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Reducing Exchange Rate Volatility and Supporting Competitiveness

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Abstract

In this paper we analyze the relationships between exchange rates, inflation and competitiveness. We show that over the 1994-2006 sample period real exchange rate depreciations did not improve the trade balance and therefore had no positive effect on growth. One reason is that SA exports are priced to market (PTM instead of PCP). We also show that if the monetary authorities would be interested in targeting competitiveness via the real exchange rate, a good way to do this is by narrowing the present inflation targeting band from the present 3-6 percent, to say 1-3 percent. The reason is that the easiest way to become uncompetitive is to let your domestic price level rise faster than those of your trading partners. Higher inflation does not lower the real exchange rate it appreciates it.

1. INTRODUCTION[1]

The objective of this paper – which was commissioned by the Presidency and is facilitated by TIPS- is to analyze growth and competitiveness issues relevant for the South African economy.

Particular attention will be paid to the question of whether one can think of policy instruments (additional to and consistent with inflation targeting and the present floating rand nominal exchange rate regime) that can be used to reduce exchange rate volatility – and in that way support the competitiveness of the SA non-commodities tradable sector.

For example, on 11 February President Thabo Mbeki suggested measures other than interest rates to manage credit. Here one can think of credit rationing and/or higher bank reserve requirements. The role of additional instruments is to improve trade-offs: decrease inflation without sacrificing growth via higher interest rates.

Further, with respect to the IT regime the Harvard Team suggested that in the MPC deliberations other factors than inflation could be formally considered; such as e.g the unemployment rate and the real exchange rate of the rand.

In the second part of the project we discuss the issue of potential growth (and its constraints). While analyzing that topic we attempt to sketch an integrated post-GEAR growth and poverty alleviation strategy that is likely to move South Africa from the present 'low growth state' to a 'high growth state'.

The remainder of this paper is organized as follows. In Section 2 we analyze the interrelationships between competitiveness, growth and pricing mechanisms. Section 3 outlines our empirical evidence for South Africa regarding exchange rate volatility and competitiveness. In Section 4 we look at exchange rate targeting and evaluate SA's inflation targeting regime. Section 5 looks at additional instruments to limit exchange rate volatility and support competitiveness of the non-commodities tradable sector. Finally, Section 6 concludes.

2.COMPETITIVENESS, GROWTH AND PRICING MECHANISMS

2.1 Exports, Net Exports and the Trade-Off between Inflation and Growth

It is common knowledge that a weaker real exchange rate tends to increase the CPI inflation rate as a result of higher domestic currency prices of imported

final/intermediate goods and/or higher wage inflation. Obviously, this is a negative aspect of exchange rate depreciation and is unconditionally bad for a country's social welfare/utility. However, a popular idea is that a weaker currency will support exports. For example, on 8 May finance minister Trevor Manuel said: 'South Africa wanted to maintain stability in the currency to benefit exports'.[2]

So, in the mind of policymakers a weaker currency seems to be associated with a trade-off between higher inflation – which is bad for social welfare – and higher exports, which is believed to be good for the economy. However in this section we explain that for a weaker real exchange rate to increase <u>growth</u> (in addition to increasing CPI inflation) it should boost <u>net</u> exports (exports minus imports) as otherwise the export sector gains at the expense of other sectors in the economy; possibly the poor.

In order to organize our thoughts let us start with the following <u>definition for GDP</u>, $\hat{y}$:

$$\hat{y} = \hat{c} + \hat{i} + \hat{g} + \left(\hat{b} - \hat{m} \right) \tag{1}$$

where all (absolute) variables are in constant prices (volumes) and $\hat{c}$, $\hat{i}$, $\hat{g}$ are respectively consumption, investment and government expenditure. Finally, $\hat{b}$ and $\hat{m}$ are exports and imports volumes, so that $\left(\hat{b} - \hat{m} \right)$ is the real trade balance.[3] This equation can be easily log-linearized:

$$y = \gamma_c c + \gamma_i i + \gamma_g g + \mu(b - m) \tag{2}[4]$$

Suppose the economy experiences a real depreciation which pushes up CPI inflation. From equation **(2)** it can be easily seen that only if <u>net exports</u> $(b - m)$ increases as a consequence of this depreciation will the adverse <u>inflation</u> effects be (partially or completely) offset – or perhaps even eclipsed – by an increase in GDP, that is by a positive effect on GDP <u>growth</u>. Table 1 illustrates.

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[2] As quoted in Business Report, Wednesday 9 May 2007.

[3] The corresponding current account deficit would be

$$(\hat{b} - \hat{m}) - r_F = \left(\hat{y} - \hat{c} - \hat{i} \right) - \hat{g} = \left(\hat{s} - \hat{i} \right) - \hat{g}, \text{ where } r_F \text{ is net interest (transfers) paid abroad. So,}$$

in this section we abstract from transfer payments.

[4] Here the parameters γ_c, γ_i and γ_g are the shares of connsumption, investment and government spending (net of taxes) in GDP and μ is the share of imports and exports in GDP; i.e. the average propensity to import (and export), that is $\mu \equiv \hat{b}/\hat{y} = \hat{m}/\hat{y}$. Later we proxy the openness of the economy by the share of imported (final) goods in the domestic consumption basket or $\gamma = \hat{m}/\hat{c}$. It can be easily seen that $\gamma = \hat{m}/\hat{c} = \hat{m}/\hat{y}.\left(\hat{y}/\hat{c} \right) = \mu / \gamma_c$.

Table 1 Real Exchange Rate Depreciation: The Trade-Off Between Inflation and Growth*

Effect on inflation	Effect on GDP growth	Net effect
Unambiguous: Δp_c ↑	Ambiguous: Δy ↑ <u>if</u> $(\Delta b - \Delta m)$ ↑	?
Role of the Marshall-Lerner condition	Δy ↑ <u>if</u> $\eta_x > 1 + \eta_m$ as then $(\Delta b - \Delta m)$ ↑	?

* Here Δp_c is the CPI inflation rate and $\Delta y_t = y_t - y_{t-1}$ (the first difference of the log of output) is GDP growth.

The important thing to take away from the second row of Table 1 is that it is not sufficient that a real depreciation increases (gross) <u>exports volumes</u> b. For, if imports are larger than exports the depreciation benefits the countries that export to South Africa, not South Africa. In that case GDP of the rest of the world (ROW) is boosted – not SA GDP – while SA does experience the adverse effects of the higher CPI inflation rate.

To make this clear, assume that $(b - m) = 0$. Then, the economy as a whole does not gain in terms of growth (the size of the cake does not increase), although the economy as a whole does end up with a higher inflation rate. As gross export volumes go up, what we have is that the <u>export sector</u> gains at the expense of other sectors in the economy that are not indexed to inflation such as pensioners, the unemployed and the poor. So in this case a real exchange rate depreciation works as a <u>subsidy</u> for exporters, a subsidy that is being paid for by other sectors of the economy. In this sense a weaker exchange rate is an <u>implicit subsidy</u> which is financed by an <u>implicit tax</u>; the inflation tax.

In order to generate the growth effects (the potentially positive effects on net exports) policymakers typically have (long run) imports and exports relations - in volume terms - like **(3)** and **(4)** at the back of their minds:

$$b_t = \alpha_0 + \eta_x s_t + \alpha_2 y_t^* + \varepsilon_{1t} \qquad \qquad (3)$$

$$m_t = \beta_0 + \eta_m s_t + \beta_2 y_t + \varepsilon_{2t} \qquad \qquad (4)$$

where α_0, β_0 are constants and variables are in natural logs, more specific $s = p_F - p_H$ is the <u>real</u> exchange rate of the rand, p_H is the price that home (SA) firms charge home and foreign consumers (in rand), p_F is the price that foreign firms charge SA consumers (also in rand), y is SA domestic economic activity, y^* is foreign economic activity), and $\varepsilon_{1,2t}$ are error terms.[5]

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[5] Here $\eta_m = \partial m / \partial s$ is the home import (demand) price elasticity, and $\eta_x = \partial b / \partial s$ is the foreign demand (price) elasticity for the home country's exports. A specification along these lines will be estimated in Section 3.

We know that a real depreciation will unambiguously increase CPI inflation. However, for a real depreciation to increase net exports – the real trade balance – and thereby GDP growth (second column of Table 1) a further condition needs to be satisfied in terms of equations **(3)** and **(4)**. This condition is known as the <u>Marshall-Lerner condition</u> and says that a real depreciation improves the trade balance (net exports) if the sum of the absolute values of the price elasticities of exports and imports is larger than 1.[6]

2.2 Symmetric Producer Currency Pricing

The traditional idea that a weaker exchange rate boosts export volumes is based on the assumption that exports are invoiced in <u>domestic currency</u> – that is that SA exporters engage in what is known in the literature as producer currency pricing (PCP).[7] In this section we explain how this mechanism is supposed to work in a stylized two-block world economy. Among other things we explain how a real depreciation then implies the classic trade-off between increasing CPI inflation and boosting net exports. A Trade-off that In Section 3 of this paper we show does in fact not exist in SA, as there in no positive robust empirical relation between the real effective exchange rate of the rand (REER) and net exports.

Let us now analyze the trade-off between inflation and growth (via competitiveness) in some more detail. In order to focus our thinking let us think about a two-country world economy where both exports and imports are <u>priced in the producers' currency</u>; that is firms in both countries set their export prices at the foreign-currency equivalents of their domestic sales prices, based on producer's currency pricing (PCP). In what follows think of SA as the home country and the rest of the world (ROW) as the foreign country. Table 2 illustrates (all variables are in logs).

Table 2 Symmetric PCP in a Two-Country World

	In domestic economy	In country *
Price of good H	$p_H = \underline{p_H}$	p_H^*, where $p_H^* = p_H - e$
Price of good F	p_F, where $p_F = p_F^* + e$	p_F^*

Here e is the nominal exchange rate of the rand (defined as units of domestic currency per unit of foreign currency), p_H is the price that home (SA) firms charge home residents (in rand), p_F is the price that foreign firms charge SA consumers (also in

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[6] For a derivation of this condition see Appendix A.2. The intuition behind the Marshall-Lerner (hereafter ML) condition is the following. A nominal exchange rate depreciation increases the (domestic currency) price of imports one-for-one (hence the 'one' in the condition). This adverse price effect has to be compensated for by (i) the fact that more expensive imports will induce people to import less (the η_m term), and (ii) higher export volumes driven by the more 'competitive' exchange rate (the η_x term). All the ML condition says is that effect (ii) must be relatively large to the 'one-for-one effect', and that the more price sensitive imports volumes are (the more negative η_m is, and thus the better the 'automatic brake' works), the less need is there for export volumes to be price sensitive. It can be shown that the standard ML conditions are equivalent whether they are formulated with respect to the nominal or the real exchange rate.

[7] In so far as this mechanism underlies the BER and NT models of the economy, the recommendations by Frankel, Smit and Sturzenegger (2006) (hereafter FSS) are flawed.

rand), p_H^* is the price SA firms charge for the home (H or SA) good overseas – the SA export price - and p_F^* is the price foreign firms charge the residents of the foreign country. Note that indeed firms in both countries set their export prices at the foreign-currency equivalents of their domestic sales prices. For example, the SA export price p_H^* in foreign currency (dollar) is simply equal to the domestic sales price p_H, adjusted for the value of the rand/dollar nominal exchange rate. This implies that the price that foreigners pay for home goods, and the price that home residents pay for foreign goods fluctuates when the nominal exchange rate changes. If this is the way the world works, a home <u>nominal</u> depreciation implies a <u>real</u> depreciation (that is an increase or improvement in the terms of trade), which will then boosts foreign demand for SA exports. Defining the real exchange rate s as $s = p_F - p_H$, and using the relations outlined in Table 2 we have

$$s = p_F - p_H = p_F^* + e - p_H \tag{5}$$

So that a nominal depreciation (an increase in e) implies a real depreciation (an increase in s). [8]

In addition, strictly speaking the implication of PCP – the fact that the export price of the home (SA) good is set in domestic currency/rand terms - should be that the latter price, p_H is <u>independent of the level of the nominal exchange rate</u> (completely uncorrelated with the level of the nominal exchange rate):

$$p_H = \underline{p_H} \qquad \text{where} \quad \frac{\partial p_H}{\partial e} = 0 \tag{6}$$

This implication of PCP will be tested in Section 3. Chart 1 illustrates.

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[8] It appears that Edwards Lawrence (2006) also (implicitly) assume PCP as in their non-gold merchandise exports equation they use the difference between the home and foreign PPI (in rand) as the relevant relative price variable (unless they are looking to pick up supply-side effects).

Chart 1 Export Price: Producer Currency Pricing
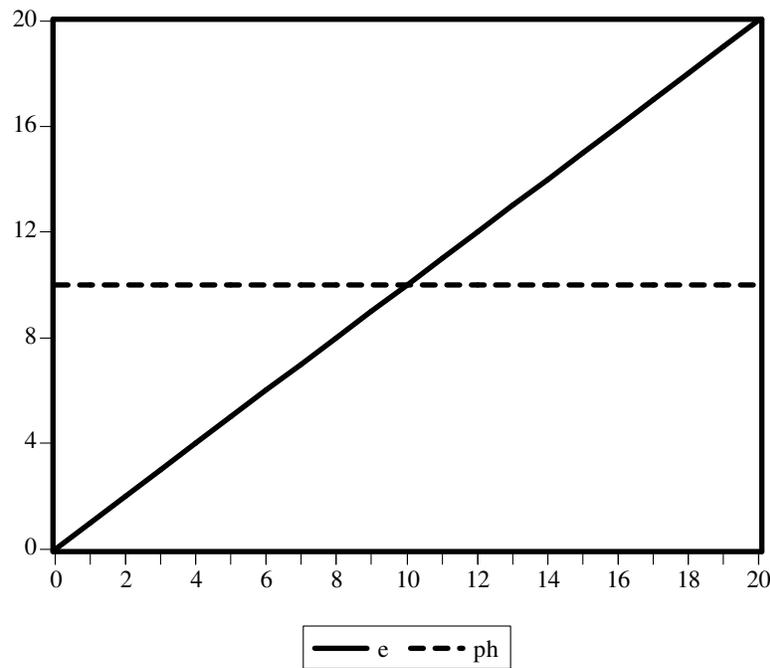
Assuming there is no trade in intermediate goods home's CPI price level is given by equation **(7)**:

$$p_C = (1-\gamma)p_H + \gamma p_F \Leftrightarrow p_C = p_H + \gamma(p_F - p_H) \tag{7}$$

, where $0 < \gamma < 1$ is the share of imported final goods in the domestic consumption basket and we have abstracted from non-traded goods.[9] Table 3 illustrates the implications of a nominal rand depreciation for the SA CPI under symmetric PCP for final goods.

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[9] For this case see Appendix A.1.3. For the case of imported intermediate goods see Schaling (2007).

Table 3 Foreign Producers Engage in PCP; $p_F = p_F^* + e$. *

p_F^*	e	p_F	p_H	$(p_F - p_H)$	p_C
1	0	1	1.1	-0.1	1.09
1	0.5	1.5	1.1	0.4	1.14
1.5	0	1.5	1.6	-0.1	1.59
1	0	1	1.6	-0.6	1.54

* All numbers are computed assuming $\gamma = 0.10$.

The numbers for p_F in column three are computed using the assumptions outlined in columns 1-2 (the numbers in column three are simply the sums of those in columns 1-2). Then, given the assumption on the home price, p_H the terms of trade $(p_F - p_H)$ follows. Finally, using equation **(7)** – and working with an imported share of final goods in the consumption basket of 10 percent – we can then compute the CPI, p_C.

In row 2 we analyze the effect of a nominal depreciation of the rand. We see that foreign producers factor this depreciation into the rand price of the imported final good, so that the SA consumer will start paying more for the imported good (compared with row 1, p_F increases to 1.5 from 1, a 50 percent increase). Of the 0.5 increase 10 percent works its way to the CPI as the CPI increases by 0.1 * 0.5 = 0.05 (the CPI was 1.09 and has as a result of the appreciation increased to 1.14).[10]

We are now ready to outline our conclusions regarding a nominal rand depreciation, its effects on 'competitiveness' (the real exchange rate/terms of trade) and the CPI inflation rate). Under symmetric PCP a nominal rand depreciation implies a <u>real</u> depreciation (in fact we have a one-to-one correspondence) which then in turn increases the CPI:

- A nominal depreciation increases the rand price of imports, which then pushes up the CPI.[11] The more so the more open the economy. This is unconditionally <u>bad</u> for inflation.
- A nominal depreciation deteriorates SA's terms of trade as a higher level of e implies a home real depreciation.
- Since SA charges at the foreign-currency equivalents of their domestic sales price, home becomes more competitive versus *.[12] Then * is more likely to source imports from SA (if *'s imports are sufficiently price-elastic) which would increase SA's export volumes. Further, <u>if</u> SA's (price) import elasticity is sufficiently negative (in other words if the Marshall-Lerner condition is satisfied) then SA's <u>net</u> exports would go up. This would be <u>good</u> for growth.
- Finally, the implication would be of no empirical correlation between SA's unit export revenue (its export price) and the nominal exchange rate of the rand.

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[10] Note that this example is consistent with the evidence reported by the Chaponda and Stern (2006) case study for small household appliances. They find that the recent <u>strength</u> of the rand has prompted consumers to respond positively to the reduced cost of imported appliances.

[11] See equation **(7)**.

[12] It can be shown that $s^* = p_H^* - p_F^* = p_H - e - p_F^*$.

Thus we have the classic trade-off in the sense that a weaker currency implies higher CPI inflation but boosts competitiveness (and growth in case the ML condition holds). When there is no trade in intermediate goods (no imported intermediate inputs such as steel and oil), and assuming that SA has a relatively modest share of imported final goods in the SA consumption basket the numbers suggest that a weaker currency is attractive as it has a large beneficial effect on 'competitiveness' – which will translate into higher growth if the ML condition holds - and a relatively small negative effect on CPI inflation.[13]

2.3 Asymmetric Pricing: PCP versus PTM

One reason why the relation between the REER and export volumes may be so weak is because in reality a lot of SA's exports are not invoiced in rand, but in dollars or euros. This is called pricing to market (PTM). Under pricing to market (PTM) home producers set the price in the <u>consumers' currency</u>. In the PTM model, the home firm chooses two different prices - one for residents of its own country, and for residents of the other country. The price charged by the $*$ firm to home and $*$ residents is the same as in the PCP model.

More specific, we assume that SA exports (of final goods) are <u>priced to market according to 'export parity pricing' (EPP)</u>; that is <u>invoiced in dollars</u>.

So we assume that domestic (SA) final goods producers would find the <u>dollar price</u> of their exports dictated by the <u>dollar price</u> (dollar price parity) of their competitors in the world economy, that is

$$p_H^* = p_F^* \tag{8}$$

Otherwise, things are the same as in Table 1. Table 4 below illustrates.

