Reducing Exchange Rate Volatility and Supporting Competitiveness

Prof. E. Schaling*

*South African Reserve Bank Chair, University of Pretoria, CentER for Economic Research, Tilburg University, The Netherlands and CDMA, University of St. Andrews
E-mail eric.schaling@up.ac.za
Web http://center.uvt.nl/staff/schaling/

This Version 16 November 2007

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 comment on the policy advice of the International Panel of Experts on Growth (The 'Harvard Team') on South Africa's Accelerated and Shared Growth Initiative (ASGISA) with respect to the present architecture of SA's inflation targeting regime. 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. We argue against this. Instead we 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.

Keywords: competitiveness, exchange rates, inflation targeting

JEL Codes: E5, F3, F4.

1. INTRODUCTION[1]

The objective of this paper 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 2007 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.

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.

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. Finally, Section 5 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]

[1] The views are those of the author and not necessarily those of the South African Reserve Bank. He thanks Bongani Motsa for research assistance.

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

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 growth (in addition to increasing CPI inflation) it should boost net 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 definition for GDP , $\hat{y}$:

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

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:

$$y = \gamma_c c + \gamma_i i + \gamma_g g + \mu(b - m) \qquad \textbf{(2)}^{4}$$

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

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[3] The corresponding current account deficit would be $(\hat{b} - \hat{m}) - \hat{r}_F = \left(\hat{y} - \hat{c} - \hat{i}\right) - \hat{g} = \left(\hat{s} - \hat{i}\right) - \hat{g}$, where $\hat{r}_F$ 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: $\Delta p_c \uparrow$	Ambiguous: $\Delta y \uparrow$ if $(\Delta b - \Delta m) \uparrow$	?
Role of the Marshall-Lerner condition	$\Delta y \uparrow$ if $\eta_x > 1 + \eta_m$ as then $(\Delta b - \Delta m) \uparrow$	?

* 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.

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 export sector 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 subsidy for exporters, a subsidy that is being paid for by other sectors of the economy. In this sense a weaker exchange rate is an implicit subsidy which is financed by an implicit tax; 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:

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

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

where α_0, β_0 are constants and variables are in natural logs, more specific $s = p_F - p_H$ is the real 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]

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 Marshall-Lerner condition 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.

[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.

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 domestic currency – that is that SA exporters engage in what is known in the literature as producer currency pricing (PCP).[6] 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 priced in the producers' currency; 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 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 nominal depreciation implies a real 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

$$s = p_F - p_H = p_F^* + e - p_H \qquad \textbf{(5)}$$

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

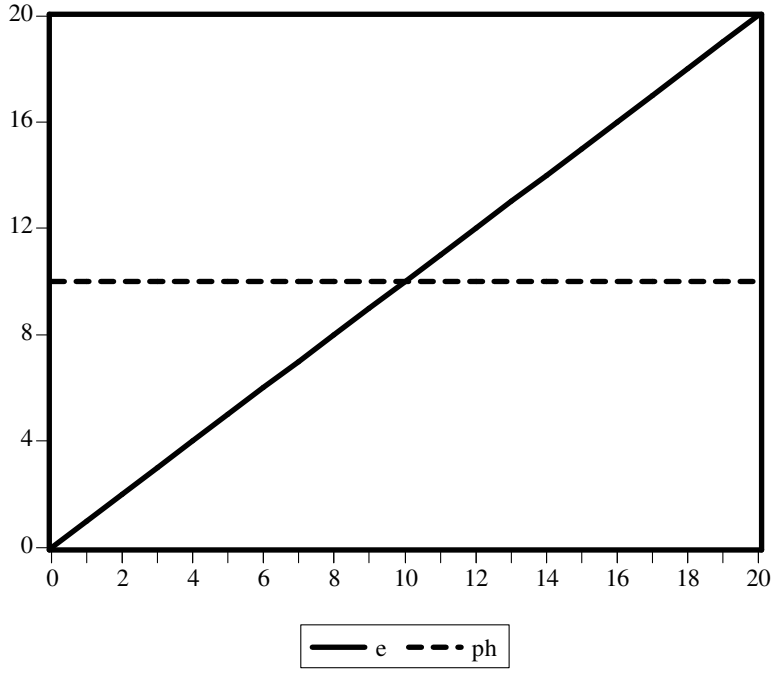
So that a nominal depreciation (an increase in e) implies a real depreciation (an increase in s). [7]

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 independent of the level of the nominal exchange rate (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.

