

# Currency Value Effects on the South African Economy and the Estimation of its Underlying Equilibrium Level

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## **ABSTRACT**

The objective of this paper is to provide a critical overview of the advantages and disadvantages of the South African rand exchange rate since it embarked on a significant appreciating trend in early 2003. By discussing developments in the South African foreign exchange market, a broad overview and understanding of the rand's recent history is provided. A critical evaluation of the advantages and disadvantages of various currency levels is presented, arguing that currency strength is beneficial to the South African economy. The focus of this paper is then turned toward South Africa's Real Effective Exchange Rate as an optimal indicator of underlying currency value, and the estimation of its equilibrium level. The estimation is extended to determine whether the rand was under or over valued in the first quarter of 2005, with econometric results indicating a rand trading at fair value for the period.

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## Introduction

There exists a substantial body of literature regarding the determinants of exchange rate values over time; from the theorem of Purchasing Power Parity, to various econometric estimations that aim to determine levels of long and short run equilibrium and the underlying fundamentals that determine such levels.

The need to determine the fair value of the rand is particularly pertinent to South African policy makers. By estimating the equilibrium value, authorities obtain clarity on whether currency weakness or strength is indicative of underlying economic health, or is being driven by external developments and sentiment. In South Africa's case, the appreciation of the rand since 2003 appears to have been due to a combination of factors: broad based US dollar weakness; improvements in macroeconomic fundamentals (including inflation containment and increasing rates of economic growth); favourable interest rate differentials; an increase in global commodity prices; as well as heightened exposure to the global investment community. This caused significant unease from certain sectors of the economy which benefit from currency weakness. Such sectors continue to impose increasing pressure on policy makers to intervene in the foreign exchange market in order to curb the appreciating trend, protecting such firms from declining revenue streams and increased foreign competition.

Although there are many benefits that arise from an appreciating currency vis-à-vis declining import costs, subdued inflation, forced productivity gains etc, benefits are not necessarily realised in such an efficient manner when a large proportion of the economy is employed or dependant upon the resource sector, which favours a weaker currency. In a labour market which is not perfectly flexible and where labour migration cannot take place immediately due to skills shortages and rigidities, problems are experienced. Therefore, this study examines the value of the rand during the first quarter of 2005, indicating the extent of under or over valuation. In addition, an attempt has been made to provide an answer as to whether a weak or strong currency would be optimal for South Africa. The structure of the paper is as follows:

A short overview of developments in South Africa's currency regime are initially discussed, which serves to provide the reader with a degree of insight into the rand's past performance, as well as to create a timeline of key developments over the past decade. Thereafter, the currency crises of the rand between 1996 and 2002 are reviewed. Unfortunately for South Africa, no other currency experienced the same extent of depreciation after the September 11<sup>th</sup> terrorist attacks, resulting in heightened inflationary pressure and a tightening of monetary policy. This is a key psychological period when determining whether the rand was under or over valued at its 2005Q1 level, as the currency had retraced the majority of its losses incurred during the crisis period. Therefore, one needs to consider whether the rand was over valued in early 2005, or simply correcting from its substantial losses.

The economic effects of the rand during 2004 - 2005 are subsequently discussed, providing an overview of the performance of certain macroeconomic variables. Furthermore, a critical evaluation of the advantages and disadvantages of various currency levels is provided, highlighting the fact that a degree of currency strength is beneficial to the South African economy. The focus of this paper is then turned toward South Africa's Real Effective

Exchange Rate as an optimal indicator of underlying currency value, with a visual overview of its performance compared to other emerging market currencies over the period under study.

In determining whether South Africa's currency is under or over valued, a valuation technique is presented which introduces a theoretical and statistical means of determining underlying currency value. This valuation technique is the estimation of the equilibrium value of the Real Effective Exchange Rate by means of appropriate econometric techniques. All data has been sourced from I-Net Bridge Data Services, Statistics South Africa, as well as various issues of the South African Reserve Bank's Quarterly Bulletin. The results of the valuation tests are discussed and summarised, followed by several concluding remarks and recommendations.

### **The South African Rand: Regime Transition and Contagion Effects**

In conjunction with a changing monetary policy environment, South Africa's foreign exchange market has experienced various regimes aimed at promoting increased currency flexibility. From US dollar or pound Sterling pegs combined with restrictions on resident and nonresident capital flows, the system moved in 1979 to a regime of dual currency dynamics. Most non-resident transactions operated at the floating 'Financial' exchange rate, while a 'Commercial' rate was instated and announced in line with market forces (Aron and Muellbauer, 2002). The latter became market determined in 1983 and the dual rates were soon re-unified. A debt crisis and the collapse of the rand provoked a return to the dual currency system after 1985. In 1995, unification of the dual currency was initiated under a managed rate. The management of the floating rate was relaxed, becoming fully floating at the introduction of inflation targeting in 2000. Incorporating earlier work by Aron and Muellbauer (2002), a time line of the various South African monetary and exchange rate regimes is illustrated in Table 1 below.

*Table 1: Monetary Policy and Exchange Rate Policy Regimes*

<b>Period</b>	<b>Monetary Policy Regimes</b>
1960 – 1981	Liquid asset based ratio system with quantitative controls on interest rates and credit
1981 – 1985	Mixed system during transition
1986 – 1998	Cost of cash reserves-based system, with pre-announced M3 targets
1998 – 1999	Daily tenders of liquidity through repurchase transactions (repo system), plus pre-announced M3 targets and targets for core inflation
2000 -	Repo system with inflation targeting
<b>Period</b>	<b>Exchange Rate Policy Regime</b>
1961(1) – 72(2)	Pegged to fixed pound Sterling
1971(3) – 74(2)	Pegged in episodes to floating Us dollar/ pound Sterling
1974(3) – 75(2)	'Controlled independent float': devaluations every few weeks
1975(3) – 79(1)	Fixed regime: pegged to the US dollar
1979(2) – 82(4)	Dual foreign exchange system: controlled floating commercial rand and floating Financial Rand
1983(1) – 85(3)	Unification to a controlled floating rand
1985(4) – 95(1)	Return to a dual system
1995(2) – 99(4)	Unification to a controlled floating rand
2000(1) -	Adoption of fully floating currency regime

Source: Aron and Muellbauer (2002), Author

The remaining parts of this section will be dedicated to a broad macroeconomic overview of the periods of significant depreciation of the rand between 1996 and 2002.

### **A. An Empirical Overview of the Rand's Demise: 1996 – 2002**

The effects of uncertainty in the South African political environment in the mid 1990's had an undeniable impact on the value of the rand against the major currencies. Similarly, the contagion effects of the Asian currency crisis of 1997/98 resulted in a change in sentiment by international investors, away from emerging market assets and toward the more secure US dollar denominated securities. A discussion of the rand's performance during these turbulent years follows.

The first major slide of the rand, post abolition of the Financial Rand, emerged in 1996 when Mr. T. Manual was appointed Minister of Finance. This depreciation was largely as a result of the ruling party's cabinet shuffle, and was in direct response to the international investment community's uncertainty toward South Africa. The local unit also suffered severely in 1998 as a result of contagion, following currency collapses and financial systemic crisis in the south-east Asian and Russian economies. Economic literature suggests several channels of contagion. Real interdependence can either be explained through bilateral trade or through trade competition in third markets. Furthermore, a crisis in one economy is more likely to spread to another economy if the two have a large degree of bilateral trade or are strong competitors in third markets (Pretorius & De Beer, 2002). Additionally, economies that share similar macroeconomic characteristics are also vulnerable to contagion affects. Pretorius and De Beer confirm the presence of financial contagion emanating from Zimbabwe and other emerging market countries, which contributed to the depreciation of the rand after the Asian crisis.

During the second quarter of 1998, the SARB embarked on an attempt to protect the value of the currency by substantial dollar sales from foreign reserves, while also intervening by engaging in forward contracts - buying dollars spot and selling dollars forward. This resulted in significant declines in the level of foreign exchange reserves, while contributing significantly to the SARB's net open forward position.

In a further attempt by authorities to salvage the value of the rand, authorities hiked short term interest rates; aimed at rewarding foreign investors for investing in the domestic currency. Subsequently, the prime overdraft rate was raised from 18.25% in March 1998 to a 13 year high of 25.5% by August 1998. This resulted in the real effective exchange rate recovering somewhat in the following year. Indeed, when measured against its main trading partners, the rand appreciated by more than 5% in the first half of 1999 alone. Unfortunately, the negative effects of such monetary tightening suppressed output levels to the extent that real GDP measured a mere 0.5% for 1998 as a whole. Unsurprisingly, the health of consumer and enterprise balance sheets deteriorated significantly, highlighted by the sharp increases in insolvencies and liquidations over that period.

Although the rand was initially, together with other emerging market currencies, adversely affected by the attacks of September 11<sup>th</sup>, no other currency suffered the same extent of depreciation since then (ABSA Group Limited, 2002). The table overleaf illustrates the extent of depreciation in the rand from 1980 to 2001.