Table 4 Home PCP + PTM (via EPP), Foreign PCP + PCP

	In domestic economy	In country *
Price of good H	p_H	p_H^* , where $p_H^* = p_F^*$
Price of good F	p_F , where $p_F = p_F^* + e$	p_F^*

Now for SA's real exchange rate we get

$$s = p_F - p_H = p_F^* + e - (p_F^* + e) = 0 \tag{9}$$

So that a nominal depreciation (an increase in e) has no effect on the real exchange rate.[14]

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[13] In the analysis here the effect of introducing non-traded final goods would most likely be to limit the adverse effect on inflation of a nominal depreciation (see footnote 5 above); thus further stacking the cards in favour of competitiveness over inflation.

[14] Now the (producer price-based) terms of trade for country $*$ (s^*) becomes $s^* = p_H^* - p_F^* = p_F^* - p_F^* = 0$. So, under 'export parity pricing' country $*$'s real exchange rate is also constant and completely insulated from rand/dollar nominal exchange rate changes. In that case a nominal depreciation does not make SA exports more attractive price-wise relative to final goods

Under export parity pricing (EPP) we get the result that a nominal appreciation hurts profitability of SA exporters.[15] To see this we realize that the rand price of the exported good is

$$p_H = p_F = p_F^* + e \qquad \text{where } \frac{\partial p_H}{\partial e} = 1 \qquad\qquad\qquad \textbf{(10)}$$

Obviously, we then have the result that a stronger <u>nominal</u> exchange rate (lower value of e) reduces unit revenue and thereby – ceteris paribus – profitability. This result is broadly in line with Rodrik (2006, p. 20) who finds that a <u>real</u> appreciation worsens the relative profitability of manufacturing (with an elasticity of 0.1).[16] He then goes on to suggest that

'The real exchange rate, which stood at a more depreciated level post-1994, makes a positive contribution to manufacturing's relative profitability. In fact, the depreciation of the real exchange rate seems to have offset about four-fifths of the adverse effect of import competition. A more depreciated exchange rate presumably would have been even better for the health of manufacturing' [Rodrik (2006, p. 21)].

We do not dispute those results. However, as in South Africa there is no evidence of positive <u>macroeconomic</u> effects of a nominal or real depreciation (see Section 3), a nominal (real) depreciation may benefit some sectors of the economy – here manufacturing – at the expense of others (e.g. households on nominal incomes like pensioners or the poor). In fact, Aghion, Braun, and Fedderke (2006) find that <u>markups</u> in South African manufacturing are both high by international standards and have refused to come down since the 1990s.[17]

Further, strictly speaking the implication of EPP – the fact that the export price of the home (SA) good is set in foreign currency/dollar terms – is that according to equation **(10)** the latter price, p_H should be <u>perfectly correlated with the level of the nominal exchange rate</u>: $\frac{\partial p_H}{\partial e} = 1$. This implication of EPP will be tested in Section 3. Chart 2 illustrates.

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produced by the foreign economy. Therefore *'s imports – SA's exports - are completely insulated from changes in the (rand) nominal exchange rate. So, there is scope for a little empirical project that checks the (long-run and error-correction implied) correlation between the (effective) nominal and real exchange rates. I guess empirically the (long-run) correlation between e and s is not zero - as would be the result in case of PCP for imported final goods (and no imported intermediate goods) and PTM (EPP) for the domestically produced good for the foreign market – or one (which would be the case of PCP for imports and exports and no imported intermediate inputs), but somewhere between zero and one.

[15] In the next section we show that a nominal appreciation also hurts SA producers that sell in the local market if they set their price according to import parity pricing (IPP).

[16] Noting that he also finds that an increase in exports has a statistically significant positive effect on the relative output price of the manufacturing sector [Rodrik (2006, p. 23)].

[17] For a macroeconomic analysis of inflation in SA and the role of markups see Fedderke and Schaling (2005).

Chart 2 Export Price: Export Parity Pricing
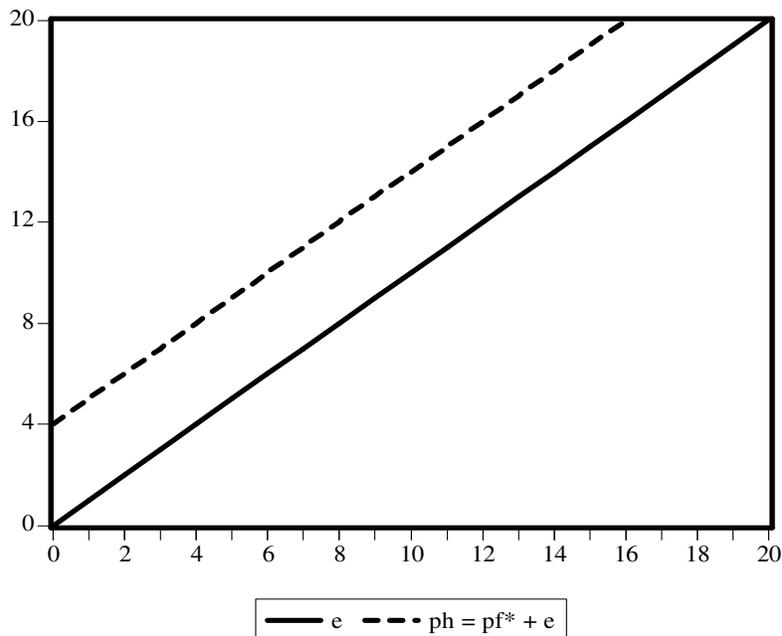
We are now ready to outline our conclusions regarding a nominal rand depreciation, its effects on 'competitiveness' (the real exchange rate/terms of trade) and the SA CPI inflation rate). The idea is that the adverse effects on inflation remain as outlined in Section 2.2, but the beneficial effects on export volumes disappear:

- A nominal depreciation increases the rand price of imports, which then pushes up the CPI. The more so the more open the economy. This is unconditionally <u>bad</u> for inflation. The effect is exactly the same as in Section 2.2 above.
- A nominal depreciation has no effect on SA's terms of trade. So. SA does not become more competitive versus *. Ceteris paribus * is not more likely to source imports from SA. <u>No effect</u> on SA export volumes or net exports. <u>No effect</u> on growth.
- Finally, another empirical implication would be that of a perfect (one-to-one) correlation between SA's unit export revenue (its export price) and the nominal exchange rate of the rand.

So, if SA engages in PTM via EPP there is <u>no trade-off</u> between competitiveness and inflation: the effect is no effect on competitiveness (export volumes) and a negative effect of inflation. So, then we are not crowding-in extra world demand, rather we are handing out subsidies to the export sector financed via an 'inflation tax'. In that case the state is effectively engaged in perverse income redistribution: exporters are effectively subsidized by the rest of the SA economy (including households on fixed nominal incomes such as pensioners, unemployed households and the poor).

2.4 Asymmetric Pricing: The Effects of Import Parity Pricing

Having suggested that a weak exchange rate can in fact be viewed as akin to a subsidy for exporters, we now explain that <u>a weak rand also protects local industry from import competition</u>. This may be seen as a good thing (protect employment in local industry), but again such a policy is not without cost. In fact, a weak currency (combined with SA's distance from international markets) may provide rational incentives for local producers to engage in what is called import parity pricing (IPP). We now show that in the case of IPP (where incentives to engage in this policy are provided by a weak rand and/or explicit tariffs) the adverse effects on CPI inflation of a nominal (real) depreciation are greatly amplified (compared to the case where local firms engage in PCP).

More specific, compared to the case analyzed in Section 2.3 above, we now assume that domestic (SA) producers of <u>final</u> goods on their domestic market engage in import parity pricing (IPP) (as before SA exports of final goods are priced to market according to 'export parity pricing' and foreign producers engage in PCP). That is, the <u>rand</u> price of the locally produced final good (p_H) is equal to the <u>rand price</u> of the imported final good (p_F). Table 5 illustrates.

Table 5 Home IPP + EPP, Foreign PCP + PCP[18]

	In domestic economy	In country *
Price of good H	p_H , where $p_H = p_F$	p_H^* , where $p_H^* = p_F^*$
Price of good F	p_F , where $p_F = p_F^* + e$	p_F^*

This case is very important for South Africa. For instance, Chaponda and Stern (2006, p. 8) use the assumption of IPP – domestic manufacturers mark-up their prices for (equivalent) products sold in South Africa – to estimate the impact of <u>protection</u> (the cost to the SA consumer) on purchases of domestically produced products. They motivate IPP by stating that there is no reason for domestic producers to charge below the cost (to the consumer) of imported appliances, on which duties are charged. The only options available to consumers are to pay the duty-inclusive price on local goods or purchase imports and pay the duty anyway.[19]

Thus, a rational pricing rule for those final goods producers would be to set their domestic price p_H according to equation **(11)** below:

$$p_H = p_F = p_F^* + e + \tau \tag{11}$$

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[18] The way this could work is that Chinese exporters price in dollars (say, they price to market with respect to the US). Then, the rand price of imported textiles in SA would be determined by $p_F = p_F^* + e$.

[19] Another example is the clothing industry [see Van der Westhuizen (2006)]. If Truworths, say, can import clothing from China, why would it pay a KwaZulu Natal Cut Make and Trim (CMT) more than what they can import those goods for (including the cost of tariff, insurance and the exchange rate) from China?

where τ is a proportional tariff.[20] Note that in line with the case of EPP, again a nominal exchange rate appreciation would – ceteris paribus - hurt profitability of domestic producers, say the manufacturing sector. The reason is that the appreciation would decrease $p_F^* + e + \tau$.

So, in case of IPP the <u>rand price</u> of home-produced final goods is equal to the <u>rand price</u> of the imported good according to equation **(11)** above. Table 6 illustrates the implications of a nominal rand depreciation for the SA CPI if domestic producers of final goods engage in IPP.[21]

Table 6 Foreign producers engage in PCP + PCP, Domestic Producers Engage in IPP + EPP $p_H = p_F = p_F^* + e$.*

p_F^*	e	p_F	p_H	$(p_F - p_H)$	p_c
1	0	1	1	0	1
1	0	1	1	0	1
1	0.5	1.5	1.5	0	1.5
1.5	0	1.5	1.5	0	1.5
1	0	1	1	0	1

* All numbers are computed assuming $\gamma = 0.10$.

In row 3 we analyze the effects of a nominal depreciation of the rand under IPP for final goods. Note that the CPI now increases from 1 to 1.5; a 50 percent increase! This increase is <u>much larger</u> than under the corresponding case where domestic producers of final goods also engage in PCP (see row 2 of Table 2) where the increase was only 4.6 percent (from 1.09 to 1.14). Thus, the presence of IPP has the effect of causing the inflationary effect of the nominal depreciation to be <u>ten times as large</u> as the one under PCP.

We are now ready to outline our conclusions regarding a nominal rand depreciation, its effects on 'competitiveness' (the real exchange rate/terms of trade) and the SA CPI inflation rate). The idea is that as before there are no beneficial effects on export volumes (no trade-off), but that the adverse effects on inflation are now much larger than in Section 2.2.

- A nominal depreciation increases the rand price of imported goods, which then – ceteris paribus – pushes up the CPI. The more so the more open the economy. The presence of IPP has the effect of causing the inflationary effect

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[20] More precisely we assume that the rand price of the (imported) foreign final good is set according to

$$\hat{p}_F = \left(\hat{p}_F^* * \hat{e} \right) * \left(1 + \hat{\rho} \right).$$ Here $\hat{p}_F$ is the rand price of the imported final good, $\hat{p}_F^*$ is the dollar price of the imported final good, $\hat{e}$ is the rand dollar exchange rate (defined as rand per dollar), and $\hat{\rho}$ is the proportional tariff (as a perunage). Define $\hat{\tau} \equiv 1 + \hat{\rho}$, then we get $\hat{p}_F = \left(\hat{p}_F^* * \hat{e} \right) * \hat{\tau}$. Taking natural logs of this expression we get equation **(11)**.

[21] For the case of IPP with respect to domestic producers of intermediate goods, see Schaling (2007).

- of the nominal depreciation to be more than <u>ten times as large</u> as the one under PCP. Unconditionally <u>very bad</u> for inflation.
- A nominal depreciation has no effect on SA's terms of trade. Home does not become more competitive versus *. Ceteris paribus * is not more likely to source imports from SA. <u>No effect</u> on SA export volumes or net exports. <u>No effect</u> on growth.

The policy conclusion from this section is the following: one of the reasons for the absence of a link between the real effective exchange rate (REER) and net exports is the presence of PTM/EPP (as earlier explained in Section 2.3). Further, as the weak rand takes the form of handing out subsidies not only to <u>exporters</u> but also to <u>domestic producers</u> this makes practices like IPP more likely. The consequence of this is that the perverse income redistribution effects outlined in Section 2.2 are magnified: the effects from a nominal depreciation on the CPI are ten times as high as in the case where SA producers engage in PCP. So, not only are there no positive benefits in terms of net exports, the poor are hit a lot harder than is conventionally understood to be the case.

3. EXCHANGE RATE VOLATILITY AND COMPETITIVENESS: EMPIRICAL EVIDENCE FOR SOUTH AFRICA

3.1 The Link Between Exchange Rate Depreciation and Inflation

As said above, we know that the effect of a weaker exchange rate is that it will push up CPI inflation. Some evidence for this adverse effect for South Africa is provided by Chart 3 below.

Chart 3 SA CPI and NEER (in logs) – Monthly Data
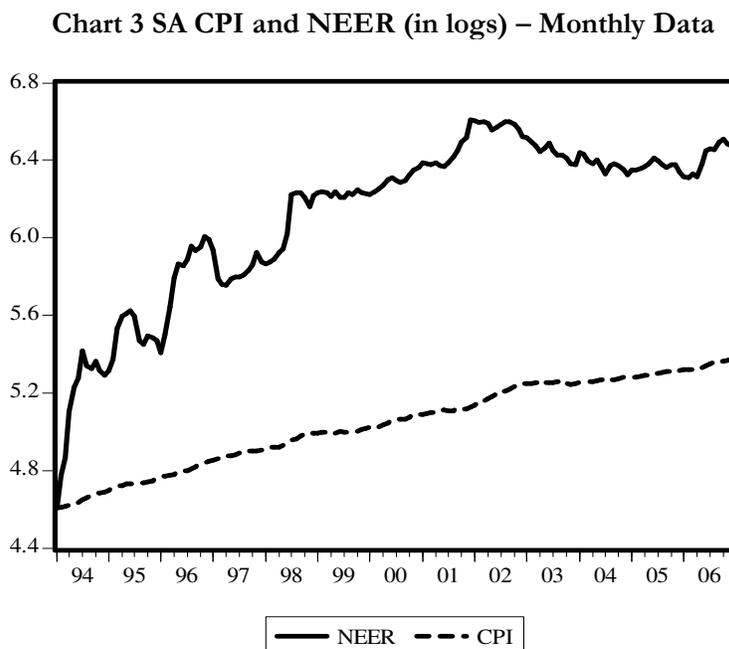
In order to add some more precision to this 'eyeball test', we also estimated the following equation (using quarterly data over our 94-06 sample):

$$p_{C,t} = \alpha_0 + \lambda e_t + \varepsilon_t \tag{12}$$

Where p_C is the CPI price level, α_0 is a constant, e is the nominal effective exchange rate of the rand (NEER) and ε is an error term. The model specified by equation **(12)** then allows us to obtain the dynamics of the CPI price level in terms of a standard error correction model, given by:

$$\Delta p_{C,t} = h_0 + \sum_{i=1}^{n} h_{1i} \Delta e_{t-i} + \gamma_1 ECM_{t-1} + \varepsilon_t \tag{12'}$$

where ECM_{t-1} denotes the deviation of the actual CPI price level from the long-run (equilibrium price level) implied by equation **(12)**, i.e. $ECM_{1-1} = p_{C,t-1} - \alpha_0 - \lambda e_{t-1}$.

Estimation results are reported in Table 7. Our key result is that the degree of exchange rate pass-through (from the NEER to the CPI) is about <u>20 percent</u> across the 94-06 sample.[22]

Table 7 Model Specification with Quarterly Data: CPI Price Level and NEER

Dependent Variables (Right)	CPI[23]
Independent Variables (Down)	
EQUATION #	**(12)**
Constant	4.426*
NEER[24]	0.194*
ECM coefficient	-0.042*

* Indicates significance.

3.2 Some Evidence on Producer Currency Pricing versus Pricing to Market

As said earlier, strictly speaking the implication of PCP – the fact that the domestic and overseas selling price of the home (SA) good are set in domestic currency/rand terms – is that the latter price, p_H is <u>independent of the level of the nominal exchange rate</u> as it is set in domestic currency/rand terms. The empirical implication of this is that in case of full PCP there should be no correlation between the domestic (SA) export price and the nominal exchange rate of the rand. Further, under PTM/EPP the empirical implication would be that of no correlation between SA's unit export revenue (its export price) and the nominal exchange rate of the rand. We will now provide some empirical evidence for SA regarding the likelihood of PCP and PTM.

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[22] Schaling (2007a) in a calibrated model finds exchange rate pass-through to be quite a bit higher: 37 percent from imported goods to the CPI. Here 10 percent is accounted for by the imported <u>final</u> goods-CPI channel, and 27 percent by the imported <u>intermediate</u> goods-CPI channel.

[23] SARB - 7032N (2000=100). Monthly series converted to quarterly series.

[24] Nominal effective exchange rate of the rand consistently excl. Zimbabwe: Average for period (5369M). We have transformed the series according to the European definition of the exchange rate (increase means depreciation); that is, minus 1* (BOP5369M) plus 200. Next, we have re-based the series to Jan 1994 (Jan 1994 = 100).

Some initial evidence is provided by Chart 4 below. This chart suggests a <u>strong positive correlation between the NEER and the SA export price; that is it idicates the presence of PTM/EPP not PCP</u>.

Chart 4 Implicit Price and NEER (Logs) – Quarterly Data[25]

Implicit_price (Left axis) ─ ─ ∙ NEER
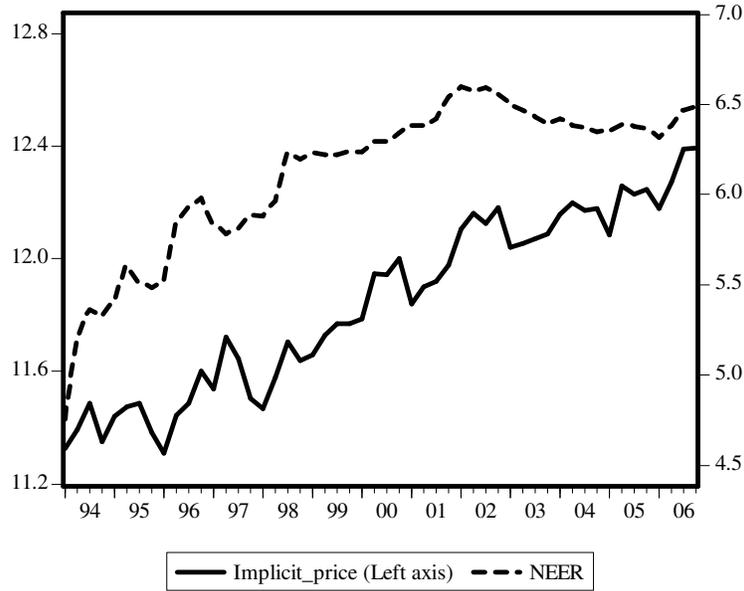
In order to provide some more rigor we also estimated equation **(13)** below.

$$p_{H,t} = \alpha_0 + \lambda e_t + \varepsilon_t \tag{13}$$

Note that the limit where $\lambda \to 0\,(\lambda \to 1)$ of equation **(13)** is exactly the case of PCP(PTMP).

