit in Canada, but improve the current account in the UK, a result in line with the findings of this paper since Canada is a small open economy like South Africa compared to the UK. In addition, in Kano (2008), whilst global shocks account for about 24% of the variation in the current account in the UK, they only account for at most 10% of the variation in the current account in South Africa, another finding in line with the structure of a small open economy. This suggests

Figure 4: Impulse Response Functions for the Detrended Model

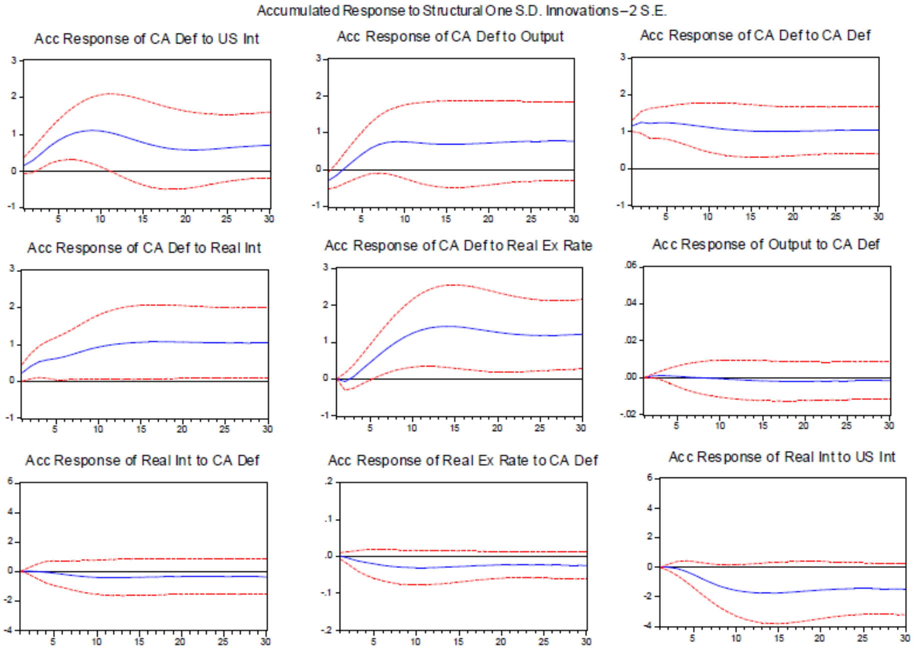


that the effect of global shocks should not be undermined in policy formulation as they have the potential of destabilising both internal and external balance.

The current account position improves when there is a positive shock to GDP, as per theoretical expectations. The improvement is however mostly significant in the first quarter with a 0.29pp response (row 1, column 2), and suggests the importance of economic growth in attaining a sustainable current account balance. The response of the current account to domestic monetary policy, proxied by the domestic real interest rate in row 2, column 1 postulates that the current account deficit worsens in response to a contractionary monetary policy shock by 0.23pp in the first quarter. In response to the appreciation of the real effective exchange rate (increase in $LREER$), the current account deficit slightly improves before it worsens by a maximum of 0.2pp. These results conform to theory, with an appreciation making exports relatively expensive and imports relatively cheaper and as a result, the trade balance worsens and consequently the current account worsens (row 2 column 2). Of interest is that the predictions of the detrended IRFs are similar to the differenced model in terms of the direction of response of variables to shocks, but the IRFs have larger and more significant impacts, and not as short lived when the detrended variables are used.

We use the accumulated impulse responses in figure 5 to demonstrate the significance of these results and show that the predictions from figure 4 still hold over an accumulated period. In figure 5, we still observe that a positive shock to US interest rates worsens the

Figure 5: Accumulated Impulse Response Functions for the Detrended Model



current account deficit with a cumulative response of 1.1pp after 9 quarters. The current account deficit increases in response to output shocks, but this effects not significant. The current account deficit is also worsened by own shocks as expected. In row 2, an increase in domestic interest rates worsens the current account, whilst an appreciation of the exchange rate leads to a slight improvement of the current account, before the deficit deteriorates with an accumulated deterioration of 1.4pp in quarter 12. This confirms the J-Curve effect we find in figure 4, and the significance of this result is evident when we use the accumulated impulse responses. The response of output, domestic nand foreign interest rates, and the exchange rate to current account deficit shocks is however not significant. This reflects that monetary policy affects current account dynamics, but however, the current account does not affect monetary policy decisions, and this result confirms our findings in figure 4. This indicates that the HP filtered series provided better predictions than the differences series, so we proceed to use the detrended series for the remainder of the analysis.

Using the variance decompositions to analyse the contribution of each shock proves useful for isolating the monetary shocks which have the largest impact on the current account. The variance decomposition of the current account in the detrended model is reported in table 10, with each column showing the percentage contribution of the relevant shock to variation in the current account.