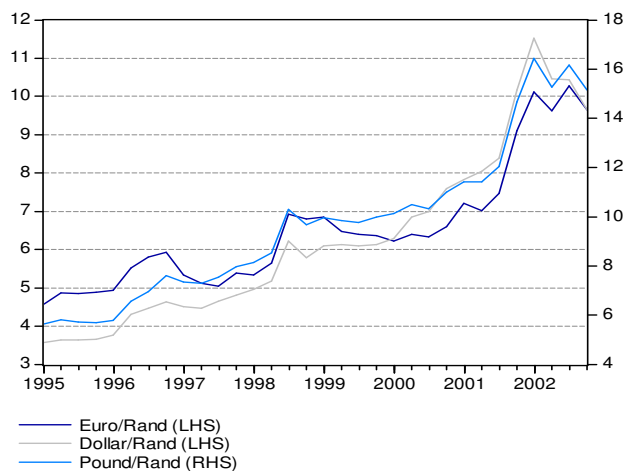
Table 2: Annual change in the average external value of the rand

Unit	Period	
	1980 - 1995	1996 - 2001
Nominal effective rate	-7.9%	-7.7%
Real effective rate	-0.4%	-4.0%
UK pound	-6.5%	-11.0%
US dollar	-8.0%	-12.4%
Euro	-10.1%	-6.7%
Yen	-12.6%	-8.3%

Source: ABSA Group Limited, Anon 2002

In 2001, despite ‘sound fundamentals’ characterized by declining inflation; an acceptable deficit on the current account; prudent fiscal and monetary policy, real growth in GDP despite spouts of slackening in global growth; together with an improvement in the net open forward position and foreign debt exposure, weakness in the currency was often as a result of negative foreign sentiment. Government’s waning credibility in respect of privatization efforts, the lack of dealing with the HIV/Aids pandemic, crime and corruption, and South Africa’s seemingly irresponsible approach to ongoing Zimbabwean turmoil, all precipitated the currency crisis of 2001/02. Moreover, the confidence of local investors in being able to preserve their wealth by means of South African investments was being eroded by capital gains tax, resulting in a flight of funds abroad, encouraged by the rand being seen as a ‘one-way-bet’.

Figure 1: The extent of the rand’s depreciation



The history of the rand over the past decade has shown that the country cannot rely upon uncertain and volatile sources of foreign capital inflows, especially bond finance, to boost investment in SA (ABSA Group Limited, 2002). In spite of this, the South African government resorted to tax measures that directly discouraged domestic savings, to the detrimental effect of long-term growth. Interestingly, there is the school of thought that argues that the rand had not been affected by fundamental factors or negative sentiment such as those just discussed. The foundation of their argument lies beyond the scope of this paper, suffice to say that rand volatility results from speculators who constantly profit from short positions in the rand, as well as the existence and developments of exchange control regulations.

## **The Effects of the 2005 Rand**

In order to facilitate the argument of whether the rand was under or over valued at its 2005Q1 level, a broad overview of developments in several key macroeconomic variables is provided. The aim is to provide the reader with an understanding of the structure of South Africa's economy, and highlight the rand's direct as well as indirect effects on such macro variables.

### **A. Broad Overview of the Current Economic Structure**

Over the past ten years, South Africa has witnessed profound change. On the political front, the democratic transition seems to have been perfectly conducted. Economic changes have been even more dramatic, although they were often relegated to the background by South Africa's "political miracle". Increased trade liberalisation has translated into a regular increase in both imports and exports. From less than 20% of GDP in the early nineties, total exports now amount to almost 30% of GDP<sup>2</sup>.

Over time, the overwhelming share of the mining sector has continuously shrunk in favour of the regularly expanding manufacturing and service activities. Indeed, while remaining a major exporter of precious and base metals, South Africa has seen a regular rise in non-metal exports, easing the country's dependence on global commodity prices. The share of gold exports has eased significantly over the past decade (at almost 15% of total exports, compared to 30% in the early nineties). By contrast, export revenues of manufactured products have increased substantially over that same period (from 9% of total in 1990 to 62% in 2004).

The ability to comfortably finance a lately negative trade balance through foreign direct and portfolio investment suggests the South African economy has coped well with the liberalisation of the capital account. Nevertheless, the deficit on the current account of the balance of payments widened considerably by the end of 2004. As a ratio of gross domestic product the current account deficit rose from 1.5% y/y in 2003 to 3.2% y/y in 2004. This significant widening of the current account deficit resulted mainly from robust domestic demand and the strengthening of the exchange rate, reflected in the physical quantity of imported goods which advanced by no less than 16.5% over the period (SARB, 2005).

However, many of the legacies of the apartheid era remain in place, such as insufficient growth rates and the high costs of restructuring, preventing a significant improvement in South Africa's social indicators (unemployment, poverty, health indicators). Encouragingly, after a decade of prudent macroeconomic policies, substantially better fiscal regimes and an enhanced solvency profile, a solid foundation to address South Africa's considerable social challenges has been laid.

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<sup>2</sup> For a distributional view of GDP composition, kindly refer to Appendix 1.

## B. Current Trends in Macro Variables

### Economic Growth

The South African economy expanded by 3.7% y/y in 2004, improving from the 2.8% y/y growth in 2003. In the first quarter of 2005, real GDP growth slowed to a 3.5% q/q seasonally adjusted annualised rate (*saar*), from 4.0% q/q *saar* in the final period of 2004. The slowdown in growth was largely caused by declines in real output growth in all sectors of the economy, except mining and quarrying (rebounding by 9.1% from -1.1% q/q *saar*). Disappointingly, manufacturing contracted by 1.9% *saar* from a rather pedestrian 2.5% increase in the previous quarter. The consecutive declines of manufacturing GDP in 2004Q4 and 2005Q1 were largely as a result of the stronger trading range of the currency, leading to a decline in manufacturers' ability to compete internationally, as well as on a domestic level vis-à-vis fierce import competition.

Although marginal declines in growth were experienced, the services sector continued to benefit from the low-interest-low-inflation environment, growing at an annualized rate of 5.9% q/q in the first quarter of 2005. This was attributed to strong domestic demand growth, increases in consumers' real disposable income, as well as business and consumer confidence levels at near record highs.

The demand side of the economy remained buoyant, albeit slowing from its robust level of 4.4% *saar* in the final quarter of 2004. Real gross domestic expenditure (GDE) measured 1.5% q/q *saar* in 2005Q1. This was the net effect of a slowdown in growth in real final consumption expenditure by households and general government as well as a much slower pace of real inventory accumulation (SARB, 2005). Although a lower level of gross domestic expenditure was recorded on a q/q *saar* basis, the 2005Q1 level of GDE was 4.5% higher than in the corresponding period of 2004.

### Investment Expenditure

In recent years there has been a marked improvement in South Africa's investment performance where, in the first quarter of 2005, real growth of fixed investments accelerated to 10.1% q/q *saar*, from 9.1% q/q *saar* in the fourth quarter of 2004. Although such levels remain short of the rate of increase in fixed capital formation required to assist in reducing South Africa's social inequalities, the increase reflects a commitment to address the low investment-GDP ratio. The acceleration in investment growth over the period was largely due to an increase in investment by public corporations and private enterprise. In this quarter, the communications sector continued its network expansion rollout, while the government owned electricity incumbent (Eskom), initiated plans of mothball power station refurbishment. General government also made a positive contribution to investment growth in the first quarter of 2005, albeit slowing to 4.0% *saar* from 6.4% *saar*, as it continued with its infrastructure investment and urban-renewal programs.

### Trade and External Accounts

Expressed as a ratio of the country's gross domestic product, the deficit on the current account receded to 3.8% in the first quarter of 2005 from 4% in the final quarter of 2004, which was easily financed by surplus savings from the rest of the world (SARB, 2005). This "superficial" improvement was largely explained by a larger decline in import volumes in relation to the decline in export volumes, whereby imports and exports declined by 4.3%

q/q and 1.3% q/q respectively. Further benefiting South Africa's trade balance was the sustained increase in the global commodity price cycle. However, although the prices of South African primary commodity exports had been on an upward trend, producers had limited benefit due to the strength of the currency; eroding the price competitiveness of domestic exporters. Nevertheless, those businesses whose expansion strategies were focused on the domestic market were able to take advantage of robust domestic demand conditions.

### Monetary Policy

Over the first quarter of 2005 targeted inflation approached the bottom end of the inflation target range, in response to a globally sanguine inflation environment and the stronger currency. Encouragingly, the year-on-year increase in the CPIX<sup>3</sup> (South Africa's official inflation targeting measure), remained within the SARB's inflation target range of 3% - 6% since September 2003.