The model specified by equation **(13)** then also allows us to obtain the dynamics of the export price in terms of a standard error correction model, given by:

$$\Delta p_{H,t} = h_0 + \sum_{i=1}^{n} h_{1i}\Delta e_{t-i} + \gamma_1 ECM_{t-1} + \varepsilon_t \tag{13'}$$

where ECM_{t-1} denotes the deviation of actual exports from equilibrium exports implied by equation **(13)**, i.e. $ECM_{1-1} = p_{H,t-1} - \alpha_0 - \lambda e_{t-1}$.

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[25] The implicit price is the difference of logs of total exports excluding gold and the log of the export index excluding gold. This gives us the implicit price per unit of total exports.

Table 8 Model Specification with Quarterly Data: Implicit Export Price and NEER

Dependent Variables (Right)	Implicit Export Price
Independent Variables (Down)	
EQUATION #	**(13)**
Constant	6.829*
NEER[26]	0.903*
ECM coefficient	

* Indicates significance.

Estimation results are reported in Table 8. Our key result is that the correlation between the nominal exchange rate and the SA export rice (in rand) is 0.903 across the 94-06 sample. Thus these results bring the visual impression of Chart 4 into very sharp focus and indicate a <u>nearly perfect correlation between the NEER and the SA export price; that is it idicates the presence of PTM/EPP not PCP</u>.

3.3 The Link Between Exchange Rate Depreciation, Competitiveness and Growth

We now present our empirical work on the link between competitiveness – the real effective exchange rate of the rand - and the trade balance in South Africa. We find that for the period 1994-2006 there is no robust statistical evidence that <u>net</u> exports is boosted by a weaker real effective exchange rate. Further, consistent with the presence of PTM/EPP rather than PCP, we find that exports are more driven by the international economy than by the exchange rate (the elasticity of foreign economic activity is much larger than the elasticity with respect to the REER). Finally – and consistent with the absence of a strong positive link between next exports and the real exchange rate - we find that the well-known Marshall-Lerner condition doesn't hold.

3.3.1 Data and Descriptive Statistics

All quarterly data series were collected (or computed) over the 1994-2006 sample period. In estimation we employ the following time series:
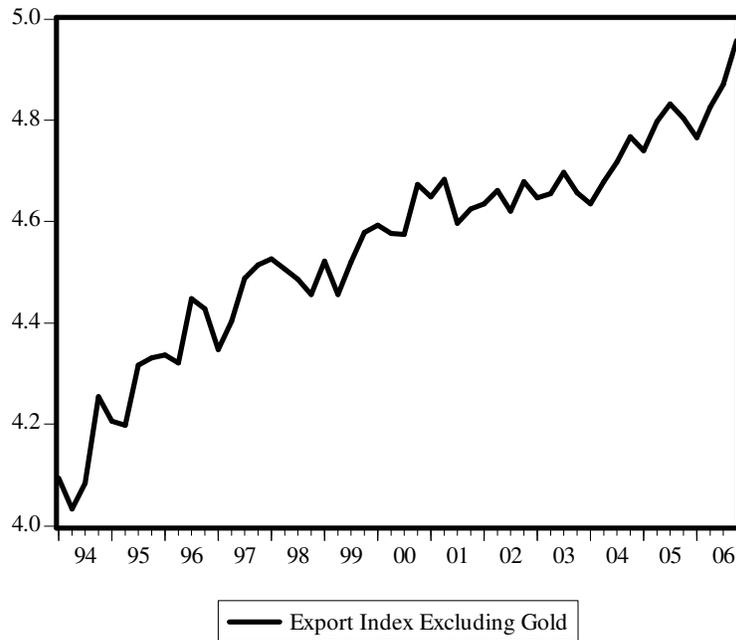
- For exports volumes, export index excluding gold (index number). The source is the SARB. Chart 4 illustrates.

- For total imports, import index (index number). The source is the SARB. Chart 5 illustrates.

- The real trade balance is simply the difference between exports volumes and imports volumes. What is notable is that the univariate properties of the trade balance (i.e. difference between export index excluding gold and the import

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[26] Nominal effective exchange rate of the rand consistently excl. Zimbabwe: Average for period (5369M). We have transformed the series according to the European definition of the exchange rate (increase means depreciation); that is, minus 1* (BOP5369M) plus 200. Next, we have re-based the series to Jan 1994 (Jan 1994 = 100).

index) in the data set (1994:1 – 2002:4) is stationary at levels except when we include the intercept term. After 2002 the series unambiguously becomes stationary after differencing once. Chart 6 illustrates.

- For the real effective exchange rate we employ the published SARB series. Chart 7 illustrates.

Chart 4 Export Index Excluding Gold – Quarterly Data[27]

Chart 5 Import Index – Quarterly Data[28]
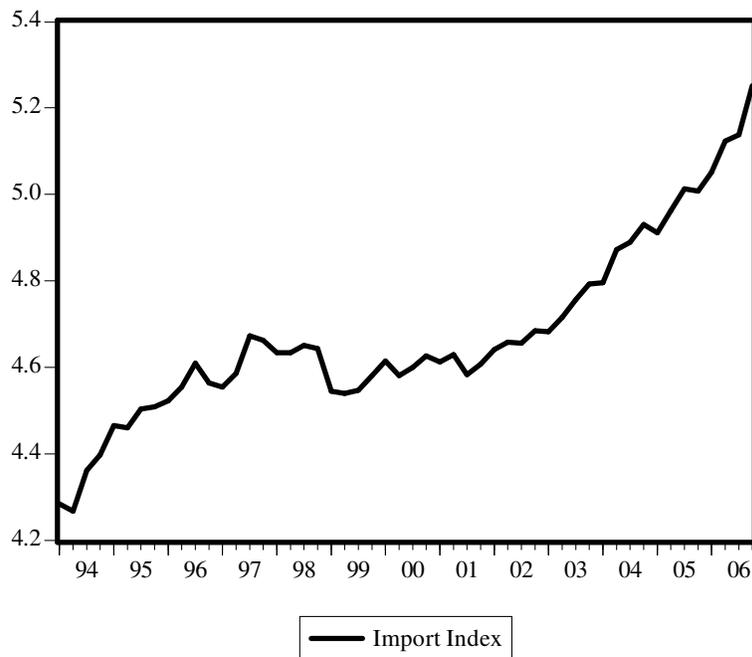
Import Index

Chart 6 Trade Balance– Quarterly Data[29]

Trade Balance (Index form)

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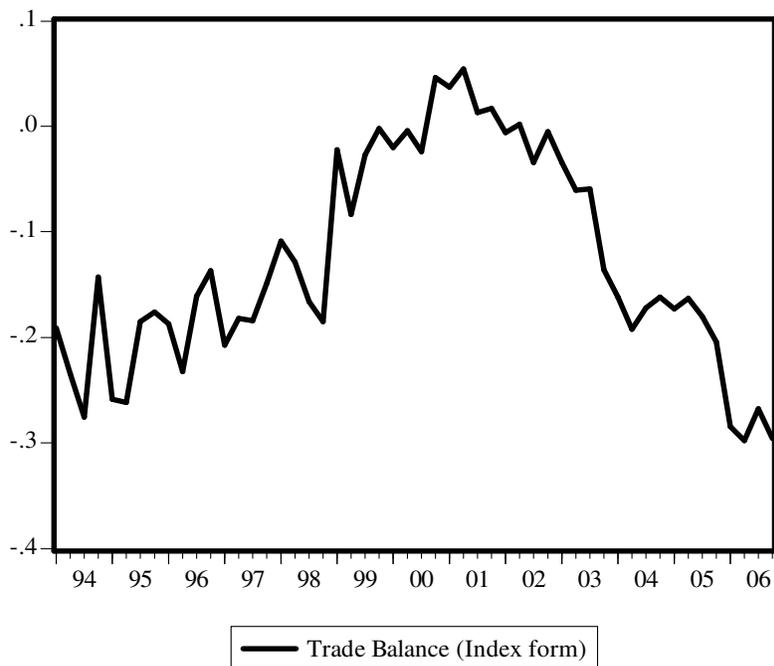
[28] SARB series: KBP5034L.

[29] Trade balance series was computed as the difference between export index excluding gold (SARB series: KBP5032L) and the import index (SARB series: KBP5034L). What is notable is that the univariate properties of the trade balance (i.e. difference between export index excluding gold and the import index) in the data set (1994:1 – 2002:4) is stationary in levels except when we include the intercept term. After 2002 the series unambiguously becomes nonstationary in levels.

Chart 7 Exports Index Excluding Gold and REER (in logs) – Quarterly Data
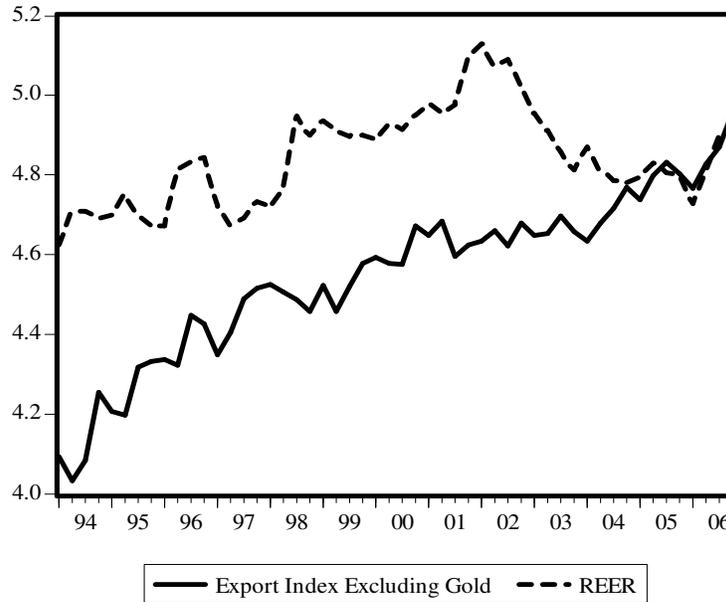
3.3.2 Model and Test Procedure

As said earlier here the aim is to estimate separate dynamic equations for imports and exports. The idea is to relate real imports and exports to the real effective exchange rate of the rand. We employ the Johansen VECM estimation framework. Johansen techniques of estimation are now standard. Relevant references are Johansen (1998) and Johansen and Juselius (1990, 1992).[30] More specific, we estimated the following equations:

$$b_t = \alpha_0 + \eta_x s_t + \alpha_2 y_t^* + \varepsilon_{1t} \tag{3}$$

$$m_t = \beta_0 + \eta_m s_t + \beta_2 y_t^i + \varepsilon_{2t} \tag{4}$$

where α_0, β_0 are constants and variables are in natural logs, more specific $s = p_F - p_H$ is the <u>real</u> exchange rate of the rand, p_H is the price that home (SA) firms charge home and foreign consumers (in rand), p_F is the price that foreign firms charge SA consumers (also in rand), y^i is domestic economic activity (South Africa's coincident indicator), y^* is foreign economic activity (foreign leading indicator), and $\varepsilon_{1,2t}$ are error terms.

The model specified by equations **(3)** and **(4)** then allows us to obtain the dynamics of exports and imports in terms of a standard error correction model, given by:

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[30] See also the brief exposition in Fedderke and Schaling (2005), who employ this framework in the context of an inflation forecasting model for South Africa.

$$\Delta b_t = h_0 + \sum_{i=1}^{n} h_{1i}\Delta s_{t-i} + \sum_{j=1}^{m} h_{2j}\Delta y^*_{t-j} + \gamma_1 ECM_{1,t-1} + \varepsilon_{1t} \qquad \textbf{(3')}$$

$$\Delta m_t = k_0 + \sum_{i=1}^{n} k_{1i}\Delta s_{t-i} + \sum_{j=1}^{m} k_{2j}\Delta y^i_{t-j} + \gamma_2 ECM_{2,t-1} + \varepsilon_{2t} \qquad \textbf{(4')}$$

where $ECM_{1,t-1}$ denotes the deviation of actual exports from equilibrium exports implied by equation **(3)**, i.e. $ECM_{1-1} = b_{t-1} - \alpha_0 - \eta_x s_{t-1} - \alpha_2 y^*_{t-1}$ and $ECM_{2,t-1} = m_{t-1} - \beta_0 - \eta_m s_{t-1} - \beta_2 y^i_{t-1}$ is the deviation of actual imports from equilibrium imports implied by equation **(4)**. Estimation results are reported in Table 9.

Table 9 Preferred Model Specifications with Quarterly Data: Exports and Imports

Dependent Variables (Right)	Export index excluding gold[31]	Import index[32]
Independent Variables (Down)		
EQUATION #	(3)	(4)
Constant	-4.883*	-1.888*
REER[33]	0.359*	0.336*
Foreign leading indicator[34]	1.680*	
South Africa's coincident indicator[35]		1.042*
ECM coefficient	-0.463*	-0.241*

* Indicates significance.

As can be seen from Table 9, the long-term price elasticity of the demand for <u>imports</u> was found to be 0.336. Note that this elasticity is positive rather than negative.[36] The long-term price elasticity of exports (excluding gold) was found to be 0.359, which has the expected sign. Plugging these numbers into the standard version of the Marshall Lerner condition we have 0.359 >? 1+ 0.336. Thus, the <u>standard version of the ML condition is not satisfied</u>. This means that over the 1994-2006 sample period – in the long run – real depreciations did not improve the trade balance even when we excluded price-insensitive components such as gold.

Although we do not use exactly the same variables as Edwards and Lawrence (2006) (hereafter EL), there are however some similarities with respect to the values of the estimated coefficients. For instance, in their export equation the 'foreign output' coefficient is more than unity in most estimations. In two instances in Table A.3.6. that coefficient is 0.93 – but overall it is larger than 1. For more details on a comparison between our empirical results and those of EL, see Appendix A.3.

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[31] SARB series: KBP5030L: Index 2000 = 100. Seasonally adjusted.
[32] SARB series: KBP5032L (Index 2000 = 100)
[33] SARB series: KBP5369M.
[34] SARB series: KBP7095N.
[35] SARB series: KBP7091N; Index 2000 = 100. Seasonally adjusted monthly series – converted to quarterly.
[36] Here explain why this may be the case, i.e. misspecification etc.

3.4 The Link Between Exchange Rate Volatility and Growth

One point of critique that could perhaps be levied against the analysis above is that is formulated in <u>levels</u>, and that it therefore tells us nothing about exchange rate <u>volatility</u>. We now address this point, and show that the results derived above can be used directly to inform us about the link between exchange rate volatility and growth.

First, note that equation **(3)** also allows us to tell a story about the effects of real exchange rate <u>volatility</u> on exports. This can be seen after we take variances which yields:

$$Var(b) = (\eta_x)^2 Var(s) + (\alpha_2)^2 Var(y^*) + \sigma_{\varepsilon 1}^2 \qquad \textbf{(14)}^{[37]}$$

So the volatility (variance) of real exports is directly proportional to – inter alia – the volatility of the real exchange rate $Var(s)$.

Similarly, for the variability of import volumes we get

$$Var(m) = (\eta_m)^2 Var(s) + (\beta_2)^2 Var(y^i) + \sigma_{\varepsilon 2}^2 \qquad \textbf{(15)}$$

Now, in order to derive an expression for the volatility of <u>growth</u> as explained by the volatility of the trade balance, we use the (log-linearized) equation for real GDP **(2)**. If in that expression - for ease of exposition we set $c = i = g = 0$ - and use results **(14)** and **(15)** we get

$$Var(y) = \mu^2 \left[\left[(\eta_x)^2 + (\eta_m)^2 \right] Var(s) + (\alpha_2)^2 Var(y^*) + (\beta_2)^2 Var(y^i) + \sigma_{\varepsilon 1}^2 + \sigma_{\varepsilon 2}^2 \right] \qquad \textbf{(16)}$$

This means that the volatility of output (or 'growth') can be neatly explained by real exchange rate volatility, the volatility of domestic and foreign economic activity and the error terms in regression equations **(3)** and **(4)**.

Using the estimated coefficients $\eta_x = 0.359$, $\eta_m = 0.336$, $\alpha_2 = 1.680$, $\beta_2 = 1.042$, $\mu = 0.296^{[38]}$ - and setting $Var(y) = \sigma_{\varepsilon 1}^2 = \sigma_{\varepsilon 2}^2 = 0$ - we find that the (ex post) volatility in SA GDP or 'growth' is described by

$$Var(y) = 0.09 \left[0.24 Var(s) + 2.82 Var(y^*) \right] \qquad \textbf{(17)}$$

This suggests that the volatility of SA output growth (via the trade balance) is largely driven by <u>international business cycles</u> (0.25), rather than by <u>real exchange rate</u>

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[37] Throughout we have assumed zero covariances. Further, note that our analysis is about ex post volatility, not ex ante volatility. The latter measure may be more relevant for real-time decision making.

[38] The number for μ is based on a calibrated share γ of imported (final plus intermediate) goods in the SA consumption basket of 0.37 (see Schaling (2007a)) and has then been converted to μ using the definition $\gamma = \hat{M}/\hat{C} = \hat{M}/\hat{Y}^* (\hat{Y}/\hat{C})$. For $\hat{Y}/\hat{C}$ we have used 1.25, which assumes a constant consumption share of 80 percent in GDP.

variability (0.02). In fact, we find that the international business cycle is more than 12 times as important for SA as the real exchange rate! Moreover, the implied coefficient on $Var(s)$ at 0.02 is larger than the effects found by Aghion et al (2006).[39]

4. EXCHANGE RATE TARGETING AND EVALUATION OF SA'S INFLATION TARGETING REGIME

In this section we address some of the criticisms of the Harvard Team with respect to the present architecture of SA's inflation targeting regime. Broadly speaking, there are two lines of critique. First, Frankel, Smit and Sturzenegger (2006) (herafter FSS) suggest that when an economy faces important supply shocks, inflation targeting exacerbates the business cycle and not the other way around. More specific, they state that by raising interest rates in response to increases in dollar prices of imports, or negative supply shocks inflation targeting is a procyclical monetary policy response that exacerbates the negative response to output by raising interest rates. Second, Rodrik (2006) argues that since the health and vitality of the formal manufacturing sector has to be at the core of any strategy of *shared growth*, the South African Reserve Bank (SARB) should switch to a modified inflation targeting framework which allows considerations of competitiveness to affect its decision-making. This amounts to suggesting the SARB should target the real exchange rate of the rand and steer the nominal exchange rate accordingly. We start with addresssing Frankel, Smit and Sturzenegger, and then move on to respond to Rodrik.