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. Table 3 illustrates the implications of a nominal rand depreciation for the SA CPI under symmetric PCP for final goods.

[7] It appears that Edwards and 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).

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).[8]

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.[9] 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 *.[10] 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.

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).

[8] 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.

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

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

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.[11]

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 consumers' currency. 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 priced to market according to 'export parity pricing' (EPP); that is invoiced in dollars.

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

$$p_H^* = p_F^* \qquad \textbf{(8)}$$

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

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

So that a nominal depreciation (an increase in e) has no effect on the real exchange rate.[12]

[11] 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.

[12] 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 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

Under export parity pricing (EPP) we get the result that a nominal appreciation hurts profitability of SA exporters.[13] To see this we realize that the rand price of the exported good is

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

Obviously, we then have the result that a stronger nominal 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 real appreciation worsens the relative profitability of manufacturing (with an elasticity of 0.1).[14] 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 macroeconomic 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 markups in South African manufacturing are both high by international standards and have refused to come down since the 1990s.[15]

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 perfectly correlated with the level of the nominal exchange rate: $\frac{\partial p_H}{\partial e} = 1$. This implication of EPP will be tested in Section 3. Chart 2 illustrates.

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:

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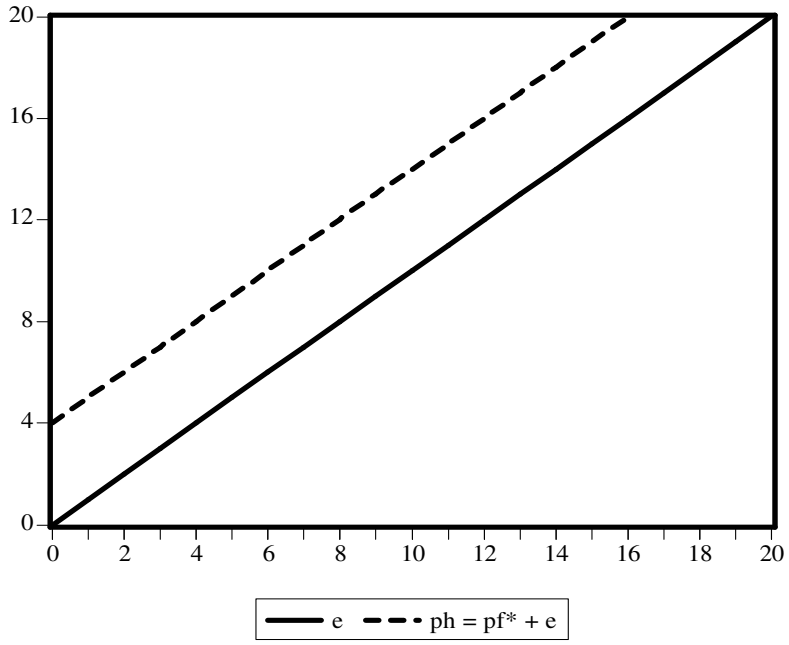
be the result in case of PCP for imported final goods (and no imported intermediate goods) and PTM (EPP) for the domestically produced good for the foreign market – or one (which would be the case of PCP for imports and exports and no imported intermediate inputs), but somewhere between zero and one.

[13] 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).

[14] 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)].

[15] 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



- 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 bad 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. No effect on SA export volumes or net exports. No effect 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 no trade-off 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 a weak rand also protects local industry from import competition. 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 final 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 rand price of the locally produced final good (p_H) is equal to the rand price of the imported final good (p_F). Table 5 illustrates.

Table 5 Home IPP + EPP, Foreign PCP + PCP[16]

	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 protection (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.[17]

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

$$p_H = p_F = p_F^* + e + \tau \qquad \textbf{(11)}$$

where τ is a proportional tariff.[18] Note that in line with the case of EPP, again a nominal exchange rate appreciation would – ceteris paribus - hurt profitability of

[16] 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 $p_F = p_F^* + e$.

[17] 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?

[18] 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 $\hat{\rho}$

domestic producers, say the manufacturing sector. The reason is that the appreciation would decrease $p_F^* + e + \tau$.