In the April 2005 Monetary Policy Statement (MPS), the Reserve Bank's Monetary Policy Committee (MPC) acknowledged the fact that certain upside risks to the inflation target existed, however the MPC viewed the general outlook for inflation in a positive light. The Reserve Bank's central inflation forecast predicted CPIX to increase over the upcoming months, peaking at around 5.3% y/y early in 2006 and declining thereafter. This upward path of inflation in 2005 has thus far unfolded, however the exact timing and level of the peak remains uncertain in spite of the SARB's central forecast vis-à-vis rising international oil prices. Nevertheless, the SARB rhetoric of inflation containment is based on a number of factors. These include the persistent expectation of attainment of the inflation target, as measured by the Bureau for Economic Research (BER) at Stellenbosch University. Indeed, the decline in inflation expectations remains one of the SARB's paramount achievements. The improvement in overall-inflation expectations is further confirmed by the yield difference between nominal (R153) and inflation-linked (R189) bonds, whose spread has been on a downward trend since mid-2002. Moreover, prudent fiscal policy remains supportive of monetary policy, assisting in containing inflationary pressures.

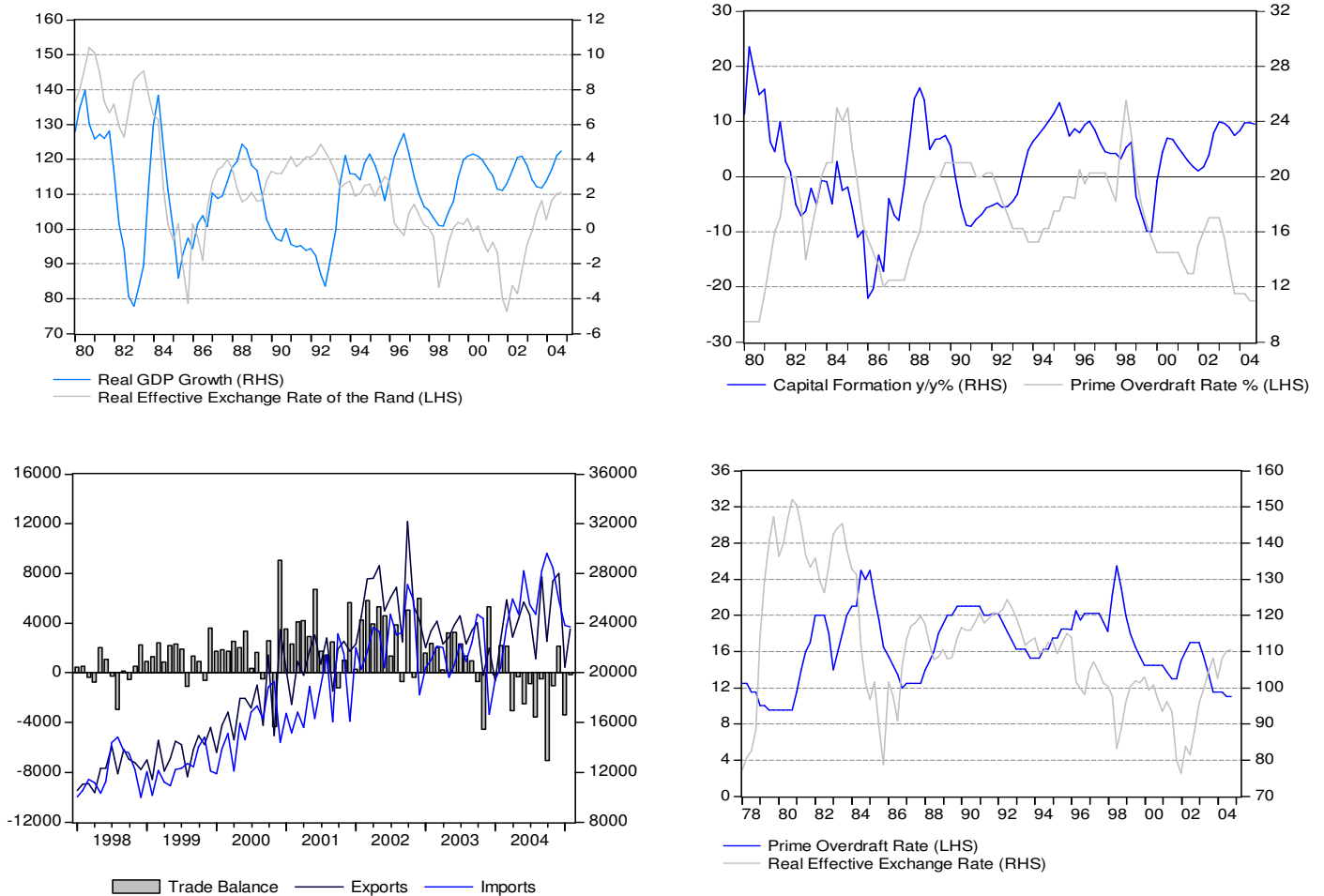
The April 2005 MPS suggests that the SARB became slightly more flexible in its approach to inflation targeting. Since the implementation of an inflation targeting regime, the SARB's mandate was to contain targeted inflation within a specified range. However, with inflation and inflation expectations firmly anchored within the target range, it is plausible that the Bank now attaches greater consideration to growth, employment, and exchange rate factors than in the past. This view stems from the comments in the MPS that the "MPC noted with concern evidence of some slacking in activity in some sectors of the economy, as a result of the move by the rand to a higher trading range over the past six months. It remains the view of the MPC that a competitive and stable exchange rate would contribute to continuing sustainable growth in output and employment" (SARB, 2005). This statement suggests that the unexpected April repo rate cut was somewhat aimed at depreciating the exchange rate to alleviate some of the pressures on South Africa's export sectors- notably the mining and manufacturing industries.

A graphic overview of the just discussed economic indicators is presented overleaf.

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<sup>3</sup> Consumer price index for metropolitan and other urban areas excluding mortgage costs

Figure 3: Long-Run Trends of Key Macro Variables



### C. The Currency Level Argument

A currency is essentially a store of wealth; a valuation of the underlying economic, political, social and psychological aspects of a country. In its simplest form, favouring a weaker currency represents the decision to discount underlying economic value. Nevertheless, in a diversified economy such as South Africa, there are sectors that benefit from a weaker currency, as well as those who perform optimally under a stronger valuation. Who are these sectors, what benefits do they derive, and more importantly, how do these benefits offset the limitations experienced by their challengers, thereby leading to an upliftment in the economic wellbeing of the entire country? The following section attempts to answer such questions.

#### Proponents of a Weaker Currency

Considering the cost structures of the South African economy, as well as the proportion of the economy that may derive short term revenue gain from a currency devaluation<sup>4</sup>, some may argue that the rand was over valued at 2005Q1 levels (R6.00/ US\$). The ability of such “weak currency” firms to compete on an international, as well as domestic scale has declined

<sup>4</sup> In this study, primary activities and manufacturing, constituting 30.7% of GDP

significantly, due to the rand's appreciating bias<sup>5</sup>. Indeed, South African exporters and manufacturers had to adjust their businesses around an exchange rate last experienced some five years earlier, whilst over the same period domestic headline inflation increased by three times more than its trading partners. This implies strenuous improvements and increases in efficiency and productivity in order to remain operational, let alone profitable.

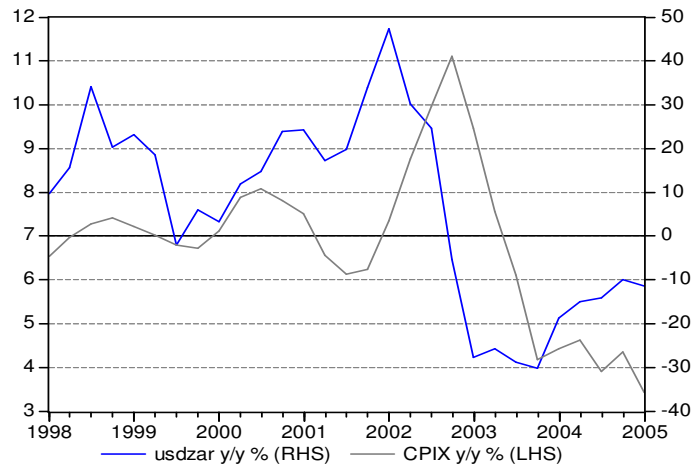
Proponents of a weaker currency advocate that in order for such firms to remain operational, it is in the best interests of the country to have a weaker rand. The profitability of such firms would encourage attainment of the socio-economic objectives of job creation and poverty reduction by increasing the demand for South African exports as well as protecting domestic industry from fierce import competition. Furthermore, by creating an environment favourable to such firms, government income tax receipts would increase on the back of increased revenue margins. This makes available additional funds at the government level. However, by allowing the currency to be fully market determined (thus appreciating in this context); the weakening of the US dollar against the major currencies has had a particularly significant impact on emerging market currencies offering attractive, albeit somewhat risky, investment returns. Such has been the case for the rand, which has appreciated by 74% and 35% since 2002, on a rand-dollar and REER valuation respectively.