4.1 Frankel, Smit and Sturzenegger (2006)

According to FSS under (adverse) supply shocks a procyclical inflation targeting monetary policy would exacerbate the negative response to output by raising interest rates. However, as we will show below FSS arre only right when the SARB follows strict inflation targeting (SIT), that is when it has no other objective than fighting inflation. We argue that this is a misrepresentation of SA's actual inflation targeting regime which can be characterized as flexible inflation targeting (FIT). Chart z illustrates.

Here the upward (downward) sloping schedules represent aggregate supply/AS (demand/AD). We use these charts as they are quite a convenient way to convey the essence of the argument without bothering the reader which too much mathematical details.[40] In Chart z the intersection point (y_1, p^*) between the solid curves indicates the intital position of the economy before the adverse supply shock hits with (the) output (gap) at the level y_1 and the inflation rate equal to its target p^*.[41]

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[39] Based on a sample of 83 countries from 1960-2000 they (we) find that a 50 percent increase in the volatility of the exchange rate leads to a 0.33 (1.05) percent reduction in annual productivity growth (growth, not productivity growth).

[40] For more sophisticated mathematical analyses of the proper implementation of (flexible) inflation targeting under the presence of supply shocks and asymmetries in the Phillips curve see Bullard and Schaling (2001) and Schaling (2004), respectively.

[41] We have normalized the initial ($t-1$) price level (in logs) to zero, so we can interpret price level shifts as movements in inflation. In addition, for ease of exposition the inflation target is modeled as a point not as a band.

Chart 9 Strict Inflation Targeting
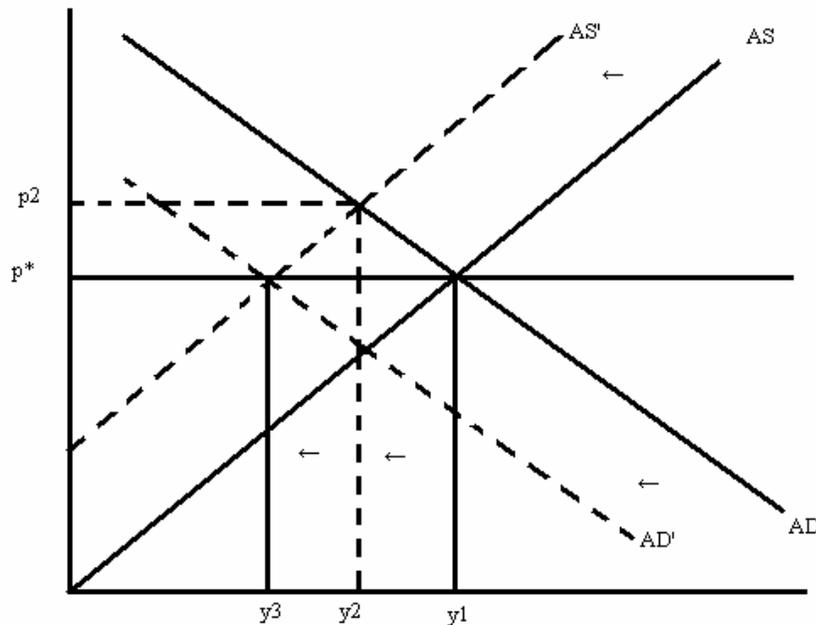
Now, we show the effects of an adverse supply shock. Assume – as in FSS – that an oil price shock pushes the supply curve to the left. This is indicated by the new dotted AS schedule. Without any response from the central bank – that is no movement of the AD curve – inflation will overshoot the inflation target, $p_2 > p^*$ and output will contract; that is $y_2 < y_1$ and the economy will end up at the point (y_2, p_2).

Now, under <u>strict inflation targeting</u> the central bank will raise short-term interest rates to make sure inflation falls back to the inflation target. In terms of this simple picture that would mean making sure the AD schedule also shifts to the left (from AD to AD'), so that the new (third) intersection point (y_3, p^*) would be the one where again we have $p = p^*$. However, at that point the level of output, y_3 would have further contracted to a level where it would lie even below y_2, that is $y_3 < y_2$. This is what FSS mean with the procyclicality of the SA inflation targeting regime. An adverse supply shock pushes inflation above the target, contracts output and - because of the inflation targeting regime dictates this - the central bank worsens the adverse effects on output (the procyclical dimension) by raising interest rates thereby lowering output even further. In fact, it should be noted that the model FSS use to illustrate their argument is a SIT model.[42]

However, this is not the practice of inflation targeting in South Africa. The main reason is that the inflation target is formulated as a <u>band,</u> not as a point. This allows the SARB quite a bit of flexibility. For instance, in the case of the adverse supply shock above it would not squeeze all the excess inflation (here $p_2 - p^*$) out of the

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[42] See FSS (2006, pp. 61-62).

economy but would allow inflation to overshoot the point target somewhat. In monetary policy speak this is called (partially) accommodating the supply shock. Then, under flexible inflation targeting inflation will end up in between its intitial target level and p_2 ($p^* < p < p_2$). As a conseqence of the fact that the SARB doesn't raise rates as aggressively as under SIT, the level of output will contract somewhat compared to the level y_2, but not as much as under SIT (we have $y_3 < y < y_2$).

So, under flexible FIT the SARB would partially accommodate the adverse supply/oil shock, which is exactly what the SARB did over the past few years by allowing inflation – CPI(X) – to approach the upper range of the inflation targeting band.[43] In fact FSS contradict their own argument later when they present empirical evidence supporting that 'monetary shocks have responded in a countercyclical way to supply/external shocks' and (…) 'In fact it seems that monetary policy has been able to achieve a decrease in output volatility as shown in figure 3.4' [FSS (2006, p 66]. Thus, a major motivation for FIT is that this allows the central bank not only to focus on inflation variability, but also on output variability.[44] FSS create the impression that they are not aware of this when they write 'This leads to our recommendation that the SARB should use its hard earned credibility to broaden the scope of its objectives to include the (…) business cycle' [FSS (2006, p. 10].

4.2 Rodrik (2006)

Rodrik (2006, pp. 22-23) says that since the health and vitality of the formal manufacturing sector has to be at the core of any strategy of *shared growth*, the South African Reserve Bank should run a modified inflation targeting framework which allows considerations of competitiveness to affect its decision-making. More specific, he argues that the SARB will need to develop views about the equilibrium real exchange rate - where "equilibrium" refers to satisfactory outcomes in terms of tradable output and employment - and steer exchange rates accordingly.This suggestion appears to be broadly in line with that of FSS when they say 'This leads to our recommendation that the SARB should use its hard earned credibility to broaden the scope of its objectives to include the real exchange rate and the business cycle' [FSS (2006, p. 10].[45]

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[43] Instead, FSS, p. 78 suggest that '(...) [I]nflation-targeting floaters do behave as if their monetary policies tend to respond to increases in dollar prices of oil imports (…) by tightening enough to appreciate the currency'. I believe this is not in line with monetary policy experience in SA during recent years. Perhaps the only noticeable exception would be the 8 June MPC decision, but that I believe was motivated by the wish to prevent further outflows and rand weakening rather than to keep CPI(X) in check.

[44] In the literature FIT is often modeled as follows. Monetary policy is conducted by a central bank with an explicit inflation target an explicit inflation target π* which aims to minimise deviations of inflation from this assigned target, on the one hand, and fluctuations of output around the natural rate (which is normalized to zero below), on the other. Consequently, the central bank will choose a sequence of current and future short-term nominal rates to minimise the following loss

function: $L^{CB} = E_t \sum_{\tau=t}^{\infty} \delta^{\tau-t} [\frac{1}{2}(\pi_\tau - \pi^*)^2 + \frac{\lambda}{2} y_\tau^2]$. Here λ represents the central bank's relative

weight on output stabilisation while the parameter δ (which fulfils $0 < \delta < 1$) denotes the discount factor (i.e. a measure of the policy horizon). Now if $\lambda \to 0$ we have the case of strict inflation targeting. It can be shown – see e.g. Schaling 2001 - that FIT is a linear combination of the cases of SIT and strict output targeting (which would be full, not partial accommodation of the supply shock).

[45] They support their argument with the following equation for the rand [FSS (2006, p. 28]:

A number of objections can be raised against the suggestions by Rodrik and FSS that the SARB should switch to a modified inflation targeting framework which allows considerations of competitiveness to affect ist decision-making.

First, in the context of open economy inflation - forecast - targeting (where for the moment it doesn't matter whether we focus on strict or flexible inflation targeting), targeting CPI(X) implies that the Reserve Bank <u>implicitly</u> already targets a combination of the GDP deflator (or domestic inflation) and the real exchange rate/competitiveness. Here the respective weights would depend on the openness of the economy.[46] To put it simply, if domestic inflation was flat the Bank would have to respond to (forecasts of) real exchange rate depreciation/appreciation anyway.

Second, the actual implementation of SA's inflation targeting framework already constitutes some mangement of the exchange rate. Arguably, the rebuilding of the country's FX reserves that accompanied the recovery of the rand following the 2001 currency crises has dampened quite a bit of the imminent rand appreciation that we would have seen in the absence of this dollar buying.[47] Effectively this amounted to sterilized FX market intervention[48] where arguably one of the obejectives of the intervention (apart from rebuilding reserves) was to stem some of the rand appreciation - driven by dollar weakness and strong capital inflows, associated with

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$$Log \; Rand \; value_t = a + \beta_1 \; Log \; Real \; Price \; Minerals_t + \beta_2 \; Log \; (SA \; GDP/foreign \; GDP)_t$$
$$+ \; \beta_3 \; \Delta Log \; Rand \; value_{t-1} + \beta_4 Inflation \; Differential_t$$
$$+ \; \beta_5 \; Real \; Interest \; Differential_t + \beta_6 Country \; Risk \; Premium_t + \beta_7 \; trend_t + u_t.$$

Here we would like to point out that this specification shows a total disregard of microstructure factors. In addition, there is no a priori recognition of different exchange rate regimes (associated with various types of objectives or intervention behavior). Their equation fits squarely into an old-fashioned 'fundamentals approach' and is therefore subject to standard Lyons (2001) and exchange-rate disconnect puzzle critiques. The empirical relevance of the microstructure critique for South Africa is particularly important in the conext of the 2001 crisis. This is in fact implicitly acknowledged by FSS when they comment on their preferred monthly exchange rate equation: 'The fit, as illustrated in Figure 1.17 for the longer sample period, looks is surprisingly good, though there appears to be no way of accounting for the magnitude of the depreciation in 2001' [FSS (2006, p. 30)].

[46]This can be seen by inspecting equation **(7)**: $p_C = (1-\gamma)p_H + \gamma p_F \Leftrightarrow p_C = p_H + \gamma(p_F - p_H)$. Here he left-hand-side is CPI inflation (or rather the price level), and on the right-hand-side we have domestic inflation (p_H) and the real exchange rate ($p_H - p_F$).

[47] FSS (2006, p. 75) agree with this assessment as they say 'here we note that the South African monetary authorities, as those in most countries that have recently experienced large inflows, have taken the increased demand partly in the form of a higher price (an appreciation of the rand) and partly in the form of a greater supply (more rand assets issued by the Reserve Bank). The proportion of the "exchange market pressure" that shows up in the form of appreciation is less than one might think from the official description of the regime as floating. South Africa shares this property with most other self-described floaters. But the tendency to intervene also looks substantially greater than that of four other commodity-exporting inflation-targeting floaters: Brazil, Australia, Canada and New Zealand. The authors of this paper, despite agreeing on the need for a flexible exchange rate, believe this is probably to the good.'

[48] The way this should be done is suggested by recent literature on the effectiveness of FX intervention [Lyons (2001)], which implies that the (nominal) exchange rate target should be private information of the central bank. Communicating this target to the markets would render the intervention ineffective and hence would not allow the central bank to manage the exchange rate <u>ex post</u>.

relative high returns on EM assets in an environment of ample global liquidity – that was seen as harmful for competitiveness.[49]

On what constitutes the equilibrium real exchange rate, Rodrik says that 'equilibrium' refers to satisfactory outcomes in terms of tradable output and employment- and the SARB should then steer exchange rates accordingly. Well, in order to build a more specific line of critique regarding Rodrik's suggestion to target 'tradeable output', let's assume tradeable output means exports. This seems to be a fair interpretation of Rodrik as his whole paper is about the crucial role of the formal manufacturing sector for the SA economy.

In Section 3 we have estimated the following exports equation:

$$b_t = \alpha_0 + \eta_x s_t + \alpha_2 y_t^* + \varepsilon_{1t} \tag{3}$$

What we found - in terms of the empirical estimates - is that exports respond to the real exchange rate (with a coefficient of 0.359), but that tradable output (exports) responds much more to a change in overseas economic activity (with a coefficient of 1.680). So, taken literally in case we target tradable output in the form of exports, this would mean that any slump (boom) in foreign economic activity should be counteracted with an engineered real depreciation (appreciation).

More specific, for argument's sake suppose that the SARB has a target level of exports at zero (in natural logs), say, so constant in levels. Then rewriting equation **(3)** (where I have set $b_t = \alpha_0 = \varepsilon_{1t} = 0$), yields the result that – if the SARB would be targeting tradable output; here exports - any adverse change in overseas demand would have to be compensated for by a real exchange rate movement in the opposite direction:

$$\eta_x s^{TARGET} = -\alpha_2 y^* \tag{18}$$

Plugging in the estimated elasticities form Section 3 we get $0.359 * s^{TARGET} = -1.680 y^*$. This means basically that any 1 percent decline of foreign economic activity ('world trade') would have to be offset by an almost 5 percent real exchange rate depreciation. Knowing that world trade can be quite volatile, targeting tradable output (here exports) will produce substantial real exchange rate variability. This doesn't seem to be a very desirable by-product of such a policy as we know from the literature that real exchange rate volatility can have a significant adverse impact on the long-term rate of productivity growth [Aghion et al (2006)].

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[49] FSS (2006, p. 31) agree with this assessment, they say 'the global commodity boom was nonetheless responsible for the appreciation of the rand over the recent years. The rand has been a "mineral play" for speculators. The reason is that investorshave piled into South African assets (especially equities), thus bidding up their price (not only in the form of higher rand prices of equities but also) in the form of an appreciation of the currency. Easy money emanating from the world's major central banks (Fed, BoJ, ECB, and PBoC) over the period 2001-2005, together with a possible bubble component over the period 2005-06, have probably been one force (the "carry trade") behind the movement into commodities generally, emerging markets generally, and commoditybased emerging markets in particular.'

Moreover, stabilizing tradable output via real exchange rate movements will be at the expense of CPI inflation variability which in terms of the existing IT framework may require an even wider band than the existing 3-6 percent range (and this would presumably mean raising the upper bound, which will therefore pose serious risks to price stability). I will say more on the appropriateness of the present 3-6 percent range in Section 5.4 below.

Further, given the fact that two key components of the real exchange rate, namely the domestic and foreign price level (respectively p_H and p_F^*)[50] are predetermined variables over which the SARB has no immediate control, the only way in which the real exchange rate can be induced to move is via <u>nominal</u> exchange rate changes. Thus, <u>real</u> exchange rate targeting then implies <u>nominal exchange rate targeting</u>. The risks of targeting the nominal exchange rate – via aggressive FX market interventions - will be outlined in more detail in Section 5.3 below. For now, it suffices to say that for South Africa nominal (and real effective) exchange rate targeting resulted in two currency crises within three years: one in 1996 and one in 1998.

A final objection regarding the implementation of real exchange rate targeting via nominal exchange rate targeting is that this will require quite large movements, and hence volatility of short-term nominal interest rates.[51] This would imply a sizeable cost on the domestic economy (volatility of mortgage interest rates) and is very likely to destabilize the foreign exchange market and the capital account of the balance of payments.

The conclusion of this section is that Rodrik-style policies that try to target the real exchange rate in terms of achieving satisfactory outcomes for tradable tradable output may in fact require quite large swings in real exchange rates (to try to off-set cycles in world trade), which can then have the perverse (unintended) effects of destabilizing macroeconomic growth, CPI inflation, the FX market, short-term nominal interest rates and the capital account of the balance of payments.

4.3 The Dangers of Exchange Rate Targeting

Frankel, Smit and Sturzenegger (2006) (herafter FSS) not only have criticize SA's inflation targeting regime, they also have strong opinions on the desirability of an active exchange rate policy. More specific, they say 'Events in the foreign exchange market are changing so rapidly that it is hard to comment prescriptively. But if the inflows of recent years are sustained in the aftermath of the global bout of turbulence of the spring of 2006, we do have a recommendation, namely that the authorities continue to intervene more heavily than is implicit in the official regime of CPI-targeting floater. One goal is to prevent overvaluation, thereby preserving the non-commodity export sector. Another is to add to the stock of reserves, which is not in the excessive range of many Asian countries' [FSS (2006, p. 77)]. Danny Rodrik (2006) is also

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[50] The real exchange rate is $s = p_F^* + e - p_H$, where e is the nominal exchange rate of the rand (defined as units of domestic currency per unit of foreign currency), p_H is the export price that home (SA) firms charge foreign residents (in rand), p_F^* is the foreign currency (dollar) price of imports.

[51] The latter is completely incosistent with international best-practice monetary policy in small open economies – such as South Africa – where it is crucial that domestic short-term interest rates follow international (world) trends in interest rates as defined by the interest rate decisions of the US Fed, the ECB and the People's Bank of China.

advocating activist FX market interventions. He argues that 'Cross-national evidence indicates that intervention and other monetary policies *can* affect the level of the real exchange rate over the medium term, with important consequences for economic growth (…) [Rodrik (2006, p. 23]. So the Harvard Team also voices strong policy advice on the desirability of exchange rate rate targeting. In this section we will respond to this advice based on SA's experiences with targeting the nominal and real effective exchange rate of the rand in the mid 1990s.

4.3.1 The 1996 Crisis: Mismanagement of Capital Flows by Targeting the Nominal Exchange Rate of the Rand and Ignoring the Lessons from the 1994-95 Mexican Crisis

Between February and November 1996 the Rand depreciated about 22 percent. In the context of the Mexican crisis of 1994-95 (that immediately preceded South Africa's first currency crisis in February 1996), the unintended consequence of Mexico's exchange rate peg was that for years it fostered the expectation of a stable Peso. This expectation influenced the composition of the balance sheets of banks and firms which engaged in practices that resulted in an excessive exposure to exchange rate risk and thus became highly vulnerable to movements in the currency.