The variance decomposition of the current account shows that most of the variation in the current account is due to own shocks, but the contribution of own shocks decreases over time.

Table 10: Structural Variance Decomposition of the Current Account Deficit: Detrended Model

Horizon/Shocks	LUSRATE	LGDP	CAD	RIR	LREER
1	0.7352	5.5869	90.2203	3.4576	11.86E-30
4	7.6492	9.5696	73.3607	5.6583	3.7622
8	9.5520	11.6470	65.2388	5.4795	8.0827
12	9.4765	11.5231	64.1173	5.7203	9.1627
16	9.6494	11.4843	63.9018	5.7444	9.2200

By the 16th quarter, the real effective exchange rate and foreign interest rate each account for a tenth of the variation in the current account, whilst output shocks explain about 11.5% of current account variation, and domestic interest rates explain 5% of variation. This is consistent with the results from the impulse response functions (figure 4) which show that the current account is significantly affected by both foreign and domestic monetary policy. As a result, the detrended model shows that contractionary foreign monetary policy worsens the domestic current account deficit through feedback to the domestic interest rate, as the domestic interest rate increases in response to contractionary monetary policy. At the same time, contractionary domestic monetary policy and exchange rate appreciation worsen the deficit as well, whilst exchange rate and foreign monetary policy shocks have larger impacts on the current account compared to domestic monetary policy. These findings suggest that monetary shocks have a stronger impact on the current account in South Africa than they do in more developed countries like the US. Bergin (2006) finds that the real exchange rate explains 6.8% of variation of the current in the US, compared to 10% in South Africa, whilst domestic interest rates explain 1.6% of current account variation in the US, compared to 5.7% in South Africa. This disparity signifies the susceptibility of small open economies, particularly emerging markets, to exogenous shocks as they are more affected by these shocks than developed countries. The predictions of the differenced model still hold in the detrended model and are more significant, suggesting that the detrended model performs better than the differenced model. This leads us to believe that the monetary variables have a stochastic trend, and motivates us to proceed with the analysis using the detrended model.

A key issue that may affect our results however is that VAR models are highly dependent on the choice of variables used in the model, and choice of restrictions, so it is necessary to vary the variables used to identify monetary shocks, and the restrictions used to identify the model, so as to analyse the robustness of these findings. To examine robustness, we first vary the variable specifications in the model to analyse sensitivity of results to alternate specifications, and then changes the identification restrictions to analyse the model's sensitivity as well. These robustness and sensitivity tests are all conducted using the HP filtered variables in the detrended model. In analysing the sensitivity of the model to alternate specifications of the global/foreign monetary policy shock, we use the real US interest rate ($USRIR$) in place of the short term monetary policy related interest rate. The direction of the IRFs is the same as in the baseline model, but however, the impact of the US real interest rate, and domestic interest rate are less significant, suggesting that the model with the US monetary policy related interest rate performs better that the US real interest rate which is calculated by subtracting CPI from the monetary policy related interest rate.

After analysing the sensitivity of the results to alternative foreign monetary variables, we move to analyse the sensitivity of the results to alternative specifications of the domestic monetary shocks. We do this by using the nominal interest rate ($REPO$) and the nominal effective exchange rate ($NEER$) in place of the real interest rate and the real effective exchange rate. The purpose of this exercise is to analyse whether the current account is better explained by monetary variables in real terms or monetary variables in nominal terms. Using nominal variables implies the model has implications for nominal variables and does not account for inflation dynamics in the economy. We compare the predictions of this model to that which uses real variables, and the results are in figure 6. Using nominal variables gives the same predictions as the real variables, for instance, the current account deficit worsens in response to a foreign interest rate shock with a maximum increase of 0.21pp in the significant range of the impulse response (row 1 column 1), whilst the deficit worsens by a maximum of 0.19pp in response to a contractionary domestic monetary policy shock (row 2 column 1). The current account deficit also worsens in response to an appreciation of the nominal effective exchange rate, with a maximum impact of 0.22pp (ow 2 column 2). The magnitude of the impulse responses when we use nominal variables are similar to the model that uses real variables. However, the main difference is that when nominal variables are used, the response of the current account to a domestic contractionary monetary policy shock becomes less significant (see figure 6), suggesting that real variables have a larger impact on current account variation than nominal variables.

The accumulated impulse responses of the current account to shocks are significant and show that current account responds to US interest rate shocks with a cumulative effect of 1.2pp that increases the deficit after 12 quarters. Output shocks worsen the current account deficit with an cumulative effect of 1.1pp after 9 quarters, whilst an exchange rate appreciation worsens the current account deficits by 1.2pp after 14 quarters. Even when observing the cumulative effect, the response of the current account to nominal Interest rates alone is still not significant.