The validity of such an argument is however only applicable in the short term. There exists a fairly strong correlation between the rand and consumer price inflation, albeit with a one quarter lag, as indicated in Figure 4 overleaf. The pass-through effects of a weaker currency onto macroeconomic aggregates such as inflation, interest rates and fixed capital formation are thus negative. A weaker currency implies increased pricing power at the factory gate, which are subsequently passed on to consumers in the form of higher prices. The effect of higher prices necessitates a tightening of monetary policy in the form of higher short term lending rates; discouraging fixed capital formation and job creation. Furthermore, a weaker currency creates a buffer for domestic firms' inefficiencies, thereby enabling profit creation at the expense of the broader economy. Thus, benefits obtained from large-scale currency depreciation over time are neutralized by higher import and financing costs. Since increasing inflation generally results in further currency weakness, this virtuous circle becomes harmful to growth and the overall health of the economy.

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<sup>5</sup> It is important to clarify at this point, that the argument is not whether manufacturers and primary agents (miners) should adapt to the strong rand, but rather a simple overview of recent experiences.

Figure 4: Pass-through effects from the exchange rate to consumer prices.



### Proponents of a Stronger Currency

To illustrate the benefits of a stronger currency, consider a currency transmission mechanism, in which the cost of production/importation of raw materials is affected by the exchange rate. A stronger exchange rate results in lower costs of production, thereby limiting the price increase passed on to intermediaries. These goods are thus able to be sold to the end user at a discounted price compared to the case of a weak currency/high production costs.

This subdued level of price increases for end user products is directly transmitted into overall consumer prices. Under benign inflationary conditions, the necessity to tighten monetary policy is reduced, thus stimulating the private sector. From this stimulation results increased levels of effective consumer demand, increased income levels, and wealth creation. Coupled with prudent monetary policy, benign inflationary conditions can be sustained. However the cycle is virtuous. With increased private sector activity and profit creation, the desire for institutions to expand and reap further profits leads to investment. Such investment takes the form of expansion of the labour force, increasing utilization capacity or opening of new subsidiaries. Furthermore, positive spill over effects occur when expanding through adding to the capital stock. This creates employment opportunities, thus increasing income. Moreover, an economy that is experiencing high levels of effective demand and consumer activity significantly increases the resources available to government through the retention of income tax receipts. Higher levels of government revenue enable expansionary policies by government, thus providing additional funding for skills and welfare development. Investment into education, technology, social aid, community projects etc. are all welfare supportive, and are made more realistic by the availability of funds.

Although a strong currency may result in short term declines of primary and manufactured goods revenues, the long-term benefits resulting from forced productivity and efficiency gains are seen to enhance long-run competitiveness. The key challenge is for such firms to remain operational during the initial period of currency appreciation. Indeed, firms can easily increase production once structural adjustments have been made, however it is less plausible to reopen a production facility after it has been shut.

Proponents of such a scenario include general retailers who benefit from increased consumer spend, emanating from higher levels of disposable income; the financial services sector which is subsequently exposed to lower levels of potential debt default; as well as those firms that make use of imported capital equipment for domestic production.

### **The Real Effective Exchange Rate: An Optimal Indicator of Underlying Currency Value**

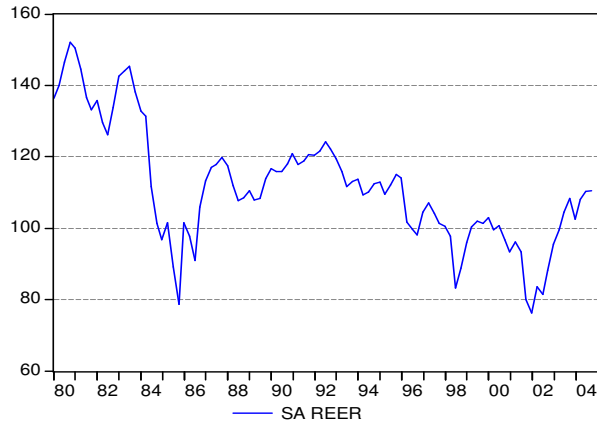
In attempting to estimate underlying currency value, misleading results may be obtained when focusing on a single bi-lateral exchange rate e.g. the rand-dollar or rand-pound exchange rate. Foreign country specific developments may influence demand and supply levels of a particular currency to the extent that the bi-lateral rate is not a true reflection of the underlying economic fundamentals or investor sentiment toward the domestic currency. An example of this exists in the 2005 rand-dollar exchange rate which, to a large degree, is the result US dollar developments, and not changes in South African economic fundamentals. The quarterly volatility, measured by the standard deviation and the coefficient of variation (indicated in parenthesis), of the rand against major currencies such as the euro (0.4; 0.05), deutschmark (0.4; 0.05), and to a lesser extent the pound (0.7; 0.05) have been significantly less than the rand-dollar volatility (0.8; 0.11) since the start of 2003.

The reasons for a globally softer dollar since the start of 2002 are beyond the scope of this paper, however, at this juncture it is important to highlight that an examination of the rand's performance against various currencies is crucial in determining its equilibrium level. An analysis of the Real Effective Exchange Rate (REER) is thus required. Therefore, the focus of this section provides an overview of South Africa's REER composition, and the suitability of the REER as a measure of competitiveness.

#### **A. Composition of the South African REER**

South Africa's REER is a price adjusted weighted average rate, derived by weighting the bi-lateral exchange rates between the rand's main trading partners; using the different countries' shares in South Africa's foreign trade as weights, and adjusting for price differentials. Such an indicator between a country and its trading partners can give a fair indication of relative price competitiveness in international trade, and is widely used for this purpose (Walters & De Beer, 1999). In general terms, a decline in competitiveness implies an increase in the REER i.e. a real appreciation of the South African rand. This could be as a result of, but not limited to, an increase in the demand for South African goods in the global market place, resulting in an improving terms of trade, or an over valuation of the domestic currency. A graphic representation of South Africa's REER is presented in Figure 5 overleaf.

Figure 5: The Real Effective Exchange Rate



South Africa's most significant trading partners hold the largest share in the REER<sup>6</sup>, these being: the Euro (36.38%); US Dollar (15.47%); British Pound (15.37%) and the Japanese Yen (10.43%). Weights for trading-partner countries are computed by taking into account firstly, competition between imports and locally produced import-competing goods, secondly, competition between own exports and goods produced locally in foreign markets and thirdly, competition between own exports and exports of other countries in third markets (Walters & De Beer, 1999). Furthermore, the SARB uses producer price indices in calculating the REER, as these indices compare the prices charged by South African producers with those charged by their counterparts in other countries. A choice of various other deflators such as unit labour costs (ULC), consumer price indices and GDP deflators are also available. Motivation for the choice of the PPI deflator is partly due to the lack of consistent and readily available data on ULC, as well as the immediate impact that nominal currency fluctuations have on the level of producer prices.

## B. The REER as a Measure of Competitiveness

The extent to which the REER is used as a measure of international competitiveness has become increasingly dependant on which definition of the REER is being used. Policies which target or use the REER as a measure of international competitiveness implicitly assume that there is one single measure of the REER, which gives an unambiguous picture of a country's competitive position (Leap, Ncube & Thomas 1995). However, different definitions and assumptions often yield conflicting results. As highlighted in the previous section, the SARB employs the most common definition, a producer price measure, deflating the nominal effective exchange rate by the relative prices in the domestic and foreign markets.

