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Does South Africa Suffer from the 'Fear of Float' Syndrome?
An Analysis of the Efficacy and Challenges of a Managed Floating Exchange Rate Regime with Financial Integration

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ABSTRACT

The paper examines whether South Africa suffers from a 'fear of float' syndrome. The analysis also covers the efficacy and challenges of a managed floating exchange rate regime. I use time series data, volatility equations and ARCH models to test the volatility of South Africa's exchange rate, interest rate and foreign exchange reserves. Evidence shows that South Africa has volatile interest and exchange rates, but not foreign exchange reserves. Yet, South Africa does not seem to suffer from an extreme and chronic form of 'fear of floating'. South Africa requires financial integration to finance its current account deficits and to complement its low savings rate. Yet, evidence indicates that both capital account openness and foreign exchange control liberalization have no robust impact on growth. The authorities' intervention in the 2001 currency crisis did not help. Hence, I recommend that South Africa should use interest rates early to target both inflation and foreign exchange rates. Challenges remain in the form of relatively high interest rates, volatile capital flows, perceptions, destabilizing speculation, and loopholes in foreign exchange controls.

1. INTRODUCTION

Emerging Market Economies ('EMEs') have continuously suffered from currency and financial crises, especially currency crisis. These crises have affected countries across the board - Latin America (Mexico in 1994, Brazil in 1998 and Argentina in 1995 and 2000); East Asia in the late 1990s (Indonesia, South Korea, Malaysia and Thailand); the Middle East (Turkey in 2000); Asia (Russia in 1998); and Africa (South Africa in 1998 and 2001). The currency crises have hit EMEs irrespective of the macroeconomic fundamentals, the type of foreign exchange ('forex') rate regime, financial markets development, 'good policies' pursued, and financial liberalization efforts. Short term capital flows have usually been blamed for these crises.

At the heart of these crises and debates is the forex rate regime followed. The foundation of the debate is the 'Impossibility Trinity', which states that a country cannot *simultaneously* have monetary policy independence, a stable exchange rate and full financial integration (Frankel *et al.* 2001, p. 356 and Frankel 1999, p. 7).[1] The Impossibility Trinity theoretically implies that a country cannot operate on all three sides of the Trilemma Triangle.[2] A country will have to have a free floating forex regime if it prefers monetary policy independence and full financial integration.

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[1] The Impossibility Trinity is also known or represented as the Trilemma Triangle.

[2] The Trilemma Triangle is from Frankel (1999) and reproduced in Appendix A1.

In the case of EMEs, they will have to be relatively closed, i.e. have full capital controls, if they prefer monetary policy independence and forex rate stability. Lastly, a country will have to be a member of a monetary union or adopt a hard peg if it prefers forex rate stability and full financial integration. Hence, according to this theoretical framework, a country is 'compelled' to choose one of the three corners and therefore only two strategies (or sides). The Impossibility Trinity does not allow for any intermediary regimes.[3]

The EMEs dire need for (foreign) capital enabled an academic policy prescription shift towards the 'Two-Corner Solution'.[4] The Two-Corner Solution assumed that full financial integration is indispensable and therefore required EMEs to choose between only two extremes on the Trilemma Triangle, namely, a pure float or hard peg regime.[5]

Free Floating regimes seem to have become popular after the collapse of the Bretton-Woods System of fixed forex regime in 1971. Yet, the question is whether EMEs who classify themselves as free floaters are genuinely floating. Economists like Calvo and Reinhart (2000) have argued that many of the 'free' floaters show a high incidence of 'fear of floating'. This fear is manifested in high

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[3] Note that a combination of at least two corners implies operation on all three sides.

[4] Also known as the 'Hypothesis of the Vanishing Intermediate', the 'Missing Middle', the 'Corner Solution' (Frankel *et al.* 2001, p. 352) or 'hollowing out' (Bordo and Flandreau 2001, p. 22).

[5] Put differently, *The Economist* (September 2000, p. 105) states that: "Nowadays most economists think that in a world of highly mobile capital, countries have two options. They must either fully fix their currency…or they must allow it to float freely."

volatilities in the interest rates, forex reserves and high absolute levels of gross forex reserves.[6]

My focus in this paper will be on EMEs, in particular, South Africa's Managed Floating Exchange Rate System ('MFERS') during the currency crisis in 2001 and its aftermath. In **Section 2**, I will consider the general theoretical expositions of 'fear of floating' and intermediary regimes. **Section 3** will empirically assess if whether South Africa suffers from a 'fear of float' syndrome. This will entail analysing the forex rate (in particular the Rand/US$ forex rate); forex reserves; interest rates; 'original sin'; and financial integration. **Section 4** will analyse the causes of the Rand's depreciation as challenges faced by South Africa's forex regime. **Section 5** will conclude.

[6] Capital Controls can be included as an instrument to manage forex rates and as a sign of 'fear of float' (Crefsa 1996).

2. GENERAL THEORETICAL ANALYSIS: 'FEAR OF FLOAT' AND INTERMEDIARY REGIMES

Empirical evidence suggests that EMEs (even some industrialized countries) are reluctant to being cornered into choosing between pure floats and hard peg regimes. Instead, many of them seem to be pursuing more subtle forms of intermediary (floating) regimes. To start with, Reinhart and Rogoff (2002) have argued that the official classification of the forex rate regimes by country has serious flaws. For example, they argue that 45% of all post 1970 classifications labelled as 'peg' should in fact be classified as limited flexibility, managed or freely floating.

Calvo and Reinhart (2000, pp. 1-2) argue that even though there has been an increase in the number of countries who have adopted what they deem as pure floating regimes,[7] they actually do not float in terms of the official labels. They find empirical evidence that shows high interest rates and forex reserves volatility for (managed) floating countries than soft pegged countries and interpret this as an attempt to stabilize forex rates (Calvo and Reinhart 2000). They contend that the reason for this camouflaged float is the perverse 'fear of floating'. Calvo and Reinhart (2000) conclude by stating that the intermediary regime is not disappearing in EMEs and that there are no countries at the corners to study.[8]

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[7] Only 11% of IMF members were pegged in 1999, compared to 97% in 1970 (Calvo & Reinhart 2000, p. 1).

[8] They are supported by Frankel (1999, p. 7) who also states that, "most countries still choose something in between rigid fixity and free float, and perhaps with good reason."

Hausmann *et al.* (2001) empirical work supports Calvo and Reinhart (2000). Their research reveals that EMEs tolerate more volatility in interest rates and forex reserves than in the forex rate. They empirically show that EMEs hold high forex reserves coupled with high forex reserves and interest rates volatilities in relation to the forex rate (Hausmann *et al.* 2001, pp. 391-398).[9] Frankel (1999, p. 7) and Frankel *et al.* (2001, p. 355) support this empirical observation by stating that there is not even a theoretical reason for the disappearance of the intermediate regime.[10]

EMEs (and even some industrialized countries) are reluctant to genuinely float their forex rates because of the following primary reasons:

(a) Pure floating is associated with volatility and overshooting of the forex rate. A volatile forex rate creates uncertainty and makes long term planning and export production investment difficult (Crefsa 1995, p. 3). Depreciation also results in high interest rates due to (a). the shortage of domestic money (during sudden capital outflows) and (b). their use to control imported inflation (especially if the pass-through is high) and to stabilize the forex rate. The primary tradeoff is that high interest rates tend to reduce real balances and hence result in recessions (Bordo and Flandreau 2001, p. 24).

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[9] The index of flexibility shows that the emerging and developing countries (all of which are proclaimed floaters) have the lowest rate of flexibility in the exchange rate (0.36 and 0.31 respectively), while the G3 countries (the only true floaters) have the highest flexibility (0.95) (Hausmann *et al.* 2001, pp. 391-393).

[10] Edwards & Savastano (1999, p. 17) also note that the intermediary floating regime has not disappeared, instead forex rate stabilization has taken another form.

(b) Floating regimes could result in capital flight under severe depreciations and cause other problems like financial crisis (Bordo and Flandreau 2001, p. 24).

(c) Severe depreciations crisis can turn a currency crisis into a debt and/or financial crisis in weak and improperly regulated financial markets due to currency and maturity mismatches.[11] Such debt crisis can be severe under strong 'original sin' presence.

(d) Forex rate depreciations can have severe repercussions on inflation and inflation targeting credibility if the exchange rate pass-through is high.

[11] As lenders panic and all withdraw their capital, a floating currency will severely depreciate and also result in financial crisis. The financial crisis occurs because the financial intermediaries, especially banks, have to suddenly repay the called loans they have on-lended (maturity mismatch) while debt services will increase due to currency depreciation (currency mismatch). Other industries will suffer due to increased real debt burden and this will affect banks through bad debts. Also, depositors will cause runs on the banks as everyone panics.

3. DOES SOUTH AFRICA SUFFER FROM A 'FEAR OF FLOAT' SYNDROME? AN EMPIRICAL ANALYSIS

3.1 Volatility Indices and Standard Deviations

One method of analysing forex rate management is to analyze the following: (i). the level of gross forex reserves under the floating regime; (ii). the degree to which the forex reserves are used to stabilize the forex rate; and (iii). the degree to which interest rates are used to stabilize the forex rate (Hausmann *et al.* 2001, p. 391). Standard deviations are also a widely accepted measure of risk (i.e. volatility) in financial variables (Elton *et al.* 2003). Yet, they are not as revealing as formal volatility indices. I, therefore, have used Hausmann *et al.* (2001) methodology to further compute the relevant volatility indices for South Africa.

I have used their methodology to compute, (i). the Relative Volatilities of the Exchange Rate and of Reserves ('RVER');[12] (ii). Relative Volatilities of the Exchange Rate and Interest Rates ('RVEI');[13] and (iii). Gross Foreign Reserves Index ('GFRI'), using the following equations:[14]

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[12] Hausmann *et al.* (2001) use *gross* foreign reserves since they argue that volatility of *changes* in reserves is similar to the volatility in *gross* foreign reserves. Hence, for South Africa I have used the South African Reserve Bank's ('SARB') 'Gross Gold and Other Foreign Reserves' as Gross (Foreign) Reserves.

[13] I have chosen the Predominant (Prime) Overdraft Rate (i.e. Prime Rate) since it tracks closely the SARB's Repurchase Rate (Repo Rate). See Appendix A2 for this close relationship.

[14] According to Hausmann *et al.* (2001, p. 394) Gross Foreign Reserves are normalized by dividing them by (the US$ value of) M2, i.e. the stock of broad money. Further, the *average* of the (Rand or US$ value of) M2 is used to prevent changes in the forex rate from affecting the measured volatility of reserves through (the Rand or US$ value of) M2.

$$RVER(\$) = \frac{Standard\ Deviation\ [Rand/US\$\ Forex\ Rate]}{Standard\ Deviation\left[\frac{Gross\ Foreign\ Reserves}{\overline{M2(\$)}}\right]} \quad (1)$$

$$RVER(R) = \frac{Standard\ Deviation\ [Rand/US\$\ Forex\ Rate]}{Standard\ Deviation\left[\frac{Gross\ Foreign\ Reserves}{\overline{M2(R)}}\right]} \quad (2)$$

$$RVEI = \frac{Standard\ Deviation\ [R/US\$\ Forex\ Rate]}{Standard\ Deviation\ [Prime\ Rate]} \quad (3)$$

$$GFRM2\ Ratio = \frac{\overline{Gross\ Foreign\ Reserves}}{\overline{M2(R)}} \quad (4)$$

According to Hausmann *et al.* (2001): (i). a higher gross foreign reserves to M2 ratio is an indication of a reluctance to freely float; (ii). a genuinely fixed forex rate regime will have a zero standard deviation of depreciations (i.e. no volatility) and therefore the RVER($) or RVER(R) indicators will have a zero value (while a pure float will have a zero standard deviation of the reserves and therefore an infinite RVER($) or RVER(R)); and (iii). a genuinely fixed forex rate regime will have a zero standard deviation of depreciations and therefore a zero RVEI (while a pure float will have a zero standard deviation in interest rates and therefore an infinite RVEI).

Put differently, low values of RVER and/or RVEI would suggest that forex rates are very stable relative to reserves and/or interest rates – i.e. there is a lot of intervention by authorities to stabilize the exchange rate.

Table 1

VOLATILITY INDICES AND STATISTICS (South Africa) January 1995 – February 2003*									
	GFR	**Prime Rate**	**R/US$**	**GFR/$\overline{M2\$}$**	**GFR/$\overline{M2R}$**	**GFR/M2**	**RVER ($)**	**RVER (R)**	**RVEI**
Standard Deviation	45157.8	3.509	2.251	0.7408	0.117	N/A	N/A	N/A	N/A
Indices	N/A	N/A	N/A	N/A	N/A	0.161	3.038	19.257	0.641

* Computed using data from the South African Reserve Bank.

Table 2[15]

HAUSMANN COMPARATIVE INDICES*						
	GFR/M2	**RVER ($)**	**RVEI**	**FLEXIBILITY**	**'Original Sin' Index**	**12 month pass-through**
Australia	0.06	3.22	72.57	0.74	0.73	0.21
Brazil	*0.24*	*0.50*	*6.24*	*0.28*	*0.97*	*0.81*
Chile	*0.48*	*0.91*	*10.27*	*0.34*	*0.98*	*0.18*
Mexico	*0.28*	*0.79*	*6.54*	*0.33*	*0.99*	*0.58*
Columbia	*0.43*	*3.69*	*12.53*	*0.55*	*1*	*0.38*
Peru	*0.60*	*0.24*	*9.06*	*0.14*	*0.98*	*0.22*
Czech Rep.	*0.33*	*0.82*	*3.20*	*0.28*	*0.87*	*0.02*
Russia	*0.21*	*1.65*	*6.43*	*0.44*	*0.91*	*N/A*
Poland	*0.43*	*2.12*	*13.46*	*0.48*	*0.88*	*0.62*
South Korea	*0.25*	*1.15*	*18.94*	*0.47*	*0.99*	*0.18*
Philippines	*0.26*	*0.93*	*22.28*	*0.45*	*0.98*	*0.3*
Thailand	*0.24*	*2.36*	*8.50*	*0.50*	*0.98*	*0.03*
India	*0.14*	*0.84*	*4.28*	*0.34*	*0.98*	*0.07*
Israel	*0.25*	*1.33*	*21.05*	*0.49*	*0.99*	*0.16*
South Africa	***0.07***	***2.01***	***16.27***	***0.57***	***0.72***	***0.11***
All countries	0.27	2.35	25.58	0.43	0.87	N/A
G3	0.06	12.82	150.51	0.95	0.30	N/A
Other Industrial	0.15	2.66	26.92	0.53	0.80	N/A
EMEs	**0.38**	**1.26**	**11.23**	**0.36**	**0.95**	**N/A**
Other Developing	0.32	0.76	9.96	0.31	0.99	N/A

* Source: Hausmann *et al.* (2001).

[15] I have chosen the individual EMEs (italicized) from Hausmann *et al.* (2001) using *The Economist's* (August 2003, p. 84) Emerging-Market Indicators. I have left out 'city states' like Hong Kong. Australia is included since it is a resource-based economy like South Africa.

Table 1 is considered: South Africa seems to hold an absolute low level of forex reserves at 16%. In relative terms, South Africa is holding lower reserves in relation to other EMEs (38%) for the period 1997-1999 (see Table 2).[16] Hausmann *et al.* (2001) indices reveal that South Africa's reserve ratio is close to the average of other industrial countries (15%).

The RVER($) is 3.038 above the zero level, indicating that the volatility of the forex rate is higher than the volatility of the reserves. This suggests that South Africa is not using much of reserves to stabilize the forex rate. My RVER($) is one point higher than Hausmann *et al.* (2001, p. 393) 2.01 figure (i.e. 51% higher). This increase might be due to South African authorities' more reliance on interest rates as an instrument of intervention.[17]

The 0.641 RVEI indicates that there is more volatility in interest rates relative to the forex rate.[18] This is a 15.62 (96%) decrease from Hausmann *et al.* (2001, p. 393) figure of 16.27. The latest RVEI index is also less than the Hausmann *et al.* (2001) EMEs average (11.23) for the period 1997-1999.

