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Exchange Rate Misalignment And International Trade Competitiveness: A Cointegration Analysis For South Africa

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ABSTRACT

Based on Edwards' (1989) intertemporal general equilibrium model of a small open economy, this study attempts to estimate the degree of real exchange rate misalignment and its impact on the international trade competitiveness of the South African economy for the period 1985:1-2000:4. For this purpose, a one-step Engle-Granger approach and five years moving average technique have been employed to estimate the exchange rate misalignment, while impulse response analysis and variance decomposition techniques of cointegrated VAR (vector auto regression) have been established to assess the impact of the misalignment on trade competitiveness. The study reveals that the real exchange rate had been consistently overvalued during the period 1988:3-1998:2 but undervalued during periods 1998:3-2000:4. For most of the periods during 1985:1-1988:2 the rand had been undervalued. Moreover, the study discloses that the exchange rate misalignment debilitates South Africa's international trade competitiveness accounting for 20 percent of the variation in competitiveness.

1. INTRODUCTION

Real exchange rate misalignment refers to a sustained departure of the actual RER from its long-run equilibrium exchange rate (ERER) value. The ERER is defined as the value of the RER that is consistent with a simultaneous attainment of internal and external equilibrium. Internal equilibrium refers to a situation that the non-tradable goods market clears. External equilibrium, on the other hand, is attained when the current account is sustainable[1]. Empirically, an exchange rate is labeled "overvalued" when it is more appreciated than the equilibrium and "undervalued" when it is more depreciated than the equilibrium.

Situations of exchange rate misalignments could arise in two cases: when the actual RER fails to reflect fundamentals driven changes in the long run equilibrium and/or when the RER moves away from the ERER in response to 'non-fundamentals' driven changes. The latter is often associated with changes in expectations and macroeconomic policies that are incompatible with maintaining internal and external balance. From a theoretical standpoint, Edwards (1994:43) has underlined that the concept of RER misalignment arises from "institutional or other type of rigidities that prevent the RER from adjusting towards its equilibrium level."

Misalignments occur under both fixed and floating exchange rate regimes. Goldstein (1995:19-20) has pointed out that in fixed rate and adjustable systems, misalignment reflect poor policy fundamentals that prohibit the exchange rate to adjust to changes in economic fundamentals. Whereas in floating exchange rate regimes the primary cause of misalignments are bubble factors such as speculative attacks that moves the exchange rate too much in relation to economic fundamentals. Generally, Goldstein (1995:21) attributes large misalignments to poor policy fundamentals.

Questions pertaining to the misalignment of exchange rate have become central issues in the analysis of macroeconomic policies in emerging and developing countries due to at- least two reasons: first persistent overvaluation of currency is seen as powerful early warning of currency crises (Kamnisky et al, 1997). And second, situations of protracted real exchange rate misalignment have been associated with poor economic performance in a number of developing countries (for e.g. see Cottani, Cavallo and Khan, 1990; Edwards, 1988, 1989, 1994 and Razin and Collins, 1997). Although the impact of overvaluation is more accentuated, undervaluation of a currency also suppresses economic performance through a higher inflation (Adams and Gros, 1986) and through discouraging consumption and investment (Kahn, 1994:13).

The misalignments of exchange rates affect growth primarily through its effect on the competitiveness of the tradables sector vis-à-vis the rest of the world and subsequent impact on investment, hence capital accumulation. The effect of the misalignments on international competitiveness can be a sustained problem[2]. As a result it is crucial for an economy to constantly assess and adjust substantial currency misalignments in order to avoid (potential) economic distresses (Ghei and Pritchett, 1999:468).

[1] Sustainability of the current account refers to a situation when the intertemporal budget constraint that states that the discounted sum of a countries current account has to be equal to zero is satisfied (see Edwards (1989), for the detailed analysis).

[2] See Krugman, 1987.

However, the estimation of the ERER has remained to be among the most controversial and challenging issues in modern macroeconomics (Montiel, 1999). For several decades, the Purchasing power parity (PPP) approach, which is based on the law of one price, has been the most widely used methodology in both developed and developing countries[3]. In South Africa, some attempts have been made to estimate the misalignment of the rand against major currencies on the basis of the PPP approach[4]. However, large numbers of empirical studies show that PPP does not hold except in the 'ultra' long run[5]. Moreover, PPP's assumption of a constant equilibrium exchange rate makes it ill-fitted to serve as a bench-mark for the analysis of the exchange rate in countries such as South Africa that has experienced substantial structural changes (Aron, 1997:2). As a result a number of macro-econometric models that relay on the macroeconomic fundamentals of exchange rate have been developed, albeit with little applicability for developing countries (see MacDonald, 2000 for a broader discussion of the models).