This is exactly what subsequently happened in South Africa as well. In the period between February 1995 and March 1996 the Reserve Bank used its discretionary powers to target the exchange rate of the rand. Between especially June 1995 and January 1996 the SARB was using the strong capital inflows to retire the liabilities of the forward book. The arguments for following this policy were to rebuild the country's foreign reserves and to prevent an appreciation of the Rand in order to protect the competitiveness of the export-oriented sector of the South African economy.Preserving this competitiveness led the authorities to absorb such quantities of hard currency inflows that the nominal exhange rate was extraordinary stable throughout most of 1995 and in January 1996. The stability of the exchange rate over this period is evident from Chart 10 below.

Chart 10 Realized Volatility in the Rand
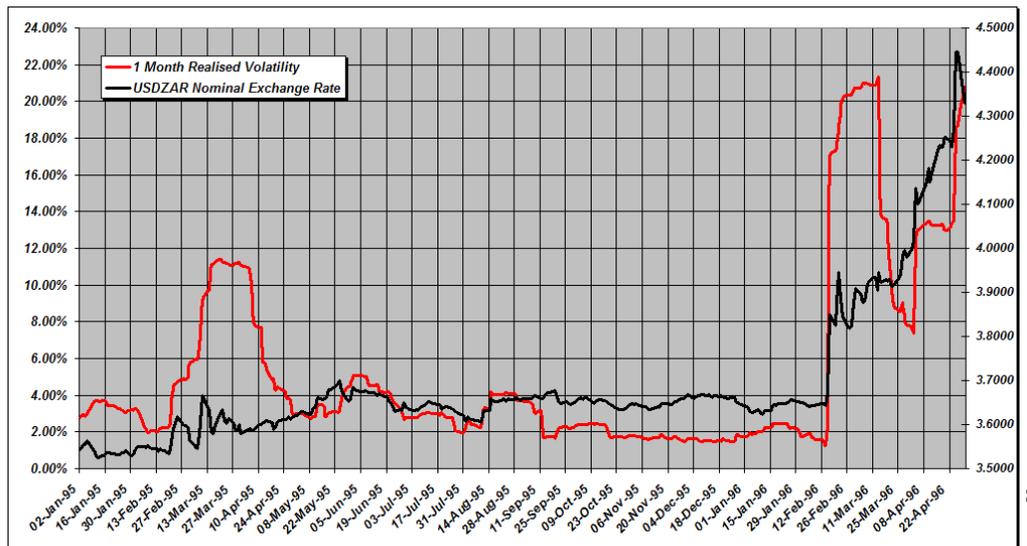
the US dollar, over the same period was about 12 percent monthly. So, the rand – an EM currency – was six times as stable as the US dollar!

Thus, in 1995 the monetary regime (policy model) can be described as – in name monetary targeting and de facto - exchange rate targeting.

A corollary of this extraordinary stability in the exchange rate was that it obviated the use of hedging transactions by non-financial institutions in South Africa, particularly those with import commitments. The average three month forward rate for the period from January 1995 to January 1996 was approximately 700 points. With such a high forward premium – due to the high interest rate differential between South Africa and its main trading partners – importers were quick to reduce forward cover to a minimum and only enter the foreign exchange market when external payments fell due. By contrast a number of exporters entered into trades that assumed substantial risk should the rand devalue substantially over a short period of time. In addition international investors did not hedge their bond (and equity) portfolios. Obviously not buying exchange rate cover worked out cheaper in the short-run and was fine as long as the currency did not move. Clearly, the currency stability lured importers/exporters and investors into a false sense of security and hence distorted risk perceptions.

Thus, the Reserve Bank's actions in 1995 undoubtedly affected the risk profile and horizon of both international investors and domestic hedgers alike. Low perceived currency risk, a clear case of which occurred in 1995, led market participants to assume risk positions and horizons that would not otherwise have been assumed in normal market conditions. This is the first - and most important - lesson from the Mexican crisis that was ignored by the SARB.

The key fault was that was made in 1995 and later caused the currency crisis in 1996 was that the SARB ignored the key lesson from the Mexican crisis and – after the demise of the dual exchange rate system in early 1995 – continued to target the exchange rate of the rand within an extremely narrow band to the US dollar.

This then encouraged short-term capital inflows – mostly of the carry-trade type – that capitalized on the high interest rate differential and low perceived currency risk that South Africa offered. In turn, the continuing inflows enabled the SARB to (i) reduce its NOFP and by (i), (ii) prevent the rand from appreciating. As a result a vicious circle, a 'house of cards' emerged where the capital inflows propped up the exchange rate, the stable exchange rate encouraged more short-term speculative inflows and so on. This state of affairs is illustrated in Figure 1. (This Figure should be read clockwise).

Figure 1 The 1995 House of Cards

Inflows	→	SARB FX Market Intervention	→	**Exchange Rate Stability**
↑				↓
Exchange Rate Stability	←	SARB FX Market Intervention	←	**Inflows**

This figure illustrates that – with hindsight - the interplay between the capital flows (cum exchange rate intervention) and the exchange rate can be characterized as a virtuous – or with hindsight – vicious cycle.

4.3.2 The 1998 Crisis: Targeting the Real Effective Exchange Rate and Misdiagnosing the Spill-Over from the Asian Crisis

In 1997 and early 1998 (prior to the May events) the SARB continued to target the exchange rate – this time the real effective exchange rate of the rand[52] – and rebuilt its foreign exchange reserves. As in 1995 the trade-offs were not presenting any obvious problems as the policy stabilized the (real effective) exchange rate and the NOFP was reduced at the same time.

At the onset of the crisis in May 1998 it should have been clear to the Reserve Bank that the situation it faced was a big international problem unlike the local problem of 1996 where an overvalued and overly stable currency – a direct consequence of the de-facto rand-dollar peg – had reduced the risk premium associated with South-African assets (the excessive currency stability produced a skewed sense of risk with international investors). The trigger of events in 1998 was the re-assessment of risk associated with EM that affected the SA bond market in May 1998. Then, the net-outflow (or stop of inflows) equalled R 3 bn or about 9.7 percent of the cumulated inflows at R 31 bn between 1997 and April 1998. This reversal of the flows is somewhat larger (though not spectacularly so) than that of April 1996[53] when the outflow at R 1.9 bn equaled 6.3 percent of the cumulated inflows between mid 1994 and 1996Q1 at about R 30 bn.[54]

As in 1996, the SARB responded to the outflows with FX market intervention.[55] It did so in spite of an earlier promise to the contrary in 1996. The onset of FX intervention is an important watershed moment as it amplifies –instead of stabilizes - a modest (international event a mere R 3 bn outflow) into a chain reaction of domestic events that quickly buils up into a full-blown crisis. The SARB's policy response to a common exposure related shock to the bond market in May, caused a full-blown currency crisis in June. Like Mexico in 1995, the 1998 currency crisis branched out into a capital flows event – namely the June and July outflows (see Box 1)

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[52] The average weighted value of the Rand against a basket of currencies of South Africa's major trading partners declined by 0.3 percent from 1996-12-31 to 1997-12-31. For practical purposes we can approximate this as zero.

[53] This is not surprising since 1996 was a localized event where it took investors a while (between February and April) to get out of the SA bond market after the collapse of the currency peg. By contrast May 1998 was a clear example of common exposure.

[54] Important to realize is that at this stage the country was not experiencing a capital flows or 'sudden stop' crisis. As in April 1996, in May 1998 there was a temporary interruption of inflows that was simply not large enough to qualify as a sudden stop or capital-flows crisis.

[55] On 25 May the Bank was estimated to have spent R 2 bn on defending the currency. In May as a whole the NOFP increased by about US$ 5.1 bn from US$ 12.754 mn to US$ 17878 mn. Note that this intervention followed the events in Asia where mid 1997 the Thai authorities unsuccessfully tried to defend the Baht, in the process running up costs to the amount of US$ 30 bn. So, this was another lesson from the Asian crisis - and from its own experiences in 1996 - that was completely ignored by the SARB.

Box 1: The 1998 Currency Crisis

The currency crisis only started building in the beginning of June. More in particular, after the market had learned the May NOFP numbers and the Bank cut Repo on 4 June (and later on 12 June) the currency started depreciating about six times as fast as in May and early June. Clearly, cutting interest rated was like waving a red flag at the hedge funds that the authorities were in no mind to raise interest rates to sufficiently high levels to make speculation prohibitively expensive. Further interest rate cuts were instigated on 23 and 26 June, followed by failed coordinated intervention and an off-shore speculative attack.

The subsequent substantial outflows from the bond market - the outflows of R 2 bn and R 5.4 bn between 23-30 June and in July respectively - were <u>induced</u> by the SARB's FX interventions and associated currency depreciation. Thus, these outflows were not the <u>causes</u> but the <u>effects</u> of the currency crisis.

Continuing on the theme of of the outflows, the final huge outflows happen in August when a total of R 6.6 bn of SA bonds were sold. These outflows – like the ones in May – can be explained by the <u>common exposure</u> channel. Thus, the August 1998 outflows - refelecting the Russian debt-moratorium and the spill-over of the crisis to Latin America - were like the May outflows, primitive events ('shocks') rather than effects of domestic policy, and as such somewhat unrelated to the June-July domestic crisis.

Therefore, South Africa was subjected to common exposure issues in May and August 1998. However, the South African Rand crisis took place essentially in <u>June 1998</u> when the currency fell by 13.6 percent (in July the pace of the depreciation slowed to 4.8 percent and the SARB stopped intervening). So, the <u>common exposure episodes pre- and postdate the currency crisis</u> (the rest of the more substantial outflows at R 7.4 bn were <u>induced</u> and hence <u>effects</u> of the currency crisis). This means that the 1998 South African financial crisis was mainly a <u>currency crisis</u>, unintentionally created by responding incorrectly to the relatively minor outflows in May.

One of the mistakes made in 1998 was that by intervening massively in the FX market – and continuing to do so - when the rand was weakening (thus without any obvious effects on the currency), the Reserve Bank created essentially a one-way bet for speculators. Almost at any price there would be a willing (and perhaps the only) buyer of rand namely the South African Reserve Bank. It is not hard to see how this one-way market (without the normal characteristics of two-way risk) fuelled the speed of the depreciation. As a consequence, the 'managed floating regime' of 1998 became intrinsically unstable, and as in 1996 earlier contained the seeds of its own collapse.

4.4 Suggestions for Modifying SA's Inflation Targeting Framework

After having critized the Harvard Team's suggestions with respect to SA's IT regime we now present our own recommendations.

We know that the monetary policy <u>objectives</u> of the SARB are defined as price stability according to SARB Act.[56] The way achieving price stability is being <u>implemented</u> is via an inflation targeting regime. This regime was introduced in February 2000.

Currently the target range is between 3 and 6 percent for CPI(X):

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[56] The South African Reserve Bank is the central bank of the Republic of South Africa. It regards its primary goal in the South African economic system as *" the achievement and maintenance of price stability".* More specific, The Act of 1989, the regulations framed in terms of this Act and sections 223 to 225 of the Constitution of the Republic of South Africa (Act No 108 of 1996) currently provide the enabling framework for the Bank's operations. The Act and regulations describe the framework of the Bank, the way in which it is managed and the actions it may take. In addition, the Constitution prescribes that the aim of the Bank's operations shall be low inflation and stable financial conditions.

$$3 \le \Delta p_{CX} \le 6 \qquad\qquad\qquad\qquad\qquad\qquad\qquad (19)$$

This target has been achieved for 44 consecutive months, but breached the upper end on 30 May 2007 when CPI(X) reached 6.3 percent. Note that this was already expected to happen by market participants in the first half of 2007 as far back as October 2006! Also note that this is not the first time the target was missed: after IT was introduced in 2000 the SARB missed the 3-6 percent target in 2002, the first year it took effect.

It should be pointed out that with inflation currently running at 6 percent the SA price level doubles in 13 years, triples in 20 years and quadruples in 25 years. Thus, the upper bound at 6 percent is incompatible with the Bank's objective of price stability as defined by the SARB Act.[57]

Now international best practice with respect to inflation targeting is to

1. start with reducing inflation and to make sure it sits comfortably within an inflation reduction band, and then

2. to move to achieving price stability by announcing an inflation control band where the new more narrow band lies inside the initial inflation reduction band.

A point in case is Canada. The inflation-reduction targets in Canada were jointly announced by the Bank and the government on February 26, 1991. The targets set out an explicit path towards price stability. The first guidepost was set for the end of 1992 (22 months after the announcement) and provided for a 12-month rate of increase in the CPI of 3 percent, to be followed by 2 1/2 percent for mid-1994 and 2 percent by the end of 1995, each with a band of plus and minus 1 percent. It was specified that after 1995 there would be further reductions of inflation until price stability was achieved. The inflation control band established by the Bank of Canada and the federal government currently extends from 1 to 3 per cent. The background to the inflation control target is the following. By December 1993, inflation had been reduced to 2 per cent. At that time, the government and the Bank agreed to extend the inflation-control target range to the end of 1998. The target range was 1 to 3 per cent. In February 1998, the target range was extended to the end of 2001. In May 2001, the 1 to 3 per cent target range was renewed to the end of 2006.

So, here is what we propose for South Africa. After consultations with the SARB, National Treasury should announce a new inflation control band that lies within the present inflation reduction band in such a way that the mid-point of the new band is consistent with what central bankers around the world consider to be an operational definition for price stability, i.e. 2 percent. For example,

$$x \le \Delta p_{CX} \le y \qquad\quad \text{where say } 1/2(x + y) = 2 \ (\text{e.g } x = 1 \text{ and } y = 3) \qquad (20)$$

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[57] Of course, since its adoption the SARB did book some success with respect to reducing inflation: CPI(X) inflation was reduced from 7.7 percent in February 2000 to 6.3 percent presently.

With the new upper range at 3 percent, say, the <u>price level</u> now will now only double every 25 years, triple in 38 years and quadruple in 48 years.[58]

Conventional wisdom is that the above suggestions are very difficult to implement in South Africa as reducing inflation – which is effectively what we are doing when we require inflation to remain within a more narrow band - is not possible in South Africa as it would cause a major recession.

However, in Hoeberichts and Schaling (2006) we show that a central bank may try to convince the private sector of its commitment to price stability –essentially manage inflation expectations - by choosing to reduce inflation quicker. We call this 'teaching by doing'. We find that allowing for 'teaching by doing' effects always speeds up the optimal disinflation (an optimal disinflation trades-off the benefits of lower inflation versus the costs of a recession). [59]

5. ADDITIONAL INSTRUMENTS TO LIMIT EXCHANGE RATE VOLATILITY AND SUPPORT COMPETITIVENESS OF THE NON-COMMODITIES TRADABLE SECTOR

5.1 Towards Price Stability and Increased Competitiveness

We find that <u>reducing</u> inflation quicker – which can be done optimally with lower output costs than conventionally thought - has the atttractive by-product of <u>depreciating</u> the real exchange rate, and thereby <u>increasing</u> competitiveness. To see this, we realize that the CPI inflation rate can be written as

$$\Delta p_C = (1-\gamma)\Delta p_H + \gamma \Delta p_F \Leftrightarrow \Delta p_C = \Delta p_H + \gamma \left(\Delta p_F^* + \Delta e - \Delta p_H\right) \qquad (7)$$

Table 10 illustrates the implications of a more narrow inflation targeting range for the level and rate of change of the real exchange rate.

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[58] One disadvantage of a more narrow range is that this will limit the Reserve Bank's ability of monetary accommodation of adverse supply shocks (see the analysis in Section 4.1 above). So, just reducing the range without any further modifications to the framework is that it will move IT from flexible to strict inflation targeting with less room for stabilization policy. One way out of this dilemma may be to exclude more items from the CPI than just mortgage interest payments. It seems that in practice the SARB does not feel comfortable anyway with reacting to fuel- and food-related inflation pressures. So one idea here is to change the target index from CPI(X) to a measure of core inflation. The question is whether such a strategy will work though. If unions keep on basing wage demands (inflation expectations) on some measure of headline inflation than the greater gains of extra room for business cycle stabilization may be short-lived and quickly be eroded by higher inflation and lower SARB credibility.

[59] See also Schaling (2003).

Table 10 Reducing Inflation Target Range and Effects on Competitiveness*

Period	Δp_c	Δp_F^*	Δe	Δp_H	$\Delta s =$ $\Delta p_F - \Delta p_H$	$s_t =$ $\Delta s_t + s_{t-1}$
t	4.5	5	5	5	5	5**
$t+1$	2	5	5	2.22	7.78	12.78

*All numbers are computed assuming $\gamma = 0.10$.

** We also assume that $p_{c,t-1} = p_{F,t-1}^* = e_{t-1} = p_{H,t-1} = 0$.

Assume that intitally (at time t) CPI inflation is sitting at the mid-point of the present targeting range, that is at 4.5 percent (column 1 of Table 10), and that foreign inflation and the nominal exchange rate remain unchanged, i.e. $\Delta p_F^* = \Delta e = 5$ in both rows 2 and 3 of this table (so that $\Delta p_F = \Delta p_F^* + \Delta e = 10$). Then, assuming $\gamma = 0.10$ equation **(7)** reads $4.5 = 0.9\Delta p_H$. So, this would imply a <u>domestic</u> inflation rate of 5 percent (row 2, column 5).

Now, let's assume everything stays as before but now (at time $t+1$) NT reduces the midpoint of the CPI(X) inflation targeting range from 4.5 to 2 percent (in line with the proposed new 1-3 percent target range from Section 4.4, see column 1, row 3):

$$x \leq \Delta p_C \leq y \qquad \text{where say } 1/2(x + y) = 2 \text{ (e.g } x = 1 \text{ and } y = 3) \qquad \textbf{(20)}$$

Then, we have $2 = 0.9\Delta p_H$. Thus, the fall in CPI(X) from 4.5 to 2 percent (3.5 percentage points) will then imply a reduction of <u>domestic</u> inflation from 5 percent to 2.22 percent (see row 3 column 5); that is a reduction of 2.78 percentage points. Now, without any change in foreign inflation and the nominal exchange rate (both remain at $\Delta p_F^* = \Delta e = 5$ in row 3) this means that the *level* of the real exchange rate $s = p_F^* + e - p_H$ will have <u>depreciated</u> (from 5 to 12.78). Therefore, reducing domestic inflation – here engineered by a more narrow CPI inflation targeting band – and increasing competitiveness go hand in hand!

In Section 4.2 in our critique on Rodrik (2006) we have explained that in the context of open economy inflation targeting), targeting CPI(X) implies that the Reserve Bank <u>implicitly</u> already targets a combination of the GDP deflator (or domestic inflation) and the real exchange rate. Here we have used this interlinkage to show that if the monetary authorities would be interested in targeting competitiveness via the real exchange rate, a good way to do this is by narrowing the present inflation targeting band from the present 3-6 percent, to say 1-3 percent. Not only is this targeting range more consistent with the SARB's objective of '*the achievement and maintenance of price stability*', it has the added potential benefit of <u>supporting competitiveness of the (non-commodities) tradable sector of the SA economy</u>. Put differently, the present targeting range of 3-6 percent and its implications for domestic inflation (in April 2007 SA producer price inflation was sitting at 11.1 percent) are not only inconsistent with price stability, but also with promoting competitiveness.