The variance decompositions (table 11) show that the nominal exchange rate accounts for 6% of the variation in the current account, which is lower that the real effective exchange

Figure 6: Impulse Response Functions for Nominal Domestic Monetary Shocks (Detrended)

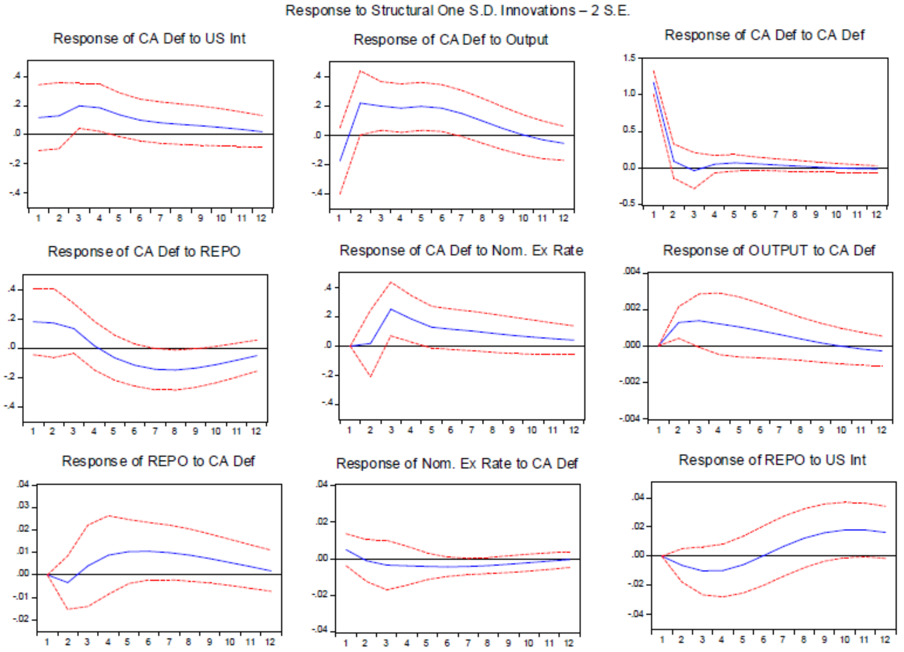


Table 11: Structural Variance Decomposition of the CA Deficit: Nominal Variables

Horizon/Shocks	LUSRATE	LGDP	CAD	REPO	LNEER
1	0.5223	2.1975	95.8812	1.3990	0.0000
4	6.4620	7.9775	77.0831	4.2113	4.2660
8	8.2402	11.9445	68.3257	5.3848	6.1051
12	8.6374	11.9313	66.9094	6.0414	6.4804
16	8.6290	12.1391	66.6606	6.0426	6.5287

rate, i.e. 7.2% in table 10. Foreign monetary policy shocks account for 8.6% of the variation in the current account in this case, compared to 9.6% when we use real variables. When the nominal interest rate is used, domestic monetary policy also accounts for about 6% of the variation in the current account. This is similar to the magnitude of domestic monetary policy in the model with real variables, which is 5.7%, and suggests that domestic monetary policy may have a small role to play towards managing the external balance.

It is also necessary to use the bilateral real exchange rate ($LEXRATE\_US$) between South Africa and the US to examine the effect of exchange rate shocks, in place of the real effective exchange rate ($LREER$), which is a basket of 20 trading partners. The bilateral exchange rate is used because the foreign interest rate in the study is based on US monetary policy. Predictions of the model with the bilateral exchange rate are similar to that with the basket of currencies. The results show that the current account deficit worsens by 0.22pp in the significant range in response to a foreign monetary policy shock, and is not responsive to a domestic interest rate shock. The current account improves when the currency depreciates (an increase in the bilateral exchange rate ($LEXRATE\_US$) is a depreciation) by 0.18pp. Decomposing the contribution of shocks to the current account using these alternative specifications still shows that after 16 quarters, 8.32% of the variation in the current account is still explained by exchange rate shocks, 8.36% of current account variation is explained by foreign monetary policy shocks, almost 15% by output shocks, and about 6.3% by domestic monetary policy. The current account is responsive to domestic monetary policy when the nominal interest rate is considered, suggesting the possibility of a role for monetary policy in current account management. Lastly, a depreciation of the exchange rate improves the current account position as per theoretical expectations with all specifications. This demonstrates the robustness of the findings to different specifications of the monetary variables. An interesting finding that also proves to be robust is that with various specifications of both global and domestic monetary shocks, if the foreign interest rate is relatively higher than the domestic interest rate, the current account balance improves, suggesting the risk of current account reversal in the event that domestic interest rates do not increase by a large enough magnitude to offset the increase in foreign interest rates.