2. EFFECT OF MISALIGNMENT ON COMPETITIVENESS

International trade competitiveness is an important determinant of a country's external payment position (Clark et al, 1994:4). In simple terms, trade competitiveness can be defined as producing better products at lower cost than other countries competing in the international market (Nam, 1993:71).

Movements in the real (effective) exchange rate have been regarded as an important indicator of a country's trade competitiveness position (see Elbadawi, 1998 and Golub, 2000). However, the evidence regarding the trade competitiveness that is provided by the time series movement of the real effective exchange rate per se would be misleading, since it does not distinguish between equilibrium and disequilibrium episodes of the movement (Clark et al, 1994:6 and Mongardini, 1998:6). The implication is that appreciation (or depreciation) of exchange rate does not necessarily reflect a loss (or gain) of competitiveness. The latter is affected by the relative movements of the exchange rate with respect to its equilibrium path.

In general, the effect of the misalignment, most notably overvaluation, on the economic performance is channeled via its impact on trade competitiveness (see, Clark et al, 1994 and Elbadawi and Soto, 1995). Intuitively it is obvious that the overvaluation of the exchange rate embodies anti-export bias that erodes incentives and ability of exporters to compete in international markets. The same intuition clarifies that the overvaluation erodes the competitiveness of import-competing sectors in the face of relatively cheaper imports.

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[3] A good example, mentioned by MacDonald (2000), is the exchange rate misalignment that is regularly published by the economist magazine based on its Big-Mac Index, which is a PPP based calculation.

[4] Two examples cited by Aron (1997:5) are Union Bank of Switzerland (UBS *Economic Research Note*, 13 February 1996) and the South African Foundation (*Growth for All*, Februry 1996).

[5] For example, see Frenkel (1981), Meese and Rogoff (1983), Breuer (1994), Froot and Rogoff (1995). For an exclusive study on African countries see Holmes (2000) and Odedokun (2000).

Moreover, Krugman (1987:278) and Clark et al (1994:5) strongly argue that a protracted currency overvaluation causes a sustained loss of trade competitiveness, which is usually manifested through prolonged trade deficit and capital outflows[6]. The main explanation that backs up this argument is the so-called a 'hysteresis effect'. Elaborating on the hysteresis-explanation, Krugman (1987:290) has underlined that the competitiveness of an economy does not simply depend on "price and installed capacity … [but] also depends crucially on invisible investments [also called invisible assets] in market position such as distribution networks, customer loyalty [and reputations]." This implies that the effect of exchange rate misalignment on competitiveness is not contemporaneous but rather is through a time lag.

3. THEORETICAL FRAMEWORK

The main theoretical framework adopted in the estimation of the RER misalignment in this study is Edwards' (1989) intertemporal general equilibrium model of a small open economy. In the Edwards model the real exchange rate is defined as the relative price of tradables to nontradables. The model is developed based on microeconomic foundations in an attempt to capture how "both policy induced and exogenous shocks affect the path of equilibrium relative prices in the [small open] economy" (Edwards, 1989:17).

3.1 The Model

The model captures most stylized features of a small open economy such as exogenous terms of trade fluctuations, capital controls and exchange and trade restrictions. Subsequently, the model is now fast becoming a standard model for empirical analysis of the behavior of the real exchange rate in developing countries. Based on this model, the fundamental determinants of the equilibrium exchange rate are external terms of trade (TOT), trade and exchange restrictions (TRES), capital control (CAPCON), government expenditure (GCN), investment (INV) and technological and productivity improvement-the so called the Ricardo-Balassa-Samuelson effect[7](TPI). The structural relationship between the ERER and the fundamentals can then be captured as:

$$\log e_t^* = b_0 + b_1 \log F_t + \mu_t \qquad \text{[eq.1]}$$

Where, e_t^* is the equilibrium exchange rate, F_t is a vector of fundamentals, μ_t is a disturbance term with mean zero and stationary random variable, and b_0 and b_1 are parameters to be estimated.

However, e_t^* is not observable; hence we use the actual real exchange rate (which is observable) to build an empirical model that is consistent with [eq.1].

$$\log e_t = b_0 + b_1 \log F_t + \mu_t \qquad \text{[eq.2]}$$

[6] Implicitly, this implies a direction of causality from misalignment to competitiveness

[7] The hypothesis emphasizes on the role of productivity differential between a country and its major trading partners.