It is better to try to achieve a more competitive (weaker) real exchange rate via a <u>lower CPI(X) inflation rate</u> than via a weaker <u>nominal</u> exchange rate. The reason is

that if we implement boosting competitiveness via a weaker nominal exchange rate, we will definitely suffer the macroeconomic consequences of a higher CPI(X) inflation rate, but without enjoying any likely macroeconomic growth benefits in terms of higher net-exports). However, if we implement boosting competitiveness via a reduction of the IT targeting range as proposed above the effect on inflation is reversed. That is, we will enjoy the macroeconomic benefits of lower CPI(X) inflation coupled with with some benefits for SA exporters. If the positive macroeconomic effects on net-exports do not materialize – which is an extremely likely outcome given the fact that over the 1994-2006 sample period real exchange rate depreciations did not improve the trade balance and therefore had no positive effect on growth – and real economic benefits simply amount to implicit subsidization of the export sector, than we can still reap the definite macroeconomic benefits of a lower inflation rate.

5.2 Asymmetric Foreign Exchange Market Intervention

In the present section we propose some suggestions and restrictions on foreign exchange market intervention policy that provides some tools for both the prevention of financial crises and smoothing of excess foreign exchange market volatility.

Why hold Reserves?
In order to prevent potential financial (liquidity) crises it is recommended that the South African Reserve Bank (SARB) should hold a substantial amount of foreign exchange reserves.[60] The holding of foreign currency reserves can be justified on a number of grounds. For example, it is common practice amongst emerging market economies (EM) to hold foreign exchange reserves, were it only for the reason that financial markets (i.e. investors and rating agencies, among others) judge a country's financial position – e.g. its international liquidity – in terms of its level of reserves.[61]

Another motivation used to justify the ambition to hold (or increase) foreign reserves is that foreign exchange reserves are an important policy tool as those reserves facilitate intervention in the FX market and can thus be seen as a proxy for the capacity of the central bank to intervene in the FX market. So, this level of reserves then captures a central bank's intervention capacity (the capacity to purchase local currency in exchange for foreign currency), and an increase in foreign reserves means an increase in intervention capacity (which may or may not be used to actually intervene in the FX market).[62]

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[60] International reserves are assets that can be used directly for the settlement of international debts, and payments to foreign countries. Such assets include securities, bank deposits, gold, special drawing rights (SDR's), and reserve positions in the IMF. Foreign exchange reserves are those international reserves – typically securities or bank deposits – denominated in a foreign currency, rather than gold or SDR's.

[61] For example, as recent as May 2001, trading in the foreign exchange markets and in the rand was very much influenced by the existence of the NOFP and the Forward Book, with the NOFP still registering a negative balance of US$ 9 bn, in spite of significant progress that had been made in reducing it from the precarious levels of over US$23bn in 1998. This was seen as a negative factor by rating agencies and investors, and the SARB was constantly called upon to explain how they were going to deal with that situation.

[62] Note that an increase in intervention capacity may or may not have implications for gross and/or net government debt, depending on how the increase in reserves is financed. This will be discussed in more detail under the fiscal impacts of reserves (see Appendix B).

Key Considerations given South Africa's Experience with Intervention
An important consideration that should further guide the suggestions with respect to foreign exchange market intervention is that the SARB does not have a very good track record with respect to supporting the currency at times of cyclical lows. The typical outcome after the currency crises of 1996 and 1998 was a substantial loss of reserves (via a very large NOFP), severe currency depreciation, and prolonged periods with high interest rates and lower cyclical output. This suggests limiting central bank discretion by trying to induce intervention capacity - for market stabilization purposes - to lie in a range that implies

- Limited ability to support the currency at cyclical lows
- Limited funding costs of reserves
- Limited potential losses on foreign exchange market intervention at cyclical lows

In South Africa interventions have typically been more effective (and less costly) when the currency was at a cyclical high, than at a cyclical low. More specifically, the SARB has been more successful in dampening the appreciation of the rand in periods such as 1995, 1997 and after the 2001 crisis, than in stemming currency depreciation during periods of capital outflows such as 1996 and 1998.[63] Some evidence for this is also provided by Box 2 which tries to estimate the cost of the 1996 FX market interventions.

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[63] The years 1995 and 1997 were characterized by strong capital inflows.

Box 2 South Africa: The 1996 Cost of FX Market Intervention*

From February through December 1996 the NOFP grew by US \$14 billion. To calculate the revaluation losses that the South African taxpayer would ultimately have to foot from the SARB's forays into the foreign exchange market, assume that the SARB on average used the six-month forward market to offer support to the market. Also assume that the month end spot rate and the month end forward rate were used by the SARB in its intervention activities. The table below sets out the cumulative losses from the outstanding NOFP at end February 1996 and the monthly additions to the NOFP over the course of 1996. The bold figures represent the rollover of six-month swap contracts by the SARB with market participants from August 1996 This assumes the entire NOFP outstanding balance of US \$8,118 Billion was financed by a six-month swap trade at the end of February 1996. Although the table below* is a relatively simple representation of the SARB's intervention activities, it does materially represent the quantum of losses suffered by the SARB, for account of the South African taxpayer, by end-1996.

Date	NOFP Core and Monthly Increases	Monthly Swaps	Rand Equivalent ZAR Billion
Feb-96	\$8,118	3.8025	-R 30,869
Mar-96	\$401	4.0425	-R 1,621
Apr-96	\$3,782	4.1470	-R 15,684
May-96	\$1,310	4.5550	-R 5,967
Jun-96	\$80	4.5800	-R 366
Jul-96	\$1,400	4.5305	-R 6,343
Aug-96	\$1,301	4.7445	-R 6,173
Sep-96	\$422	4.7050	-R 1,986
Oct-96	\$3,086	4.7580	-R 14,683
Nov-96	\$1,035	4.9525	-R 5,126
Dec-96	\$1,232	4.8855	-R 6,019
Aug-96	**-\$8,118**	**4.4870**	**R 36,425**
Feb-97	**\$8,118**	**4.7445**	**-R 38,516**
Sep-96	**-\$401**	**4.5370**	**R 1,819**
Mar-97	**\$401**	**4.7580**	**-R 1,908**
Oct-96	**-\$3,782**	**4.6925**	**R 17,747**
Apr-97	**\$3,782**	**4.9525**	**-R 18,730**
Nov-96	**-\$1,310**	**4.6130**	**R 6,043**
May-97	**\$1,310**	**4.8855**	**-R 6,400**
Dec-96	**-\$80**	**4.6760**	**R 374**
Jun-97	**\$80**	**4.9260**	**-R 394**
End 1997 NOFP Balance	\$22,167	**4.4379**	-R 98,375
Profit/Loss	Year End Revaluation Rate	**4.6720**	-R 5,189

*Source: NOFP Data (SARB,) Spot and Forward Rate (Reuters)

It is important to note that as a contract matures and is rolled over in the market, the revaluation losses suffered from adverse exchange rate movements are now realised and the net cash flow has to be financed. For example consider the extension of the core NOFP position at end August 1996. The cash flow to be financed is the product of nominal oversold position (\$8,118 billion) and the difference between the back-leg of the initial swap, 3.8025 and the front leg of the rollover swap, 4.4870. For just the core NOFP (\$8,118 billion) at end 1996 this financing requirement is approximately ZAR 5.5 billion.

* Source: Kinsey (2003).

The above suggests that the intervention capacity for market stabilization purposes when the currency is at a cyclical low should not only be <u>limited</u>, but ideally should be <u>lower</u> than the central bank's capacity to buy the reserve currency during periods when the domestic currency is at a cyclical high.[64]

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[64] Intervention capacity is in general not identical to (but typically larger than) a country's official stock of foreign exchange reserves.

This suggests trying to get intervention capacity to lie in a range that implies

- Lower ability to support the currency at cyclical lows than to lean against cyclical highs

Another major problem in South Africa was that reserves were too aggressively rebuilt in the wake of the 1998 crisis, especially in April and May 2001, which was a factor that destabilized the foreign exchange market and ultimately culminated – via the spark of the October 2001 statement – in the country's third currency crisis since 1996.[65] Thus, another requirement of a sensible intervention policy framework is that

- There should be a large difference between interventions that have to do with restoring reserves to normal levels and those that are driven by the motivation to affect the level of the exchange rate during market volatility. The former should be gradual and in principle could take a long time, while the other interventions should be more episodic and of shorter duration.

The Link Between FX Intervention and the Inflation Target
There is a risk that exportes, among others, may misunderstand FX market intervention and wrongly assume that the Bank will be targeting or defending a particular exchange rate.[66]

- It must be made clear via an ongoing communication strategy (eg via public statements) that this is not what (potential) intervention is seeking to achieve.

Ruling out the perceptions of an exchange rate target is extremely important. Experiences in several EM economies, amongst those Mexico in 1994-1995 and South Africa in 1996 have shown that targeting/pegging the exchange rate was a factor that directly contributed to the financial crisies in these countries. In South Africa, the effective rand-dollar peg during 1995 reduced the incentives for exporters and importers to manage their currency risk by maintaining appropriate exchange rate hedges. For more details see Sections 4.3.1 and 4.3.2 above.
Further, it is very easy to confuse financial markets, central bank watchers and the general public about exactly what the focus of monetary policy is. The lesson from this incident is that it should be clearly understood that potential foreign exchange market intervention is an additional and potential secondary instrument to help the
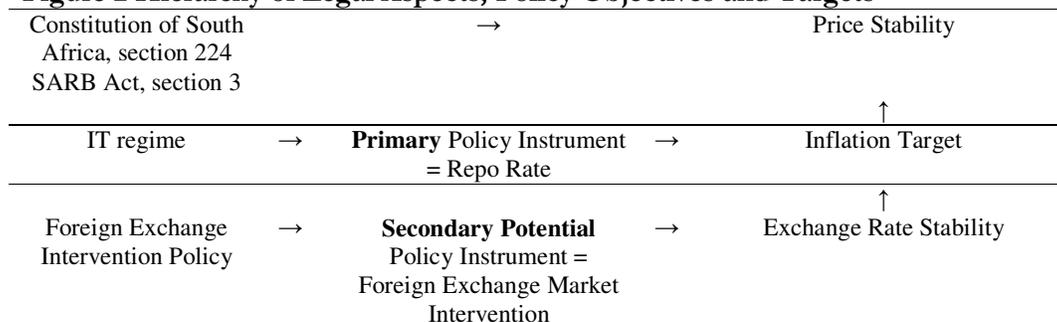
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[65] However, it seems as if the SARB has learned from this episode, as the Bank later [SARB (2004a, p. 4)] said that 'The Bank's objective is to build up foreign exchange reserves in a prudent manner, and in such a way that has a *minimum impact on the exchange rate*. The Bank does not have a target for the exchange rate, and at this stage the Bank does not have a target for foreign exchange reserves or a target for the rate of accumulation of reserves (emphasis mine)'

[66] The approach proposed here is basically a continuation of the foreign exchange intervention that has been conducted by the SARB under the inflation targeting regime, where intervention is an additional and secondary part of the overall monetary policy toolkit. It is important to note that the proposed intervention is not in any way similar to that associated with Japan that seeks to alter the underlying exchange rate cycle. Note that SARB (1999, p. 2) points out that the Bank does not envisage intervening 'Japanese style', this is evident from the fact that the Bank status that: 'Intervention in financial markets can assist in smoothing the adjustment process, but should not oppose market trends. The authorities have to allow interest rates and the exchange rate of the currency to move to new levels. Such adjustments increase the cost of speculation, reduce inflationary pressures and contribute to an improvement in the balance of payments position of a country.'

SARB smooth excessive volatility in the exchange rate in ways that are consistent with the pursuit of its price stability objective (according to section 224 of the Constitution and section 3 of the SARB Act) and with its obligations under the existing inflation targeting regime.

If thus implemented, there should be no confusion between the <u>primary</u> (repo rate) and <u>potential secondary</u> (foreign exchange market intervention) instruments of monetary policy aimed at keeping inflation in the present 3-6 percent range (for our suggestions regarding the inflation targeting range see Section 4.4 above) Figure 2 illustrates.

Figure 2 Hierarchy of Legal Aspects, Policy Objectives and Targets

Constitution of South Africa, section 224 SARB Act, section 3	→			Price Stability
				↑
IT regime	→	**Primary** Policy Instrument = Repo Rate	→	Inflation Target
				↑
Foreign Exchange Intervention Policy	→	**Secondary Potential** Policy Instrument = Foreign Exchange Market Intervention	→	Exchange Rate Stability

From this figure it can be seen that there is a clear hierarchy in terms of ultimate objectives and operational targets (last column) and the primary and secondary policy instruments (second column).

Sterilized versus Unsterilized Interventions

South Africa had some really bad experiences with <u>non-sterilized interventions</u>. The 1998 forward market interventions (among other things) implied substantial losses on the forward book which – if those had not been offset between 2002 and 2004 by mopping upsome R 70 bn of excess liquidity – would have effectively derailed the inflation targeting regime.

Further, when the SARB increased its foreign reserves on the back of the recovered rand after the 2001 currency crisis it sold domestic currency in exchange for foreign currency – thus it followed essentially a <u>local funding strategy</u>. This had the desired effect of placing some downward pressure on the rand/dollar exchange rate.[67] However, this strategy raises some serious transparency issues. For example, a central bank may intervene in the FX market without sterilization (i.e. by selling domestic currency in exchange for foreign currency), and justify this as 'rebuilding reserves'. In fact, the latter could be a cover for a desire to manipulate the level of the exchange rate.

- For those reasons it is proposed that all interventions as a matter of standard procedure be <u>sterilized interventions</u>.

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[67] Note that converting a negative NOFP position of US$ 23.2 bn in September 1998 into a positive net reserve position of US$ 8.6 bn in August 2004, implies that over this six-year period the Bank has acquired a staggering amount of almost US$ 32 bn, most of which was obtained from the foreign exchange markets [SARB (2004b, pp. 2-4)].

By requiring sterilization, it is also clear – i.e. <u>transparent</u> - that foreign exchange market intervention – although part of the overall monetary policy toolkit – has a <u>secondary role</u> to play, secondary to the <u>primary monetary policy instrument</u> of the short-term <u>repo rate</u>. So, in this way the policymaker has 'horses for courses'. The primary instrument - the repo rate – affects fundamentals and thereby (among other things) economic activity and the inflation rate. The secondary instrument – sterilized foreign exchange market intervention – does not affect the level of interest rates (and the money supply), but does affect the inflation rate <u>indirectly</u>; namely via the exchange rate (see also Figure 2 above).

Another aspect of intervention policy that has a bearing on central bank transparency has to do with interventions other than those in the spot market. For instance, forward market intervention – like intervention in the options market – is a <u>derivative transaction</u> or off-balance sheet transaction that gives rise to contingent claims[68] that <u>reduce the transparency of central bank accounts</u>. This may result in serious problems regarding the proper assessment of the financial position of the monetary authority, and by implication of the overall macroeconomic conditions of the country.[69]

- Therefore, it is proposed that the Bank as a matter of standard procedure does not intervene in the forward or options markets.[70]

The Role of Secrecy in Intervention
Central banks prefer secrecy in interventions for good reasons. In this section we outline a few of those reasons. We start with an important argument in favour of keeping the exchange rate target level secret.

In the context of the recent <u>microstructure approach to exchange rates</u> [Lyons (2001)], Vitale (1999) addresses why central banks prefer secrecy about the exchange rate target. In this framework there is a single, risk-neutral dealer (FX market maker) who transacts foreign exchange with a group of uninformed liquidity FX traders and a central bank. The central bank can influence the exchange rate only by altering the dealer's expectations about the fundamental (intervention does not affect the value of the fundamental, i.e., it is <u>sterilized</u>).[71] Vitale explains that if the central bank were to reveal both its intervention trade and its exchange rate target, then the dealer could back out the fundamental value of the exchange rate (because the latter would then be the only unknown). With the dealer knowingthe fundamental value of the exchange

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[68] Contingent liabilities are financial commitments that are triggered by the occurrence of an event whose realization is uncertain. This could include a change in valuation and prices of financial assets, a bank failure etc.

[69] See Blejer and Schumacher (2000). In addition, the ability to intervene in the derivative markets at a low cost and the lack of a material constraint to intervention levels could lead to (i) serious quasi-fiscal losses (as was the case with the South African forward market intervention episodes of 1996 and 1998), and it could also lead to (ii) potential postponement of important policy decisions (such as for example raising domestic short-term interest rates in the face of a potential FX crisis – which was a central feature of the 1998 South African currency crisis).

[70] An exception could be some allowance for the management of domestic liquidity (<u>money market operations</u>) via the use of FX swaps. Here, it would have to be made clear that those operations are conducted as part of the affecting the primary lever of monetary policy, the <u>repo rate</u>, and as such are part of the implementation apparatus of the <u>inflation targeting regime.</u>

[71] The dealer sees only the total order flow, which he uses to extract information about the fundamental and to set the market-clearing price E (the spot exchange rate).

rate, no attempt to target the exchange rate would be effective. Vitale's main result is therefore that the central bank always prefers to conceal its target. When the target is secret, the realized exchange rate is distributed more tightly around the target, which minimizes the expected loss. A secret target gives the central bank the greatest possible room to manipulate the beliefs of the marketmaker, and thereby the actual level of the exchange rate. For more details see Box 2.

Box 2 The Viatle (1999) Model

In the Viatle model central bank intervention targets the exchange rate to some level $\bar{E}$ via minimizing a loss function that depends on the gap between E and its target $\bar{E}$, and on the cost of intervention: $L = X(E - V) + b(E - \bar{E})^2$. Here X is the central bank's (market) order of foreign currency (purchases of FX have a positive sign and sales have a negative sign). The first term in the loss function reflects the capital commitment or cost of the intervention: if the central bank is buying foreign currency at a local-currency price above its fundamental value V, this is costly — a loss. The parameter b indicates the degree of commitment to the pre-determined target $\bar{E}$.[72]

The Reserve Bank of New Zealand [RBNZ (2004b)] mentions that the degree of disclosure of intervention activity has two additional dimensions. The first dimension is around whether the intervention is kept secret or not, and depends on the purpose of the intervention. The second dimension is around information on reserves limits and where the Bank is relative to those limits, and how this information relates to market perceptions about how deep the pockets of the Bank and the Government are (i.e. the reserve limits). This sort of information affects their willingness to take the authorities on and can also limit the effectiveness of the intervention policy.