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16 Caution should be exercised in comparing my indices with Hausmann *et al.* (2001) indices since the data and computation period is different – mine is from 1995 to 2003.

17 The other reason could be due to the difference in the time series periods.

18 As another guide, the RVEI would be 1 if both standard deviations (volatilities) were equal; less than 1 if the standard deviation of the forex rate was lower than the standard deviation of the interest rates; and greater than 1 if the standard deviation of the forex rate was greater than that of the interest rates.

The indices seem to indicate, *prima facie*, that interest rates might have superceded forex reserves as an instrument of managing the forex rate in South Africa, especially post 1998 currency crisis and post 1999.

3.2 ARCH Models

Volatility in financial time series is very common and can be measured by ARCH (Autoregressive Conditional Heteroscedasticity) and/or GARCH (General Autoregressive Conditional Heteroscedasticity) models (Gujarati 2003). There is a strong tendency for financial time series to be nonstationary, with strong Random Walk attributes. Yet, they can be made stationary by taking their First Differences.[19]

Nevertheless, the First Differences of such financial time series tend to also exhibit *volatility clustering*, i.e. periods in which the variable shows wide fluctuations (or large values) for an extended period, followed by periods of normality or relative calm (Gujarati 2003, p. 856). This suggests that the variance of that financial time series varies over time. We can model this varying variance by using ARCH models. The ARCH models simply model a relationship whereby the heteroscedasticity or unequal variance (i.e. the volatility) observed over different periods might be autocorrelated (Gujarati 2003, p. 856-857; Campbell, Lo & MacKinlay 1997, p. 482; and Mills 1999, p. 127).

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[19] A stationary time series has a mean and variance which are time invariant (i.e. constant over time), and an autocovariance which remains constant at various time lags (Gujarati 2003, p. 792-834). A Random Walk With or Without Drift is an indication of a violation of one of the above stationarity conditions and therefore of nonstationarity.

I will use the following simple ARCH modelling process in Gujarati (2003) to model the volatility of interest rates, forex rate and forex reserves:[20]

$$Y_t = Relevant\ Variable \quad (5)$$

$$Y_t^* = log\ of\ Y_t \quad (6)$$

$$dY_t^* = Y_t^* - Y_{t-1}^* = Relative\ Change\ in\ Y \quad (7)$$

$$\overline{dY_t^*} = Mean\ of\ dY_t^* \quad (8)$$

$$X_t = dY_t^* - \overline{dY_t^*} \quad (9)$$

$$X_t^2 = Measure\ of\ Volatility \quad (10)$$

$$Y_t = \hat{a} + u_t \quad (11)$$

$$u_t \sim N[0,(\acute{a}_0 + \acute{a}_1 u_{t-1}^2)] \quad (12)$$

$$var(u_t) = (\acute{a}_0 + \acute{a}_1 u_{t-1}^2) \quad (13)$$

$$var(u_t) = \acute{o}_t^2 = \acute{a}_0 + \acute{a}_1 u_{t-1}^2 + \acute{a}_2 u_{t-2}^2 + ...\acute{a}_p u_{t-p}^2 \quad (14)$$

$$\hat{u}_t^2 = \hat{a}_0 + \hat{a}_1 \hat{u}_{t-1}^2 + \hat{a}_2 \hat{u}_{t-2}^2 + ...\hat{a}_p \hat{u}_{t-p}^2 \quad (15)$$

$$H_0 : \acute{a}_0 = \acute{a}_2 = ... = \acute{a}_p = 0 \quad (16)$$

$$H_1 : \acute{a}_0 \neq \acute{a}_2 \neq ... \neq \acute{a}_p \neq 0 \quad (17)$$

$$nR_{asy}^2 \sim \chi_p^2 \quad (18)$$

The time series must be checked for stationarity before modelling can be undertaken. Table 3 below gives a summary of the Augmented Dickey-Fuller (ADF) Regression Results:[21]

[20] Models 5 to 10 are theoretical, while models 11 and 15 are the practical test regressions. Models 16-18 are for hypothesis testing.

Table 3[22]

UNIT ROOT TESTS RESULTS DICKEY- FULLER REGRESSIONS (South Africa) January 1995 - February 2003*											
	Without Trend					With Trend					
	ADF critical value	**AIC**	**SBC**	**HQC**	**Decision**[23]	**+Time Trend**	**ADF critical value**	**AIC**	**SBC**	**HQC**	**Decision**
LRUSD	-2.895	-1.669 ADF(1)	-1.730 DF	-1.669 ADF(1)	Non-stationary		-3.462	-2.467 ADF(2)	-2.467 ADF(2)	-2.467 ADF(2)	Non-stationary
DLRUSD	-2.895	-7.032 ADF(1)	-7.032 ADF(1)	-7.032 ADF(1)	Stationary	0.889 [0.376]	-3.463	-7.150 DF	-7.150 DF	-7.150 DF	Stationary
LGROSRES	-2.895	-1.030 ADF(1)	-1.030 ADF(1)	-1.030 ADF(1)	Non-stationary		-3.462	-1.750 ADF(1)	-1.750 ADF(1)	-1.750 ADF(1)	Non-stationary
DLGROSRES	-2.895	-7.181 DF	-7.181 DF	-7.181 DF	Stationary	1.271 [.207]	-3.463	-7.217 DF	-7.217 DF	-7.217 DF	Stationary
LOGPRIMER	-2.895	-1.342 ADF(5)	-1.386 ADF(1)	-1.342 ADF(5)	Non-stationary		-3.462	-2.054 ADF(5)	-1.996 ADF(1)	-2.054 ADF(5)	Non-stationary
DLPRIMER	-2.895	-3.4460 ADF(4)	-5.516 DF	-3.4460 ADF(4)	Stationary	-1.52 [.13]	-3.462	-3.428 ADF(4)	-5.491 DF	-3.428 ADF(4)	Mixed

* Computed with *Microfit 4.1* using data from the South African Reserve Bank.
+These are the *t*-ratios with the *p*-values in square brackets. The Dependant variables are in their First Differences.

The time trend for all the relevant *stationary* dependant variables are insignificant at 5% critical value, hence the mixed results for DLPRIMER under the regression 'With Trend' should not be a concern. The regressions also suggest that the time series follow a Random Walk Without a Drift. The above results are confirmed by the graphs in Appendix A3 and below.

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21 The Unit Root Tests were computed with *Microfit 4.1*. *Microfit* uses the Maximum Likelihood method to implement the Information Criteria Statistics (i.e. AIC, SBC and HQC). Hence, the Test Statistic(s) will be chosen based on the maximum values of the Information Criteria Statistics (Smith 2003). The complete regression outputs are in Appendix B1.

22 The Unit Root Tests regression outputs are in Appendix B1 and the Time Trend Tests regressions are in Appendix B2.

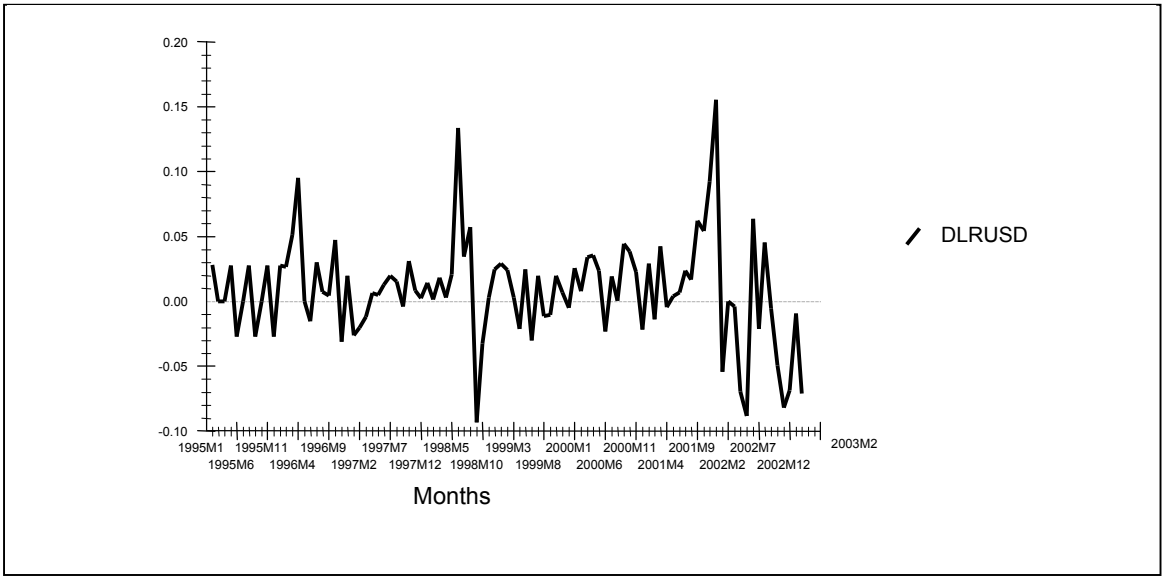
23 The Null Hypothesis is that the time series is nonstationary, while the Alternative Hypothesis is that the time series is (trend) stationary. A *p*-value of less than the critical value (5%) means the Null Hypothesis should be rejected. Further, the Null Hypothesis is rejected if the test statistic is less than the ADF critical value.

Table 4

ARCH(1) REGRESSION RESULTS: TEST FOR VOLATILITY CLUSTERING (South Africa) January 1995 – February 2003					
	Coefficient	Standard Deviation	*t*-ratio	*p*-value	ARCH Effect[24]
RSDLRUSD(-1)	.27873	.10017	2.7825	.007	Yes
RSDLGR(-1)	-.02717	.10310	-.26357	.793	No
RSDLPRIM(-1)	.25884	.098749	2.6212	.010	Yes

Table 4 above is a summary of the results from the ARCH regressions.[25] The results confirm the indices in Table 1. The evidence (*p*-value of less than the 5% critical value) suggests that the R/US$ forex rate has strong attributes of volatility clustering. Figure 1 below confirms these wide swings in 1998 and in late 2001.[26]

Figure 1: First Differences of the Logs of R/US$ Exchange Rate



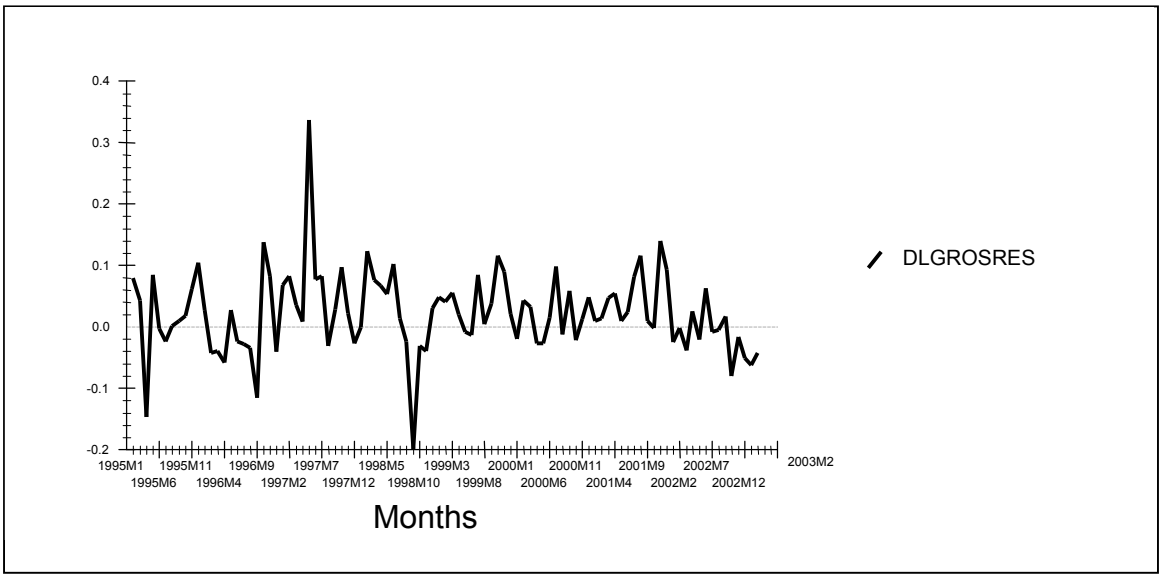
[24] The Null Hypothesis of 'No Arch Effect' is rejected if the *p*-value is less than the 5% critical value.

[25] The ARCH Regression outputs are in Appendix B3.

[26] See Appendix A3 for the plots of R/USD forex rate, gross forex reserves and prime rates.

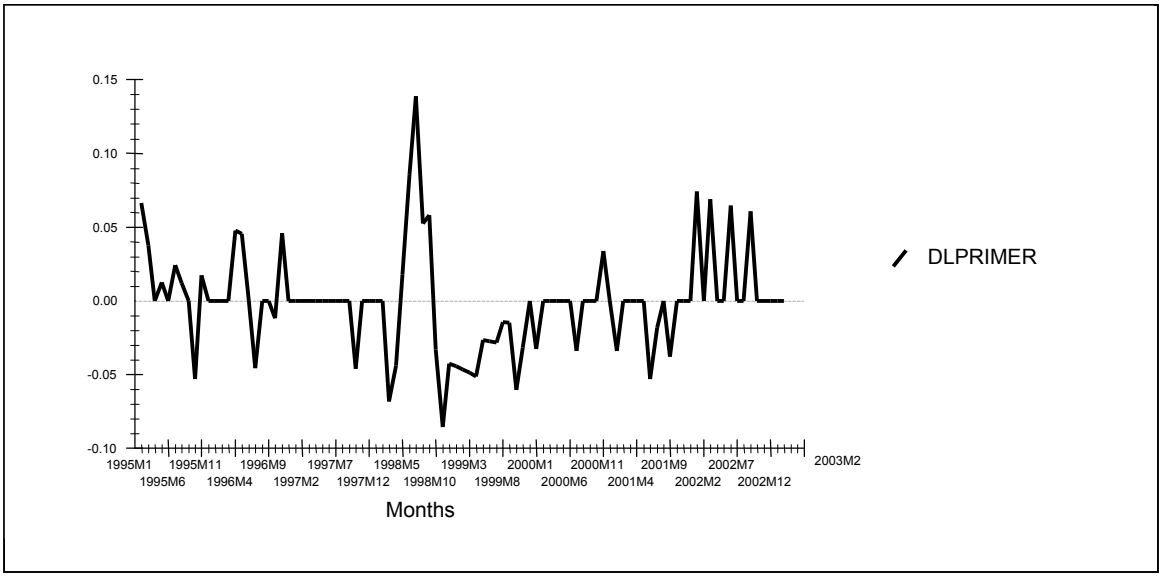
The gross foreign reserves do not seem volatile given their 0.793 *p*-value. Figure 2 seems to confirm this for the period 2001.

Figure 2: First Differences of the Logs of Gross Foreign Reserves (South Africa)



The evidence further suggests that interest rates are volatile - with a *p*-value of 0.010. This is also evidenced in Figure 3 below for periods 1998 and post 2001.

Figure 3: First Differences of the Logs of Primary Rate (South Africa)



The empirical analysis seems to strongly indicate that South Africa's forex rate is volatile - and therefore should probably suffer from a 'fear of float'; that interest rates are volatile in absolute and relative terms - suggesting that South Africa is trying to defend the currency or to fight inflation; and that forex reserves do not seem to be volatile (in absolute and relative terms). Yet, if the R/US$ forex rate shows volatility under what is supposed to be a managed system, does this imply that South Africa is genuinely floating or that the management of the floating forex rate (by interest rates) is not effective?

