

Sustainable macroeconomic balance and the implications for monetary policy in South Africa

I Abedian, W de Wet and L Pitso¹

Introduction

In recent years the debate surrounding the current account and its associated deficit or surplus has been much publicised. This is largely due to the current-account deficit that the United States (US) has amassed over the past decade. Most of the research therefore also focuses on the US (Stucka, 2003). Recently South Africa has moved into the same waters as the US with a fairly large deficit on the current account. Although in absolute terms the deficits cannot be compared, there are similarities in their respective macroeconomic impacts. For both the US and South Africa the deficit did not pose a problem as it was financed through capital inflows via the financial account. If one of the largest economies in the world can run a deficit, is it really such a concern for South Africa?

Up until the 1970s current-account deficits such as the ones carried by the US and South Africa would not have been possible for an extended period of time. In those days it often happened that goods and services moved quicker between countries than capital. Due to financing issues and restrictions on capital flows it would have been impossible to sustain exports at levels exceeding imports. If this continued for some time, an exchange rate revaluation or depreciation would have been necessary. Over time, less would have been imported and more exported. This would turn the current-account deficit into a surplus. However, since rapid development in financial markets and the technology that made it possible to transfer money quicker than goods and services between countries, it became possible to support a current-account deficit for much longer periods than before without an exchange rate adjustment taking place.

Many people question whether running a deficit is good or bad for the economy. In this research we consider this question. We furthermore analyse the relationship between the current account, the exchange rate and economic growth from a macroeconomic balance perspective. The position of selected countries is compared with that of South Africa. We analyse the factors that drive the internal and external balance of an economy in order to determine where South Africa is. Lastly we determine which level of the real effective exchange rate is likely to provide the maximum benefit to the South African economy in terms of a balanced economy.

The balance of payments: A balancing act?

The balance of payments tracks all financial flows between a country and the rest of the world for a given period. The international transactions captured in the balance of payments are grouped into two major categories, namely the current account and the financial account².

The current account covers all transactions that take place in the normal day-to-day business of residents. Although the current account is dominated by the trade balance, i.e. the balance of all imports and exports of goods, it also includes various other transfers. More specifically the current account is made up of the following:

- Exports and imports
- Services
- Income (dividends, interest etc.)
- Current transfers (these are gifts and other flows without *quid pro quo* compensation)

¹ The authors would like to thank participants at the Conference on Macroeconomic Challenges for South Africa hosted by the South African Reserve Bank, 22-24 October 2006 for the valuable comments and suggestions.

² The definition of the balance of payments according to the 1993 International Monetary Fund terminology is used.

The balance of these four items provides us with the current-account balance.

As far as the financial account is concerned it covers investments by residents abroad and investment by non-residents at home. It is made up of the following:

- Direct investments
- Portfolio investments
- Other investments and liabilities

The financial account balance represents the net value of these three items.

By accounting definition the sum of these two accounts should be zero. If you are spending more on imports than you earn on exports you will need to finance the excess consumption. This excess consumption can be financed through borrowing or accumulated official reserves. The official reserves are also called the overall balance on the balance of payments³. If the sum of the current and financial accounts is not zero, the monetary authorities can use its reserves to restore balance.

Of the different components in the balance of payments, the major component in the current account, i.e. the trade balance, receives a lot of attention by practitioners, academics and the media alike. Although very volatile, the trade balance statistics are released each month and discussed in detail. The general feeling is that a negative balance, or a deficit, on the trade balance is not good for the economy. By extension it is believed that a current-account deficit is also “bad” or at least not as good as a current-account surplus.

In order to finance a current-account deficit it has to be offset by a financial-account surplus. If this is not the case, monetary authorities have to use official reserves to cover the deficit. This, however, is only a temporary solution as reserves are not infinite (especially in the case of South Africa). Therefore, to be sustainable a current-account deficit must be at least matched by a financial-account surplus. If the surplus on the financial account is greater than a deficit on the current-account official reserves will increase.

The question that begs is whether a current-account deficit is a negative economic signal? When a country runs a deficit on the trade balance it means more is imported than exported. As long as foreigners are willing to finance the difference this deficit poses no problem. This is exactly the case in the US where residents consume more than they produce and this is financed by international investors. Of course in terms of the exchange rate the current-account deficit depreciates the currency. An inflow or surplus on the financial account appreciates the currency. As long as the financial account surplus is larger than the current-account deficit, the currency will face overall appreciation pressures. If the overall balance is close to zero, the net effect on the currency is zero.

However, a deficit on the current account does not always imply that a country is consuming in excess of what it can afford. A deficit can also be caused by economic growth. When a country grows faster than its major trading partners, it tends to import more to sustain the economic growth. Since the trading partners are growing at a slower rate, they also demand fewer exports because of slow income growth. This results in a deficit on the trade balance. Higher economic growth also provides more attractive returns on invested capital and therefore attracts more foreign investment. This inflow provides a natural financing means to finance the higher economic growth. Economic growth differentials can explain part of the US trade deficit in the nineties. Growth differentials between South Africa and its major trading partners (US, United Kingdom, and Japan) can also explain part of the current-account deficit in 2003 and 2004.

³ Two other small accounts exist. They are the balance on the capital account (which tracks capital transfers, i.e. gifts etc.) and the net errors and omissions. These accounts are very small in magnitude and are usually added to the financial account.