So, in case of IPP the rand price of home-produced final goods is equal to the rand price 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.[19]

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 much larger 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 ten times as large 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 of the nominal depreciation to be more than ten times as large as the one under PCP. Unconditionally very bad 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. No effect on SA export volumes or net exports. No effect 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 exporters but also to domestic

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is the proportional tariff (as a decimal). 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)**.

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

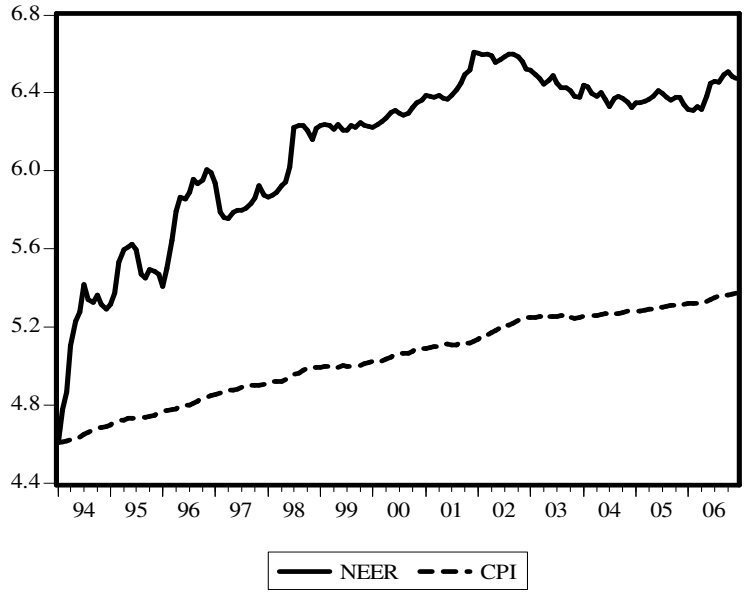
producers this makes practices like IPP more likely. The consequence of this is that the perverse income redistribution effects outlined in Section 2.2 are magnified: the effects from a nominal depreciation on the CPI are ten times as high as in the case where SA producers engage in PCP. So, not only 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):

$$p_{C,t} = \alpha_0 + \lambda e_t + \varepsilon_t \qquad \textbf{(12)}$$

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:

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

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 20 percent across the 94-06 sample.[20]

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

Dependent Variables (Right)	CPI[21]
Independent Variables (Down)	
EQUATION #	**(12)**
Constant	4.426*
NEER[22]	0.194*
ECM coefficient	-0.042*

* Indicates significance.

3.2 Some Evidence on Producer Currency Pricing versus Pricing to Market

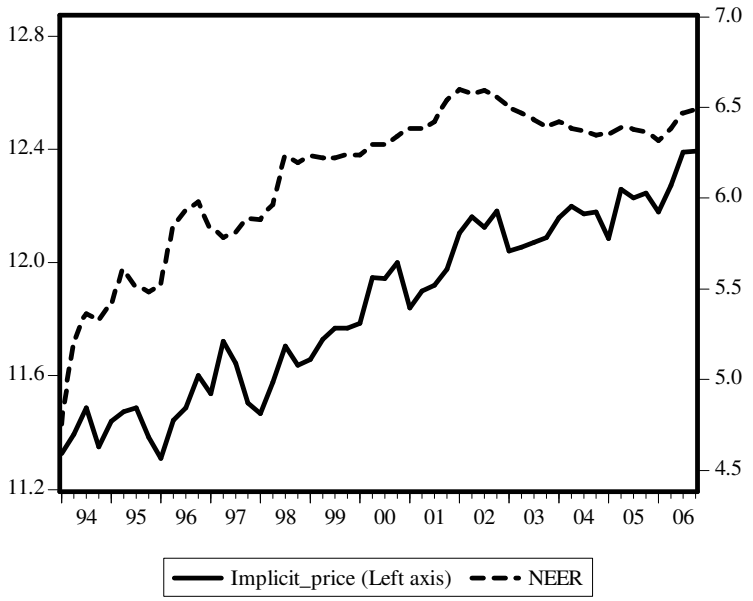
As said earlier, strictly speaking the implication of PCP – the fact that the domestic and overseas selling price of the home (SA) good are set in domestic currency/rand terms – is that the latter price, p_H is independent of the level of the nominal exchange rate as it is set in domestic currency/rand 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.
Some initial evidence is provided by Chart 4 below. This chart suggests a strong positive correlation between the NEER and the SA export price; that is it idicates the presence of PTM/EPP not PCP. In order to provide some more rigor we also estimated equation **(13)** below.

$$p_{H,t} = \alpha_0 + \lambda e_t + \varepsilon_t \qquad \textbf{(13)}$$

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

[20] Schaling (2007) 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 final goods-CPI channel, and 27 percent by the imported intermediate goods-CPI channel.
[21] SARB - 7032N (2000=100). Monthly series converted to quarterly series.
[22] 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).