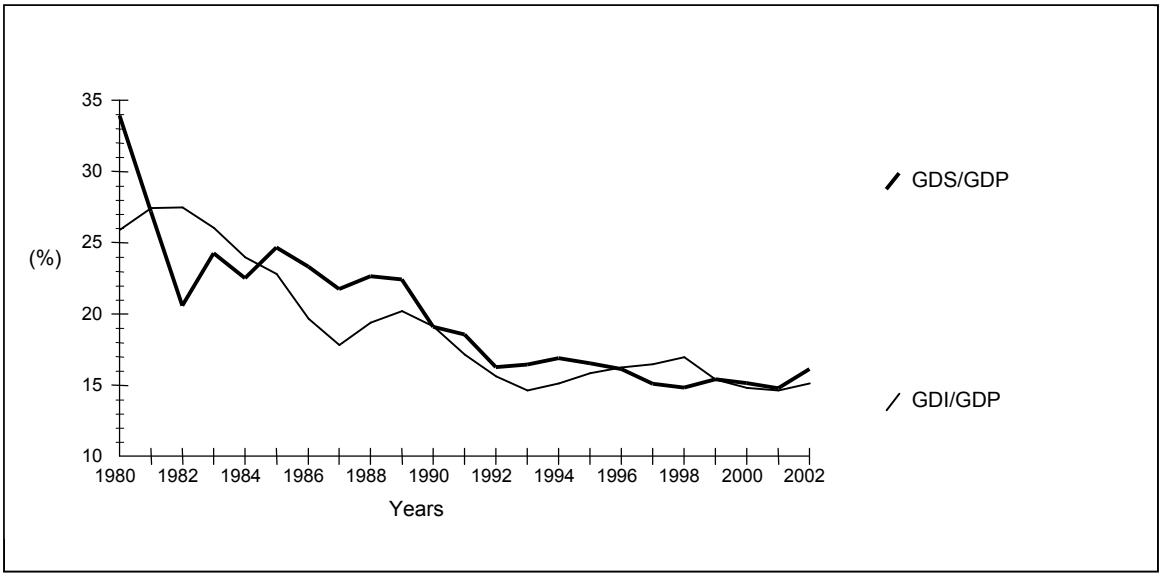
3.3 Globalization, Financial Integration and the Need for Capital

Growth is one of the important methods of alleviating unemployment and poverty in South Africa. High growth usually requires high saving and investment rates. Figure 4 below shows that South Africa's domestic saving and investment rates have *both* been decreasing since 1980. South Africa's growth rate averaged 1.8% and 2% for the last 12 and 22 years, respectively. Loots (2002, p. 21) states that South Africa's growth pattern has been lower than the acceptable norms in other EMEs.

The low investments could be due to gradual forex controls liberalizations that have enabled South Africans to invest abroad. These low rates could explain why South Africa has low economic growth compared to other EMEs, despite capital account openness. Ironically, this suggests that South Africa has not even raised long term capital abroad to increase its capacity, despite its high unemployment and poverty rates.

Although South Africa seems not to have a persistent Savings-Investment Gap (except for certain periods), it does have a gap arising from persistent current account deficits. Hence, Wesso (2001, p. 59) states that net inflows of foreign capital are a pre-condition if South Africa is to achieve high economic growth.

Figure 4: Gross Domestic Savings/GDP and Gross Domestic Investment/GDP Ratios (South Africa)



The Economist (2001, p. 28) also notes that capital inflows are even more important for industrialization in developing countries. South Korea and Taiwan have industrialized rapidly due to large USA aid received between 1946 and 1978 (Arrighi 2002, pp. 30-31). Access to capital is also important for Governments who operate Lender of Last Resort facilities (Calvo 2000, p.2). Further, investment in foreign assets is important for diversifying risk, hence South African residents have taken advantage of the gradual liberalization of capital controls.

The above arguments make a justifiable case for the financial integration of EMEs and South Africa, an objective consistently pursued by the South African authorities. Unfortunately, this might give the impression that EMEs are being cornered into free floats or hard pegs regimes since financial integration is considered indispensable. It should be stressed that a country can pursue financial integration and still exercise independence over monetary policy with a relatively stable forex rate.

Financial integration comes with its own major challenges, especially for a small open and emerging economy like South Africa. *The Economist* (2001, p. 27) notes that foreign capital flows have mixed blessing. This is because capital flows tend to be dominated by short term finance like Foreign Portfolio Investments ('FPI') and (short term) foreign debt. Short term finance usually flees at short notice. This 'sudden stop', i.e. contraction in international credit, has resulted in currency, debt and financial crises for EMEs (Calvo 2000, p. 1).

Does financial liberalization and capital account openness result in higher growth? Loots (2002) empirical study shows that only East Asia's EMEs have a positive and significant correlation between capital account openness, financial liberalization and growth. Other EMEs (South Africa, Turkey, India, Egypt and Israel) show a positive but *insignificant* relationship.[27]

[27] Latin America and Eastern Europe countries have significantly negative correlations between growth, financial liberalization and capital account openness.

Loots (2002, p. 20) uses the following model to produce the results for South Africa in Table 4:[28]

$$log\ GDP = \acute{a} + \hat{a}_1 IMEXGDP + \hat{a}_2 AVIMTAR + \hat{a}_3 TOTINGDP + \hat{a}_4 GRADFINLIB + e_t \quad (19)$$

Table 4

GLOBALIZATION IMPACT ON SOUTH AFRICA* (1990-2001)			
	Coefficient	**Standardized Beta Coefficient**	**Significant/Non-significant**
CONSTANT	13.0334	N/A	Significant
IMEXGDP	0.0053	N/A	Significant
AVIMTAR	-0.0039	N/A	Significant
TOTINGDP	0.0042	N/A	Significant
GRADFINLIB	0.0204	N/A	Significant
XINV		*0.0547*	
XAVIMTAR		*-0.2462*	
XFINLIB		*0.2749*	
XEXIM		*0.4868*	

*SOURCE: Loots (2002, p. 20) and R^2 =0.9798 for model 19.

Both financial liberalization and capital account openness variables are positive and *statistically* significant. Gradual liberalization of forex controls has the highest impact on growth, but just of 2%. The standardized coefficients reveal that trade volumes have the greatest contribution on growth (48.68%), followed by *financial liberalization* (27.5%), then trade liberalization (24.62%), and lastly *total investment flows* (5.47%). Interestingly, 73% of the contribution is from trade!

Loots (2002, p. 20) comments that the *small* contribution of investment flows indicates that "…the benefit for the South African economy through capital

[28] GDP=Real GDP; IMEXGDP=Total Value of Imports and Exports as a % of GDP; AVIMTAR=Import Weighted Average Tariff Rate; TOTINGDP=Total Inflow and Outflow of Investment as % of GDP; and GRADFINLIB=Financial Liberalization Variable Adjusted for Gradual Relaxation Approach in South Africa for the period 1990-2001.

accounts openness is negligible." This also suggests that South Africa's growth might not be adversely affected by capital flows volatility.

The above results also suggest that South Africa's policy of gradual financial integration (liberalization) is beneficial but not as beneficial as to realize robust growth. Nissanke and Stein (2002) warn that liberalization of capital accounts by developing countries has not resulted in major development finance inflows or economic development.

This is because these countries lack institutions (like norms, regulations, trust, capacities, and organizations) which will ensure that the financial flows feed into the real sector (Nissanke and Stein 2002). Yet, South Africa has the relevant institutions. Its low investment and growth rates could suggest that it is not receiving sufficient development finance, or if it does, such finance is not injected into the real sector. On a positive note, Crefsa (1998, p. 21) argues that the liberalizing of forex controls, especially on residents and capital outflows, could neutralize the excessive volatile capital inflows.

3.4 Foreign Debt, Financial Depth and South Africa's 'Conditional Original Sin'

Most EMEs trade is invoiced in US Dollars[29] and therefore depreciations tend to result in fiscal and debt crises as foreign currency denominated debt becomes difficult to service (Calvo and Reinhart 2000, p. 9). A large part of South Africa's exports, imports and foreign debt is denominated in US Dollars (SARB *Fact Sheet* No. 5).

High foreign debt and its sudden withdrawal can result in defaults, bankruptcies due to iliquidity, financial market crisis (especially banking crisis since most of the international lending is intermediated by banks) and low trade (Hausmann *et al.* 2001, p. 398). Policy makers will therefore be biased towards achieving forex rate stability under floating regimes because forex rate volatility creates uncertainty over imports and export prices, the valuation of forex reserves, and repayments of debt and other foreign denominated open positions (Farrell 2001).

From 1995 to 2000 FPI were dominant than Foreign Direct Investment ('FDI') in South Africa (SARB QB 2003, p. S-84).[30] Wesso (2001, p. 62) states that the SARB warned in 1999 that FPI, especially fixed-interest securities (bonds), are known for their volatility and often reversed flow. This is because bonds are highly sensitive to global interest rates differentials.

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29 Calvo (2000, p. 7) calls this 'Liability Dollarization'.

30 'QB' stands for Quarterly Bulletin.

The preferred form of investment would then be FDI and equity investment within FPI.[31] Crefsa (1998) and the Rand Commission (2002, p. 76) recommend that policy should be geared towards attracting FDI. Yet, Crefsa (1998) quickly cautions that such sustainable inflows will depend on both domestic (pull) and international (push) factors, while policy may affect only domestic factors. Hence, there is no guarantee that policy will eventually limit unsustainable short term capital inflows, especially when the EMEs, including South Africa, cannot dictate the type of capital flows they would like to receive from global investors.

Increased ownership of South African equities by foreign investors also means increased dividend outflows. This has and will put pressure on the current account (Ramos 2002, p. 706). Further, FDI will not guarantee growth. Carkovic and Levine (2002) study finds "…that the exogenous component of FDI does not exert a robust, independent influence on growth."

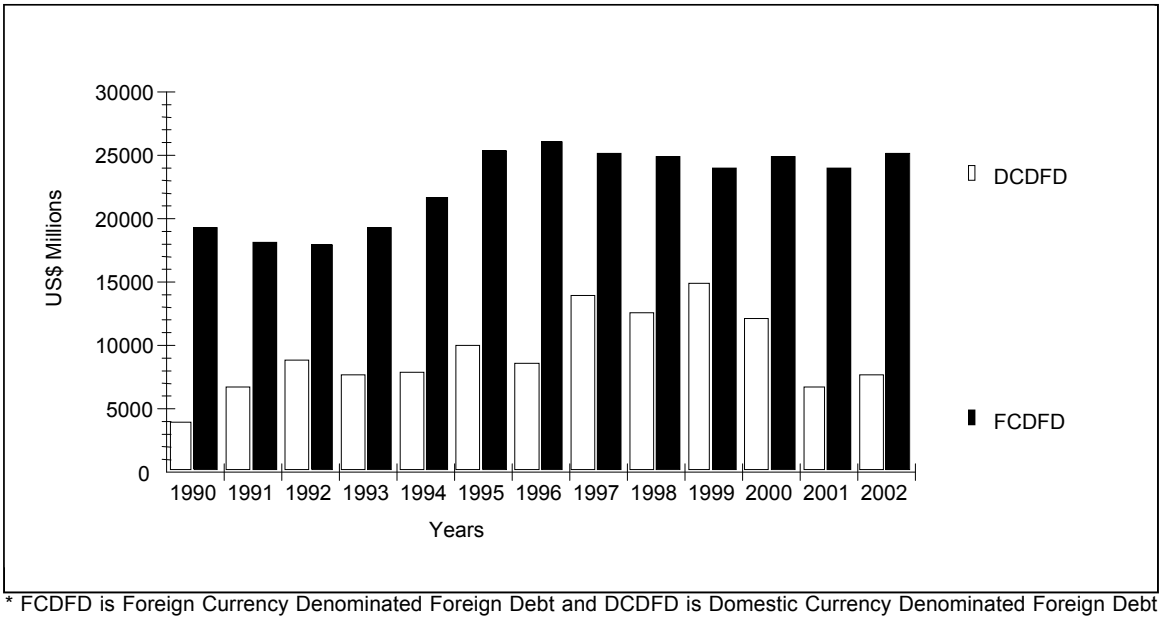
Crefsa (1998, p. 18) contends that volatility in equity investment might be due to equity speculation, which in South Africa's case could be aided by the existence of derivatives. Hence, although the derivatives market could serve as a good strategy to deepen financial markets, it could also result in speculation (which could be good or bad depending on its nature).

[31] See Loots (2002, p. 21) and Crefsa (1998, p. 20) on their preference for long term FDI as a stable form of capital inflow.

I will now focus on (short term) debt since it has greater negative consequences. Figure 5 reveals that South Africa has relied more on Foreign Currency Denominated Foreign Debt ('FCDFD') than Domestic Currency Denominated Foreign Debt ('DCDFD') for the period 1990 to 2002. Years 2001 and 2002 show that more than 50% of South Africa's foreign debt was denominated in foreign currency. Could this suggest that South Africa is suffering from 'original sin'?

'Original sin' is the inability of a country to issue bonds or raise foreign debt denominated in its own domestic currency. 'Original sin' also implies that a country is unable to hedge against forex rate risk since it cannot borrow in its own currency, especially in the short term (Hausmann *et al.* 2001, p. 405 and McKinnon 2000, p. 15).

Figure 5: Foreign Debt Profile (South Africa)*



* FCDFD is Foreign Currency Denominated Foreign Debt and DCDFD is Domestic Currency Denominated Foreign Debt (Rands converted into US$).

This sin constrains EMEs from being genuine free floaters. Figure 5, *prima facie* shows that South Africa seems to suffer from a significant degree of 'original sin'. Hausmann *et al.* (2001) indices give South Africa an 'original sin' index of 0.72 (see Table 2 on p. 14), which can be considered high in *absolute* terms.[32] Yet, in relative terms, South Africa's 'original sin' fares better than the average 'original sin' index for EMEs (0.95) (Hausmann *et al.* 2001, p. 405). In fact, South Africa's 'original sin' index is lower than the average for 'All Countries' (0.87) and for 'Other Industrial' countries (0.80).

Hausmann *et al.* (2001) also run regressions of forex rate flexibility against the 'original sin' indices. Their empirical work reveals that countries suffering from (high) 'original sin' tend to have less flexibility in their forex rates. South Africa's absolute 'original sin' index seems to constrain its forex rate flexibility.[33] Yet, its flexibility fares far better than most countries, both EMEs and industrialized.[34]

Total FCDFD in 2002 reveals that 41% of its composition has a maturity of between 2-6 years, while 59% is both trade finance (30% of total FCDFD) and 1-2 years maturities (29% of total FDFC) (SARB QB June 2003, p. S-101). Hence, the short term debt risk does not seem serious.[35]

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32 The 'original sin' indices are calculated by Hausmann *et al.* (2001) with a high value signifying high 'original sin'.

33 See South Africa's favorable position in Figure 2 on page 406 of Hausmann *et al.* (2001).

34 Out of 38 countries surveyed by Hausmann *et al.* (2001), South Africa's forex flexibility in relation to its 'original sin' index is bettered only by Australia (but same 'original sin' with South Africa), Germany, USA, UK, Czech Republic, and Japan.

35 Since the current year is 2003, I have considered maturities in 2003 and 2004 (1-2 years) as short to medium term and those from 2005 to 2009 (from 3 to 5 years and above) as long term.

South Africa fares better than many countries despite its foreign debt profile raising some concerns in absolute terms.

In fact, Hausmann *et al.* (2001, p. 403) comment that "…South Africa is the only developing country with significant amount of debt securities denominated in their own currency." Bordo and Flandreau (2001, p. 53) identify South Africa as one of the few EMEs (seven in total) to have issued international securities denominated in Rand for the period 1980 to 1997. The reality is that international investors seek investments in securities which also offer stability in returns and they 'silently' dictate the terms of capital flows. South Africa is not an exception in this regard, hence its conditional 'original sin' could also be explained by the global financial power relations.