However, a large current-account imbalance can have social implications (Frankel, 2005). If a country imports more, it might imply that less domestic products are consumed and exported. Domestic jobs are lost to foreign countries. Therefore, a current-account deficit is not a bad economic signal as long as foreigners finance this by investment inflows. This is similar to corporate finance where the need for outside financing may be satisfied via debt and equity. As long as investors believe the company is managed well and will provide attractive yields they will hold the equity and debt of the company. But a large deficit or surplus might be bad from a political perspective.

Since a current-account deficit is not necessarily bad in an economic sense, the question of sustainability of the current-account deficit is probably a more relevant question. This sustainability will depend on the investment climate of a country. Financial flows are attracted by high expected returns and little uncertainty. This includes a political climate, a rigorous but fair legal system, free movement of capital and a well-managed macroeconomic environment, i.e. monetary and fiscal policy. Since emerging markets tend to be perceived as more risky they often see dramatic turnarounds in investor sentiment. During the Asian crisis of 1997 and 1998 many Asian countries had large current-account deficits due to their superior economic growth. This was financed by international capital (Liew, Lim and Hussain, 2004). As soon as sentiment changed towards these countries they experienced an outflow on the financial account, and a resulting depreciation in the currencies (Frankel, 1999 b). This currency depreciation eventually turned the current-account deficit into a surplus as less goods were imported and more exported. Since this turnaround in the current account happens much slower than the turnaround in the financial account, it is possible that a deficit might exist for a period of time on both accounts (Onafowora, 2003). This must then be financed by official reserves from the central bank.

To summarise, a current-account deficit is not a bad thing as long as it is sustainable through a surplus on the financial account. The greater the deficits on the current account, the greater the probability of a severe correction when investor sentiment turns around (especially for emerging markets). With a free-flow floating currency this will automatically lead to depreciation of the currency. Because there are often “pipeline-effects” on the trade balance there might be a period when both accounts are in a deficit and foreign reserves will be necessary to fund this shortage. If there are no sufficient reserves it effectively means that the country is consuming goods and services that are not being financed through the financial account. To avoid the country from defaulting on international payments, the central bank must utilise foreign reserves. However, the use of foreign reserves also comes at a cost. To avoid being subjected to such a dramatic correction (as experienced by Asian countries in the late nineties) many emerging markets have built up large amounts of foreign reserves to finance any deficits as well as manipulate currency movements.

Internal and external balance

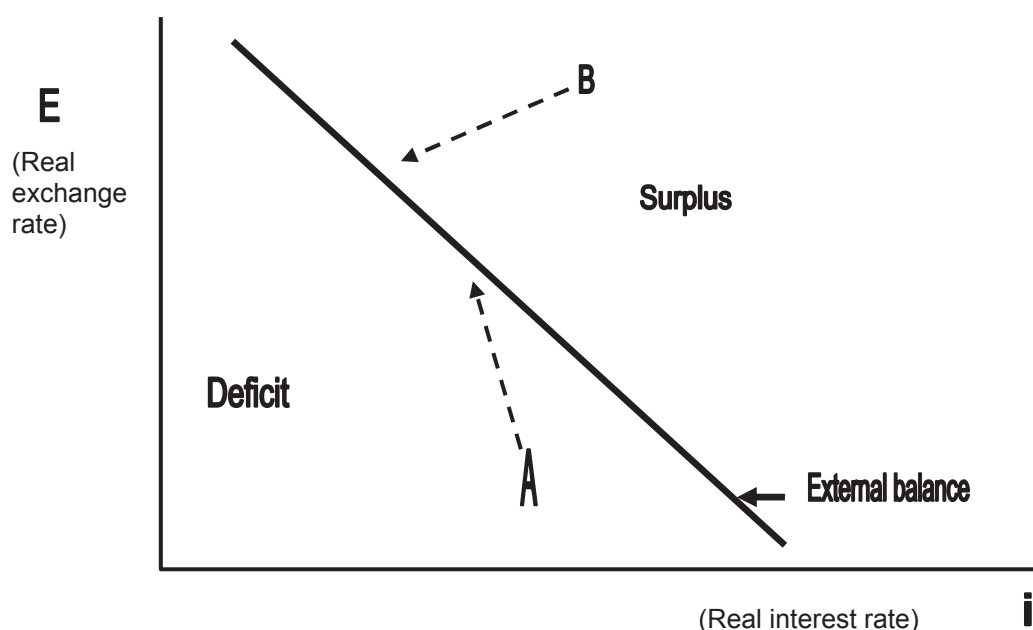
Internal and external balance need not co-exist, but they are linked. Internal balance is fulfilled when an economy is operating at full employment or, equivalently, producing at capacity. External balance is achieved when the current account is equal to a target goal. While the tendency is to aim for a current-account balance of zero, developing countries that are borrowing through their financial account are likely to target a modest current-account deficit. Changes in the interest rate influence aggregate demand and therefore where an economy is operating relative to its capacity. A depreciation of the real exchange rate can correct a trade deficit while an appreciation can eliminate a surplus. When we talk about internal and external balance we are asking how to make the best use of two independent policy instruments, namely the interest rate and the real exchange rate (Frankel, 2005).