Chart 4 Implicit Price and NEER (Logs) – Quarterly Data[23]



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:

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

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

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[24]	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

[23] 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.

[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).

the 94-06 sample. Thus these results bring the visual impression of Chart 4 into very sharp focus and indicate a nearly perfect correlation between the NEER and the SA export price; that is it idicates the presence of PTM/EPP not PCP.

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 net 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:

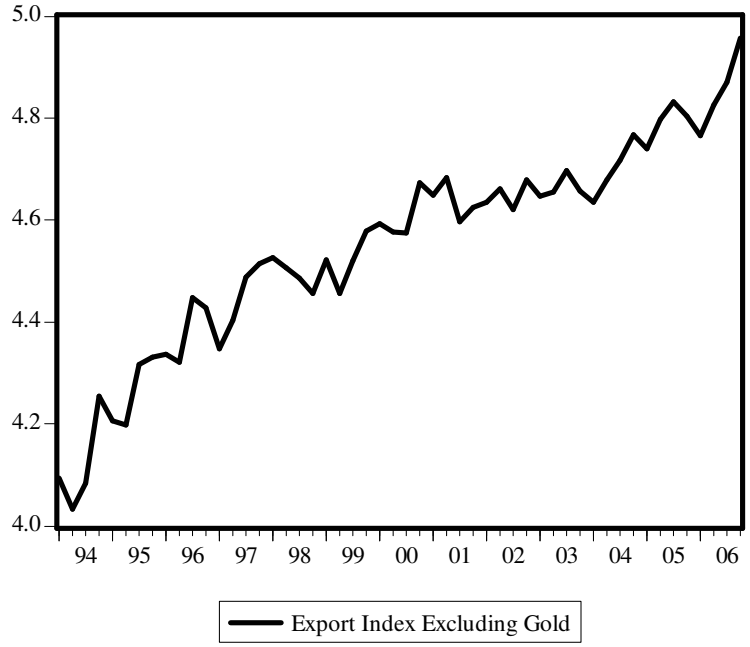
- For exports volumes, export index excluding gold (index number). The source is the SARB. Chart 4 illustrates.
- For total imports, import index (index number). The source is the SARB. Chart 5 illustrates.
- The real trade balance is simply the difference between exports volumes and imports volumes. What is notable is that the univariate properties of the trade balance (i.e. difference between export index excluding gold and the import 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.

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).[25]

[25] 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.

Chart 4 Export Index Excluding Gold – Quarterly Data[26]



More specific, we estimated the following equations:

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

$$m_t = \beta_0 + \eta_m s_t + \beta_2 y_t^i + \varepsilon_{2t} \quad \textbf{(4)}$$

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:

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

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

[19] SARB series: KBP5032L.

Chart 5 Import Index – Quarterly Data[27]