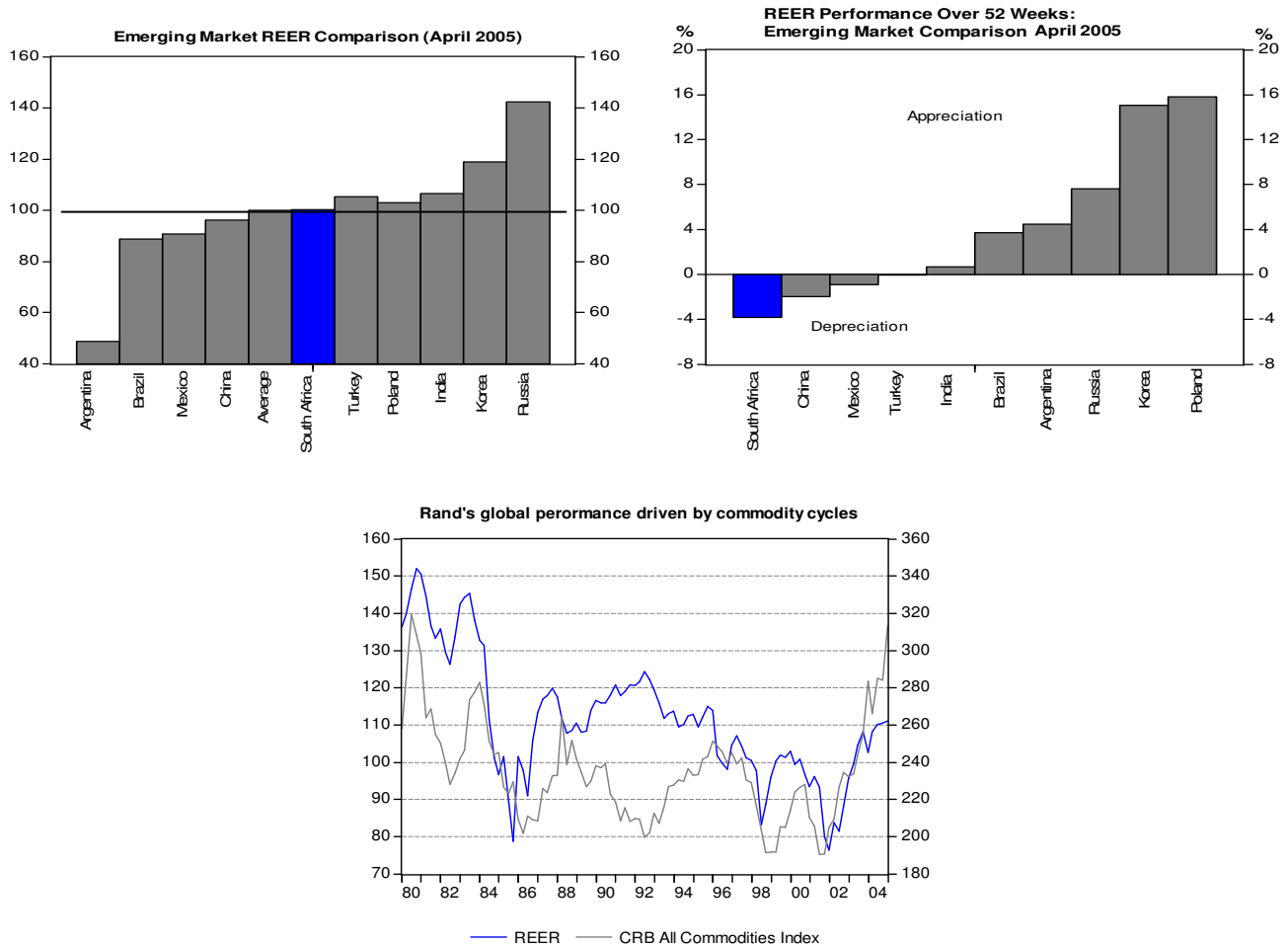
One obvious problem that arises when using such a definition is that producer price baskets have different components, and if similar, different weightings, as one examines various economies. Furthermore, this measure focuses entirely on the tradable goods sector,

<sup>6</sup> For a complete breakdown of the weights of various trade partner countries, kindly refer to Appendix 1.

therefore resource pull affects<sup>7</sup> between the traded and non-traded goods sectors are ignored (Leap et al, 1995). By overlooking such changes in the micro-structure, an imperfect representation of competitiveness results. Kahn (1998) shows that although some of the different measures show similar broad trends of South Africa's international competitiveness, significant differences do arise. As noted by Lipschitz and McDonald (1992), the alternate measures "highlight the dangers in interpreting competitiveness indicators too literally: There is no 'cookbook' approach to assessing competitiveness, and it is important to understand exactly what the different indicators measure".

The implications of such findings are that when analyzing South Africa's REER in the following sections of this paper, the issue of international competitiveness will not be critically analysed. Rather, the focus of the analysis will be on the REER's recent trends, driving forces, macroeconomic implications, and estimation of its equilibrium level, to assist in determining whether the South African rand was under or over valued in the study period.

### An International REER Comparison



<sup>7</sup> This occurs when prices in one sector rise relative to another. The rise in price results in an increase in profitability, leading to labour migration from e.g. tradable sectors to non-tradable industry.

## Means of Exchange Rate Valuation

In attempting to determine whether the rand exchange rate is reflective of its underlying fundamentals i.e. consistent with its equilibrium level, a framework of valuation techniques is necessary to provide a theoretically justified conclusion. Two methods of currency valuation have been identified based on their credibility, reputation, and appropriateness in such a study.

### A. Valuation by Means of Purchasing Power Parity

The traditional purchasing power parity (PPP) framework is the starting point in determining the equilibrium value of a currency. The absolute PPP hypothesis implies that the exchange rate between two currencies is determined by the ratio of the price levels in each country. This relationship should hold true if the following are observed:

- Each tradable good obeys the law of one price, reflecting identical prices in each country<sup>8</sup>;
- Firms face identical costs and productivity from their inputs (e.g. labour & capital), equalizing prices of non-tradable goods across countries; and
- Each good receives an equal weight in the aggregate price indices for each country.

Thus, PPP ignores issues such as product diversification in manufactured goods, divergences in transportation costs, trade restrictions, taxes and other factor endowments, as well as possible rigidities in price levels. Given such stiff assumptions, proponents of PPP argue that the relationship holds over the long-run (Edison, 1987; Frankel, 1998), albeit allowing for short run divergences. Such failure of PPP to hold in the short-run is well documented in the existing literature (Froot and Rogoff, 1995 and MacDonald, 1995), with the foremost explanation of which being that prices in goods markets are generally regarded as being sticky. However, PPP was never meant to characterize the short term dynamics of currencies. Prices do not adjust to monthly/quarterly fluctuations in the exchange rate (Hausmann; Panizza and Rigobon, 2004). Indeed, a key tenet of Dornbusch's 1976 seminal paper attributes exchange rate overshooting to the difference in arbitrage speeds between the financial and goods markets.

Several studies have found that PPP does appear to hold in the long run (Hakkio, 1984; Liu, 1992; Aggarwal & Simmons, 2002). Thus, if PPP holds as a long-run relationship, it provides the link between prices of goods in various countries, which when combined with interest rate parity, facilitates our understanding of exchange rate behaviour (Kargbo, 2004). Therefore, the use of PPP theory could be applied to South African data in order to identify whether PPP does hold for the rand. These results would assist in determining whether the South African rand was under or over valued in PPP terms over the study period. As the predominant focus of this paper is the estimation of the equilibrium REER, PPP estimations of the rand-dollar and rand-pound bi-lateral rates are provided as an appendix.

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<sup>8</sup> PPP is often used interchangeably with the popular "law of one price". However, there exists an important difference. The law of one price applies to individual commodities while PPP applies to aggregate price levels. Proponents of PPP as a long run-run theory argue that the law of one price need not necessarily hold for every good in the basket.

## B. Estimation of the Equilibrium Exchange Rate by Appropriate Econometric Techniques

In determining the equilibrium level of a particular currency, a variety of econometric estimation methods are available to assist in providing an economic as well as mathematical and statistical underpinning to one's conclusion. Cointegration<sup>9</sup> analysis combined with an ordinary least squares (OLS) estimation, provides a theoretical framework for examining the long-term comovements of a set of time-series variables. Intuitively, cointegrated variables may drift apart temporarily, but systematically converge over time. Cointegration estimation techniques are therefore particularly well suited to the study of real exchange rate determination, since short run shocks, or speculative and cyclical factors, may cause the real exchange rate to deviate temporarily from its equilibrium path, as determined by the movements of its (nonstationary) fundamental determinants (Candy, J 2003).

In the following section of this paper, a cointegrating relationship of South Africa's REER will be estimated by means of an OLS estimation. In estimating the real effective rate, an attempt has been made to identify a multivariable regression model that does not consider the implicit weights of South Africa's main trading partners, but rather attempts to identify a relationship that is statistically and theoretically valid between the real effective rate and various other macroeconomic variables.

When comparing the model's estimated results to actual values, deviations from long run equilibrium levels will be computed in order to determine whether South Africa's REER was under or over valued against a basket of its main trading partners in the first quarter of 2005.

### Valuation Results

#### Model Specification

Incorporating a slightly modified version of the specification provided by MacDonald and Ricci (2002), the REER is specified as a function of the degree of openness<sup>10</sup> of the South African economy (OPEN), the percentage change in the dollar price of gold (GOLD), the year-on-year percentage change in real GDP (GDP), as well as the differential between South African and United States 91-day Treasury Bill rates (DIFFERENTIAL). A dummy variable has been used as a means of introducing qualitative regressors in the estimation, thus assuming the value of 1 during the 1996, 1998 and 2001/2002 currency crisis, and zero elsewhere. The econometric representation of the model is provided below. The a priori expectations of the effects that these variables have on the real effective rate are postulated thereafter:

$$\log(\text{REER}) = \alpha - \beta [(\text{exports} + \text{imports})/\text{GDE}] + \theta \log(\text{gold}) + \zeta (\text{GDP}) - \varphi (\text{SATB} - \text{USTB}) - \text{dummy} + \mu$$

---

<sup>9</sup> Cointegration provides a solution to the so called spurious regression, whereby estimates of non-stationary economic variables are non-consistent and the customary tests of statistical significance do not hold. Granger and Newbold (1974) provide a detailed examination of the consequences of violating the stationarity assumption.