Even though the results are robust to alternative specifications of the monetary variables, it is also important to test the sensitivity of the results to alternative identification restrictions. This is necessary for ensuring that the predictions given by the impulse responses and variance decompositions reflect the true relationships between variables, and are not significantly driven by the choice restrictions. The alternative identification restrictions used are reported in table 12, where superscripts 2 and 3 refer to the alternative identification schemes. In framing these alternative restrictions, we assume in identification scheme 2 that the real interest rate is not contemporaneously affected by foreign monetary policy. This is because the real interest rate includes inflation, but prices do not adjust immediately due to price stickiness. In restriction 3, we assume that changes in domestic interest rates are significant enough to affect the current account in the quarter due to their impact on capital flows, and GDP on the other hand is also affected by domestic interest rates, foreign interest rates and the current account within the quarter. This enables us to analyse how monetary policy affects real variables. Figure 7 shows the impulse responses from alternative identification set 2, and figure 8 shows the impulse responses from alternative identification set 3. Our alternative restrictions show that the model predictions still hold, that is, a shock to US interest rates still worsens the current account deficit, an increase in the domestic interest rate worsens the current account deficit, with an appreciation worsening the deficit as imports become cheaper. These key findings are significant when we report the accumulated impulse responses, indicating that monetary variables affect the current account, even though the current account itself has no effect on monetary variables. These findings demonstrate the robustness of the results are they are in line with baseline model, and are also supported by figure 8.

Figure 7: Impulse Response Functions Using Alternative Identification Scheme 2

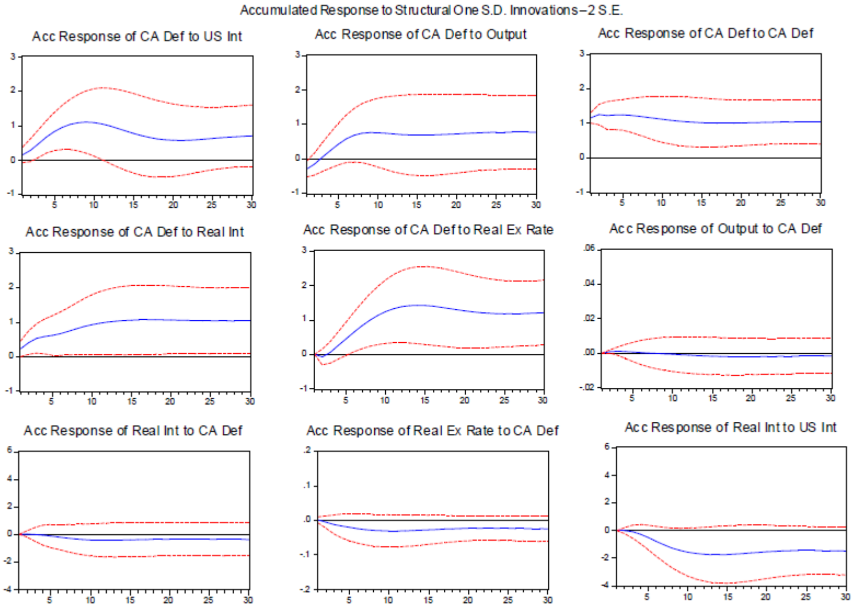


Table 12: Alternative Identification Restrictions

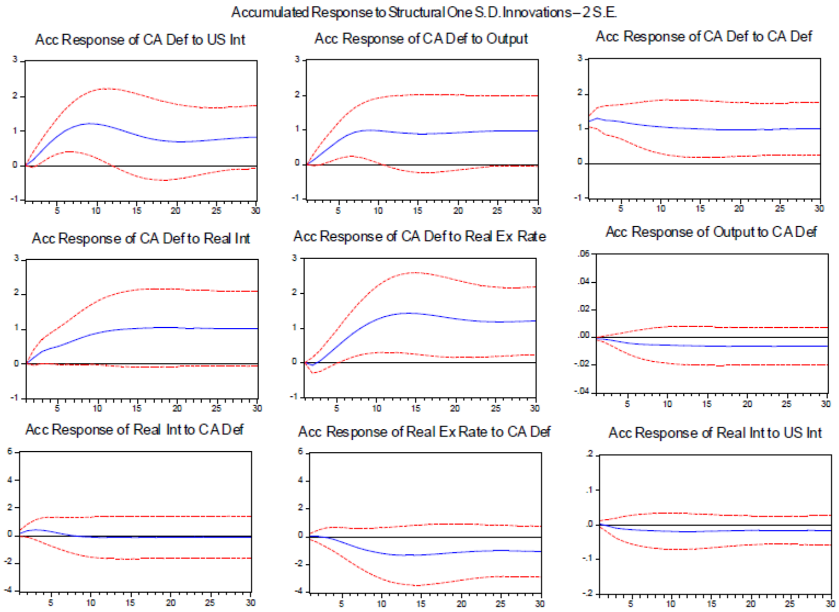
$\left\{\begin{matrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ g_{31} & g_{32} & 1 & g_{33} & 0 \\ 0 & 0 & 0 & 1 & 0 \\ g_{51} & g_{52} & g_{53} & g_{54} & 1 \end{matrix}\right\}^{2}$	$\left\{\begin{matrix} 1 & 0 & 0 & 0 & 0 \\ g_{21} & 1 & g_{22} & g_{23} & 0 \\ 0 & 0 & 1 & 0 & 0 \\ g_{41} & 0 & g_{42} & 1 & 0 \\ g_{51} & g_{52} & g_{53} & g_{54} & 1 \end{matrix}\right\}^{3}$
Note: Overidentifying restrictions are not rejected in each case	