For example, on 7 December 1994 South Africa issued a US$500 million global bond which, according to Crefsa (1995), received high and wide demand resulting in the bond being upgraded to US$750 million. Crefsa (1995, p. 3) comments on this *high and wide demand* for the bond that it "…confirmed the appropriateness of the choice of currency for the issue."[36]

South Africa's latest Sovereign Credit Ratings stood at Baa2 (Moody's) and BBB (Standard & Poor's and Fitch) as of 2 May 2003 (SARB QB June 2003, p. 30). These are Investment and not Speculative Grades and are important in determining the type of investments undertaken by global investors in EMEs.

[36] 50% of the issue was in USA, 35% in Europe, and the rest in Asia.

Again, South Africa seems to fare better than other EMEs since the sovereign risk premium of its Government foreign-currency denominated debt is far less than that of EMEs debt (SARB QB June 2003, p. 30).[37]

McKinnon (2000, p. 15) regards the presence of 'original sin' as a sign of incomplete or immature financial markets. Bordo and Flandreau (2001) and Hausmann *et al.* (2001) further argue that the ability to freely float seems to be strongly linked with the level of depth and maturity of the financial markets. McKinnon (2000, pp. 25-26) recommends the deepening of the term structure of finance by developing the crucial long term bond and mortgage markets in developing countries.

The fact that South Africa has not suffered from a financial crisis since 1995, amid a relatively high degree of floating, suggests that it has a relatively deep financial market which is also well regulated. Fischer (2001, p. 1) notes the success of South Africa's MFERS in avoiding "…crises of the type that inflicted emerging market countries with pegged rates."[38]

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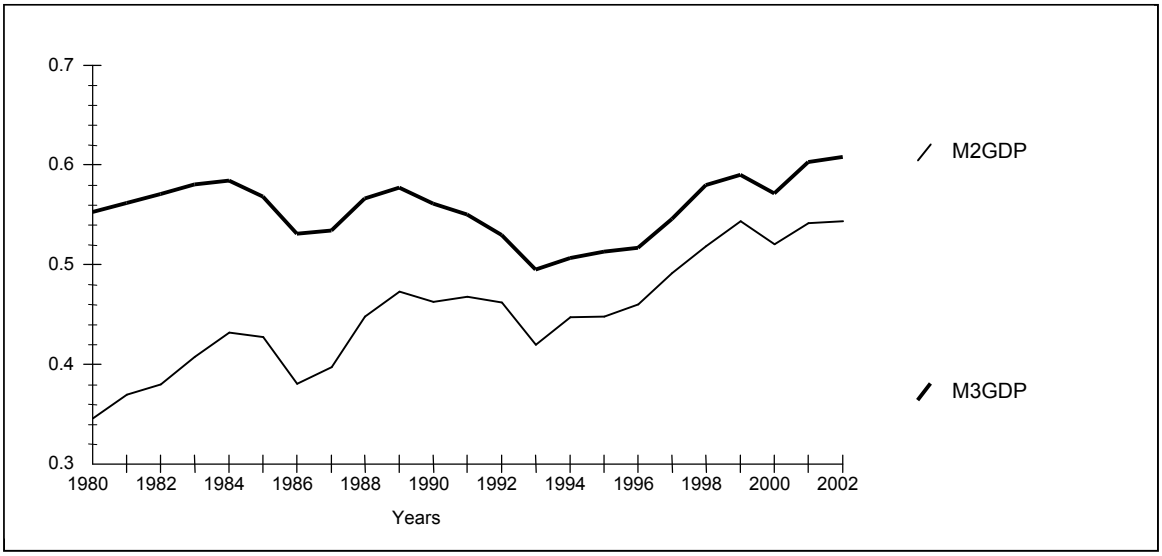
[37] Poor credit ratings have a negative effect on a country since they result in that country's sovereign risk being considered high. This results in investors looking for higher returns to invest in that country. Higher interest rates tend to attract more speculative investors and therefore short term capital. This causes volatility of forex rates under floating regimes and could threaten the financial system.

[38] I say this despite the 1998 and 2001 currency crises given that South Africa has never suffered a financial crisis within the period 1995 to 2003. Even sophisticated and strong financial markets like the USA and United Kingdom have suffered currency crises in the 1970s and 1980s, and in 1992, respectively (Oxford Dictionary of Finance and Banking 1997, p. 256 and Elliott, Hutton and Wolf 1992).

Financial Depth can be measured by the ratio of M2 or M3 over GDP, i.e. the real broad money balance. Figure 6 plots M2/GDP and M3/GDP ratios for South Africa. It shows the steady improvement in South Africa's financial depth since 1993. The maintenance of this steady improvement will enable South Africa to be a better floater and to overcome its 'original sin'. Hence, I think South Africa suffers from what I would term 'Conditional Original Sin', and not a full-blown and chronic 'original sin'.

Figure 6: Financial Depth (M2/GDP and M3/GDP) (South Africa)



3.5 Exchange Rate Pass-Through, Inflation and Interest Rates

The forex rate pass-through is the relationship between forex rate depreciation and inflation (Bhundia 2002, p. 4). Calvo and Reinhart (2000) contend that the pass-through from forex rate to inflation seems higher in developing countries and EMEs. This poses a threat to price stability. Hausmann *et al.* (2001, p. 402) empirically find a significantly negative relationship between the flexibility of the forex rate under floating regimes and the pass-through, especially for EMEs.

Currency depreciations pose challenges to managed floating forex rate regimes because they affect domestic prices directly by increasing the domestic currency price of tradebables, and indirectly through changes in the economic activity when the price of foreign goods increases relative to domestic prices (Bhundia 2002, p. 4). Inflation also poses serious problems for financially integrating countries. Wesso (2001) argues that high domestic inflation rates decrease the real value of domestic assets and therefore results in residents diverting their wealth into foreign assets to avoid inflation tax.

Further, high inflation rates relative to the world inflation rates result in the expectation that the forex rate will depreciate. This can easily result in capital flight and in self-fulfilling crisis. The Rand Commission (2002, p. 39) states that the fundamental reason for the long term depreciation of the Rand is South Africa's high inflation rate relative to its trading partners (UK, USA and Europe).[39]

South Africa has adopted an inflation targeting system to manage inflation. The primary aim of inflation targeting is to hold inflation at or near some numerically specified level – these are ranges rather than single numbers (Bernanke and Mishkin 1997, p. 98).

[39] Wesso (2001) uses Error Correction Models and also finds that South Africa has a negative long term relationship between net capital inflows and high inflation rates.

Does South Africa have a high pass-through? Bhundia (2002, pp. 8-9) empirically shows that Sough Africa has a low pass-through elasticity of 12% after two years and 8% after one year: i.e. on average, a 1% (10%) depreciation in the Rand results in 0.12% (1,2%) change (increase) in the Consumer Price Index Excluding Interest Rates ('CPIX') after 8 quarters (2 years). The reason for this absolute low pass-through could be due to New Keynesian menu costs, consumers substituting imports with domestic products (unlikely in South Africa)[40] and price-to-market strategic behaviour, which cause short to medium term price rigidities (Bhundia 2002, p. 9).

Yet, Bhundia's (2002) study also reveals that the pass-through to import prices is higher than that of production prices and the CPIX. Further, the pass-through from producer prices to the CPIX is very high and close to complete, with an elasticity of 75% after 8 quarters and 85% in the long run.[41] The pass-through from import prices to the CPIX is very low at 3.5% in the long run. The above results have major implications for South Africa's manufacturing industry, especially if it relies heavily on imported intermediary goods.

A high import prices pass–through could result in a 'Second Gap' and negatively affect South Africa's objective of structurally shifting towards more tertiary sector

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40 This is because South Africa is still a resource-based economy.

41 On average, the level of CPIX increases by 7.5% following a 10% increase in the producer prices after 8 quarters.

activity – which is important for industrialization.[42] Bhundia (2002, p. 16) recommends that South Africa should focus on targeting production prices rather than the CPIX.

Hausmann *et al.* (2001) use Error Correction Models to calculate the forex rate pass-through coefficients for EMEs and other countries. Their study shows that South Africa has a coefficient of 0.11 (all countries average = 0.228) for one year and 0.47 (all countries average = 0.626) for the long run.[43] Their study also shows that South Africa has a more flexible forex rate in relation to the pass-through than many other countries due to its relatively low (or lower) pass-through.[44] This suggests, *technically*, that South Africa's pass-through is not high and therefore South Africa has no reason to worry about forex rate flexibility and volatility.

Yet, in *reality*, the general public is not so much concerned about economic technicalities. Severe currency depreciation and its repercussions traumatize everyone. Any adverse effects of the forex rate should also look specifically at food prices. Figure 7 below shows the relationship between the forex rate, food prices rate and the CPIX. It shows overshooting of food prices under severe depreciation and inflation within 16 months (2001M9-2002M12).

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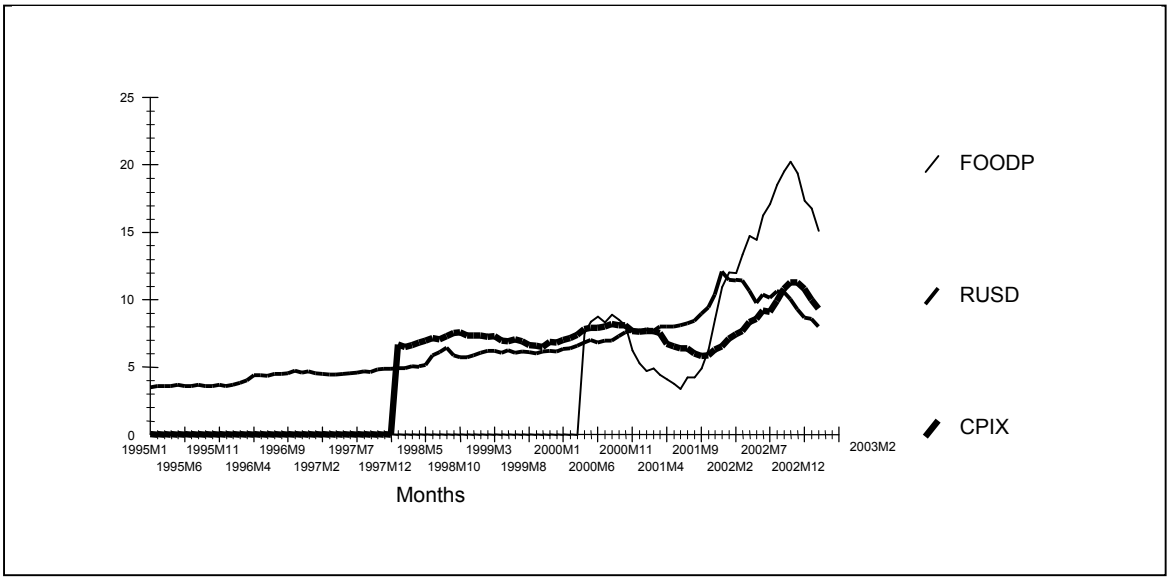
42 According to the Second Gap Model, a country requires sufficient forex currency to continue importing intermediate inputs for domestic production (Taylor 1993, p 10 and Taylor 1994, p. 18). This domestic production is important for industrialisation.

43 See Table 2.

44 See South Africa's favorable position in Figure 1 in Hausmann *at al.* (2001, p. 402).

One of the reasons the currency depreciation in 2001 severely affected food prices is that some of the most important South African produced food like maize, are interestingly priced in US Dollars. The overshooting of food prices did not settle well with South African trade unions - an important ally of the ruling party.

Figure 7: Food Prices, R/US$ Foreign Exchange and CPIX rates



The repo rate was increased in January, March, June and September 2002, amid South Africa's low growth rates. Were these increases to defend the Rand? I do not think so because the SARB has made it clear that the primary objective of monetary policy is price stability and, therefore, other variables such as forex rate should not be targeted.[45]

Of course, vigorously targeting and defending a particular forex rate would defeat the purpose of a floating forex regime. Yet, given that South Africa is a small open economy, one might argue that it is expedient to allow the Rand to fluctuate

[45] See the SARB article titled "The Objectives and Importance of Inflation Targeting".

within a certain band, rather than it being a free float at this stage. It does not seem strategic to only target inflation and then to have an overshooting currency which results in overshooting food prices and eventually imported inflation. Ultimately, even inflation targets will be missed.

Targeting also the forex rate, to an extent, would provide some certainty and avoid the negative effects which come with future several increases in interest rates. *The Economist* (May 2000, p. 77) also notes that countries "…may raise interest rates if a weaker exchange rate threatens to push up import prices." An early reaction could prevent potential crisis - by increasing interest rates early, South African authorities might avoid further higher interest rates to fight imported inflation.

Subsequent higher interest rates could threaten South Africa's already low growth rates.[46] Aron and Maulbauer (2000, pp. 15-16) argue that the most important factor affecting growth in South Africa for the period 1994-1998 was high real interest rates.[47] Higher interest rates also attract the dreaded short term capital inflows. The question then is whether monetary policy should be used for crisis management or prevention. I think it should be used more for crisis prevention.

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[46] For example, Bordo and Flandreau (2001, p. 24) state that "…the record for Latin American countries is that letting the exchange rate go, forces an increase in interest rates and causes major decline of output."

[47] Growth in South Africa in 1994 was 3.1%, 1996 was 4.2%, 1997 was 2.4%, 1998 was 0.5%, and 2001 was just 3%.

Schaling and Schoeman (1999) have argued that the severe depreciation of the Rand in 1998 could have been avoided if the authorities had intervened less in the forex market, especially the forward market, and if they had been less hesitant to raise the repo rate more firmly and at an earlier stage.[48] They further contend that speculation in the spot forex market was made easy by the low borrowing costs relative to the forward forex rate (Schaling and Schoeman 1999, p. 3). Hence, they and Crefsa (1996, p. 5) strongly argue that raising interest rates is crucial for increasing the costs of using borrowed capital for speculation, especially in the short term.

Timing is essential! Interest rates can be used effectively to prevent crises by raising them when certain forex rate thresholds are passed. Williamson (2000 p. 51) prefers a publicly announced *managed float with a monitoring band* since it gives guidance to the market as to when to expect official action to limit misalignment and speculation. It is because of such misalignments that South Africa needs to have a managed floating regime with a monitoring band.

Edwards (1998, p. 4) contends that Argentina and Chile were able to avoid currency devaluations and crisis after the 1994 Mexico currency crisis because they used interests rates to defend their currencies. Edwards' (1998) study shows that Chile was able to avoid the Mexican contagion better than Argentina

[48] A similar critique is put forward by Crefsa (1996), who argue that the SARB used extensively forex reserves and the forward forex market to unsuccessfully intervene in the 1995-1996 currency crisis. For example, the SARB net intervention in the forex market for the period February to April 1996 exceeded US$5.3 billion. This forward market intervention unfortunately also led to a large Net Open Oversold Position – a good source of future speculation on the currency.