<sup>10</sup> The ratio of the sum of nominal exports and imports, divided by nominal gross domestic expenditure

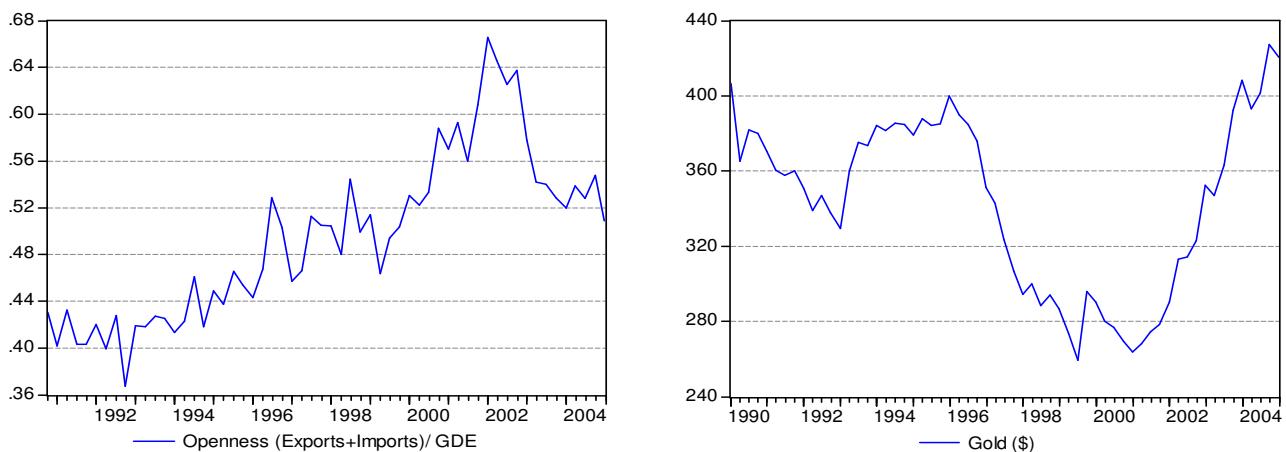
The effect of the abolishment of trade sanctions, thus increasing the openness of the South African economy, is expected to have a rather ambiguous effect on the REER. In one instance, the availability of imported goods as the economy “opens” increases the country’s import propensity. This would have potentially negative effects on the REER. However, with openness comes the availability of competitively priced foreign goods, thus lowering the price of tradable goods and aggregate price levels. A more benign inflation climate should have the effect of raising the REER. The most applicable outcome in the case of South Africa will be reflected by the sign of the estimated coefficient.

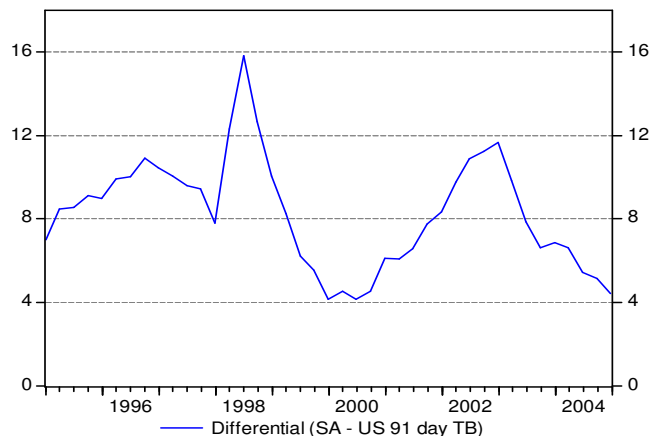
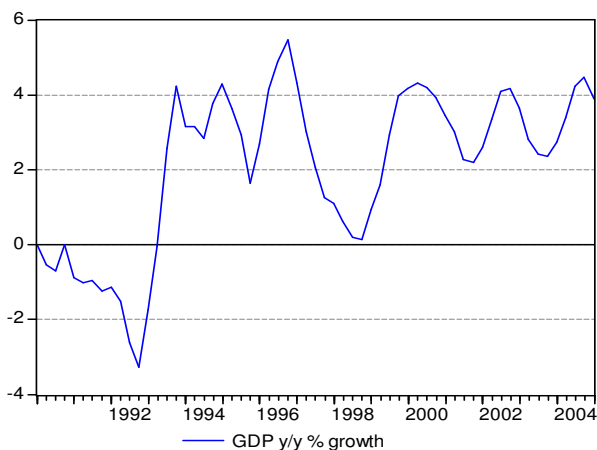
An increase in the dollar price of gold implies support for the South African rand. As the world’s second largest producer of gold, dollar export revenues increase in times of an increasing gold price, thereby providing an appreciating bias for the rand. Furthermore, gold is seen as a safe-haven investment by global investors; a natural hedge against inflation and uncertainty. This usually stems from a weakening of the US dollar, providing further support for alternative, “commodity” currencies, such as the rand, Australian and Canadian dollars. Therefore, a positive relationship is expected between the REER and the dollar price of gold.

An increase in output (economic growth) reinforces positive foreign sentiment toward an economy. Opportunities exist in which real returns are made possible, and therefore encourage a flow of funds into the economy. This provides a degree of support for the currency. Furthermore, the favourable business environment (in part contributing to increased growth) may result in attractive returns from the domestic securities exchange. This attracts international investor attention, resulting in foreign portfolio flows. Therefore, a positive relationship is expected between the rate of real GDP growth and the REER.

An increase in the differential between South African and United States Treasury Bill rates may result in some level of weakness for the real exchange rate over the longer term. This is due to the suppressing effect higher real interest rates have on domestic growth. MacDonald and Ricci (2002) provide further motivation for a negative differential coefficient, suggesting that a tightening of monetary policy would raise real interest rates—an outcome that would need to be associated with an expectation of currency depreciation, given the interest parity condition. Although one could argue that higher domestic interest rates attract short-term speculative capital (supporting the rand, thus a positive coefficient), this has not been the case in South Africa. Since 2003 prime lending rates have fallen by 650 basis points, yet the rand has experienced a marked appreciation.

Figure 6: Determinants of the Real Effective Exchange Rate (1990Q1 – 2005Q1)





### Estimation Results

Appendix 3 provides a summary of the test results examined to ensure the integrity of the model's results. However, it is stated herein that the Johansen Cointegration Test as well as the Engle-Granger two stage error correction model estimation methods were employed to determine whether a long run equilibrium relationship does in fact exist between the REER and the specified variables. The cointegration tests indicate the presence of one cointegrating vector at the 5 percent significance level. Furthermore, the OLS errors from the estimated cointegrating equation tested as stationary (at the 1 percent level), indicative of cointegration, since the linear combination of nonstationary variables cointegrate to produce a stationary error term (Candy, J 2003). The estimation results are presented below.

*Table 3: REER Estimation Results*

Coefficient	Statistic
<b>Log (REER)</b>	
$\alpha$	3.39 [10.28]
OPEN	-1.01 [-8.08]
GOLD	0.32 [6.22]
GDP	0.009 [4.19]
DIFFERENTIAL	-0.01 [-4.64]
Currency Dummy	-0.06 [-3.62]
<b>Parameter</b>	
Adjusted R-squared	0.901
Akaike info criterion	-3.621
Schwarz criterion	-3.408
S.E. of regression	0.037
Durbin-Watson	1.414
F-statistic	95.528

Note: *t*-statistics in square brackets

The model's results are consistent with economic a priori expectations, with coefficients that are both plausible and realistic. Furthermore, the variables are all significant at the 1 percent confidence level. The estimated adjusted R-squared indicates a relatively high goodness of fit, whereas the F-Stat indicates that the model is jointly statistically significant. A more detailed overview of the model's characteristics with regard to multicollinearity, autocorrelation and heteroskedasticity is provided in Appendix 3.