The robustness of the findings to various variable specifications and restrictions suggests that the detrended model given by the data vector $\{LUSRATE\_DT$, $LGDP\_DT$, CAD_DT, RIR_DT, $LREER\_DT\}$ gives accurate results, so we proceed to use this model to understand how monetary shocks are transmitted to the various components of the current account.

7.2 Transmission of Monetary Shocks to the Current Account

Understanding the transmission of monetary shocks to current account components facilitates in narrowing down the components of the current account that are more affected by monetary policy shocks, and helps in narrowing down policy options. Transmission of monetary shocks is analysed by adding the current account component to the basic model detrended model that uses the data vector $\{LUSRATE\_DT$, $LGDP\_DT$, CAD_DT, RIR_DT, $LREER\_DT\}$. The current account components used are household consump-

Figure 8: Impulse Response Functions Using Alternative Identification Scheme 3



tion ($HCONS\_DT$) and household savings ($HSAV$), which are used to infer household behaviour in response to monetary shocks, the trade balance ($TBAL\_DT$), used to infer the effect of monetary policy on exports and imports, government investment ($GINV\_DT$) and government savings ($GSAV\_DT$), which are used to analyse how monetary shocks are transmitted to savings and investment components. All current account components are tested for a stochastic trend and are detrended using the HP filter.

To identify the expanded models, we maintain the same assumptions as in the baseline model. We still consider foreign monetary shocks to be exogenous to South Africa. Output is not contemporaneously affected by other domestic variables, the current account deficit is contemporaneously affected by foreign and domestic monetary policy, but not the exchange rate. The real interest rate is not contemporaneously affected by other domestic variables, whilst all variables besides current account components are assumed to have contemporaneous effects on the exchange rate since it is a forward looking asset price. In addition to this, we assume that current account components are contemporaneously affected by other variables in the system (see Kim & Roubini 2000, Kim & Roubini 2008). An illustration of these identification restrictions for the expanded model is given below where e_{comp} are the structural disturbances from current account components and u_{comp} are the residuals from the reduced form equations.

$$
\begin{bmatrix} e_{lu\,\mathrm{srate}} \\ e_{\lg dp} \\ e_{cad} \\ e_{rir} \\ e_{reer} \\ e_{comp} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ g_{21} & 1 & 0 & 0 & 0 & 0 \\ g_{31} & g_{32} & 1 & g_{33} & 0 & 0 \\ g_{41} & 0 & 0 & 1 & 0 & 0 \\ g_{51} & g_{52} & g_{53} & g_{54} & 1 & 0 \\ g_{61} & g_{62} & g_{63} & g_{64} & g_{65} & 1 \end{bmatrix} \begin{bmatrix} u_{l\,\mathrm{srate}} \\ u_{\lg dp} \\ u_{cad} \\ u_{rir} \\ u_{reer} \\ u_{comp} \end{bmatrix} \tag{12}
$$

Household consumption increases in response to contractionary foreign monetary policy, indicating that relatively lower domestic interest rates encourage borrowing which stimulates an increase in consumption whilst the real effective exchange rate affects household consumption, with an appreciation in the exchange rate causing an increase in consumption. This result is consistent with the response of household consumption to domestic real interest rates but is not significant, which conforms earlier findings that domestic interest rates are less important for the current account compared to foreign interest rate and exchange rate shocks. Even though an increase in the current account deficit reduces household savings, there is no significant impact of monetary shocks on these household savings. This indicates that monetary shocks are not transmitted to the current account through household behaviour, and motivates for an analysis of the transmission of monetary shocks to the current account through the trade balance and the public sector components.