The real exchange rate is defined as the nominal exchange rate adjusted for inflation, which is a measure of the purchasing power of a unit of currency. There are theories which claim that the exchange rate has no effect on the trade balance. The first of these theories claims that the elasticities of imports and exports to changes in the real exchange rate are so low, that changes

do not elicit any significant effect. The second of these arguments maintains the polar opposite position. It claims that elasticities are so high that any change in the real exchange rate forces firms to change their prices instantly to avoid losing customers. Of course, the average elasticity for goods will depend upon the closeness of substitutes in international markets for locally traded goods as well as the proportion of traded to non-traded goods. It should be noted, however, that changes in the interest rate can, through their effects on the financial account, influence the nominal exchange rate and therefore influence the current-account balance. As mentioned above, the implications of the relationship between the current and financial-account balance in the case of a developing country lead us to believe that a target of a modest current-account deficit financed by capital inflows is appropriate for a developing economy.

External balance

Figure 1: Macroeconomic balance: External balance

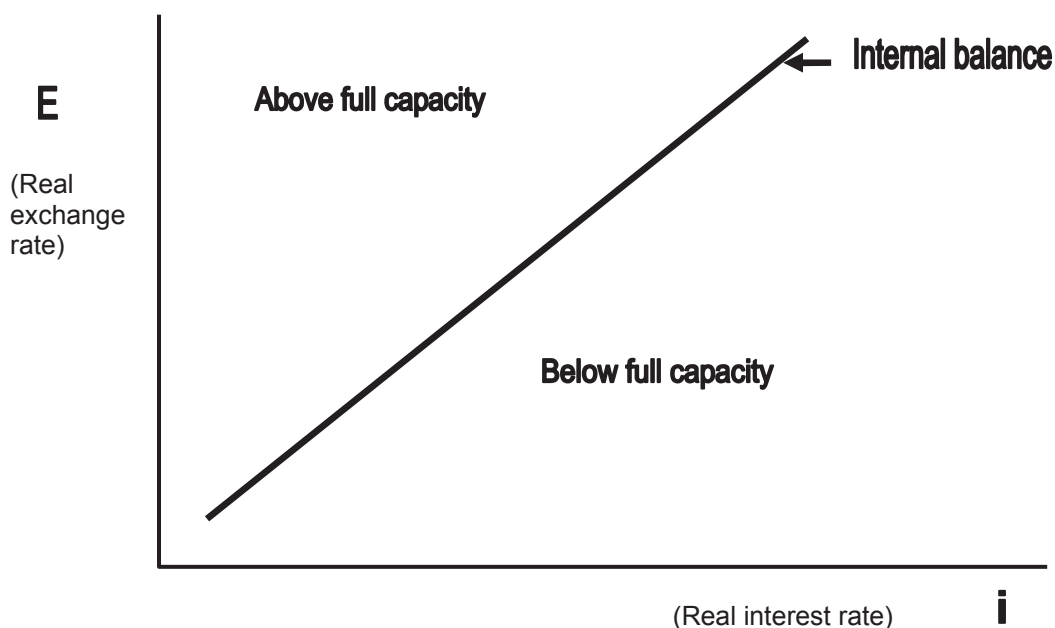


External balance is represented by the negatively sloped line in Figure 1. The line represents the different combinations of the real exchange rate consistent with a zero trade balance (Frankel, 1999a). The exchange rate is measured in the amount of foreign-currency units it takes to buy a unit of domestic currency (higher values of E are associated with local currency depreciation while lower values of E are associated with currency appreciation).

The combinations of exchange and interest rates consistent with external balance form a negative sloping graph because greater exports associated with weaker values of the currency require greater imports associated with the stimulation in aggregate demand that is consistent with lower interest rates. A country in A's situation would therefore have a strong exchange rate which would encourage imports and put the country into a current-account deficit. To achieve external balance, country A must lower interest rates and depreciate its currency. Country B has a weak exchange rate and its cheap exports and expensive imports have rendered a current-account surplus. In order to achieve external balance, Country B can raise interest rates and appreciate its currency.

Internal balance

To achieve internal balance, a country must achieve output equal to potential output (equivalently, employment equal to its natural rate). Output beyond potential output results in inflationary pressure as prices rise in response to excess demand for goods. Figure 2 illustrates this definition of internal balance.

Figure 2: Macroeconomic balance: Internal balance

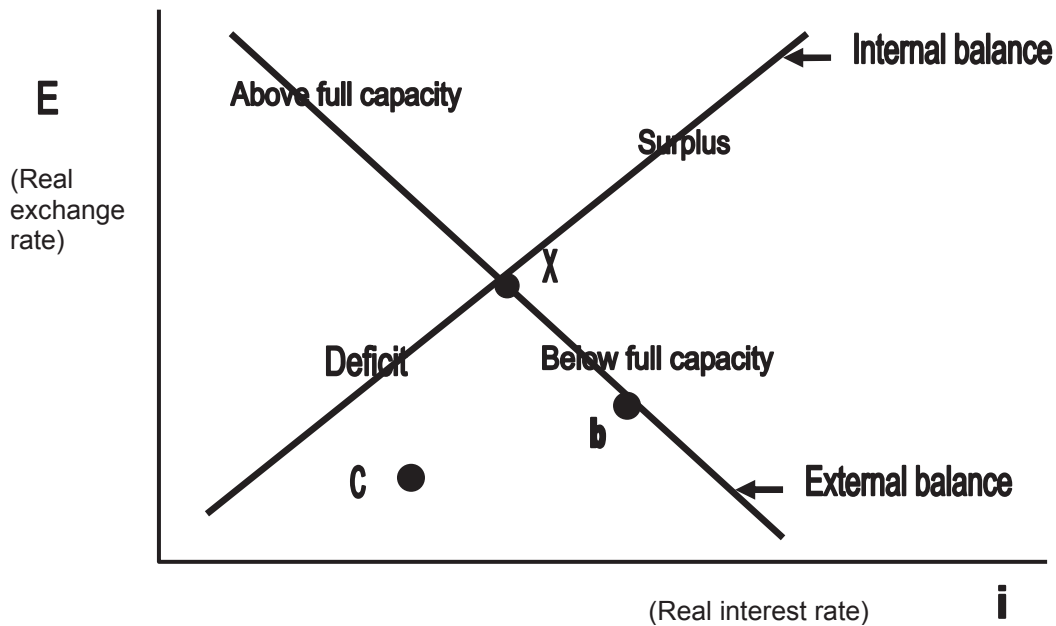
The positively sloping line represents the combinations of the interest rate and exchange rate that correspond to internal balance (Frankel, 1999a). The combinations of interest and exchange rates consistent with internal balance generate a positive sloping curve because weaker values of the currency stimulate exports and therefore need to be offset by higher values of the interest rate to ensure that the economy is not operating beyond capacity.