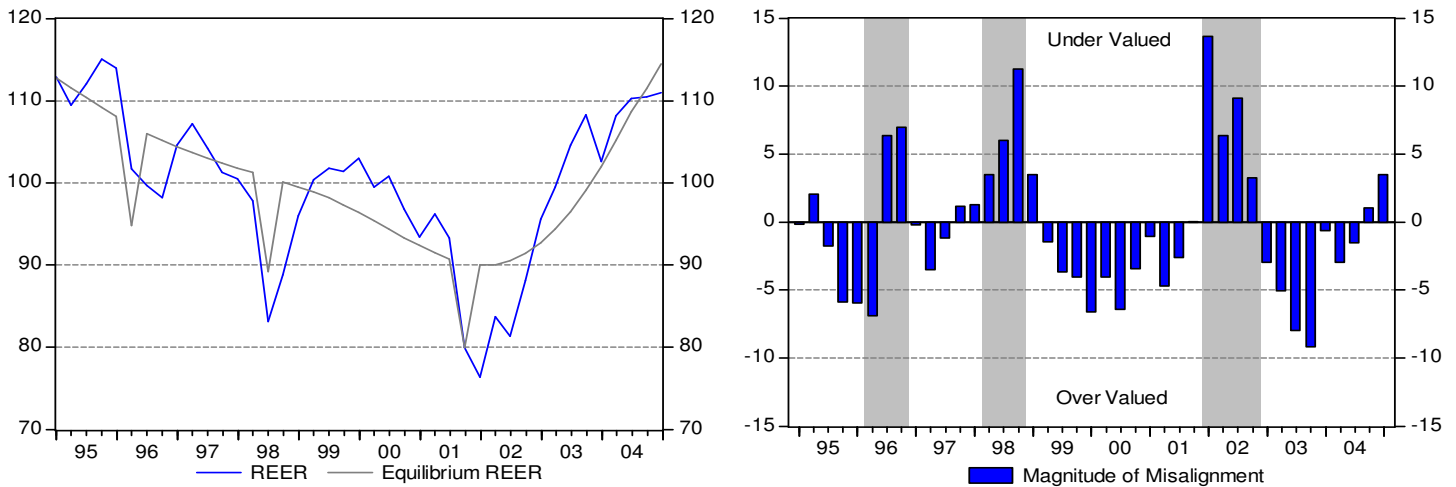
Incorporating earlier work by MacDonald and Ricci (2002), it is possible to estimate the equilibrium level of the REER by neutralizing the impact of temporary fluctuations in the explanatory variables by means of smoothing techniques<sup>11</sup>. This method eliminates volatile short term fluctuations in the variables, thereby providing their long-run equilibrium values. The model has therefore been re-estimated incorporating such estimates (whilst maintaining the same specification), whose results are compared to the actual REER in Table 4 and Figure 7 below:

*Table 4: REER compared to estimated equilibrium level*

Period	REER	
	Actual REER	Estimated Equilibrium REER
2004Q1	102.60	101.95
2004Q2	108.13	105.18
2004Q3	110.23	108.70
2004Q4	110.48	111.49
2005Q1	111.00	114.06
Actual vs. Estimated Correlation	0.85	

Source: Author's Estimates

*Figure 7: REER compared to estimated equilibrium level*



<sup>11</sup> The Hodrick-Prescott filter has been applied to the explanatory variables using a seasonal smoothing factor of 1600, as recommended by Hodrick and Prescott for quarterly data.

At any point in time, the real exchange rate is likely to differ from the equilibrium level either because a change in the explanatory variables alters the equilibrium level or because temporary factors (such as financial market pressure on the rand) move the real exchange rate away from it (MacDonald & Ricci, 2002). The specified models results indicate the REER's degree of misalignment (overshooting) in relation to economic fundamentals during the currency crises of 1998 and 2001/2002, although suggesting the 1996 devaluation was somewhat insulated compared to what fundamentals would imply. Importantly, the results of the OLS estimation show that the observed REER was in close proximity to its estimated equilibrium level for most of 2004. However, the second and first quarters of 2004 and 2005 reflect the largest deviations from equilibrium, of -2.95 index points and +3.06 index points respectively. Therefore, after removing the volatile fluctuations in the specified explanatory variables, the model suggests that the rand was somewhat under valued against a basket of its main trading partner currencies during the first quarter of 2005. The magnitude of the under valuation was 2.7% (or 3.06 index points).

The actual REER is however shown to fall within a 97 percent confidence interval of the estimated REER (as illustrated in Figure 2, Appendix 3). This suggests that the observed error can be considered negligible, falling within a margin of estimation error considered acceptable. Therefore, the cointegrating equation indicates that the REER was consistent with its long run equilibrium level in the first quarter of 2005.

### **Concluding Remarks**

There existed a large amount of criticism in the early stages of 2005 about the strength of the rand exchange rate and its subsequent constraining effects on job creation and profit retention in certain corners of the South African economy. The appreciation against the benchmark US dollar resulted in heightened pressure from the private sector and labour unions alike, aimed at the South African authorities to intervene in the foreign exchange market to curb the rand's appreciation. However, in accordance with the free floating regime the SARB subscribes to, the weakening US dollar resulted in sustained rand strength to the displeasure of the South African mining and manufacturing sectors. However, it has been shown in earlier sections of this study that currency strength is beneficial to South Africa's competitiveness in the long-run, and in the short-medium term, beneficial to several macroeconomic aggregates. Currency strength is therefore advocated herein.

Furthermore, this study attempted to determine whether the value of the South African rand was under or over valued at its 2005 level. An OLS estimation was specified incorporating cointegration techniques in order to determine the magnitude of the rand's deviation from the theoretically implied equilibrium rate. Such analysis indicated that the rand was trading at fair value on a REER basis during the first quarter of 2005.

Therefore, two key conclusions should be drawn from this study's findings. Firstly, it would be inadvisable for policy makers or government to attempt to influence the rand's current performance with the aim of alleviating pressure from the supply side of the economy. On the contrary, government authorities should continue to abstain from currency intervention. Secondly, it has been shown that the rand was valued at its equilibrium level in the first quarter of 2005, and therefore indicative of underlying economic fundamentals.

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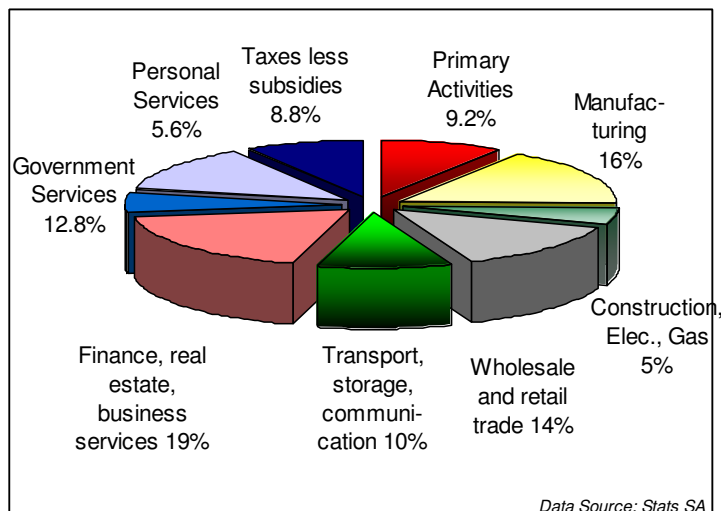
**Appendix 1**

*Table 1: REER Weighting Composition (excluding Zimbabwe)*

<b>Trade Partner</b>	<b>Weight</b>
Euro	36.38
USA	15.47
UK	15.37
Japan	10.43
Switzerland	5.54
China P.R.: Mainland	3.14
China P.R.: Hong Kong	2.70
Korea	2.64
Canada	1.96
Australia	1.68
Sweden	1.81
Singapore	1.66
Israel	1.22
Total	100

Source: SARB, 2004

*Figure 1: Composition of GDP: 2005Q1*



## ***Appendix 2***

An estimation of the bi-lateral exchange rates of the rand-dollar and rand-pound are performed according to PPP theory below. The estimations provide insight into how the rand has performed against these currencies in particular, which contribute toward a significant portion of the REER (30.84%). The reason for excluding the euro-rand in the PPP estimations is due to the fact the euro-rand bi-lateral rate constitutes the largest proportion of the REER. Therefore by excluding the euro-rand, a diversified analysis is presented without the prospect of replicating such results in the predominant econometric estimation of the REER

### **PPP Valuation**

In *absolute* terms, the theory of PPP states that the exchange rate between two countries' currencies equals the *ratio* of the two countries' price levels. Therefore, absolute PPP predicts a rand exchange rate of:

$$e = p_d/p_f$$

where the domestic price of foreign currency is determined by the ratio between domestic and foreign price levels (in this study, producer price indices).

However, such a relationship makes no sense in applied estimations due to differences in the basket composition of price level aggregates. Indeed, there is no reason to expect different commodity baskets to sell for the same price (Krugman, 2000). Therefore, it may be beneficial to employ the theory of *relative* PPP, which states that the percentage change in the exchange rate over a specific time equals the *difference* between the percentage change in aggregate price levels. Therefore, relative PPP implies the following (in first difference, natural logs):

$$e = p_d - p_f$$

Unlike absolute PPP, relative PPP can be only defined with respect to the time interval over which price levels and the exchange rate change. Therefore, in determining whether the South African rand is under or over valued on a bi-lateral basis, the percentage change in respective price differentials will be compared to the observed percentage change in the bi-lateral exchange rate. This will provide an indication of whether the currency is fluctuating in accordance with the relationship posited by relative PPP.