Where, e_t is the actual real exchange rate.
However, movements in the real exchange rate do not necessarily reflect an equilibrium path as speculative bubbles and inconsistent macroeconomic policies could affect it. Nonetheless, in the long run the RER has a mean-reversion property, where the mean is the equilibrium exchange rate towards which the actual RER converges in the absence of new disturbances. A general error correction model (ECM) can capture this dynamics of the RER and can be specified as:

$$\Delta \ln e_t = \alpha(\ln e_{t-1} - \beta F_{t-1}) + \sum u_j \Delta \ln e_{t-j} + \sum \gamma_j \Delta F_{t-j} + \nu_t \qquad \text{[eq.3]}$$

Where F_t is the vector of fundamentals and ν_t is an independent and identically distributed, mean zero, stationary random variable and α is a parameter that measures the speed of adjustment of the exchange rate disequilibrium. The ECM is stable for $\alpha<0$.

3.2 The long-run RER fundamentals

The kernel of Edwards' model is the specification of the fundamental determinants of the equilibrium exchange rate. At this juncture, it is worthy to explore the dynamic path that the ERER follows in response to disturbances in each of the exchange rate fundamentals: TOT, GCN, CAPCON, TRES, TPI and INV. To this end, Edwards (1989) has outlined the path in a very sophisticated fashion. Below, we have presented a simplified version of Edwards' original outline.

Terms of trade (TOT): TOT is one of the most important external real exchange rate fundamentals that reflects the foreign price shocks that developing countries face. Edwards (1988, 1989) observed that changes in TOT imply higher domestic prices of importables and thus generates intertemporal and intratemporal substitution effects as well as income effects. As a result the net effect on the ERER is ambiguous. However, the bulk of the empirical literature (see for e.g. Edwards, 1988:7; and Baffes et al, 1999:438) suggests that the income effects of TOT changes overwhelm the substitution effect. Thus, an improvement (deterioration) in TOT leads to an equilibrium real appreciation (depreciation).

Government expenditure (GCN): Government expenditure is another important fundamental variable that affects the ERER. The direction of the movement in ERER associated with changes in government expenditure depends on composition of the expenditure between tradable goods and nontradable goods. If the major portion of the increase in government expenditure is on nontradable goods, then there will be excess demand for nontradables in the short run that bids up the price of nontradables thereby resulting in RER appreciation. However if the large proportion of the increase in government expenditure is directed towards the tradable goods sector, then the relative price of nontradables fall resulting in RER depreciation. The empirical literature, however, seems to suggest that the share of government expenditure towards nontradables outweigh that of tradables thereby predicting a positive coefficient (for example see Elbadawi, 1994; Mongardini, 1998; Baffes et al, 1999).

Capital controls (CAPCON): Capital controls refer to any restriction or control that results in some impediment on free borrowing and lending of capital to and from the rest of the world. A relaxation of capital controls may affect the long run path of RERE positively or negatively. Edwards (1989) shows that if liberalization of capital controls increase the inflow of capital, it leads to expansion of monetary base. Chowdhury (1999:8) explains that the expansion of the monetary base "raises current expenditure over income and increases the demand for nontradables." As a result, prices of nontradables increase in order to maintain internal balance hence resulting in appreciation of the ERER. Therefore, the net effect on ERER of the relaxation of capital controls depends on the net inflow of capital.

Trade restrictions (TRES): This variable refers to countries' trade policy stance that is mainly reflected by the magnitude and structure of import tariffs and quotas. Trade restrictions, i.e., tariffs and quotas, increase the domestic price of tradables and thus result in both income and substitution effects. Depending on whether the income or substitution effects of trade restrictions dominate the ERER either depreciates or appreciates. Edwards (1988:7) has pointed out that unlike the change in TOT the substitution effect of trade restrictions dominates the income effect. Thus tightening restrictions (i.e., a rise of tariff or a reduction of quotas) leads to a higher relative increase in the price of nontradables thereby resulting in real appreciation of the ERER. On the other hand, declines in trade restrictions, i.e. a shift towards trade liberalization, result in real depreciation of the ERER.

Technological and productivity improvements (TPI): TPI is a non-policy domestic variable that generally increases productivity efficiency. This variable is used to capture the so-called the Ricardo-Balassa-Samuelson hypothesis that states that technological and productivity improvements in rapidly growing economies tend to be concentrated in the tradable goods sector[8]. As a result, the relative price of tradable goods falls thereby resulting in appreciation of the equilibrium exchange rate path.