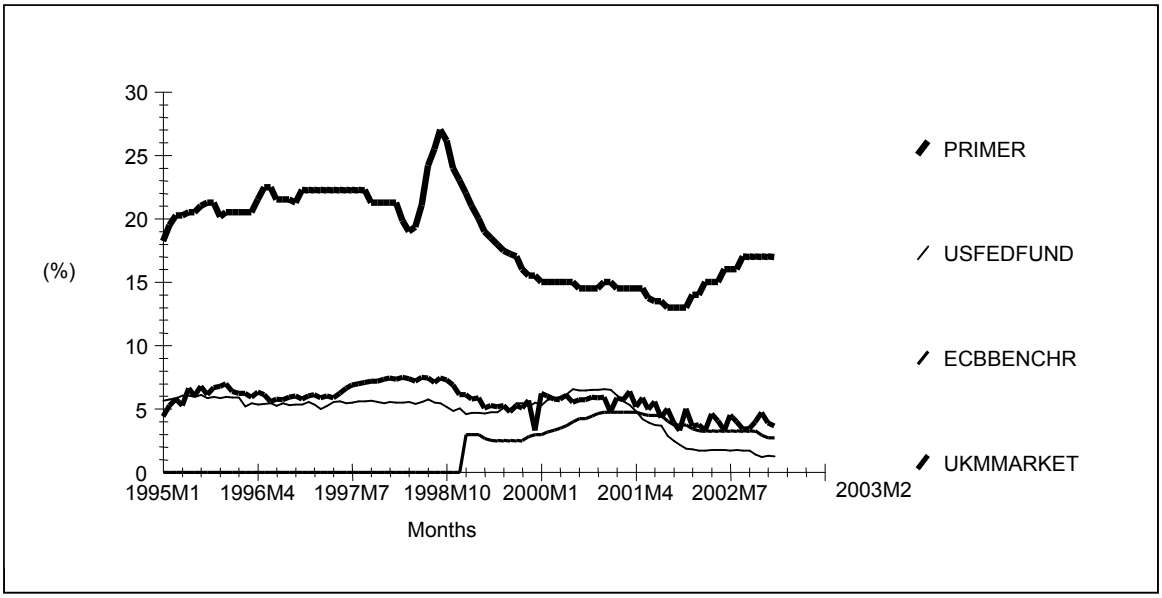
because the existence of capital controls on short term capital inflows enabled the extensive use of interest rates to defend the currency and fight inflation.[49]

South Africa does not have controls on short term capital inflows. An increase in interest rates to fight imported inflation is therefore likely to also appreciate the Rand. This seems to have been the case given the Rand's remarkable recovery in 2002 to 2003. It would also be difficult for South Africa to introduce controls on short term capital inflows since they could be interpreted as a renege from gradual liberalization and could harm the credibility of the authorities.

Interest rates cannot always guarantee success - e.g. the UK could not defend the overselling of the Pound in 1992 by using interest rates, let alone reserves (Elliott, Hutton and Wolf 1992). Yet, their efficacy seems better than of reserves. Further, interest rates differentials between South Africa and its major trading partners (Figure 8) suggest that South Africa is likely to continue attracting volatile short term capital inflows.

[49] Chile capital controls, through reserve requirements, enabled it to have higher interest rates to fight inflation and prevent forex rate excessive appreciation and volatility due to short term capital inflows. For further details on the success of Chile's capital controls, see Rodrik and Velasco (1999, pp. 23-28)

Figure 8: South African Prime Rate, European Central Bank Benchmark, United States Federal Reserve Rate, and United Kingdom Money Market Rate



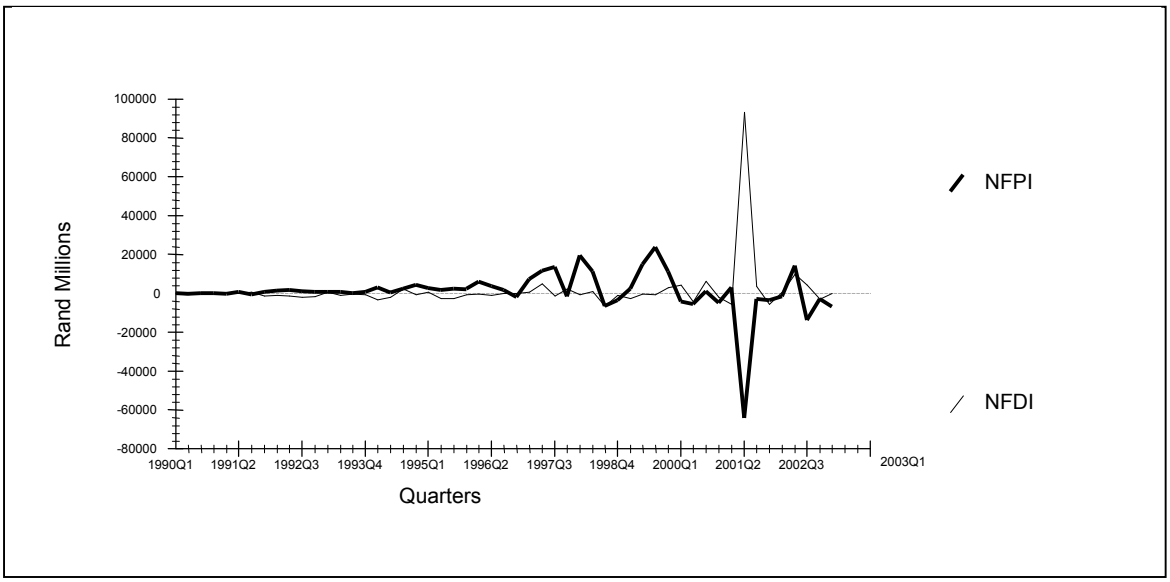
Interest rates have become a popular and effective instrument for managing floating forex rates. Such management might be cheaper since it does not require the holding of large reserves and intervention through the forward forex markets. *What makes interest rates so appealing is their ability to simultaneously control inflation and defend a depreciating currency.*

4. WHAT COULD HAVE BEEN THE SOURCE OF THE OVERSHOOTING IN 2001? PRACTICAL CHALLENGES FACING INTERMEDIARY REGIMES

4.1 Capital Flows

The Rand suffered the worst volatility (depreciation) in 2001 between 1 September and 31 December - it weakened by 42% with an average of 10.5% per month (Rand Commission 2002, p. 11).[50] From R7.60/US$ in the beginning of the year, the Rand depreciated by 82% to an all-time low of R13.84 on 21 December 2001.

Figure 9: Net Foreign Portfolio Investments (NFPI) and Net Foreign Direct Investments (NFDI) (South Africa)



[50] The Commission of Inquiry into the Rapid Depreciation of the Exchange Rate of the Rand and Related Matters: The Final Report 30 June 2002, will be abbreviated as 'Rand Commission 2002'.

Figure 9 represents quarterly movements of Net Foreign Portfolio Investments ('NFPI') and Net Foreign Direct Investments ('NFDI'). The period between 2001Q1 to 2001Q4 is of particular interest. 2001Q2 shows the highest NFPI outflows, yet interestingly, they are matched by higher inflows of NFDI. My hypothesis is that investors were simply selling their short term financial securities and reinvesting them in what is supposed to have been long term investments (FDI), especially given the simultaneous timing of the flows.

Computations also reveal that the average forex rates for the quarters were as follows: 2001Q1=7.832; 2001Q2=8.0218; 2001Q3=8.53; and 2001Q4=10.626. While NFPI dropped from net inflows (surplus) of R2.88 billion in 2001Q1 to net outflows (deficits) of R64.33 billion in 2001Q2 (2332% decrease), the Rand only depreciated by 2.4% from the first quarter to the second quarter of 2001. Hence, the large short term outflows in 2001Q2 seem to have been significantly neutralized by NFDI inflows.

The fourth quarter of 2001 reveals the immediate source of the currency crisis in 2001. In 2001Q4, NFDI and NFPI were both deficits (net outflows) of R5.6 billion and R3.4 billion, respectively. Although Net Other Investments ('NOI') in 2001Q4 were positive (net inflow), the damage had already been done during the year with NOI net outflows equaling R22 billion for the year 2001. Both the capital account balance and trade balance recorded deficits of R6.8 billion and R939 million, respectively, in 2001Q4. The Rand Commission (2002, p. 41) notes that

the current account deficit was unmatched by an inflow of foreign capital investment in this period.

The evidence suggests that the immediate source of the currency crisis was excessive capital outflows accompanied by domestic overspending. It could also be argued that as the Rand continued to lose value from the beginning of the year, it had already triggered a capital flight 'standby mode', which just needed any news or event to cause panic. One such event could have been the 11 September 2001 attack on the USA.

The above data also interestingly shows that both short term and long term capital outflows were the source of the overshooting, and not only the usually blamed volatile short term capital flows. Crefsa (1999, p. 31) states that there is little evidence which supports the hypothesis that FDI and long term loans are less volatile than FPI and short term loans. They also support intervention by stating that "…there is some justification for exchange rate intervention to manage the impact of such (unsustainable) flows" (Crefsa 1998, p. 20).

Equally interesting is the revelation by the SARB QB (June 2003, p. S-91) that 92% (R5.2 billion) of the NFDI outflows (deficits) and 98% (R3.3 billion) of the NFPI outflows (deficits) in 2001Q4 were by South African residents. Hence, the data analysis further indicates that the overshooting in 2001Q4 was not driven by foreign investors but largely by South African investors. It is, therefore, difficult to

solely blame these outflows on credibility concerns by global investors regarding South Africa's MFERS.[51]

4.2 Perceptions and Destabilizing Speculation

Foreign investors tend to be blamed for holding negative perceptions. Yet, Preuss (2003) remarks that: "Generally foreign-based economists seem to be more optimistic on South Africa's prospects than SA based economists." One is tempted to extend this remark to investors too. The Rand Commission (2002, p. 22) acknowledges the evidence that the forex market transactions are based on medium to short term views of the prospects of the Rand, but quickly warns that: "These views determine the market sentiments and may not always in the short term be based on complete or accurate information."

Some of the reasons given for the depreciation of the Rand in 2001 seem dubious and could not be reconciled with the economic fundamentals of South Africa.[52] Expected (imported) inflation due to the depreciating Rand in 2001 could have easily caused or reinforced the panic and the domestic-to-foreign asset switching in 2001Q4, as investors sought to shield their wealth and avoid high prices.

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[51] Global investors are perceived to be more concerned with certainty when undertaking investment decisions. This requires ability to verify the forex regime. Hence, intermediary regimes are or were considered unfavorable since they could not be easily self-verified by foreign investors.

[52] For example: the announcement that the Government would challenge a court decision on the provision of anti-retroviral drugs for HIV/Aids, and the proximity to Zimbabwe (despite the South African government's repeated statements about its different socio-political fundamentals). Such excuses might have been used by destabilizing speculators to attack the Rand.

The decline in NFDI inflows in 2001Q4 further suggests another asset switching and again shows that FDI can easily behave like short term capital flows. South Africa's reserves do not show significant volatility during 2001, yet they do show some changes.[53] These small changes do not seem to be an attempt to defend the depreciating Rand in year 2001 because while the Rand was depreciating quarterly in this period, gross reserves were increasing instead of decreasing.[54]

This increase in reserves is paradoxical because the authorities would have been expected to allow the demand for the Rand to be completely reflected in the appreciation of the currency, especially when it is rapidly depreciating. There is a reason why the SARB continued to accumulate forex reserves in 2001, the Net Oversold Open Position ('NOOP').[55] In fact, the Rand Commission (2002, p. 47) argues that the buying (accumulation) of forex reserves from the market ('mopping up') by the SARB made the Rand a one-way depreciating bet.

This leads us to the issue of destabilizing speculation, which I think was the prime reason for the overshooting of the Rand in 2001Q4. Evidence submitted to the Rand Commission (2002) revealed that a decrease in the NOOP was accompanied by the depreciation of the Rand/US$ forex rate. An expert testified at the Rand Commission that: "Ironically, the rand falls each time the NOFP is

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53 'In principle, the variance of reserves should be zero in a pure float' (Calvo and Reinhart 2001, p. 16). Yet, South Africa's gross reserves have a standard deviation of 45157.8 (Table 1).

54 All things equal, a decrease in gross forex reserves indicates that the central bank (SARB) is selling forex reserves to limit ('smooth' out) the depreciation of the currency (Crefsa 1996, p. 6). An increase in gross reserves would indicate a buying (or accumulating) of forex reserves to limit ('smooth' out) the appreciation of the currency.

55 Also called the Net Open Forward Position ('NOFP).

reduced, *because the process absorbs dollars that would otherwise have entered the market*" (my emphasis) (Rand Commission 2002, p. 47).

The Rand's 'one-way bet' was consolidated by the SARB's public and justified announcement that it will not use the forward forex market to defend it (Rand Commission 2002, p. 45). On 14 October 2001 the SARB announced that it would no longer buy forex reserves from the market to reduce the NOOP, instead it will use proceeds from Government's offshore borrowings and privatization.[56]

The Government issued a €1.25 billion 10-year global bond, whose proceeds were used to close the NOOP. This was a good move, as endorsed by the SARB's comment that: "In this way, a perceived element of risk and vulnerability which had attracted much attention…was laid to rest" (SARB QB June 2003, p. 3).

The NOOP was an important *fundamental* which underpinned perceptions and speculation about the Rand. The large balance on the NOOP meant that the SARB could not use reserves for defending the Rand on the spot, but more for meeting its future forex contracts. This could probably explain the lesser role played by reserves between 1998 and 2003. Further, the manner in which the floating rate was 'managed' by 'mopping up' forex reserves to reduce the NOOP was not helpful.

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[56] This announcement was more of a crisis management than prevention. With South Africa's unhedged foreign debt already at high levels, the damage was already done.

4.3 Foreign Exchange Controls

I hold the view that the Rand's depreciation and possible recovery was worsened and stalled, respectively, by the perverse propensity of South African exporters to hold forex export proceeds for more than the stipulated 180 days in their Customer Foreign Currency (CFC) accounts, i.e. lags, once the Rand became a one-way bet.[57] It was interestingly revealed in the Rand Commission 2002 that South African exporters held on to their forex proceeds beyond the legal 180 days period because they believed they were assisting the authorities to liberalize capital controls (Rand Commission 2002, p. 58)!

This can and should be interpreted as destabilizing (harmful) speculation and highlights the loopholes in forex controls. The Rand Commission (2002, p. 59) is of the view that there is no sufficient evidence that unacceptable speculation was the cause or contributing factor to the rapid decline of the Rand. I differ with this view and their implicit criticism that the SARB's public announcements to enforce *existing* forex controls rules strictly resulted in a thin market and worsened the depreciation.[58]

It must be stressed that the SARB was enforcing existing rules (and/or new rules) necessary for an *orderly market*. The SARB's announcements unfortunately coincided with a period when participants had taken a negative position about the

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[57] Interestingly, the Rand dramatically stabilized when it was announced that there will be a Rand Commission.

[58] The SARB convincingly argued that there is no causal link between liquidity and the Rand forex rate. They used 1998 as an example - when the Rand depreciated by 26.4% from February 1998 to July 1998, while the average daily turnover in the forex market increased by some 139% for the same period (Rand Commission 2002, p. 52).

Rand and were all out to make supernormal profits. The ‘thin market’ caused by these announcements could indicate the disappearance of destabilizing speculators, who had to be rightly cautioned.

The Rand Commission 2002 also acknowledges that the 180 day period and its monitoring needs to be reviewed. This shows how a simple violation of forex rules can trigger or/and underpin a crisis.

5. CONCLUSION

My study reveals that South Africa has significant volatility in its forex and interest rates, but not in its forex reserves. This would suggest, *prima facie,* that it suffers or should suffer from a 'fear of float'. With high unemployment and poverty rates, low investment and saving rates, low growth and persistent current account deficits, South Africa seems to require foreign capital inflows and financial integration. Yet, evidence indicates that the opening of the capital account does not have major impact on South Africa's growth. Gradual liberalization of forex controls has a meager 2% influence on growth.

South Africa's international debt is still dominated by foreign currency denominated debt, but a fair amount of this is long term. This would insulate South Africa from debt and financial crises. South Africa's financial depth has also been improving over time. Hence, South Africa's 'original sin' is not extreme and chronic. The study further shows that South Africa has a low forex rate pass-through. Yet, such technicalities do not matter much when food prices overshoot within 16 months, inflation eventually sets in and interest rates have to be repeatedly increased.

Generally, South Africa does not seem to be suffering from a dire and chronic 'fear of float' syndrome given its relatively better statistics and performance.

My study further shows that both FDI and FPI can be volatile and that South African residents drove the volatility in 2001Q4. Further, the authorities seem to have worsened the crisis by their non-intervention stance (they could have used interest rates early) and subtle negative intervention through 'mopping up' forex reserves during the 2001 crisis. Loopholes in forex controls management, especially the 180 day rule, played a major part too. The closing of the NOFP is commendable since it will control wayward perceptions.