### **Estimation Results**

Relative PPP will be estimated in an attempt to determine whether the South African rand is under or over valued against the US dollar as well as the UK pound. The estimations take the following functional form, whose results are presented below:

$$\Delta \log (e) = \Delta \log (p_d) - \Delta \log (p_f)$$

Table 1: PPP Estimation Results

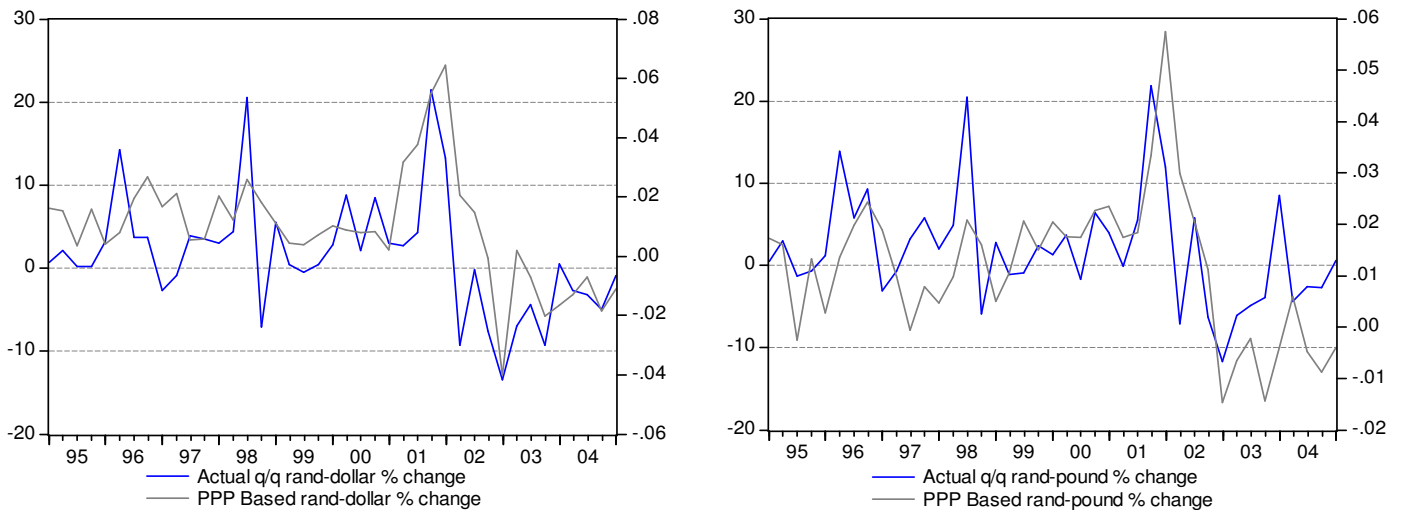
Period		Rand-Dollar	
	Actual Percentage Change	Estimated PPP Percentage Change	
2004Q1	0.54	-0.02	
2004Q2	-2.69	-0.01	
2004Q3	-3.22	-0.01	
2004Q4	-5.00	-0.12	
2005Q1	-0.92	-0.01	
Actual vs. PPP Correlation		0.0352	

Period		Rand-Pound	
	Actual Percentage Change	Estimated PPP Percentage Change	
2004Q1	8.49	0.00	
2004Q2	-4.40	0.01	
2004Q3	-2.62	0.00	
2004Q4	-2.64	-0.01	
2005Q1	0.57	0.00	
Actual vs. PPP Correlation		-0.2543	

Source: Author's Estimates

Figure 1: Relative PPP results vs. Actual Developments



Despite a fair correlation upon visual inspection, the above results suggest that the rand's value has not fluctuated in a manner which is consistent with the theory of relative PPP since 2004Q1. It is shown in Table 1 above that the average percentage change in the rand against the dollar and pound since 2004 has been an appreciation of 2.25% and 0.12% per quarter respectively. Conversely, the average relative PPP implied percentage change in the rand against the dollar and pound since 2004 should have been an average depreciation of 0.01% and 0.05% per quarter respectively. This illustrates that relative PPP does not hold in South Africa over the observed time period. Although the correlation coefficients do improve marginally upon extending the sample period, the results fail to reflect an explicit relative PPP relationship.

### Appendix 3

Table 1: Data Unit Root Characteristics

Variable	ADF Statistic (Level)	Critical Value 5%	ADF Statistic (First Difference)	Critical Value 5%
Openness	-2.295*	-2.935	-8.018	-2.935
Gold	-0.349*	-2.935	-1.970**	-2.935
GDP	1.265*	-2.935	-1.339**	-2.935
Differential	-2.446*	-2.935	-4.562	-2.935

\*nonstationary and contains unit root at level  
 \*\* nonstationary and contains unit root at first difference; stationary at second difference

Table 2: Violation of CLRM Assumptions

Econometric Criteria	Test Employed	Null Hypothesis ( $H_0$ )	Test Results	Violation of $H_0$
Multicollinearity	R-squared, t-statistics and correlation matrix	No multicollinearity	Significant t-stats and relatively high R-squared, correlation coefficient varies between 0.003 & 0.76 between explanatory variables.	No, multicollinearity is not problematic
Heteroskedasticity	White Heteroskedasticity	No heteroskedasticity	$p=0.41^*$	No, $H_0$ is not rejected
Autocorrelation	Breusch-Godfrey Serial Correlation LM Test	No autocorrelation	$p=0.00^*$	Yes, $H_0$ is rejected
Residual Normality	Jacque-Bera	Residuals are normally distributed	$P= 0.059^*$	No, $H_0$ is not rejected
Cointegration	Johansen test, trace statistics	No cointegration	See results in Johansen cointegration test below	Yes, $H_0$ is rejected
Cointegration	Engle-Granger two stage test	No cointegration	Residual ADF test statistic -5.49	Yes, $H_0$ is rejected

\* Significance evaluated at 95% confidence levels, reject  $H_0$  if  $p < 0.05$

Table 3: REER Cointegration results

Johansen Cointegration Test
Sample: 1990:1 2005:1
Included observations: 56 after adjusting endpoints
Series: log(Gold); log(Reer); @pcy(GDP); Openness; Differential
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	70.19	68.52	76.07
At most 1 *	37.04	47.21	54.46
At most 2 *	17.99	29.68	35.65
At most 3	6.89	15.41	20.04
At most 4	1.065	3.76	6.65
At most 5			

\*(\*\*) denotes rejection of the hypothesis at the 5%(1%) level  
Trace test indicates 1 cointegrating equation(s) at the 5% level  
Trace test indicates 0 cointegrating equation(s) at the 1% level

Figure 1: Actual vs. fitted REER

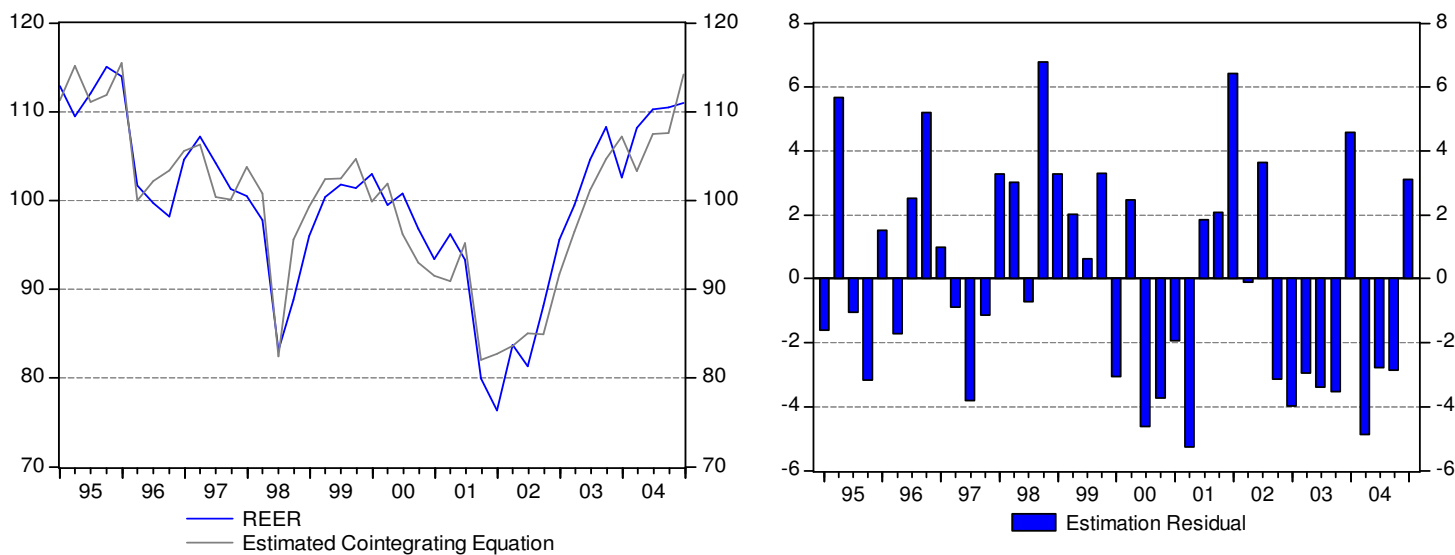


Figure 2: 97 percent confidence interval of Estimated Equilibrium REER