The RBNZ then goes on to state that disclosure can be a 'double edged' sword – sometimes it can be important to signal strongly that the Bank is intervening (when transacting). However, the Bank also does not necessarily want to 'give the game away' by disclosing the level of reserves it has left to continue its intervention operations, and possibly undermine its credibility. The Bank concludes that the reality is that regular disclosures of the Bank's and the Government's balance sheets imply that the market will be able to discover (or infer) quite a lot of information about intervention actions and intervention capacity within a relatively short time.[73]

The latter point has an interesting analogue with the South African experience. Interestingly, in and before 1996, (the second major episode in post-apartheid South Africa when the NOFP was increased) there were no 'real time' numbers published

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[72] Vitale points out that as b may vary between 0 and infinite, this definition of the loss function encompasses all possible motives for intervention between purely speculative (where the central bank just wants to make money from the intervention), for $b = 0$, and purely targeting, for $b \uparrow \infty$. In the latter case it wants to move the exchange rate to its target value irrespective of the cost of the intervention.

[73] RBNZ (2004b, p. 11) states that one means of helping to ensure that the market cannot readily discover the Bank's (and the Government's) full capacity to intervene would be to have a contingent liability or "fiscal risk" noted, but not quantified, in the Government's accounts.

on the size of the NOFP.[74] This means that broadly speaking in and before 1996 the SARB's interventions can be classified as <u>non-transparent with respect to reserve limits</u>. However, between May and October 1998, when we saw another aggressive build-up of the NOFP market participants were aware of the intensity of the intervention - unlike in 1996 when this was not the case.[75] In addition, in 1998 market participants knew in from the events that ultimately in 1996 intervention was futile, thereby perhaps inviting them to a larger extent to 'bet against the central bank'. So, the 1998 build-up had a similar intensity to the one in 1996 but happened under a different policy regime - different rules of the game.

If we compare the 1996 and 1998 episodes we see that in the latter episode the currency depreciated by about 14 percent (14.05 percent to be precise) over a six-month period (during the build-up period of the NOFP), compared to a 13 percent depreciation (13.35 percent to be precise) over the 12 month build-up period in 1996. This suggests that there is some support for the Reserve Bank of New Zealand point that disclosure can be a 'double edged' sword – a central bank does not necessarily want to 'give the game away' by disclosing intervention actions and intervention capacity.

6 POLICY RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER WORK

In this paper we have analyzed the relationships between exchange rates, inflation and competitiveness. We now summarize our results and outline suggestions for further work.

We know that in South Africa a weaker nominal exchange rate increases the CPI inflation rate. We find that the degree of exchange rate pass-through (from the nominal effective exchange rate to the CPI) is about <u>20 percent</u> across the 94-06 sample.

However, it is the <u>real exchange rate</u> that is important for South Africa's competitiveness and not the nominal exchange rate rate and its short-term fluctuations. The reason is that if inflation were to increase by the same amount as a depreciation of the rand then there is no real change to the real exchange rate.

We show that for a weaker real exchange rate to increase <u>growth</u> (in addition to increasing CPI inflation) it should boost <u>net</u> exports (exports minus imports, or the trade balance) as otherwise the export sector gains via implicit subsidization at the expense of other sectors in the economy; possibly the poor (inflation tax). So, in

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[74] Between February 1996 and February 1997, the NOFP was built up from an initial level of about US\$ 8 bn to about US\$ 22 bn (in other words it sold about US\$ 14 billion into the market). This means an increase of about US\$ 14 bn, or about 172 percent in cumulative terms. However, the intervention was unsuccessful; the rand-dollar nominal exchange rate depreciated by <u>13.35 percent</u> over this period, at this point in time this was the <u>greatest fall in the rand since January 1994</u>.

[75] In this period the NOFP was built up from an initial level of about US\$ 13 bn to about US\$ 23 bn. This means an increase of about US\$ 10 bn, or about 81 percent in cumulative terms. In spite of this being the most aggressive SARB intervention since 1994:2, the intervention was unsuccessful. Over this period, the rand-dollar nominal exchange rate depreciated by <u>14.05 percent.</u>

principle a weaker real exchange rate could present policymakers with a trade-off between higher inflation and improved competiteveness (and then possibly growth).

However, we demonstrate that over the 1994-2006 sample period real exchange rate depreciations did not improve the trade balance and therefore had no positive effect on growth! One reason is that SA exports are priced to market (PTM instead of PCP). We also find that the volatility of SA output growth (via the trade balance) is largely driven by international business cycles, rather than by real exchange rate variability. In fact, we find that the international business cycle is more than 12 times as important for SA as the real exchange rate! Thus, more rapid growth in foreign markets has a considerably larger and more immediate impact on exports. This implies that for sustained export growth a combination of good access to rapidly growing markets and more efficient production processes is more useful than attempts to target the rand.

Rodrik (2006) argues that the South African Reserve Bank (SARB) should switch to a modified inflation targeting framework which allows considerations of competitiveness (or the real exchange rate) to affect its decision-making. On what constitutes the equilibrium real exchange rate, Rodrik says that 'equilibrium' refers to satisfactory outcomes in terms of tradable output. Interpreting tradable output as exports, we find that – if the SARB would be targeting exports - any adverse change in overseas demand would have to be compensated for by a real exchange rate movement in the opposite direction. More specific, any 1 percent decline of foreign economic activity ('world trade') would have to be offset by an almost 5 percent real exchange rate depreciation. Knowing that world trade can be quite volatile, targeting tradable output (here exports) will therefore produce substantial real exchange rate variability. This doesn't seem to be a very desirable by-product of such a policy as we know from the literature that real exchange rate volatility can have a significant adverse impact on the long-term rate of productivity growth. This implies that we do not recommend that the South African Reserve Bank (SARB) should switch to a modified inflation targeting framework which allows explicit considerations of the (real) exchange rate.

We know that the SARB's inflation target has been achieved for 44 consecutive months, but breached the upper end on 30 May 2007 when CPI(X) reached 6.3 percent. It should be pointed out that with inflation currently running at more than 6 percent the SA price level doubles in 13 years, triples in 20 years and quadruples in 25 years. Thus, the upper bound at 6 percent is incompatible with the Bank's objective of price stability as defined by the SARB Act.

So, here is what we propose for South Africa. After consultations with the SARB, National Treasury should announce a new inflation control band that lies within the present inflation reduction band in such a way that the mid-point of the new band is consistent with what central bankers around the world consider to be an operational definition for price stability, i.e. 2 percent. Conventional wisdom is that the above suggestions are very difficult to implement in South Africa as reducing inflation – which is effectively what we are doing when we require inflation to remain within a more narrow band - is not possible in South Africa as it would cause a major recession. However, in Hoeberichts and Schaling (2006) we show that a central bank may try to convince the private sector of its commitment to price stability –essentially
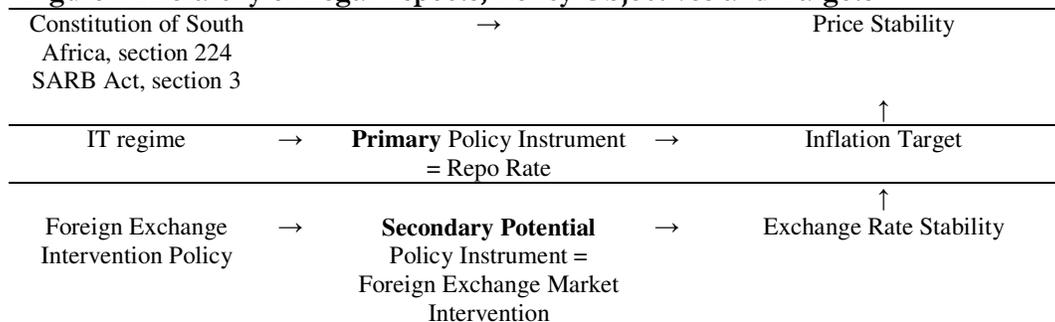
manage inflation expectations - by choosing to reduce inflation quicker. We call this 'teaching by doing'. We find that allowing for 'teaching by doing' effects always speeds up the optimal disinflation (an optimal disinflation trades-off the benefits of lower inflation versus the costs of a recession).

In Section 4.2 in our critique on Rodrik (2006) we have explained that in the context of open economy inflation targeting), targeting CPI(X) implies that the Reserve Bank implicitly already targets a combination of the GDP deflator (or domestic inflation) and the real exchange rate. In Section 5.1 of the paper we have used this interlinkage to show that if the monetary authorities would be interested in targeting competitiveness via the real exchange rate, a good way to do this is by narrowing the present inflation targeting band from the present 3-6 percent, to say 1-3 percent. The reason is that the easiest way to become uncompetitive is to let your domestic price level rise faster than those of your trading partners. Higher inflation does not lower the real exchange rate it appreciates it.

Not only is the new 1-3 percent targeting range more consistent with the SARB's objective of *'the achievement and maintenance of price stability'*, it has the added potential benefit of supporting competitiveness of the (non-commodities) tradable sector of the SA economy. Put differently, the present targeting range of 3-6 percent and its implications for domestic inflation (in April 2007 SA producer price inflation was sitting at 11.1 percent) are not only inconsistent with price stability, but also with promoting competitiveness.

It is better to try to achieve a more competitive (weaker) real exchange rate via a lower CPI(X) inflation rate than via a weaker nominal exchange rate. The reason is that if we implement boosting competitiveness via a weaker nominal exchange rate, we will definitely suffer the macroeconomic consequences of a higher CPI(X) inflation rate, but without enjoying any likely macroeconomic growth benefits in terms of higher net-exports). However, if we implement boosting competitiveness via a reduction of the IT targeting range as proposed above the effect on inflation is reversed. That is, we will enjoy the macroeconomic benefits of lower CPI(X) inflation coupled with with some benefits for SA exporters. If the positive macroeconomic effects on net-exports do not materialize – which is an extremely likely outcome given the fact that over the 1994-2006 sample period real exchange rate depreciations did not improve the trade balance and therefore had no positive effect on growth – and real economic benefits simply amount to implicit subsidization of the export sector, than we can still reap the definite macroeconomic benefits of a lower inflation rate.

There is also a secondary instrument available to the SARB to help it reach its objective of price stability, namely foreign exchange market intervention. Figure 2 illustrates.

Figure 2 Hierarchy of Legal Aspects, Policy Objectives and Targets

Constitution of South Africa, section 224 SARB Act, section 3		→		Price Stability
				↑
IT regime	→	**Primary** Policy Instrument = Repo Rate	→	Inflation Target
				↑
Foreign Exchange Intervention Policy	→	**Secondary Potential** Policy Instrument = Foreign Exchange Market Intervention	→	Exchange Rate Stability

We now summarize our suggestions with respect to the proposed asymmetric foreign exchange market intervention.

An important consideration that should further guide the suggestions with respect to foreign exchange market intervention is that the SARB does not have a very good track record with respect to supporting the currency at times of cyclical lows. The typical outcome after the currency crises of 1996 and 1998 was a substantial loss of reserves (via a very large NOFP), severe currency depreciation, and prolonged periods with high interest rates and lower cyclical output. This suggests limiting central bank discretion by trying to induce intervention capacity - for market stabilization purposes - to lie in a range that implies

- Limited ability to support the currency at cyclical lows
- Limited funding costs of reserves
- Limited potential losses on foreign exchange market intervention at cyclical lows

In South Africa interventions have typically been more effective (and less costly) when the currency was at a cyclical high, than at a cyclical low. More specifically, the SARB has been more successful in dampening the appreciation of the rand in periods such as 1995, 1997 and after the 2001 crisis, than in stemming currency depreciation during periods of capital outflows such as 1996 and 1998. The above suggests that the intervention capacity for market stabilization purposes when the currency is at a cyclical low should not only be limited, but ideally should be lower than the central bank's capacity to buy the reserve currency during periods when the domestic currency is at a cyclical high.

This suggests trying to get intervention capacity to lie in a range that implies

- Lower ability to support the currency at cyclical lows than to lean against cyclical highs

There is a risk that exportes, among others, may misunderstand FX market intervention and wrongly assume that the Bank will be targeting or defending a particular exchange rate.

- It must be made clear via an ongoing communication strategy (eg via public statements) that this is not what (potential) intervention is seeking to achieve.

- It is also proposed that all interventions as a matter of standard procedure be sterilized interventions.

By requiring sterilization, it is also clear – i.e. transparent - that foreign exchange market intervention – although part of the overall monetary policy toolkit – has a secondary role to play, secondary to the primary monetary policy instrument of the short-term repo rate. So, in this way the policymaker has 'horses for courses'. The primary instrument - the repo rate – affects fundamentals and thereby (among other things) economic activity and the inflation rate. The secondary instrument – sterilized foreign exchange market intervention – does not affect the level of interest rates (and the money supply), but does affect the inflation rate indirectly; namely via the exchange rate (see also Figure 2 above).

In draft 2.0 of this paper we will suggest furter instruments to supplement IT regime: for example the possible role of higher bank reserve requirements to constrain excessive 'consumerism' and bank credit. The role of those additional instruments is to improve trade-offs: to decrease inflation without sacrificing growth via higher interest rates. In draft 2.0 we will also pay some attention to the issue of trade liberalization and the role of increasing the openness of the economy. For instance, Allard (2006) has shown that a more open economy may improve inflation/output trade-offs.

APPENDIX A.1: EXTENSIONS

A.1.1 Aggregate Supply Effects

One criticism that can be levied against the analysis from Sections 2.2-2.4 is that it is exclusively focused on (proving the absence of positive) expenditure switching/demand factors with respect to exports and doesn't include potential beneficial supply-side effects of a weaker currency. Here the idea is that if SA firms generate nominal revenues according to export parity pricing (equation **(3)**), whereas their cost-structure is denominated in domestic currency then a nominal depreciation may in fact boost domestic supply of exports.

The idea is most easily formalized by modeling domestic aggregate export supply, b, as

$$b = p_H - w \tag{A.1}^{76}$$

where w are nominal (money) wages. Now, with the dollar price of exports dictated by the dollar price (dollar price parity) of their competitors in the world economy, equation **(3)** can be shown to imply

$$p_H = p_H^* + e = p_F^* + e \tag{A.2}$$

Substituting **(A.2)** into **(A.1)** we find that a nominal depreciation indeed has a positive supply effect

$$b = p_F^* + e - w \tag{A.3}$$

However, it can be easily seen from **(A.1)** that domestic exporters only gain from a nominal depreciation when domestic costs do not adjust accordingly; that is if there is no offsetting effect from nominal wages. If, in fact nominal wages are indexed to the CPI inflation rate – for which there is strong empirical evidence in SA – and if so that (apart from exogenous wage pushes) money wages could be proxied by

$$w = p_C = p_H + \gamma(p_F - p_H) = p_H + \gamma(p_F^* + e - p_H) \tag{A.4}$$

Combining **(A.4)** with **(A.3)** now aggregate supply is given by

$$b = (1 - \gamma)(p_F^* + e - p_H) \tag{A.5}$$

So now aggregate export supply is still increasing following a nominal depreciation, but the boosting effect becomes smaller the larger the share of imported final goods in the cosumption basket. Note that if the price that home (SA) firms charge home residents (in rand) is set in accordance with IPP, so that in **(9)** p_H is set according to equation **(A.2)** above the positive supply effect on export volumes associated with a

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[76] This expression has been derived from a Cobb-Douglas production function with a fixed capital stock and (for ease of exposition) assuming equal income shares of labor and capital.

nominal depreciation disappears altogether, as then the increase in domestic cost completely offsets the higher rand revenue and we have

$$b = 0 \qquad\qquad\qquad (A.6)$$

A.1.2 Imported Intermediate Inputs

In the analysis conducted in this Section we have assumed that all trade concerns trade in <u>final</u> goods. Schaling (2007) abandons this restriction and considers the effects of imported intermediate inputs.

The key result there is that the adverse effect on CPI inflation of a nominal rand depreciation are much more substantial than if we only consider final goods. The numbers in the exercise conducted there suggest that these adverse effects are almost three times as large as an equivalent depreciation when we only consider imported final goods.[77]

A.1.3 Non-Traded Goods

So far we have assumed that all goods are final goods and all goods are tradable. In Now we analyze the effect of imported intermediate inputs such as oil and steel. In this Section we briefly touch upon the sensitivity of the results above when some goods in the economy are non-tradable.

In the case where we do have non-traded goods, instead of **(2)** have

$$p_C = (1-\alpha)p_T + \alpha p_N \qquad\qquad\qquad (A.7)$$

where α is the share of imported tradable goods in the consumption basket and the limit $\alpha \to 0$ is the existing case (see equation **(2)**).[78] Then all goods (locally produced and imported are tradable). That is, the consumption basket consists solely of traded (final) goods.

As before we define $1-\gamma$ and γ to be the shares of locally (home) produced and foreign produced (imported) traded final goods in the home tradable goods consumption basket, or

$$p_T = (1-\gamma)p_H + \gamma p_F$$

Then, combining **(A.7)** with the latter equation we get the following expression for the home CPI:

$$p_C = (1-\gamma_1)p_H + \gamma_1 p_F + \alpha p_N \qquad\qquad\qquad (A.8)$$

here $1-\gamma_1 \equiv (1-\alpha)(1-\gamma)$ and $\gamma_1 \equiv (1-\alpha)\gamma$.

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[77] Assuming that foreign firms engage in producer currency pricing (PCP) and that domestic producers mark-up domestic unit labor costs. For more details see Schaling (2007).
[78] For a similar approach see equation (2) of Frankel (2007).

Note that $\lim_{\alpha \to 0}(A8) = $ equation **(2)**. So, the basic effect of introducing non-traded final goods is that the influence of the foreign economy diminishes - the more so, the higher the share of non-tradable goods in the home consumption basket.

APPENDIX A.2: REAL GDP GROWTH AND THE MARSHALL-LERNER CONDITION

In this Appendix we show that for a real exchange rate depreciation to increase real GDP the well-known Marshall-Lerner condition should hold.

We start with the definition of nominal GDP:

$$\hat{Y} = \hat{X} + \left(\hat{B} - \hat{M} \right) \tag{A.9}$$

This equation says that the <u>trade balance</u> is equal to output less domestic absorption $\hat{X} \equiv \hat{C} + \hat{I} + \hat{G}$.[79]

Setting $\hat{X} = 0$ (as we want to focus on the trade balance as a determinant of GDP), defining $\hat{p}_H$ as the domestic GDP deflator, $\hat{p}_F$ as the foreign price (in domestic currency) and $\hat{b}$ and $\hat{m}$ as exports and imports volumes, **(A.9)** can then be rewritten as

$$\hat{y} = \left\{ \hat{b} - \hat{m}.\hat{s} \right\} \tag{A.10}$$

where the real exchange rate (terms of trade) $\hat{s} = \hat{p}_F / \hat{p}_H = \hat{p}_F^* \hat{e} / \hat{p}_H$.