South Africa remains a small open economy and cannot *freely* float at this stage. It has to manage its floating regime until it has sufficient financial depth, low inflation, lower interest rate differentials, better confidence in its economy and robust economic growth to enable it to absorb shocks better. One way of doing this is to have a *managed float with a monitoring band* and to use interest rates, as a crisis-prevention instrument, to defend the Rand and to control inflation on time.

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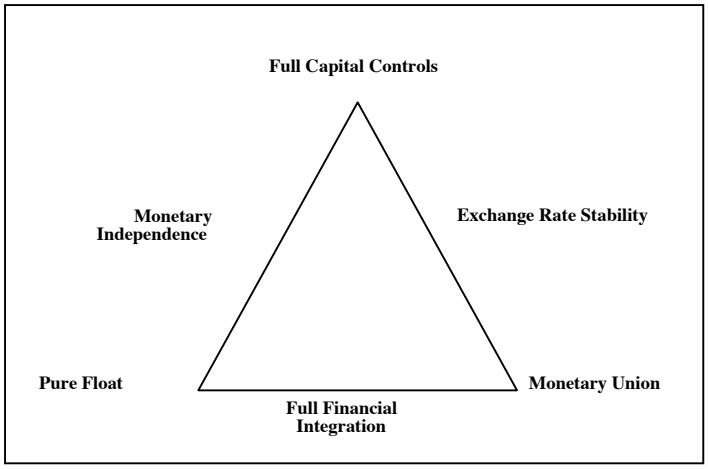
APPENDIX A

[GRAPHS]

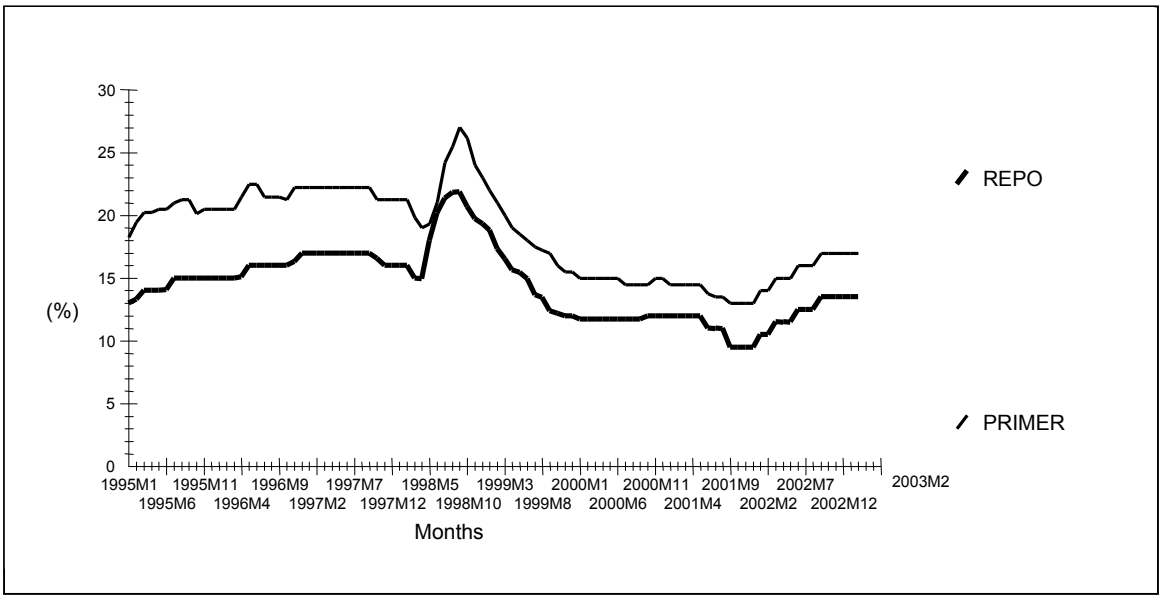
APPENDIX A1

The Trilemma Triangle



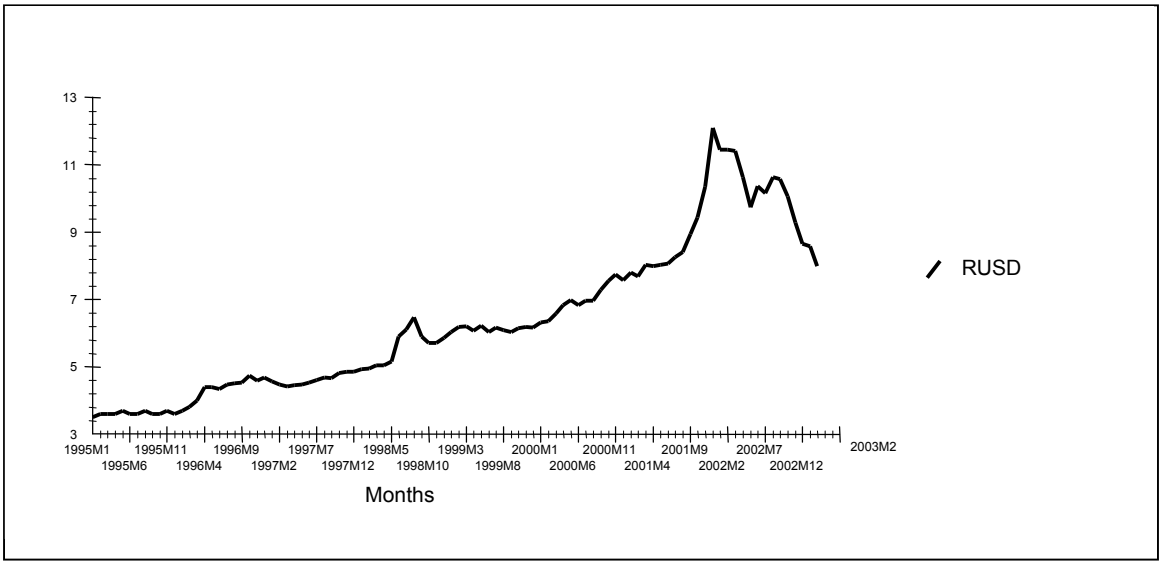
APPENDIX A2

Repo Rate and Prime Rate (South Africa)

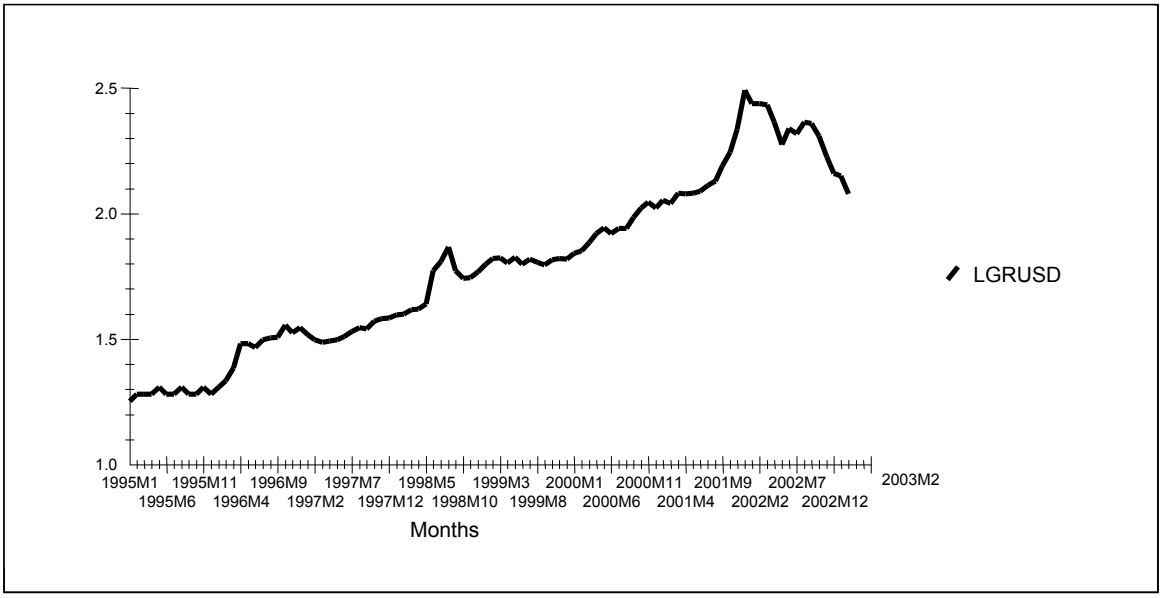


APPENDIX A3
[STATIONARITY GRAPHS]

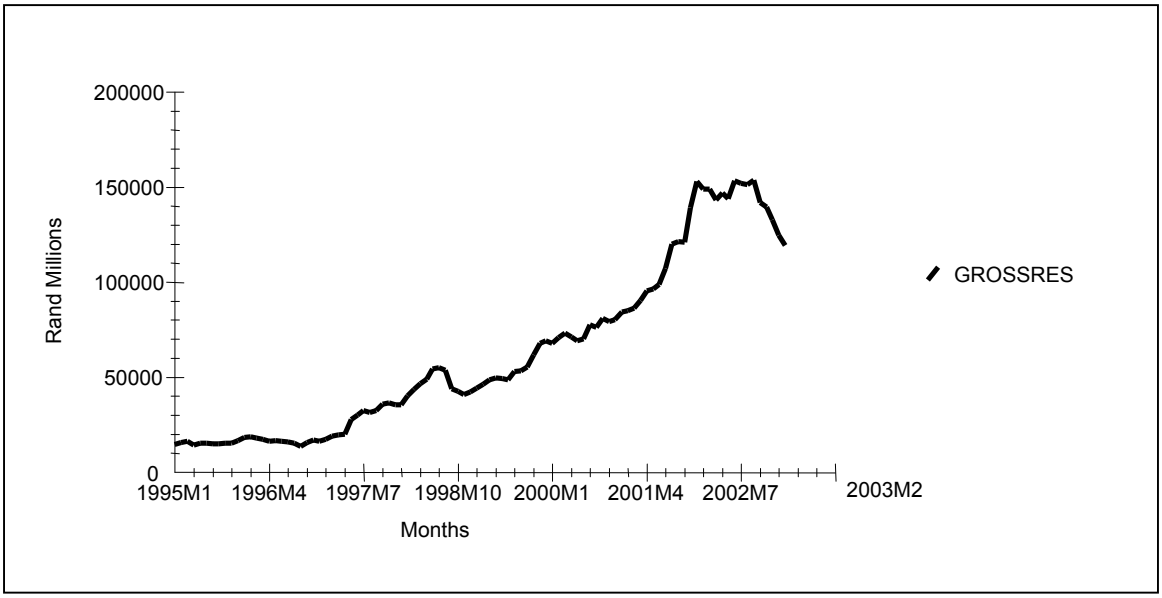
Plot of Rand/US$ Foreign Exchange Rate (South Africa)



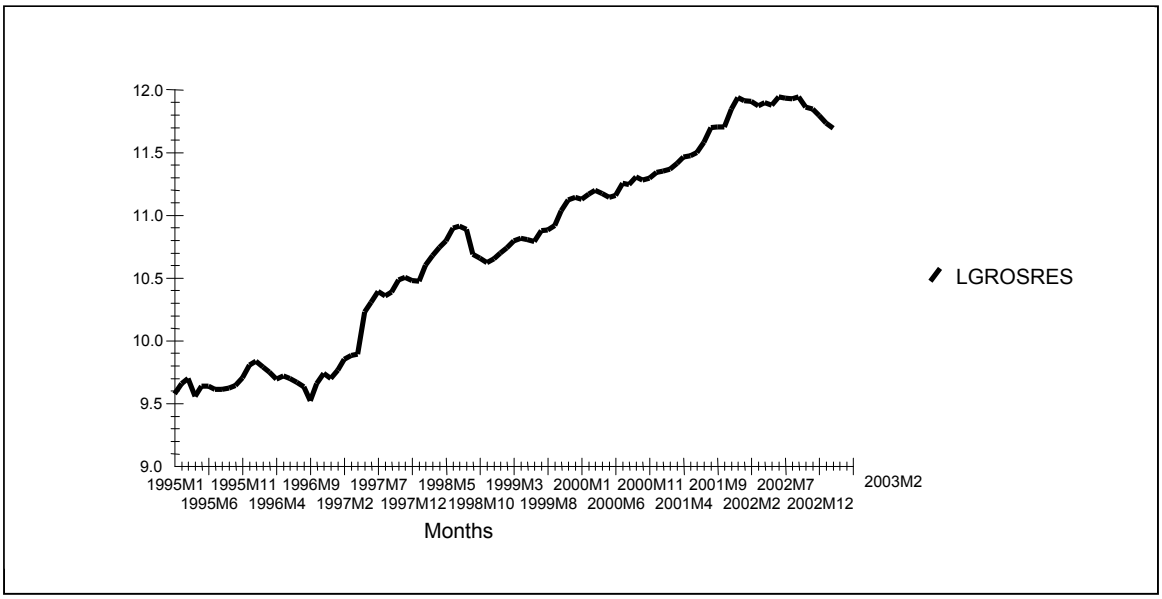
Plot of Logs of Rand/US$ Exchange Rate



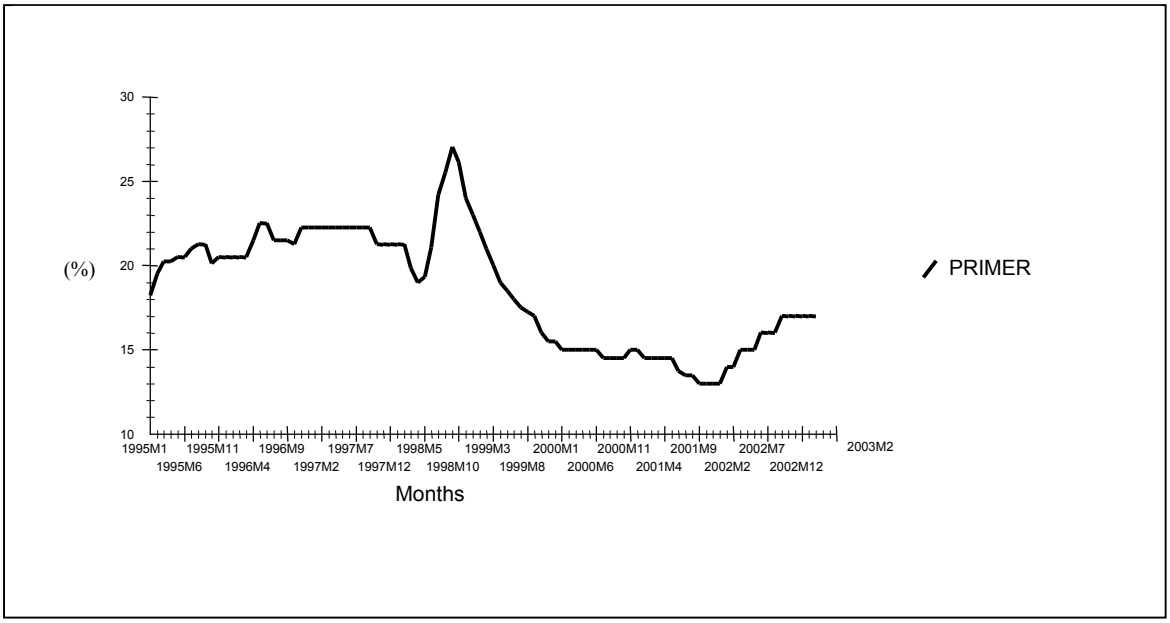
Plot of Gross Foreign Reserves (South Africa)