The matter of macroeconomic balance is complicated by the dual balancing act a country has to accomplish. That is, a country may strive to achieve simultaneous internal and external balance. The concepts of internal and external balance are intimately related and feed back from one another. Figure 3 superimposes Figures 1 and 2 on one another.

Consider a country that is to the right of the internal balance line and to the left of the external balance line such as point c. The exchange and interest rates of Country A therefore place it firmly in the deficit/below full capacity quadrants. If the interest rate was to rise faster than the exchange rate was to depreciate, the country would move closer to point b, and it would be in external balance but not in internal balance. It would still be below the internal balance line, meaning that its interest rates need to be lower to bring the economy to full employment.

The movement from one point on this graph to another is not a simple matter of flipping interest rate and exchange rate switches. By way of the influence of interest rates on capital flows, we observe that lowering the interest rate weakens the exchange rate and vice versa.

South Africa is experiencing moderate, although rising inflation. The economy also seems to be operating above full capacity. The current-account deficit is above 5% of gross domestic product (GDP). South Africa therefore falls short of both the internal and external balance. Real interest rates in South Africa therefore need to rise and the exchange rate has to weaken in order to steer the economy to internal and external balance.

Figure 3: Macroeconomic balance: Internal and external balance

The internal-external balance model relies on two tenuous assumptions. The first is that currency depreciation will improve the current-account balance. The second key assumption is that aggregate demand is restored to full employment by effecting the appropriate changes in the interest rates. Structural complications often make restoration to full employment a matter more complex than tweaking the interest rate.

What level of currency is consistent with macroeconomic balance?

Given that a current-account deficit is not necessarily a bad thing but that it might hold potential dangers, where should the currency be to provide the South African economy with a sustainable balanced growth path?

Currently South Africa has a current-account deficit/GDP ratio of over 6%. For three years the currency has shown resilient performance while nominal interest rates were at 20-year lows. Given the performance of the South African rand in the face of other macroeconomic variables, the question: What level of the currency is best for South Africa has been raised many times. The answer to the question will definitely depend on the hat that you wear. Central bankers and importers will tell you that a strong currency is preferred because it maintains inflation, creates jobs and increases revenue. Labour and exporters will tell you that a weak currency is better because it creates jobs and increases export earnings. Politicians will tell you whatever you want to hear. The point is that the answer to the preferred level of currency is not straightforward and will ultimately depend on how it affects the individual.

Therefore, before making any assessment regarding the appropriate level of the currency, a definition of what the preferred outcome of movements in the level of the currency is should be made. We define the “optimal” level of the currency as the level that establishes internal and external balance in the economy.

Economic theory suggests a number of theories to determine the equilibrium exchange rate. This is partly due to the mixed success in forecasting the behaviour of exchange rates over a relative short time-horizon (i.e. less than a year). Over longer periods of time, theories such as the purchasing power parity have been more successful in explaining the exchange rate. However, very few theories look at what level of exchange rate should give a country both internal and external balance. One theory that partly ignores the dynamics of exchange rate

changes and rather focuses on what level of exchange rate determination will achieve a “balanced” economy is the macroeconomic balance approach.

The macroeconomic balance approach derives estimates of the exchange rate that will be consistent with internal and external balance in the economy. The exchange rate that is produced by this approach is also referred to as the “fundamental equilibrium exchange rate” or the FEER. The roots of this theory are based on the financial-account identity of the balance of payments (Dvornak, Kohler and Menzies, 2003):

$$\text{Financial account} = \text{current account} = CA(E, P^*, P, Y, Y^*, Z) \quad (1)$$

According to this identity, current account (CA) is a function of the real effective exchange rate (EP/P^*). The current account also depends on the levels of domestic (Y) and foreign (Y^*) incomes as well as other factors (Z) that may shift the current-account balance over time. Of course the current-account balance is equal to the financial-account balance by definition.

The question that arises is whether the economy is in internal balance, external balance, or both? As discussed above, an economy is said to be in internal balance when it is operating at full potential production capacity and the current exchange rate effects have worked through the system. This is a medium-term concept. With this level of output, there will be a certain balance on the current account. This “underlying current account” will change over time.

External balance is achieved when the “underlying current account” is equal to a certain target for the financial account. This target should be a sustainable desired balance of net flows of resources between countries when they are in internal balance.

Therefore, the macroeconomic balance approach models exchange rate equilibrium as the level that generates an underlying current account equal to the target financial account should the domestic and foreign economies be in internal equilibrium. It is important to note that this approach is based on a medium-term equilibrium which is likely to change over time. The target financial account is influenced by factors that change over time such as demographics, fiscal policy or monetary policy. All these may change the underlying exchange rate.