The <u>nominal</u> trade balance, $\hat{T}$, is

$$\hat{T} = \hat{p}_H.\hat{b} - \hat{p}_F^*.\hat{e}.\hat{m} \tag{A.11}$$

where $\hat{e}$ is the nominal exchange rate of the rand. Now define the real trade balance $\hat{t}$ as $\dfrac{\hat{T}}{\hat{p}_H}$, then dividing both sides of **(A.11)** by $\hat{p}_H$, we get:

$$\hat{t} = \hat{b} - \hat{s}\,\hat{m} \tag{A.12}$$

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[79]The corresponding <u>current account deficit</u> would be $(\hat{B} - \hat{M}) - \hat{R}_F = \hat{Y} - \hat{X}$, where $\hat{R}_F$ is net interest (transfers) paid abroad. So, in this Paper we abstract from net transfer payments.

Comparing equations **(A.12)** and **(A.10)** we see that there is a one-to-one corrrespondence between the determinants of the real trade balance and real GDP:

$$\hat{y} = \left\{ \hat{b} - \hat{m}.\hat{s} \right\} = \hat{t}$$

Therefore, everything that affects the real trade balance has a similar effect on real GDP. We will use this below to show that for a real exchange rate depreciation to increase real GDP the well-known Marshall-Lerner condition should hold.

We reallize that in line with equations **(3)** and **(4)** from the main text, both exports and imports volumes depend on the level of the real exchange rate, so that

$$\frac{\partial \hat{t}}{\partial \hat{s}} = \frac{\partial \hat{b}}{\partial \hat{s}} - \hat{s}\frac{\partial \hat{m}}{\partial \hat{s}} - \hat{m} \qquad\qquad\qquad \textbf{(A.13)}$$

In line with equations **(3)** and **(4)** define $\eta_m = \dfrac{\partial \hat{m}}{\partial \hat{s}}.\dfrac{\hat{s}}{\hat{m}}$ as the home (SA) import

(demand) price elasticity with respect to the real exchange rate, and $\eta_x = \dfrac{\partial \hat{b}}{\partial \hat{s}}.\dfrac{\hat{s}}{\hat{b}}$ as the

foreign demand (relative price) elasticity for SA's exports. A <u>real</u> depreciation

improves the trade balance and thereby real GDP, $\dfrac{\partial \hat{t}}{\partial \hat{s}} = \dfrac{\partial \hat{y}}{\partial \hat{s}} > 0$, if the right hand side

(RHS) of equation **(A.13)** is greater than zero. To find the Marshall-Lerner condition

first set $\dfrac{\partial \hat{t}}{\partial \hat{s}} = 0$, then divide the RHS by $\hat{m}$ and now multiply the first term by $\dfrac{\hat{s}\hat{b}}{\hat{s}\hat{b}}$.

Upon simplification the RHS becomes:

$$\eta_x.\frac{\hat{b}}{\hat{s}\hat{m}} - \eta_m - 1 > 0 \qquad\qquad\qquad \textbf{(A.14)}$$

Assuming that trade, $\hat{t}$, is balanced, i.e. $\dfrac{\hat{b}}{\hat{s}\hat{m}} = 1$, the real trade balance – and hence

real GDP - improves if, the sum of the absolute values of the import and export elasticities is greater than unity:

$$\left|\eta_m\right| + \left|\eta_x\right| > 1 \qquad\qquad\qquad \textbf{(A.15)}$$

APPENDIX A.3: ALL MODEL SPECIFICATIONS AND COMPARISON WITH EDWARDS AND LAWRENCE (2006)

Table A.3.1 Model Specifications with Quarterly Data: Imports

Dependent Variables (Right)	Import volumes (2000 constant prices)[80]	Import volumes (2000 constant prices)	Import volumes (2000 constant prices)	Import volumes (2000 constant prices)	Import index[81]	Import index	Import index	Import index
Independent Variables (Down)								
EQUATION #	1	2	3	4	5	6	7	8
Constant	-7.103*	3.072*			-1.888*	-3.102*		-12.880*
REER[82]	-0.093	0.137	-0.237*	0.382*	0.336*	0.106	0.069	-0.114*
South Africa's leading indicator[83]		1.550*		1.950*		1.544*		
South Africa's coincidence indicator[84]					1.042*		0.916*	
Gross domestic expenditure[85]	1.503*		0.985*					1.465*
ECM coefficient								

* Indicates significance.

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[80] Nominal export and import data less gold exports and oil imports, respectively (see footnote 1). Oil imports data sourced from Quantec database (Easydata), codename: HS 2709 (Data in rands). Gold exports data sourced from Quantec database (Easydata). The code name is: HS 7108 (Data is in rands).

[81] SARB series: KBP5032L (Index 2000 = 100)

[82] SARB series: KBP5369M.

[83] SARB series: KBP7090N.

[84] SARB series: KBP7091N; Index 2000 = 100. Seasonally adjusted monthly series – converted to quarterly.

[85] SARB series: KPB6012C

Table A.3.2 Model Specifications with Quarterly Data: Exports

Dependent Variables (Right)	Export volumes[86]	Export index[87]	Export index	Export index excluding gold[88]
Independent Variables (Down)				
EQUATION #	1	2	3	4
Constant	4.054*	-4.198*	-2.321*	-4.883*
REER[89]	0.263*	-0.041	0.230*	0.359*
Foreign leading indicator[90]	1.245*		1.25*	1.680*
Foreign coincident[91]		1.959*		
ECM coefficient				

* Indicates significance.

Table A.3.3 EL Determinants of Aggregate Non-Gold Merchandise Export (Long-Run Relationship)

	Coefficient (Quarterly Data: 1975:1-2004:3)	Coefficient (Quarterly Data: 1961:3-2004:3)	Coefficient (Annual data: 1963 – 2004)
Explanatory variables:			
SA Domestic PPI	-0.64	-0.86	-0.93
Foreign PPI in Rands	0.64	0.86	0.93
Foreign Output	1.05	1.4	1.28
Collection of taxes including surcharges	-	-	-

Source: Edwards and Lawrence (2006:31)
Note: Variables in logs

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[86] Calculated by taking the respective nominal monthly series and dividing it by the rebased (1994:1) CPI series., and then averaging it to obtain data at a quarterly frequency.
[87] SARB series: KBP5032L; Index 2000 = 100. Seasonally adjusted.
[88] SARB series: KBP5030L: Index 2000 = 100. Seasonally adjusted.
[89] SARB series: KBP5369M.
[90] SARB series: KBP7095N.
[91] SARB series: KBP7098N.

Table A.3.4 EL Determinants Of Manufacturing Trade Balance: Nominal Output Tariffs And Effective Protection[92]

	Nominal tariffs			Nominal tariffs		
	All sectors	Commodities	Non-commodities	All sectors	Commodities	Non-commodities
Explanatory variables:						
Tariff	-1.34***	-0.78	-0.84*			
Export tax ERP				-0.29***	-0.14	-0.41***
Surcharges	1.97**	6.11***	3.05***	2.84 ***	6.92***	4.01***
Advalorem	-0.07	-0.37	0.37	-0.11	-0.43	0.27
REER	-0.25	0.78	-0.68	-0.23	0.78	-0.69**
Volume	-0.09	-1.47***	0.50***	-0.09	-1.46***	0.51***
K/L	0.00**	0.00**	0.00*	0.00**	0.00**	0.00*
Skill share	1.46	-15.99***	12.08***	1.58	-15.84***	12.40***
DMIDP	0.39***		0.01	0.36***		-0.06
F-statistics	7.78***	5.09***	14.07***	7.93***	5.15***	15.04***
Obs	572	208	364	572	208	364
Groups	44	16	28	44	16	28

Source: Edwards and Lawrence (2006, p. 51)
Note: Equation is estimated using a two-way fixed effects estimator with sector and time effects

Table A.3.5   EL Determinants Of Manufacturing Trade Balance: Export Taxes and Nominal Output Tariffs

	Export taxes			Nominal tariffs and export taxes		
	All sectors	Commodities	Non-commodities	All sectors	Commodities	Non-commodities
Explanatory variables:						
Tariff				-1.26***	-0.75	-0.05
Export tax	-0.33	-0.21	-1.29***	-0.19	-0.20	-1.28***
ERP						
Surcharges	2.09**	6.33***	3.05***	2.00**	6.27***	3.05***
Advalorem	0.13	-0.27	0.40*	-0.07	-0.38	0.39
REER	-0.25	0.78	-0.72***	-0.25***	0.82***	-0.72***
Volume	-0.10	-1.49***	0.46***	-0.09	-1.47***	0.46***
K/L	0.00*	0.00**	0.00	0.00**	0.00**	0.00
Skill share	0.23	-17.20***	12.08***	1.18	-16.56***	12.87***
DMIDP	0.40***		-0.12	0.37***		-0.12
F-statistics	7.38***	5.07***	15.48***	7.43***	4.84***	14.7***
Obs	572	208	364	572	208	364
Groups	44	16	28	44	16	28

Source: Edwards and Lawrence (2006, p. 52)
Note: Equation is estimated using a two-way fixed effects estimator with sector and time effects

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[92] The estimated equation is $TB_{it} = \mu_i + \beta_1 TAR_{it} + \beta_2 ADVALOR_{it} + \beta_3 RER_{it} + \beta_4 VOL_{it} + \delta'D + \lambda_t + \varepsilon_{it}$, where: TB is the trade balance measured as ln(export value/import value); TAR is the measure of tariff protection in three forms – scheduled tariff rates, surcharges and the effective rate of protection and implicit export taxes; the measure of complexity of tariff schedule is the proportion of HS 8 digit tariffs within each sector which are advalorem; RER is the relative price index calculated as the SA PPI relative to US PPI price (measured in common currency); DMIDP is a dummy variable for the motor industry from 1995 to 2002; K/L measures machinery and equipment capital stock (Rm in constant 2000 prices) per worker; the skill share variable measures skilled labour as a share of total employment; and VOL is an index of domestic production per sector. The equation also includes sector fixed (μ_i) and time effects (λ_t).

Table A.3.6   EL Determinants Of Aggregate Manufacturing Exports, Annual Data

	Manufacturing 1971-2004		Commodity manufactures 1972-2004		Non-commodity manufactures 1971–2004)	
	Export	PPI	Export	PPI	Export	PPI
Explanatory variables:						
SA Domestic PPI	-1.37*		-1.59*		-1.28 *	
Collection rates excluding surcharges		0.66*		0.57*		0.63*
Foreign PPI in Rands[93]	1.37*	1*	1.59*		1.28*	0.97*
Foreign Output[94]	0.93*		0.93*		1.31 *	

Source: Edwards and Lawrence (2006, p. 39)

APPENDIX B: FUNDING OF RESERVES AND FISCAL IMPACTS

Importantly, there are alternative ways to fund reserves. One way to finance reserves is to borrow in the foreign currencies in which investments are held, thereby protecting the central bank and the country (the government) from foreign exchange risk. This approach would be consistent with a general preference to hold zero net foreign currency debt. In addition, this approach would provide the central bank with a clear benchmark (i.e. the actual costs associated with borrowing reserves against which it can assess its reserves management performance).

The way reserves are funded will have implications for a government's fiscal position. Suppose reserves are funded by borrowing in foreign (the reserve) currency. Then, gross government debt will increase. Borrowing in foreign currency will have no implications for net government debt because the debt raised will be invested in liquid foreign currency assets (which offsets the debt raised). As funding in foreign currency affects gross government debt any policy decisions on, say, an increase in foreign reserves that is financed in this way will have to be consistent with government (fiscal) policy for gross debt. For example, if there exists a ceiling for gross debt – as is relevant for the case of New Zealand for example – then the increase in gross government debt will have to be consistent with the overall gross government debt target.[95]

Alternatively, a central bank can borrow in its own currency to finance its holding of foreign reserves. Under this strategy, when building up foreign reserves, these central banks will borrow in their own currencies, sell the funds raised for foreign currencies which are then invested as foreign reserves. The result is that these central banks are left with an exposure to foreign exchange risk.

If the SARB intervenes near the top of the exchange rate cycle – as it did in 2004 - (i.e. sell rand and buy dollars), foreign reserves and money in circulation increase (if

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[93] Foreign PPI in Rands is the weighted average foreign price, constructed using SARB weights as used in REER.

[94] Foreign output the weighted average index of foreign industrial production constructed using SARB weights as used in REER.

[95] According to RBNZ (2004a), the New Zealand government has a gross debt target celing of 30 percent of GDP. Therefore, RBNZ (2004a) recommends a gradual or phased increase in reserves funded by borrowing in foreign currency so as to make sure gross government debt stays below its target debt ceiling.

the intervention is not sterilized), and the SARB thereby changes the composition of its liabilities from being all foreign currency liabilities to being a mixture of domestic and foreign currency liabilities. If the above intervention is sterilized, then there would be no (net) increase in money in circulation but an increase in foreign reserves financed by domestic currency liabilities (domestic government bonds).[96] In the latter case, the increase in foreign reserves is then effectively funded by <u>borrowing in local currency</u> (although there is no increase in gross government debt as we assume the central bank uses government paper that has already been issued, i.e. was not issued with the express purpose of funding reserves).

If reserves are funded by borrowing in local (domestic) currency, this will also increase gross government debt. Again, the increase in liabilities will have to be netted out against the increase in liquid foreign currency assets. Of course, this will expose the government to foreign exchange risk. Finally, if reserves are funded by intervening in the foreign exchange market – by selling domestic currency in exchange for foreign currency and assuming no sterilization – the domestic money supply and the central bank's foreign reserves will increase in tandem with no effect on gross government debt.

REFERENCES

Aghion, P. , P. Bacchetta, R. Ranciere and K. Rogoff (2006). 'Exchange Rate Volatility and Productivity Growth: The Role of Financial Development', <u>NBER Working Paper</u>, No. 12117, March.

Aghion, Braun, and Fedderke (2006). 'Competition and Productivity Growth in South Africa', <u>CID Working Paper</u> No. 132, August.

Allard (2006). 'Inflation In Poland: How Much Can Globalization Explain', <u>Mimeo International Monetary Fund</u>, September.

Blejer, M. I. and Schumacher, L. (2000). 'Central Banks Use of Derivatives and Other Contingent Liabilities: Analytical Issues and Policy Implications.' Working Paper No. 00-66, International Monetary Fund (Washington, DC), March.

Bullard, J. and E. Schaling (2001). 'New Economy: New Policy Rules?', *Quarterly Review Federal Reserve Bank of St. Louis*, Volume 83, No. 5, September/October, pp. 57-66.

Chaponda, T. and M. Stern (2006). 'Trade and Poverty Case Study: Small Household Appliances', January.

Edwards, L. and R. Lawrence (2006). 'South African Trade Policy Matters: Trade Performance & Trade Policy', CID Working Paper No 139, March.

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[96] In the first half of 2004 the Reserve Bank continued its accumulation of foreign exchange reserves and the strengthening of its international liquidity position. Importantly, the potential impact of these transactions on domestic money-market liquidity was <u>sterilized</u> by means of open-market operations [SARB (2004c, p.4)].

Fedderke, J. and E. Schaling (2005). 'Modeling Inflation in South Africa: A Multivariate Cointegration Analysis', *South African Journal of Economics*, Vol. 73, No 1, 2005, pp. 79-92.

Frankel, J. (2007). 'On the Rand: Determinants of the South African Exchange Rate', CID Working Paper No 139, March.

Frankel, Smit and Sturzenegger (2006). 'South Africa: Macroeconomic Challenges after a Decade of Success', <u>CID Working Paper</u>, No. 133, September.

Hoeberichts, M. and E. Schaling (2006). 'Why Speed Doesn't Kill: Learning to Believe in Disinflation', <u>Paper Presented at the South African Reserve Bank Conference Macroeconomic Policy Challenges for South Africa</u>', 22-24 October.

Johansen, S. (1998). 'Statistical Analysis of Cointegrating Vectors', *Journal of Economic Dynamics and Control*, 12, pp. 551-70.

Johansen, S. and K. Juselius (1990). 'The Full Information Maximum Likelihood Procedure for Inference on Cointegration – with Applications to the Demand for Money', *Oxford Bulletin of Economics and Statistics*, 52, pp. 168-210.

Johansen, S. and K. Juselius (1992). 'Testing Structural Hypotheses in a Multivariate Cointegrating Analysis of PPP and UIP for the UK', *Journal of Econometrics*, 53, pp. 211-44.

Kinsey, A. (2003). 'Foreign Exchange Intervention and Policy in South Africa from 1995 – 2001', Unpublished Masters Thesis, University of Johannesburg.

Lyons, R.K. (2001). 'The Microstructure Approach to Exchange Rates', MIT Press.

RBNZ (2004a). 'Letter to Minister of Finance on Foreign Reserves', 9 February.

RBNZ (2004b). 'Foreign Exchange Intervention Options', Main Background Paper on New Approaches to Foreign Exchange Intervention, 1 March.

Rodrik (2006). 'Understanding South Africa's Economic Puzzles', <u>CID Working Paper</u>, No. 130, August.

SARB (1999). Governor's Address, The Seventy-Ninth Ordinary General Meeting of Shareholders, 24 August.

SARB (2004a). 'Recent Economic Developments and Monetary Policy In South Africa', Address by Mr TT Mboweni, Governor of the South African Reserve Bank, at the Mercury/Safmarine Business Breakfast, International Convention Centre, Durban, 14 May.

SARB (2004b). Remarks by Governor Tt Mboweni at the Cocktail Function in Honour of the ACI South Africa in Pretoria, 20 September.

SARB (2004c). Address by Mr TT Mboweni, Governor of the South African Reserve Bank, at the School of Economics Awards Evening, University of Pretoria, 8 July.

Schaling, E. (2001). 'Dynamic Programming versus Lagrange: Is there a Horse Race in Dynamic Optimization?', in H. Klok, T. van Schaik and S. Smulders (eds), '*Economologues – Liber Amicorum voor Theo van de Klundert*', Tilburg University Press, March, pp. 334-349.

Schaling, E. (2003). 'Learning, Inflation Expectations and Monetary Policy', Discussion Paper Bank of Finland, No. 20/2003, August 2003.

Schaling, E. (2004) . **'**The Nonlinear Phillips Curve and Inflation Forecast Targeting: Symmetric vs. Asymmetric Monetary Policy Rules', *Journal of Money, Credit and Banking*, Vol. 36, Number 3, Part 1, June, pp. 361-386.

Schaling, E. (2005). 'South Africa: From Fear of Floating to Targeting Inflation', Comments and Review (I), in Martin Grandes and Nicolas Pinaud (eds), *Reducing Capital Costs in South Africa*, OECD Development Centre, OECD Publishing, December, pp. 115-121.

Schaling, E. (2007). **'**Trade and Poverty in South Africa: The Roles of the Exchange Rate, Tariffs and Import Parity Pricing for CPI Inflation**',** TIPS Trade and Industry Monitor, Forthcoming.

Vitale, P. (1999). 'Sterilized Central Bank Intervention in the Foreign Exchange Market', *Journal of International Economics*, Vol. 49, pp. 245-267.