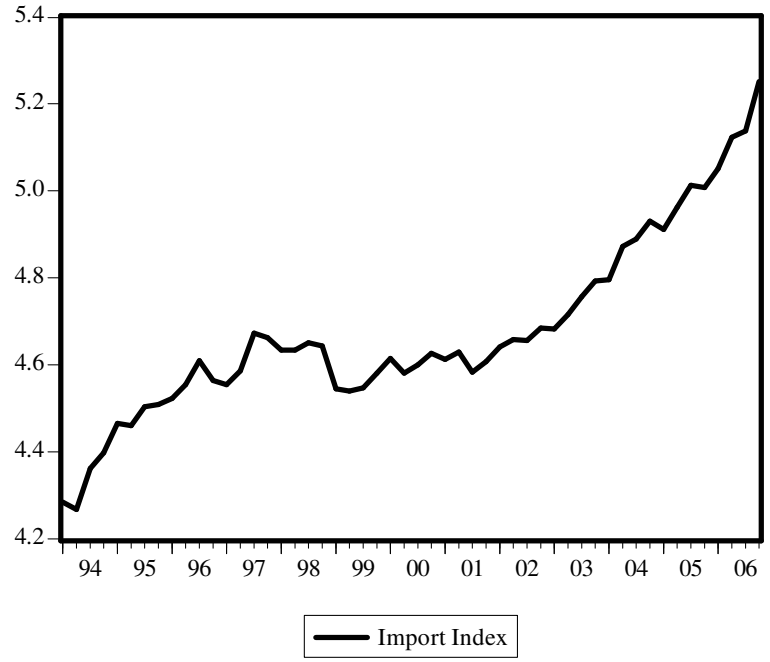
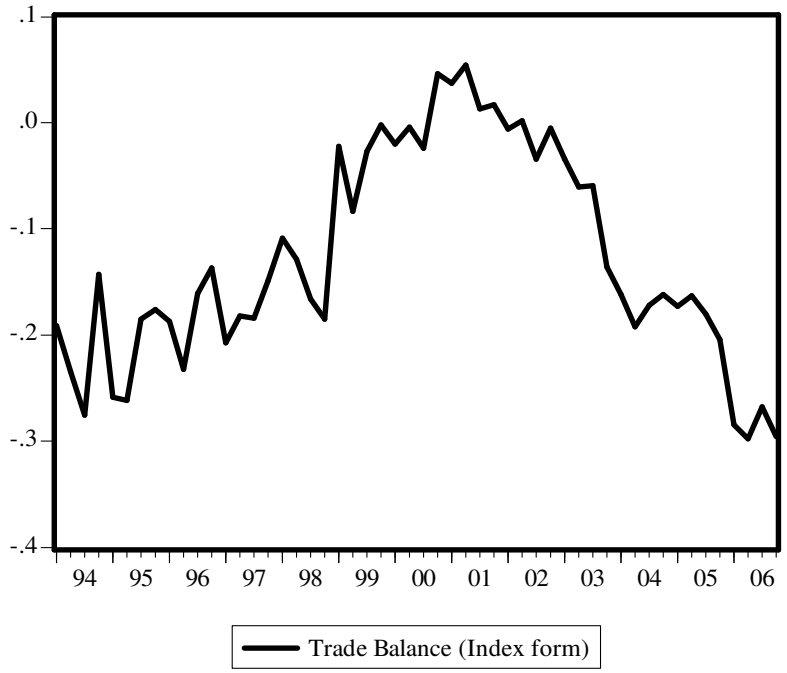


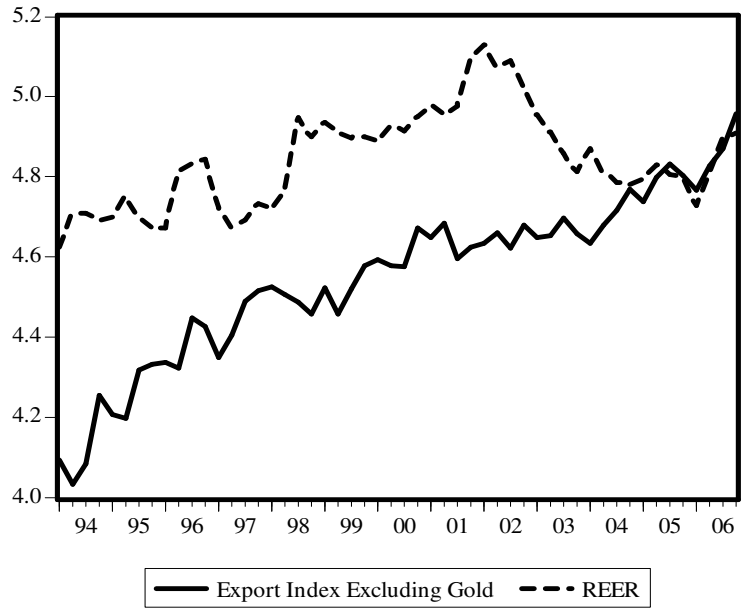
Chart 6 Trade Balance– Quarterly Data[28]



[27] SARB series: KBP5034L.

[28] 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



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.

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. 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), 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.[29]

[29] For more details on a comparison between our empirical results and those of Edwards and Lawrence (2006), see Appendix A.3 of Schaling (2007).

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

Dependent Variables (Right)	Export index excluding gold[30]	Import index[31]
Independent Variables (Down)		
EQUATION #	**(3)**	**(4)**
Constant	-4.883*	-1.888*
REER[32]	0.359*	0.336*
Foreign leading indicator[33]	1.680*	
South Africa's coincident indicator[34]		1.042*
ECM coefficient	-0.463*	-0.241*

* Indicates significance.