Similar to Dvornak, Kohler and Menzies (2003) we implement the macroeconomic balance approach in three steps.

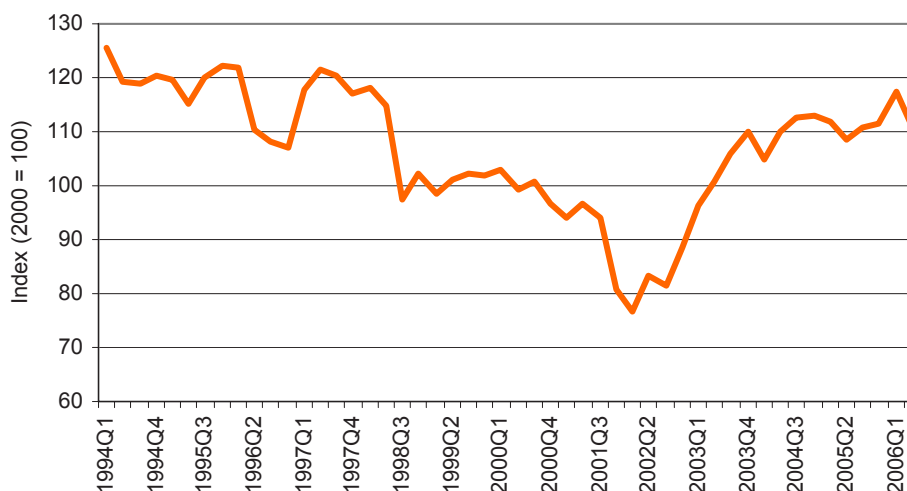
1. Firstly, we choose a sustainable level, or target financial account. This is contentious in itself. For this reason we choose different target levels of the financial account (or current account) and model accordingly. More specifically, we choose a current-account deficit of 6% and 3% of GDP, a current-account balance of 0% of GDP and a surplus of 3% of GDP.
2. Secondly, we model the underlying exchange rate (specified as Equation 1 but normalised on the real effective exchange rate, REER). In order to determine the underlying exchange rate we use a Hodrick-Prescott filter to derive potential output and apply this in the model. This potential output represents internal economic balance.
3. Thirdly, given the level of the current account and the model for the underlying exchange rate we solve for the FEER. The exchange rate that we use is the real trade-weighted exchange rate or the real effective exchange rate (Figure 5).

It is important to note that the FEER we calculate produces the trade-weighted exchange rate that will prevail if the economy is producing at full capacity given a certain target for the current account.

Since the macroeconomic balance approach focuses on medium-term relationships we are also more concerned about picking up a robust trend in the variables rather than short run dynamics.

Although it is possible to obtain a more precise fit, this would be at the cost of stability in the simulations.

Figure 4: Real effective exchange rate (Index: 2000 = 100)



Source: SARB (*Quarterly Bulletin*)

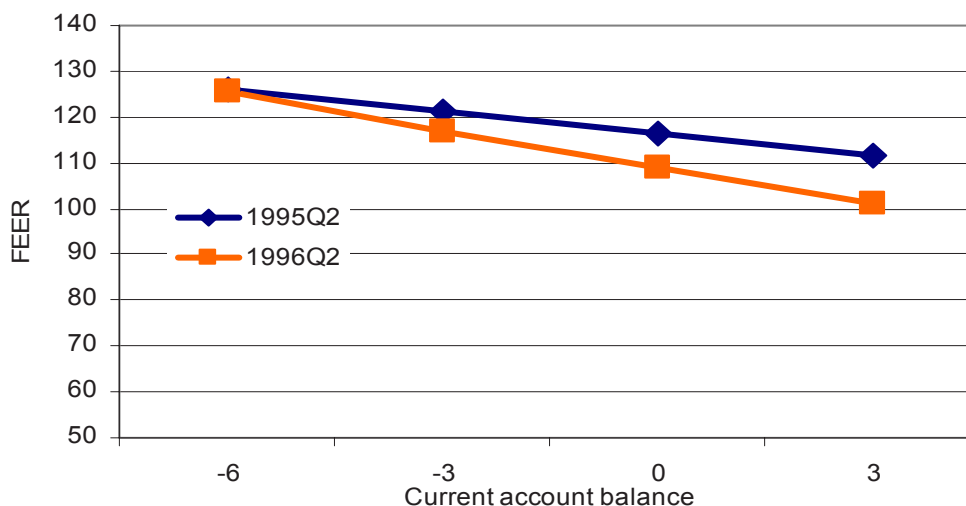
Analysis of results

The FEER will differ over time as various factors change. This may be due to external shocks or domestic policy changes. It is therefore impossible to take one level of the exchange rate and ascribe it to the optimal level for a balanced macroeconomy. For this reason, we provide the FEER for different quarters. The choice of these quarters has been in the main arbitrary. However, periods of financial crisis and major monetary policy changes in South Africa have been included to capture the currency reaction.