Investigating the impact of monetary shocks on the trade balance gives an indication of how these shocks are transmitted to export and import components. An improvement in the trade balance improves the current account position, and an appreciation of the exchange rate worsens the trade balance by 0.35pp. This shock is significant between quarters 3 and 7, and is consistent with theory as an appreciation makes imports relatively cheaper and exports relatively expensive, suggesting that the consumption of imports increases and the current account deficit worsens. The response of the trade balance to both domestic and foreign interest rates is not significant, suggesting the use of the exchange rate to influence the trade balance as an appropriate tool as compared to interest rates. These findings prove the existence of a J-Curve effect as the trade balance first improves before deteriorating, following an exchange rate appreciation, (see row 2, column 3 of figure 9 in the appendix). Findings on the impact of exchange rate shocks on the trade balance and current account are similar to Lee & Chinn (2006) and Ncube & Ndou (2013), where temporary shocks depreciate the exchange rate and improve the current account. The results are also in line with findings on France, UK and Italy by Kim (2001a) who finds that an expenditure switching effect exists, whereby contractionary monetary policy appreciates the currency and worsens the trade balance. One notable difference however is that whilst Kim (2001a) fails to find evidence of a J-Curve in these countries, the J-Curve does exist in South Africa, which reflects the importance of the exchange rate in explaining South Africa's current account. We also analyse the accumulated response of the trade balance to shocks in the other variables and find that are results are consistent and significant. The trade balance is worsened by at most 1.3pp in response to a current account deficit shock, and this response is significant, whilst a positive shock to the trade balance improves the current account by at most 1pp in the 13 quarter.

Analysing the transmission of monetary policy shocks to public sector components reveals how the government sector responds to monetary shocks. We find that both contractionary foreign monetary policy shocks and exchange rate shocks affect government savings. When foreign interest rates increase, the domestic interest rate increases through the feedback effect as the domestic interest rate increases in response to contractionary foreign monetary policy, and consequently government savings increase. At the same time, an appreciation reduces government savings as they may be used to finance the deteriorating current account position, (see figure **??**). With regards to government investment, an increase in the current account deficit increases government investment by 0.38pp, but however, the response of government investment to monetary shocks is only significant as far as the domestic interest rate is concerned, (figure **??**; row 2, column 1 in the appendix). Contractionary monetary policy increases government investment by 0.046pp in quarter 4, which is a result of higher returns on investment since the real interest rate is used. However, the magnitude of this response is very small and is outweighed by the impact of monetary shocks on the trade balance and government savings, suggesting that monetary policy is more suited to influence current account dynamics through exports, imports, and public sector savings. The results for these transmission mechanisms are summarised and compared in table 13 and show that foreign monetary shocks are mostly transmitted to the current account through the public sector, whilst the trade balance is significantly affected by the exchange rate. This suggests the need for consideration of foreign monetary policy on the current account, and particularly, on the savings-investment gap through the behaviour of the public sector.

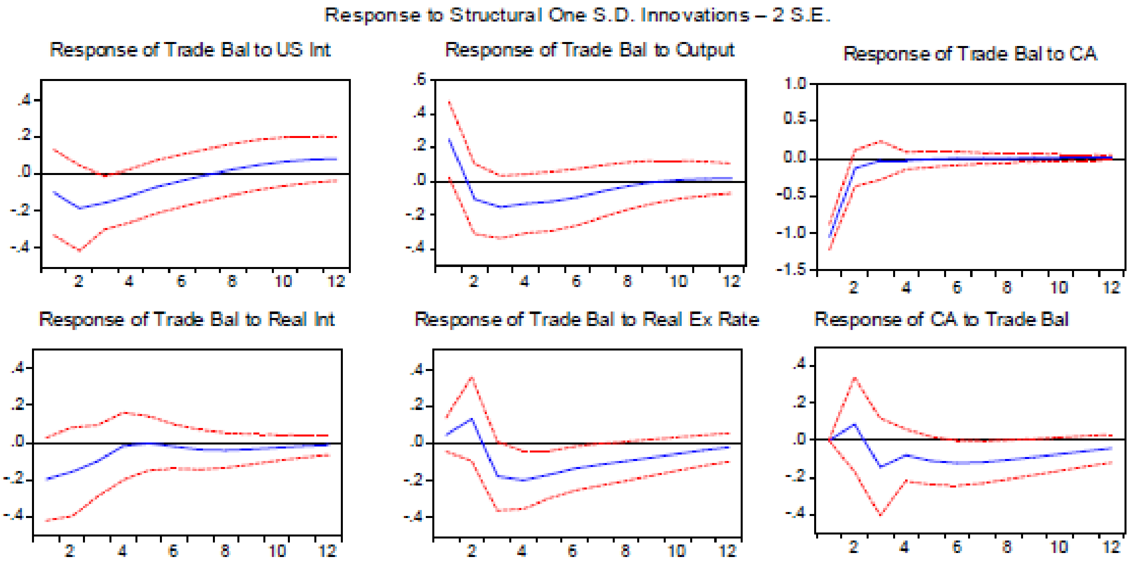
Table 13: Summary of Transmission of Monetary Shocks