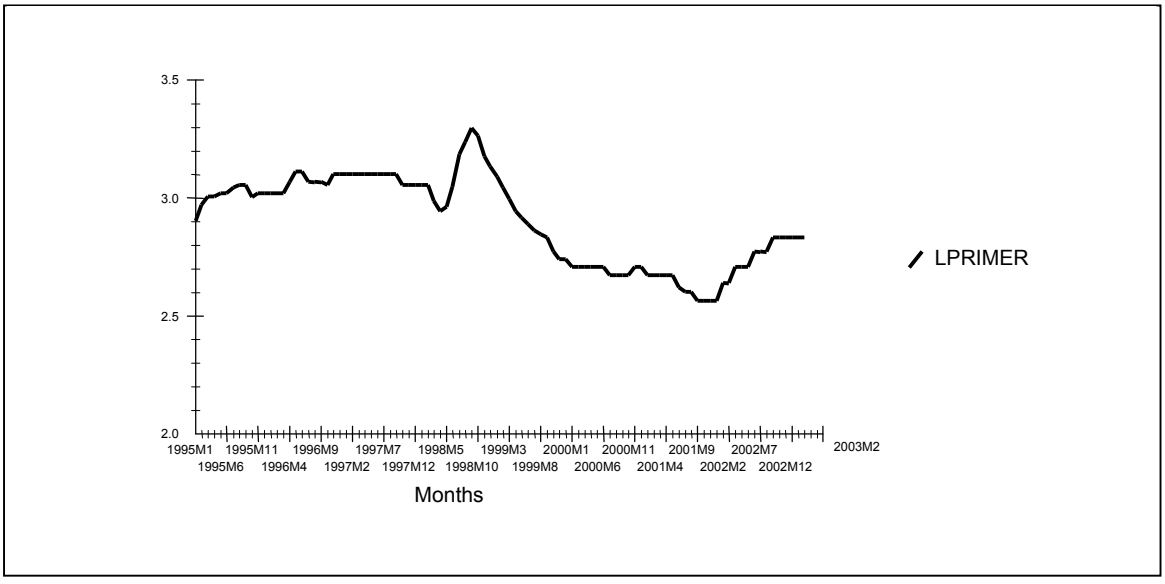
Plot of Logs of Gross Foreign Reserves South Africa



Plot of Prime Rate (South Africa)



Logs of Prime Rate (South Africa)



APPENDIX B

REGRESSION OUTPUTS

APPENDIX B1 [UNIT ROOT TESTS]

Unit root tests for variable **LRUSD (logs of Rand/US$ Exchange Rate)**
The Dickey-Fuller regressions include an intercept but not a trend

85 observations used in the estimation of all ADF regressions.
Sample period from 1996M2 to 2003M2

Test Statistic		LL	AIC	SBC	HQC
DF	**-1.7309**	151.7865	149.7865	**147.3439**	148.8040
ADF(1)	**-1.6697**	153.8637	**150.8637**	147.1997	**149.3899**
ADF(2)	-1.7038	154.8365	150.8365	145.9512	148.8715
ADF(3)	-1.6664	155.0375	150.0375	143.9309	147.5813
ADF(4)	-1.5918	156.1660	150.1660	142.8381	147.2185
ADF(5)	-1.5433	156.3618	149.3618	140.8125	145.9230
ADF(6)	-1.6532	158.1972	150.1972	140.4266	146.2672
ADF(7)	-1.6399	158.1978	149.1978	138.2059	144.7766
ADF(8)	-1.6289	158.2027	148.2027	135.9894	143.2902
ADF(9)	-1.7014	158.6109	147.6109	134.1763	142.2072
ADF(10)	-1.5483	159.0062	147.0062	132.3503	141.1112
ADF(11)	-1.5735	159.0706	146.0706	130.1933	139.6843
ADF(12)	-1.2817	160.1990	146.1990	129.1004	139.3214

95% critical value for the **augmented Dickey-Fuller statistic = -2.8955**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **LRUSD**
The Dickey-Fuller regressions include an intercept and a **linear trend**

85 observations used in the estimation of all ADF regressions.
Sample period from 1996M2 to 2003M2

Test Statistic		LL	AIC	SBC	HQC
DF	-1.0017	151.9513	148.9513	145.2873	147.4775
ADF(1)	-1.7514	154.8424	150.8424	145.9571	148.8774
ADF(2)	**-2.4671**	157.1625	**152.1625**	**146.0559**	**149.7063**
ADF(3)	-2.3406	157.1871	151.1871	143.8591	148.2396
ADF(4)	-1.9121	157.5749	150.5749	142.0256	147.1361
ADF(5)	-1.7747	157.5894	149.5894	139.8188	145.6594
ADF(6)	-2.4078	160.6616	151.6616	140.6696	147.2403
ADF(7)	-2.5365	161.0387	151.0387	138.8254	146.1262
ADF(8)	-2.6732	161.4589	150.4589	137.0244	145.0552
ADF(9)	-3.2446	163.5627	151.5627	136.9068	145.6677
ADF(10)	-3.0685	163.5878	150.5878	134.7106	144.2016
ADF(11)	-3.3542	164.6383	150.6383	133.5397	143.7608
ADF(12)	-2.9582	164.7275	149.7275	131.4076	142.3587

95% critical value for the **augmented Dickey-Fuller statistic = -3.4626**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **DLRUSD (First Differences of the Logs of Rand/US$ Exchange Rate)**

The Dickey-Fuller regressions include an intercept but not a trend

84 observations used in the estimation of all ADF regressions.
Sample period from 1996M3 to 2003M2

	Test Statistic	LL	AIC	SBC	HQC
DF	**-7.0326**	150.2103	**148.2103**	**145.7795**	**147.2332**
ADF(1)	-4.6598	151.1636	148.1636	144.5174	146.6979
ADF(2)	-4.3713	151.4308	147.4308	142.5691	145.4764
ADF(3)	-4.5485	152.6394	147.6394	141.5623	145.1965
ADF(4)	-4.1256	152.8569	146.8569	139.5645	143.9254
ADF(5)	-2.6918	154.4421	147.4421	138.9342	144.0220
ADF(6)	-2.5028	154.4459	146.4459	136.7226	142.5372
ADF(7)	-2.2965	154.4479	145.4479	134.5092	141.0507
ADF(8)	-1.9234	154.6956	144.6956	132.5416	139.8098
ADF(9)	-2.1836	155.3305	144.3305	130.9610	138.9560
ADF(10)	-1.8917	155.3318	143.3318	128.7469	137.4688
ADF(11)	-2.4299	156.8956	143.8956	128.0953	137.5440
ADF(12)	-2.1181	156.8959	142.8959	125.8802	136.0557

95% critical value for the **augmented Dickey-Fuller statistic = -2.8959**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **DLRUSD**

The Dickey-Fuller regressions include an intercept and a **linear trend**

84 observations used in the estimation of all ADF regressions.
Sample period from 1996M3 to 2003M2

	Test Statistic	LL	AIC	SBC	HQC
DF	**-7.1509**	150.9688	**147.9688**	**144.3226**	**146.5031**
ADF(1)	-4.7797	151.7756	147.7756	142.9139	145.8212
ADF(2)	-4.4978	152.0758	147.0758	140.9987	144.6329
ADF(3)	-4.6763	153.3406	147.3406	140.0481	144.4090
ADF(4)	-4.2498	153.5747	146.5747	138.0669	143.1546
ADF(5)	-2.8119	155.1951	147.1951	137.4718	143.2864
ADF(6)	-2.6125	155.1982	146.1982	135.2596	141.8010
ADF(7)	-2.3821	155.1983	145.1983	133.0443	140.3125
ADF(8)	-1.9924	155.4886	144.4886	131.1191	139.1142
ADF(9)	-2.2023	156.0087	144.0087	129.4238	138.1456
ADF(10)	-1.8369	156.0310	143.0310	127.2307	136.6794
ADF(11)	-2.3177	157.3504	143.3504	126.3347	136.5102
ADF(12)	-1.9345	157.3661	142.3661	124.1350	135.0373

95% critical value for the **augmented Dickey-Fuller statistic = -3.4632**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **DLGROSRES (First Differences of the Logs of Gross Foreign Reserves)**

The Dickey-Fuller regressions include an intercept but not a trend

84 observations used in the estimation of all ADF regressions.
Sample period from 1996M3 to 2003M2

	Test Statistic	LL	AIC	SBC	HQC
DF	**-7.1819**	110.2612	**108.2612**	**105.8304**	**107.2840**
ADF(1)	-5.4199	110.2787	107.2787	103.6325	105.8130
ADF(2)	-4.3536	110.3417	106.3417	101.4801	104.3874
ADF(3)	-3.4138	110.8000	105.8000	99.7230	103.3571
ADF(4)	-3.3488	111.0062	105.0062	97.7137	102.0747
ADF(5)	-3.4961	111.6172	104.6172	96.1094	101.1971
ADF(6)	-2.9590	111.7464	103.7464	94.0231	99.8377
ADF(7)	-2.9080	111.8785	102.8785	91.9398	98.4812
ADF(8)	-2.3043	112.6580	102.6580	90.5039	97.7722
ADF(9)	-2.5460	113.3716	102.3716	89.0021	96.9972
ADF(10)	-2.3506	113.3832	101.3832	86.7983	95.5202
ADF(11)	-2.0208	113.5838	100.5838	84.7835	94.2322
ADF(12)	-2.3985	114.8748	100.8748	83.8591	94.0346

95% critical value for the **augmented Dickey-Fuller statistic = -2.8959**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **DLGROSRES**

The Dickey-Fuller regressions include an intercept and a **linear trend**

84 observations used in the estimation of all ADF regressions.
Sample period from 1996M3 to 2003M2

	Test Statistic	LL	AIC	SBC	HQC
DF	**-7.2176**	110.6672	**107.6672**	**104.0210**	**106.2014**
ADF(1)	-5.4628	110.6799	106.6799	101.8183	104.7256
ADF(2)	-4.4036	110.7315	105.7315	99.6545	103.2886
ADF(3)	-3.4681	111.1647	105.1647	97.8723	102.2332
ADF(4)	-3.3974	111.3705	104.3705	95.8626	100.9504
ADF(5)	-3.5402	111.9869	103.9869	94.2636	100.0782
ADF(6)	-2.9985	112.1227	103.1227	92.1840	98.7254
ADF(7)	-2.9320	112.2377	102.2377	90.0836	97.3518
ADF(8)	-2.3230	113.0550	102.0550	88.6855	96.6806
ADF(9)	-2.5519	113.7371	101.7371	87.1522	95.8741
ADF(10)	-2.3351	113.7626	100.7626	84.9623	94.4110
ADF(11)	-1.9803	114.0207	100.0207	83.0050	93.1806
ADF(12)	-2.3344	115.1904	100.1904	81.9593	92.8616

95% critical value for the **augmented Dickey-Fuller statistic = -3.4632**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **LGROSRES (Logs of Gross Foreign Reserves)**
The Dickey-Fuller regressions include an intercept but not a trend

85 observations used in the estimation of all ADF regressions.
Sample period from 1996M2 to 2003M2

Test Statistic	LL	AIC	SBC	HQC
DF -1.0283	109.8754	107.8754	105.4328	106.8929
ADF(1) -1.0306	112.1090	**109.1090**	**105.4450**	**107.6352**
ADF(2) -1.0248	112.1109	108.1109	103.2256	106.1459
ADF(3) -1.0244	112.1689	107.1689	101.0622	104.7126
ADF(4) -1.0526	112.6883	106.6883	99.3603	103.7408
ADF(5) -1.0109	112.8389	105.8389	97.2896	102.4002
ADF(6) -.94822	113.3288	105.3288	95.5582	101.3988
ADF(7) -.98736	113.5527	104.5527	93.5608	100.1315
ADF(8) -.94323	113.6372	103.6372	91.4239	98.7246
ADF(9) -1.0070	114.3481	103.3481	89.9136	97.9444
ADF(10) -.91661	114.5506	102.5506	87.8947	96.6556
ADF(11) -.91942	114.5608	101.5608	85.6836	95.1745
ADF(12) -.98161	114.7810	100.7810	83.6824	93.9035

95% critical value for the **augmented Dickey-Fuller statistic = -2.8955**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **LGROSRES**
The Dickey-Fuller regressions include an intercept and a **linear trend**

85 observations used in the estimation of all ADF regressions.
Sample period from 1996M2 to 2003M2

Test Statistic	LL	AIC	SBC	HQC
DF -1.0600	110.2558	107.2558	103.5918	105.7821
ADF(1) -1.7500	**113.3808**	**109.3808**	**104.4955**	**107.4158**
ADF(2) -1.8373	113.5602	108.5602	102.4536	106.1039
ADF(3) -2.0194	113.9852	107.9852	100.6572	105.0376
ADF(4) -2.4739	115.5205	108.5205	99.9712	105.0817
ADF(5) -2.3915	115.5419	107.5419	97.7713	103.6119
ADF(6) -2.1638	115.5837	106.5837	95.5918	102.1624
ADF(7) -2.4442	116.4869	106.4869	94.2736	101.5744
ADF(8) -2.4020	116.5321	105.5321	92.0975	100.1283
ADF(9) -2.9887	118.8902	106.8902	92.2343	100.9952
ADF(10) -2.8957	118.9208	105.9208	90.0436	99.5345
ADF(11) -3.0769	119.5613	105.5613	88.4627	98.6838
ADF(12) -3.4993	121.2643	106.2643	87.9444	98.8955

95% critical value for the **augmented Dickey-Fuller statistic = -3.4626**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **LOGPRIMER (Logs of Prime Rate)**
The Dickey-Fuller regressions include an intercept but not a trend

85 observations used in the estimation of all ADF regressions.
Sample period from 1996M2 to 2003M2

Test Statistic		LL	AIC	SBC	HQC
DF	-.90818	164.8517	162.8517	160.4090	161.8692
ADF(1)	-1.3862	175.4532	172.4532	**168.7892**	170.9795
ADF(2)	-1.4244	175.5472	171.5472	166.6619	169.5822
ADF(3)	-1.3928	175.5486	170.5486	164.4420	168.0923
ADF(4)	-1.0951	179.0367	173.0367	165.7087	170.0892
ADF(5)	-1.3427	181.8951	**174.8951**	166.3458	**171.4563**
ADF(6)	-1.2811	181.9361	173.9361	164.1655	170.0061
ADF(7)	-1.2127	182.0023	173.0023	162.0103	168.5810
ADF(8)	-1.1973	182.0024	172.0024	159.7891	167.0899
ADF(9)	-1.1494	182.0218	171.0218	157.5872	165.6180
ADF(10)	-1.2037	182.1713	170.1713	155.5153	164.2762
ADF(11)	-1.1657	182.1780	169.1780	153.3008	162.7918
ADF(12)	-1.2200	182.2939	168.2939	151.1953	161.4164

95% critical value for the **augmented Dickey-Fuller statistic = -2.8955**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **LOGPRIMER**
The Dickey-Fuller regressions include an intercept and a **linear trend**

85 observations used in the estimation of all ADF regressions.
Sample period from 1996M2 to 2003M2

Test Statistic		LL	AIC	SBC	HQC
DF	-.96745	164.9968	161.9968	158.3328	160.5231
ADF(1)	**-1.9961**	176.5436	172.5436	**167.6583**	170.5786
ADF(2)	-2.1248	176.8617	171.8617	165.7550	169.4054
ADF(3)	-2.1195	176.9141	170.9141	163.5862	167.9666
ADF(4)	-1.4087	179.5460	172.5460	163.9967	169.1073
ADF(5)	**-2.0548**	183.2448	**175.2448**	165.4742	**171.3148**
ADF(6)	-1.9890	183.2453	174.2453	163.2534	169.8241
ADF(7)	-1.9076	183.2469	173.2469	161.0337	168.3344
ADF(8)	-1.9244	183.3190	172.3190	158.8845	166.9153
ADF(9)	-1.8804	183.3195	171.3195	156.6636	165.4245
ADF(10)	-1.9819	183.6388	170.6388	154.7615	164.2525
ADF(11)	-1.9522	183.6451	169.6451	152.5465	162.7676
ADF(12)	-1.9768	183.7729	168.7729	150.4530	161.4041

95% critical value for the **augmented Dickey-Fuller statistic = -3.4626**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **DLPRIMER (First Differences of the Logs of Prime Rate)**

The Dickey-Fuller regressions include an intercept but not a trend

84 observations used in the estimation of all ADF regressions.
Sample period from 1996M3 to 2003M2