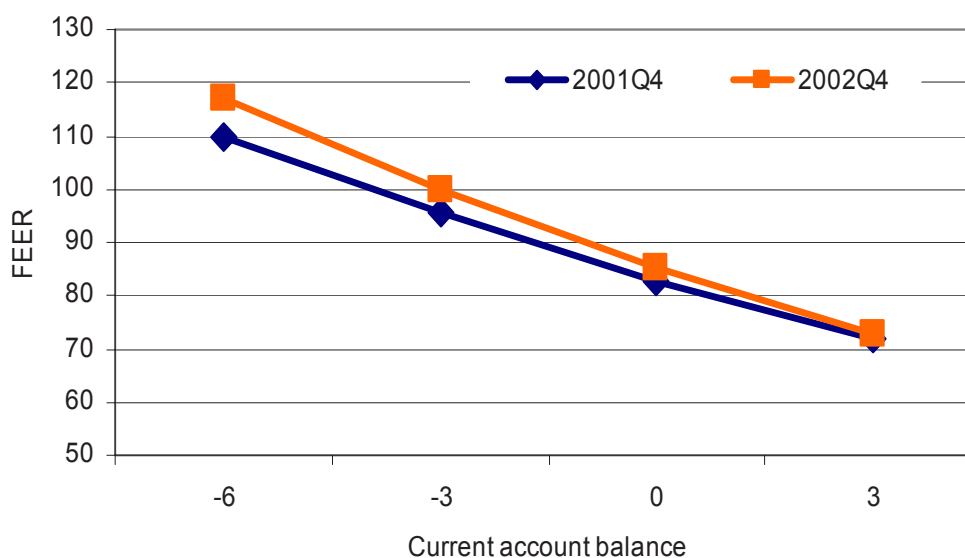
From these quarters it is clear that FEER differs greatly from REER and this largely depends on the prevailing economic conditions. In some cases the prevailing REER is not close to the FEER. However, in other periods the REER is very close to FEER, indicating that at times a macroeconomic balance is attained.

In each figure below we provide a FEER for different target levels of the current account. The horizontal axes show the current-account balance. The figures also provide the prevailing REER in the specific quarter.

IN 1995Q2 South Africa had a current-account deficit of 3.4% of GDP. In the year that followed the REER depreciated from an index value of 115 to 110 in 1996Q2. The current account improved to a deficit of only 2% of GDP in that quarter. The levels of the FEER for this period indicate that during this time the value of the currency that would have prevailed in a balanced economy did not differ greatly across different quarters, especially for a deficit on the current account. However, the value of the currency that should have prevailed in 1996q2 for a 3% surplus on the current account is 100. The value for the currency during the same quarter that should have prevailed under a 6% deficit is 125. This represents an appreciated currency of 25%.

Figure 5: The fundamental effective exchange rate for 1995Q1 and 1996Q2

Source: Own calculations

Figure 6: The fundamental effective exchange rate for 2001Q1 and 2002Q2

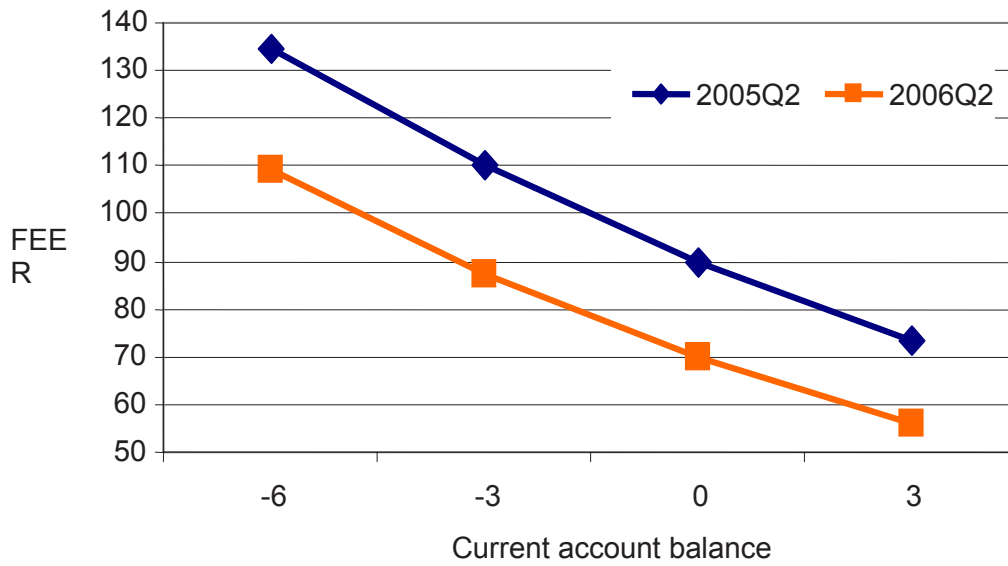
Source: Own calculations

During the period 2001Q1 and 2002Q1 the results indicate that the FEER that should have prevailed varies much more than for the period 1995Q2 to 1996Q2 across different targets for the current account. The FEER ranges from 72 for a current-account surplus of 3% to a value of 110 and 117 for a deficit of 6% in 2001Q1 and 2002Q1, respectively. This represents a currency depreciation of 63% for 2002 when moving from one end of the target range to the other end. It is also worth mentioning that the FEER does not differ greatly across the two quarters.

Lastly we present the values for the FEER for 2005Q2 and 2006Q2. Similar to the previous graph the values for the FEER across time for target values for the current account differ greatly. For example, the FEER that should prevail under a current-account deficit of 6% is at an appreciation of 83% relative to the FEER that should prevail under a current-account surplus of 3% to GDP. During 2005Q1 the actual current-account deficit was 3.72% of GDP and for the REER 111. For 2006Q2 the values for the same variables were -6.11% and 110, respectively. This indicates that, in 2006Q1, if the current-account target was a deficit of 6% of GDP the

REER was at levels that indicated a macroeconomic balance. However, it is unlikely that a 6% deficit is sustainable over the long run.