CA Component	LUSRATE	RIR	LEXRATE_US
TBAL	not significant	not significant	-0.12pp
GSAV	+0.53pp	not significant	-0.36pp
GVTINV	-0.25pp	+0.023	not significant

+ increase in response to shock
- decrease in response to shock

Decomposition of these effects in table 14 shows the proportion of variation in current account components that is explained by monetary shocks. This is essential in clarifying how

Figure 9: Transmission of Monetary Shocks to Trade Balance (Detrended)



monetary policy actually influences the savings-investment gap and the trade balance. Table 14 confirms the findings of the IRFs and shows that the larger proportion of variation in the trade balance is explained by exchange rate shocks (about 9%), whilst 17.4% of the variation in government savings is explained by foreign monetary policy, and 10% by exchange rate shocks. This highlights the importance of foreign monetary shocks on the current account as they explain almost 30% of the variation in government savings alone. These findings imply that monetary policy targeted at current account management should consider the impact on exports and imports. Government savings play a large role in improving the savings-investment gap, but more effort is needed to stimulate household savings which may compliment efforts by the public sector to improve the current account balance.

Issues about the reliability of inferences from the results arise in VAR models, and to deal with this, it is necessary to test for stability, serial correlation, and any evidence of heteroscedasticity. The requirement for stability is that the roots should lie inside the unit circle, which is verified in figure 11 in the appendix. Table 15 reports results for heteroscedasticity and serial correlation tests for the two basic models used, and the results show that there is no evidence of serial correlation, and variances are homoscedastic in these and subsequent models, suggesting that the results can be relied on for policy inference.

Table 14: Structural Variance Decomposition of the Transmission of Monetary Shocks to Current Account Components

CA Component		LUSRATE_DT	RIR_DT	LREER_DT
TBAL_DT	4 quarters	4.6752	4.2929	5.1777
	8 quarters	4.6585	4.1425	8.4141
	12 quarters	5.5709	4.1897	8.7894
	16 quarters	6.5113	4.1524	8.7338
GSAV_DT	4 quarters	14.9278	1.0771	7.7505
	8 quarters	17.2869	1.3095	9.2284
	12 quarters	17.2675	1.3766	10.140
	16 quarters	17.4203	1.3921	10.244
GVTINV_DT	4 quarters	0.5478	3.4141	0.9686
	8 quarters	1.0942	5.7445	1.5799
	12 quarters	1.5631	5.7640	2.5916
	16 quarters	1.5805	5.7582	2.9480

8 Conclusion

The changes in global monetary conditions as countries adjust from the effects of the 2008 financial crisis have had unforeseen consequences in many economies. In particular, expectations about the normalisation of US monetary policy have raised concern about the stability of the current account balances and macroeconomic fundamentals in emerging market economies. This is more so in countries that have run large current account deficits financed by an influx of foreign capital. Emerging markets fall into this group as they have been characterised by relatively higher interest rates than the rest of the world. The risk of a sudden stop of capital flows to emerging markets has raised concerns about how current account deficits in these countries are affected by global monetary conditions, and the extent to which domestic monetary policy can be used to insulate the effects of exogenous shocks, and achieve stable adjustment of the current account. This, coupled with the need for case studies that analyse the link between the current account and monetary policy in countries of different income levels motivate this study to investigate the role of monetary policy in the stabilisation of the external balance.

To carry out the objectives, we utilise SVAR models to determine the effects of global/foreign and domestic monetary shocks on current account movements, and to analyse the channels through which monetary shocks are transmitted to the current account. We contribute to the literature on the effects of monetary policy on the current account and provide a case study of South Africa, an emerging economy, that has developing country characteristics, a highly depreciated currency, and widening current account deficit which has been affected by global monetary conditions in comparison to similar emerging markets. South Africa also has impressive availability of time series data that has not been used extensively to analyse the dynamics of the current account, and we exploit this dataset to understand the relationship between the current account and monetary policy.