	Test Statistic	LL	AIC	SBC	HQC
DF	**-5.5168**	171.9199	169.9199	**167.4891**	168.9428
ADF(1)	-4.5660	171.9466	168.9466	165.3003	167.4808
ADF(2)	-4.1651	171.9815	167.9815	163.1199	166.0272
ADF(3)	-5.1119	175.9400	170.9400	164.8630	168.4971
ADF(4)	**-3.4460**	178.5679	**172.5679**	165.2754	**169.6364**
ADF(5)	-3.3380	178.6652	171.6652	163.1574	168.2451
ADF(6)	-3.2575	178.7719	170.7719	161.0487	166.8633
ADF(7)	-3.1067	178.7985	169.7985	158.8599	165.4013
ADF(8)	-2.9865	178.8467	168.8467	156.6926	163.9609
ADF(9)	-2.6695	178.9150	167.9150	154.5455	162.5406
ADF(10)	-2.5850	178.9390	166.9390	152.3541	161.0760
ADF(11)	-2.3158	179.0024	166.0024	150.2021	159.6509
ADF(12)	-2.3763	179.2076	165.2076	148.1918	158.3674

95% critical value for the **augmented Dickey-Fuller statistic = -2.8959**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable **DLPRIMER**

The Dickey-Fuller regressions include an intercept and a **linear trend**

84 observations used in the estimation of all ADF regressions.
Sample period from 1996M3 to 2003M2

	Test Statistic	LL	AIC	SBC	HQC
DF	**-5.4918**	171.9567	168.9567	**165.3104**	167.4909
ADF(1)	-4.5469	171.9819	167.9819	163.1203	166.0276
ADF(2)	-4.1490	172.0184	167.0184	160.9413	164.5755
ADF(3)	-5.0912	175.9886	169.9886	162.6961	167.0571
ADF(4)	**-3.4285**	178.5855	**171.5855**	163.0776	**168.1654**
ADF(5)	-3.3213	178.6819	170.6819	160.9587	166.7733
ADF(6)	-3.2412	178.7888	169.7888	158.8501	165.3915
ADF(7)	-3.0910	178.8146	168.8146	156.6605	163.9287
ADF(8)	-2.9702	178.8606	167.8606	154.4911	162.4862
ADF(9)	-2.6537	178.9323	166.9323	152.3474	161.0693
ADF(10)	-2.5672	178.9546	165.9546	150.1543	159.6030
ADF(11)	-2.2889	179.0275	165.0275	148.0118	158.1873
ADF(12)	-2.3408	179.2159	164.2159	145.9847	156.8871

95% critical value for the **augmented Dickey-Fuller statistic = -3.4632**
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

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APPENDIX B2
[TIME TREND TESTS]

Ordinary Least Squares Estimation

Dependent variable is **DLRUSD**
97 observations used for estimation from 1995M2 to 2003M2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.088541	.062436	1.4181[.159]
T	**.5655E-3**	**.6358E-3**	**.88951[.376]**
LLRUSD	-.060701	.052045	-1.1663[.246]

R-Squared	.026485	R-Bar-Squared	.0057719
S.E. of Regression	.039541	F-stat. F(2, 94)	1.2787[.283]
Mean of Dependent Variable	.0085107	S.D. of Dependent Variable	.039656
Residual Sum of Squares	.14697	Equation Log-likelihood	177.2361
Akaike Info. Criterion	174.2361	Schwarz Bayesian Criterion	170.3741
DW-statistic	1.5224		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(12)= 25.7823[.012]	F(12, 82)= 2.4738[.008]
B:Functional Form	CHSQ(1)= .41313[.520]	F(1, 93)= .39779[.530]
C:Normality	CHSQ(2)= 49.6594[.000]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 4.8441[.028]	F(1, 95)= 4.9936[.028]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is DLGROSRES
 97 observations used for estimation from 1995M2  to 2003M2
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 INPT                       .61006            .40900             1.4916[.139]
 T                        .0015755          .0012395             1.2710[.207]
 LLGROSRES                -.062095           .043710            -1.4206[.159]
*******************************************************************************
 R-Squared                  .025025   R-Bar-Squared                 .0042810
 S.E. of Regression         .066583   F-stat.    F(  2,  94)    1.2064[.304]
 Mean of Dependent Variable .021778   S.D. of Dependent Variable     .066726
 Residual Sum of Squares     .41673   Equation Log-likelihood       126.6892
 Akaike Info. Criterion     123.6892   Schwarz Bayesian Criterion    119.8271
 DW-statistic                1.5660
*******************************************************************************
                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(  12)=  16.0042[.191]*F(  12,  82)=   1.3502[.207]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)= .0038238[.951]*F(   1,  93)= .0036663[.952]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=  60.9350[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   3.9814[.046]*F(   1,  95)=   4.0662[.047]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is DLPRIMER
 97 observations used for estimation from 1995M2  to 2003M2
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 INPT                       .15062            .087703             1.7173[.089]
 T                        -.2900E-3          .1896E-3            -1.5293[.130]
 LLPRIMER                 -.047107           .027626            -1.7052[.091]
*******************************************************************************
 R-Squared                  .031363   R-Bar-Squared                 .010754
 S.E. of Regression         .034286   F-stat.    F(  2,  94)    1.5218[.224]
 Mean of Dependent Variable -.7315E-3 S.D. of Dependent Variable     .034472
 Residual Sum of Squares     .11050   Equation Log-likelihood       191.0685
 Akaike Info. Criterion     188.0685   Schwarz Bayesian Criterion    184.2064
 DW-statistic                1.0693
*******************************************************************************
                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(  12)=  30.5264[.002]*F(  12,  82)=   3.1380[.001]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .26334[.608]*F(   1,  93)=   .25317[.616]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=  54.1937[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   1.4538[.228]*F(   1,  95)=   1.4455[.232]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

APPENDIX B3
[ARCH MODEL REGRESSIONS]

Ordinary Least Squares Estimation

Dependent variable is **DLRUSD (First Differences of the Logs of R/US$ Exchange Rate)**

97 observations used for estimation from 1995M2 to 2003M2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.0085107	.0040265	2.1137[.037]

R-Squared	0.00	R-Bar-Squared	0.00
S.E. of Regression	.039656	F-stat.	*NONE*
Mean of Dependent Variable	.0085107	S.D. of Dependent Variable	.039656
Residual Sum of Squares	.15097	Equation Log-likelihood	175.9343
Akaike Info. Criterion	174.9343	Schwarz Bayesian Criterion	173.6470
DW-statistic	1.5715		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(12)= 18.0767[.113]	F(12, 84)= 1.6033[.106]
B:Functional Form	CHSQ(1)= .0000[1.00]	F(1, 95)= .0000[1.00]
C:Normality	CHSQ(2)= 26.4560[.000]	Not applicable
D:Heteroscedasticity	CHSQ(1)= *NONE*	F(1, 95)= *NONE*

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is RSDLRUSD (Residuals Squared of the First Differences
 of the Logs of R/US$ Exchange Rate)
 94 observations used for estimation from 1995M5  to 2003M2
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 INPT                     .0010246           .4007E-3             2.5570[.012]
 RSDLRUSD(-1)              .30402             .10518              2.8904[.005]
 RSDLRUSD(-2)             -.10815             .10996             -.98356[.328]
 RSDLRUSD(-3)              .18678             .10642              1.7551[.083]
*******************************************************************************
 R-Squared                  .10740   R-Bar-Squared                  .077647
 S.E. of Regression         .0032096 F-stat.    F(  3,  90)    3.6097[.016]
 Mean of Dependent Variable .0016004 S.D. of Dependent Variable    .0033419
 Residual Sum of Squares    .9271E-3 Equation Log-likelihood       408.3761
 Akaike Info. Criterion     404.3761 Schwarz Bayesian Criterion    399.2895
 DW-statistic               1.9821
*******************************************************************************
                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(  12)=   5.0174[.957]*F(  12,  78)=   .36651[.971]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   4.0877[.043]*F(   1,  89)=   4.0462[.047]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1032.0[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   2.7331[.098]*F(   1,  92)=   2.7551[.100]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                    *Ordinary Least Squares Estimation*
*******************************************************************************
 Dependent variable is RSDLRUSD (Residuals Squared of the First Differences of
 the Logs of R/US$ Exchange Rate)
 96 observations used for estimation from 1995M3  to 2003M2
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 INPT                     .0011485           .3600E-3             3.1904[.002]
 RSDLRUSD(-1)              .27873             .10017              2.7825[.007]
*******************************************************************************
 R-Squared                  .076098  R-Bar-Squared                  .066269
 S.E. of Regression         .0032021 F-stat.    F(  1,  94)    7.7424[.007]
 Mean of Dependent Variable .0015686 S.D. of Dependent Variable    .0033138
 Residual Sum of Squares    .9639E-3 Equation Log-likelihood       416.2102
 Akaike Info. Criterion     414.2102 Schwarz Bayesian Criterion    411.6459
 DW-statistic               1.9480   Durbin's h-statistic      1.3309[.183]
*******************************************************************************
                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(  12)=   8.1177[.776]*F(  12,  82)=   .63119[.810]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   7.7076[.005]*F(   1,  93)=   8.1185[.005]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1095.8[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   1.5092[.219]*F(   1,  94)=   1.5013[.224]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                    Ordinary Least Squares Estimation
*******************************************************************************
Dependent variable is DLGROSRES (First Differences of the Logs of Gross
Foreign Reserves)
97 observations used for estimation from 1995M2  to 2003M2
*******************************************************************************
Regressor              Coefficient       Standard Error         T-Ratio[Prob]
INPT                      .021778           .0067750             3.2145[.002]
*******************************************************************************
R-Squared                    -.0000   R-Bar-Squared                   -.0000
S.E. of Regression          .066726   F-stat.                         *NONE*
Mean of Dependent Variable  .021778   S.D. of Dependent Variable     .066726
Residual Sum of Squares      .42743   Equation Log-likelihood       125.4600
Akaike Info. Criterion     124.4600   Schwarz Bayesian Criterion    123.1727
DW-statistic                 1.6236
*******************************************************************************


                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(  12)=   8.0837[.779]*F(  12,  84)=   .63639[.805]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=    .0000[1.00]*F(   1,  95)=    .0000[1.00]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)= 100.0233[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   *NONE*      *F(   1,  95)=   *NONE*      *
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                    Ordinary Least Squares Estimation
*******************************************************************************
Dependent variable is RSDLGR (Residuals Squared of the First Differences of
the Logs of Gross Foreign Reserves)
94 observations used for estimation from 1995M5  to 2003M2
*******************************************************************************
Regressor              Coefficient       Standard Error         T-Ratio[Prob]
INPT                     .0044905           .0014497             3.0974[.003]
RSDLGR(-1)               -.021268             .10304            -.20641[.837]
RSDLGR(-2)               -.039958             .10295            -.38811[.699]
RSDLGR(-3)              -.0030477             .10300           -.029589[.976]
*******************************************************************************
R-Squared                  .0020946   R-Bar-Squared                -.031169
S.E. of Regression          .011642   F-stat.    F(  3,  90)    .062970[.979]
Mean of Dependent Variable .0042067   S.D. of Dependent Variable     .011464
Residual Sum of Squares     .012198   Equation Log-likelihood       287.2604
Akaike Info. Criterion     283.2604   Schwarz Bayesian Criterion    278.1739
DW-statistic                2.0007
*******************************************************************************


                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(  12)=   2.5384[.998]*F(  12,  78)=   .18040[.999]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .64240[.423]*F(   1,  89)=   .61241[.436]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=  10513.6[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .58026[.446]*F(   1,  92)=   .57144[.452]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is RSDLGR
 96 observations used for estimation from 1995M3  to 2003M2
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 INPT                     .0045380           .0012750            3.5593[.001]
 RSDLGR(-1)               -.027174             .10310           -.26357[.793]
*******************************************************************************
 R-Squared                  .7385E-3   R-Bar-Squared               -.0098920
 S.E. of Regression          .011671   F-stat.    F(  1,  94)   .069468[.793]
 Mean of Dependent Variable .0044182   S.D. of Dependent Variable     .011614
 Residual Sum of Squares     .012804   Equation Log-likelihood       292.0533
 Akaike Info. Criterion     290.0533   Schwarz Bayesian Criterion    287.4890
 DW-statistic                 2.0017   Durbin's h-statistic           *NONE*
*******************************************************************************


                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(  12)=   2.5964[.998]*F(  12,  82)=   .18995[.999]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .10047[.751]*F(   1,  93)=  .097435[.756]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   9190.2[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .26050[.610]*F(   1,  94)=   .25577[.614]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is DLPRIMER (First Differences of the Logs of the Prime
 Rate)
 97 observations used for estimation from 1995M2  to 2003M2
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 INPT                    -.7315E-3           .0035001           -.20898[.835]
*******************************************************************************
 R-Squared                    .0000   R-Bar-Squared                      0.00
 S.E. of Regression          .034472   F-stat.                         *NONE*
 Mean of Dependent Variable -.7315E-3  S.D. of Dependent Variable     .034472
 Residual Sum of Squares      .11408   Equation Log-likelihood       189.5230
 Akaike Info. Criterion     188.5230   Schwarz Bayesian Criterion    187.2356
 DW-statistic                 1.0869
*******************************************************************************


                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(  12)=  27.6972[.006]*F(  12,  84)=   2.7976[.003]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   *NONE*      *F(   1,  95)=   *NONE*      *
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=  34.8179[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   *NONE*      *F(   1,  95)=   *NONE*      *
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

Ordinary Least Squares Estimation

Dependent variable is **RSDLPRIM (Residuals Squared of the First Differences of the Logs of the Prime Rate)**
94 observations used for estimation from 1995M5 to 2003M2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.6748E-3	.3030E-3	2.2268[.028]
RSDLPRIM(-1)	.23352	.10443	2.2360[.028]
RSDLPRIM(-2)	.048616	.10726	.45326[.651]
RSDLPRIM(-3)	.12367	.10363	1.1934[.236]

R-Squared	.089049	R-Bar-Squared	.058684
S.E. of Regression	.0024230	F-stat. F(3, 90)	2.9326[.038]
Mean of Dependent Variable	.0011501	S.D. of Dependent Variable	.0024974
Residual Sum of Squares	.5284E-3	Equation Log-likelihood	434.8001
Akaike Info. Criterion	430.8001	Schwarz Bayesian Criterion	425.7136
DW-statistic	2.0612		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(12)= 8.3633[.756]	F(12, 78)= .63479[.806]
B:Functional Form	CHSQ(1)= 3.6816[.055]	F(1, 89)= 3.6279[.060]
C:Normality	CHSQ(2)= 2864.3[.000]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 2.5443[.111]	F(1, 92)= 2.5595[.113]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

Ordinary Least Squares Estimation

Dependent variable is **RSDLPRIM (Residuals Squared of the Difference of the Logs of the Prime Rate)**
96 observations used for estimation from 1995M3 to 2003M2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.8340E-3	.2717E-3	3.0697[.003]
RSDLPRIM(-1)	.25884	.098749	2.6212**[.010]**

R-Squared	.068113	R-Bar-Squared	.058199
S.E. of Regression	.0024010	F-stat. F(1, 94)	6.8706[.010]
Mean of Dependent Variable	.0011416	S.D. of Dependent Variable	.0024740
Residual Sum of Squares	.5419E-3	Equation Log-likelihood	443.8534
Akaike Info. Criterion	441.8534	Schwarz Bayesian Criterion	439.2891
DW-statistic	2.0290	Durbin's h-statistic	-.56199[.574]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(12)= 10.5146[.571]	F(12, 82)= .84049[.609]
B:Functional Form	CHSQ(1)= 1.5170[.218]	F(1, 93)= 1.4932[.225]
C:Normality	CHSQ(2)= 2668.2[.000]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 3.1432[.076]	F(1, 94)= 3.1819[.078]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values