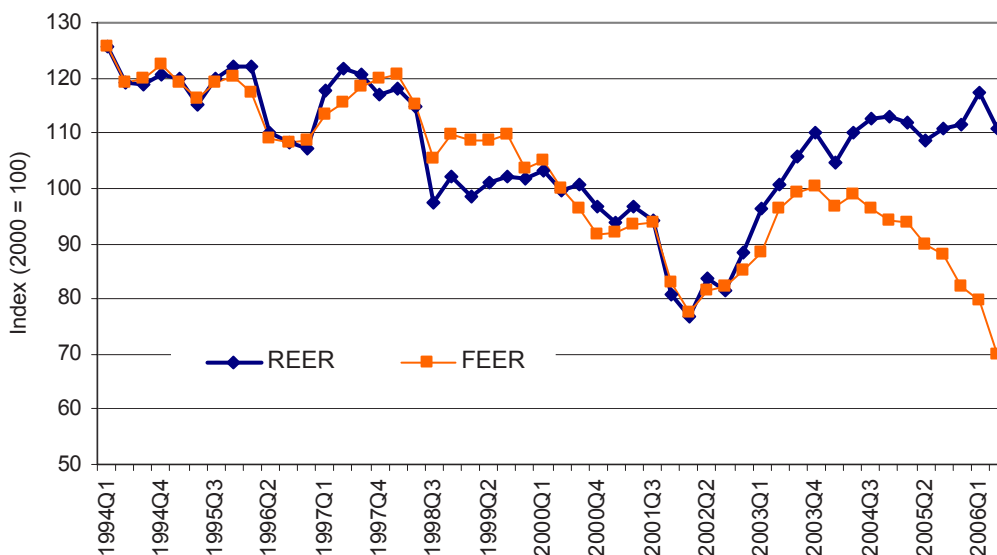
Figure 7: The fundamental effective exchange rate for 2005Q1 and 2006Q2



Source: Own calculations

How do you make sense of all the graphs together? First of all, one has to decide on a certain level of potential output for the economy. This in itself changes over time as the economy undergoes structural changes. Given this level of potential GDP, you have to decide what the external balance for the economy is. If we believe that this balance is obtained at a current-account balance of zero, i.e. 0% of GDP, it is possible to determine the exchange rate level that is consistent with internal and external balance. For example, using the HP-filter level of potential output (which is a standard workhorse in econometrics to determine potential output) and a balance of zero on the current account the resulting currency levels are displayed in Figure 8.

Figure 8: The FEER consistent with a zero balance on the current account and GDP at full capacity



Source: Own calculations

It is clear from the figure that since 2003 the REER has drifted apart from the FEER consistent with internal balance and an external balance associated with a balanced current account. This is due to the fact that the economy has been drifting from its internal balanced path and, at the same time, has been experiencing an external imbalance relative to the target. In 2006Q2 the FEER consistent with a zero balance on the current account is an appreciation of just over 50% relative to the prevailing REER.

Two observations are worth mentioning:

- The FEER varies greatly across time. Depending on the prevailing macroeconomic conditions, both abroad as well as domestic, the FEER has varied from a possible 128 basis points to as low as 69 basis points. It should therefore not be expected that the exchange rate that provides a balanced economy will be a stable exchange rate over time. The exchange rate is merely the relative price that facilitates the adjustment of the underlying current account to the target financial account for a certain level of output at full potential.
- The prevailing exchange rate is rarely a level of macroeconomic balance. One should not be surprised by this. The role of this approach is to emphasise exchange rate misalignments in a macroeconomic framework, not necessarily what is going to happen in the short run. These models do not have great predictive power. However, they do give an indication of what will happen to exchange rates in the medium to long run.

Is South Africa any different from other countries?

The macroeconomic balance approach has been used to assess the preferred level of effective exchange rates for a number of countries. These countries mostly include developed countries like the US, UK, euro area, Japan and Australia. In all these studies it was found that the exchange rates that will establish equilibrium in the economy deviate (sometimes greatly) from the actual exchange rate.

Table1: Equilibrium exchange rate for the euro, pound and yen relative to the US dollar (2001)

	Euro	Yen	Pound
Nominal exchange rate misalignment (%)*	-16%	-22%	-15%
Target current account (% of GDP)	+1.2	+1.8	+0.0
Output gap (%)	-2.3	-0.5	-0.1

*A negative sign indicates a currency undervaluation

Source: Borowski and Couharde, 2003

It is clear from Table 1 that there exist large misalignments in currency at certain periods and this phenomenon is not only confined to South Africa. Other studies in Australia have found that the currency also experienced large misalignments during certain periods. However, it was also found that the currency is (just as with South Africa) sometimes overvalued or undervalued. The disequilibrium described in Table 1 has since been corrected and the values in the table will have changed dramatically. This proves once again that in the long run the currency adjusts to macroeconomic equilibrium. However, this might take some time and is not as quick as original exchange rate theories suggested.

Concluding remarks and implications for South Africa

The macroeconomic balance approach highlights the fact that although the exchange rate serves as an adjustment mechanism to establish equilibrium in an economy, it may take some time before this adjustment happens. However, the adjustment will definitely happen eventually.