The findings show that should domestic interest rates fail to rise by a large enough magnitude to offset the increase in foreign interest rates, there is a possibility of a current account reversal as the deficit narrows. In addition, the monetary shocks that are most important for the determination of the current account are the foreign interest rate and exchange rate, with the exchange rate depreciation improving the trade balance, and a contractionary foreign monetary policy shock stimulating an increase in the domestic interest rate, which increases government savings. These findings are similar to other studies on developed countries such as Lee & Chinn (2006) and Kim (2001a), although South Africa, being an emerging market, is more susceptible to these shocks. The novelty of our findings is in the effect of foreign monetary policy, which poses a risk of current account reversal. Combating these risks requires appropriate policy measures to ensure a smooth adjustment of the current account, with minimal effects on the economy. As a result, further research should investigate the optimal monetary policy that would ensure smooth adjustment of the current account.

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9 Appendix

Figure 10: Impulse Response Functions - Differenced model with Nominal Interest rate and Exchange Rate

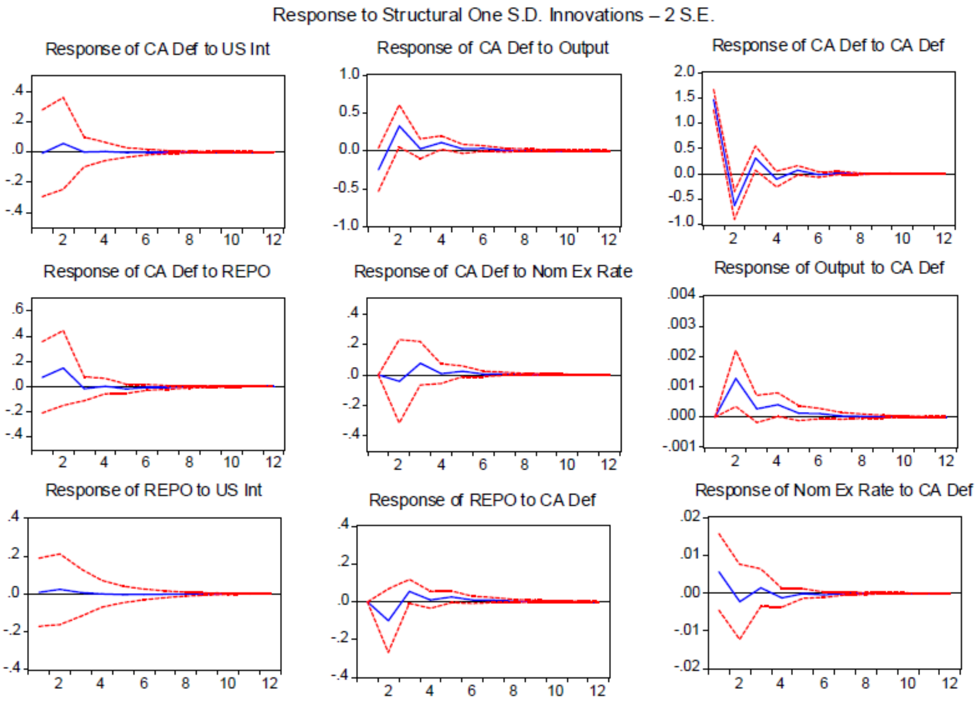

Figure 11: Stability of the Detrended VAR

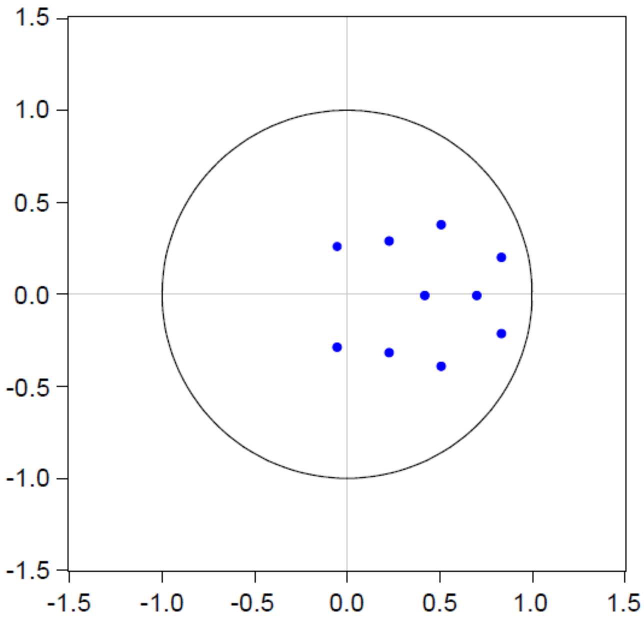

Table 15: Diagnostic Tests

Variables	LAGS	LM test	WHITE test
Differenced Model	2	0.3517	0.0016
Detrended Model	2	0.3748	0.0014

Notes: P-Values recorded
LM Test H_0 : no serial correlation
White Test H_0 : heteroscedasticity