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 levels, and that it therefore tells us nothing about exchange rate volatility. 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 volatility on exports. This can be seen after we take variances which yields:

$$Var(b) = (\eta_x)^2 Var(s) + (\alpha_2)^2 Var(y^*) + \sigma_{\varepsilon 1}^2 \qquad \textbf{(14)}^{35}$$

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 growth 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

[30] SARB series: KBP5030L: Index 2000 = 100. Seasonally adjusted.
[31] SARB series: KBP5032L (Index 2000 = 100)
[32] SARB series: KBP5369M.
[33] SARB series: KBP7095N.
[34] SARB series: KBP7091N; Index 2000 = 100. Seasonally adjusted monthly series – converted to quarterly.
[35] 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.

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

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 $\eta_x = 0.359$, $\eta_m = 0.336$, $\alpha_2 = 1.680$, $\beta_2 = 1.042$, $\mu = 0.296$[36] - 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

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

This suggests that the volatility of SA output growth (via the trade balance) is largely driven by international business cycles (0.25), rather than by real exchange rate 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).[37]

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. 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.

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 Frankel, Smit and Sturzenegger (2006) when they say

[36] 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 (2007)) 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.

[37] Based on a sample of 83 countries from 1960-2000 they 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).

'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' [Frankel, Smit and Sturzenegger (2006, p. 10].[38]

A number of objections can be raised against the suggestions by Rodrik and Frankel, Smit and Sturzenegger (2006) 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 implicitly 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.[39] 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.[40] Effectively this amounted to

---

[38] They support their argument with the following equation for the rand [Frankel, Smit and Sturzenegger (2006, p. 28]:

$$\begin{aligned} \textit{Log Rand value}_t = {} & a + \beta_1\, \textit{Log Real Price Minerals}_t + \beta_2\, \textit{Log (SA GDP/foreign GDP)}_t \\ & + \beta_3\ \ \Delta \textit{Log Rand value}_{t-1} + \beta_4 \textit{Inflation Differential}_t \\ & + \beta_5\ \textit{Real Interest Differential}_t + \beta_6 \textit{Country Risk Premium}_t + \beta_7\, \textit{trend}_t + u_t. \end{aligned}$$

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 Frankel, Smit and Sturzenegger (2006) 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' [Frankel, Smit and Sturzenegger (2006, p. 30)].

[39] 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 ($p_H - p_F$).

[40] Frankel, Smit and Sturzenegger (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.'

sterilized FX market intervention[41] 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 relative high returns on EM assets in an environment of ample global liquidity – that was seen as harmful for competitiveness.[42]

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:

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

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 argumment'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:

$$\eta_x s^{TARGET} = -\alpha_2 y^* \qquad \textbf{(18)}$$

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

[41] 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 ex post.

[42] Frankel, Smit and Sturzenegger (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.'

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)].
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 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^*)[43] 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 nominal exchange rate changes. Thus, real exchange rate targeting then implies nominal exchange rate targeting. 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.[44] 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.

5 POLICY RECOMMENDATIONS

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

5.1 Suggestions for Modifying SA's Inflation Targeting Framework

We know that the monetary policy objectives of the SARB are defined as price stability according to SARB Act.[45] The way achieving price stability is being

[43] 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.

[44] 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.

[45] 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

implemented 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):

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

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.[46]
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,

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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.

[46] 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 (June 2007) presently.

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

With the new upper range at 3 percent, say, the price level now will now only double every 25 years, triple in 38 years and quadruple in 48 years.[47]
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 (2007) 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). [48]

5.2 Towards Price Stability And Increased Competitiveness

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

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

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

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

[47] One disadvantage of a more narrow range is that this will limit the Reserve Bank's ability of monetary accommodation of adverse supply shocks. 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.
[48] See also Schaling (2003).

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 domestic 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 domestic 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 depreciated (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 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. 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 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.

REFERENCES

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

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

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

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.

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

Hoeberichts, M. and E. Schaling (2007). 'Why Speed Doesn't Kill: Learning to Believe in Disinflation', Conference Proceedings, South African Reserve Bank Conference 'Macroeconomic Policy Challenges for South Africa', 22-24 October 2006

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.

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

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

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

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*, Volume 38, pp. 74-97.