This raises the question whether the authorities (i.e. Reserve Bank) should intervene to make adjustments smoother and quicker (or allow the process to adjust on its own). If the marginal cost of intervening in the foreign-exchange market is smaller than the marginal benefit that would be gained from quicker adjustment, then intervention is encouraged. However, it is highly unlikely that the marginal cost to the country will be less than the benefit gained. Successful foreign-exchange intervention requires large amounts of foreign reserves – much more than South Africa currently has. Although South Africa's foreign reserves have increased substantially over the past two years, it is unlikely that they could be sufficient to alter the forces that drive the currency. Any intervention through the utilisation of foreign reserves will be temporary and only result in much greater volatility of the rand.

Under the current situation, where the economy is at full capacity and domestic demand rampant, raising interest rates will also realign the economy (as Figure 3 suggests). However, raising interest rates is only a short-term solution. In the longer run an increase in the real interest rate will result once again in a currency appreciation and macroeconomic imbalance. The sustainable solution lies in expanding the supply side capacity of the economy. This will ensure that domestic demand will not exceed supply, which will help to raise exports and decrease imports, forcing the economy back into balance. This can only be done through expansion in infrastructure capacity, securing necessary skills at national, provincial and local government structures as well as establishing appropriate sector strategies to improve the economy's competitiveness.

References

Borowski, D and Couharde, C. 2003. The exchange rate macroeconomic balance approach: new methodology and results for the euro, the dollar, the yen and the pound sterling. *Open Economies Review* 14: 169 – 190.

Dvornak, N, Kohler, M and Menzies, G. 2003. Australia's medium-run exchange rate: A macroeconomic balance approach. *Reserve Bank of Australia Research Discussion Paper* 2003-3.

Frankel, J. 1999a. *Coping with crises in emerging markets: adjustment versus financing. Key Issues in Reform of the IMF*. Peter Kenen and Alexander Swoboda (eds), 2001.

Frankel, J. 1999b. The balance between adjustment and financing. *Key Issues in Reform of the IMF* ed. Peter Kenen and Alexander Swoboda, 2001.

Frankel, J. 2005. On the renminbi: the choice between adjustment under a fixed exchange rate and adjustment under a flexible rate. *NBER Working Paper* 11274.

Liew, K, Lim, K and Hussain, H. 2004. Exchange rate and the trade balance relationship: the experience of Asian countries.

Onafowora, O. 2003. Exchange rate and the trade balance in East Asia: is there a J-curve? *Economics Bulletin*, Vol. 5, no. 18.

Stucka, T. 2003. The impact of exchange rate changes on the trade balance in Croatia. *Croatian National Bank Working Paper* W-11.

Appendix A

List of variables used

REER	South African real effective exchange rate (Index)
G7GDP	Real GDP of G7 economies
GDPR	Real GDP of South Africa
US prime	US prime interest rate
SA prime	SA prime interest rate
CA	Current account
SA infl	South African inflation
US infl	US inflation
Gold	Gold price in rand

Sample

1990Q1 – 2006Q2

Regression results

Since the data are non-stationary it is necessary to test for cointegration of the variables. The Johansen Cointegration test was utilised. Lag length criteria indicate that four lags in the VAR render the residuals white noise. Test results indicate one cointegration equation.

Unrestricted Hypothesised No. of CE(s)	Cointegration Eigenvalue	Rank Test (Maximum Eigenvalue)		
		Max-Eigen Statistic	0.05 Critical Value	Prob
None	0.557601	46.4859	28.58808	0.0001
At most 1	0.294628	19.89474	22.29962	0.1047

Once the number of cointegrating vectors was determined a VECM (with four lags) is estimated with the REER as dependent variable. The gold price was included as exogenous variable to the system. The results are shown on the following page (standard errors in parenthesis):

Dependent variable: REER	
CA(-1)	1.97E-05 (-3.60E-06)
LOG(GDPR(-1)/G7GDP(-1))	0.424104 (-0.03915)
(SAPRIME(-1)-INFL_SA(-1))-(USPRIME(-1)-INFL_US(-1))	-0.030226 (-0.00814)
C	-4.290579 (0.07423)
CointEq1	-0.16485 (0.06755)
D(LOG(REER(-1)))	0.046013 (0.11195)
D(LOG(REER(-2)))	0.070722 (0.11915)
D(LOG(REER(-3)))	-0.007794 (0.11945)
D(LOG(REER(-4)))	0.038904 (0.11877)
D(CA(-1))	-2.19E-07 (1.80E-06)
D(CA(-2))	-9.71E-07 (1.80E-06)
D(CA(-3))	-9.35E-07 (1.70E-06)
D(CA(-4))	-1.41E-06 (1.50E-06)
D(LOG(GDPR(-1)/G7GDP(-1)))	1.336686 -0.47842
D(LOG(GDPR(-2)/G7GDP(-2)))	0.26377 (0.42139)
D(LOG(GDPR(-3)/G7GDP(-3)))	0.018528 (0.43592)
D(LOG(GDPR(-4)/G7GDP(-4)))	0.840241 (0.47356)
D((SAPRIME(-1)-INFL_SA(-1))-(USPRIME(-1)-INFL_US(-1)))	0.000712 (0.00318)
D((SAPRIME(-2)-INFL_SA(-2))-(USPRIME(-2)-INFL_US(-2)))	0.001883 (0.00302)
D((SAPRIME(-3)-INFL_SA(-3))-(USPRIME(-3)-INFL_US(-3)))	-0.006991 (0.00306)
D((SAPRIME(-4)-INFL_SA(-4))-(USPRIME(-4)-INFL_US(-4)))	-0.004656 (0.00311)
DLOG(GOLD)	-0.568001 (0.07613)