4. EMPIRICAL FRAMEWORK

4.1 The Data

The data set spans fifteen years, starting in the first quarter of 1985 and ending in the fourth quarter of 2000. All variables except the technology are in logarithms. For the real exchange rate variable the Producer-price-index (PPI) based real effective exchange rate published by the Reserve Bank of South Africa is used[9]. However, data is readily available for the real (effective) exchange rate variable, the TOT and the ratio of investment variable (INV) that are easily obtained from the web site of the Reserve Bank of South Africa. Proxies are constructed for the other variables. These

[8] The Ricardo-Balassa-Samuelson hypothesis is widely discussed and broadly accepted hypothesis in the literature (see, Edwards, 1989 (136) and Baffes et al (1999)).

[9] This CPI-based exchange rate differs from the real exchange rate definition in Edwards model that is based on the relative price of tradables to nontradables. Although this CPI-based effective exchange rate is prone to severe theoretical shortcomings (see Khan, 1995), modeling it has a more valuable policy relevance (see Aron, 1997).

proxies are government consumption on current account (GCA) for the government consumption of nontradables; domestic resource balance (RESBAL)[10] for capital controls[11]; openness of the economy (OPEN)[12] for trade and exchange restrictions; the rate of growth of real output (TECH) for the technological and productivity growth variables. Nor does data is readily available for trade competitiveness, hence we used unit labor cost and volume of export as proxies.

4.2 Empirical Methodology

4.1.1 Estimating the degree of the RER misalignment

The empirical estimation of the exchange rate misalignment is all about estimating the equilibrium exchange rate (ERER) and computing the percentage deviation of the actual exchange rate from the equilibrium. The estimation the ERER involves three steps. The first step is estimating the long ran parameters of the relationship between the RER and its fundamental variables from the static model, [eq.2]. The second step is calculating sustainable components for the fundamental variables by removing temporary components from the time series. The third step is deriving the ERER by combining the long run parameters obtained from step one with the sustainable components of the fundamental variables.

4.1.1.1 Step One: Estimating the ECM

Most macroeconomic time series data appear to be nonstationary. Based on the standard econometric tests for the presence of unit roots, i.e., the DF, the ADF and the PP tests, the variables used in this study, except the terms of trade and the rate of output growth appear to be nonstationary at level, I(1). One property of nonstationary data is that it drifts away from its mean stochastically (randomly) invalidating traditional estimation and inference procedures. As a result, recent studies in applied work have emphasized on cointegration as an appropriate dynamic modeling of macroeconomic time series. Cointegration implies to the presence of long run equilibrium relationship among the nonstationary variables. Thus, a cointegrated group of variables is stationary despite it being a linear combination of individually nonstationary variables.

Table 3 and Box 1 in the appendix show a cointegration and weak exogeneity tests respectively. The tests reveal the presence of a unique (one) cointegration vector and weak exogeneity of the exchange rate fundamentals with the exception of the investment, INV, variable, which appeared to be endogenous[13]. Following the

[10] Following Baffes et al (1999), the domestic resource balance is calculated as: RESBAL=(export*TOT-import)/GDP, with all the variables in constant 1995 price.

[11] A number of studies including Edwards (1989) have used net capital inflow to proxy capital control. However, in our estimation this variable appeared to be insignificant. Thus, we substituted the ratio of domestic balance to GDP as an alternative proxy (for the same proxy, see Baffes et al, 1999:460).

[12] OPEN is expressed as the ratio of the sum of export to gross domestic product (GDP) and import to gross domestic expenditure (GDE), $[(X/GDP) + (M/GDE)]^{12}$, at constant 1995 price.

[13] Baffes et al (1999) found similar situation with the INV variable being endogenous for Côte D'Ivoire. To overcome the endogeneity problem they used two-stage-least-squares (2SLS) technique and found comparable result with the Engle-Granger approach. Encouraged by this result, on the one

Granger representation theorem[14], an error correction model (ECM) is the appropriate modeling procedure for a cointegrated group of variables (Engle and Granger, 1987).

In the presence of a unique cointegration vector and exogeneity of the right-hand side variables, the single equation Engle-Granger (EG) approach is a simple and an unbiased estimator of the ECM (see Harris, 1995).

In the Engle-Granger approach the general error correction model (ECM) can be represented as:

$$\Delta e_t = \gamma_0 + \gamma_1 \Delta F_t - (1-\alpha)\varepsilon_{t-1} + \mu_t \quad \text{[Eq.4]}$$

Or equivalently as:

$$\Delta e_t = \gamma_0 + \gamma_1 \Delta F_t - (1-\alpha)[e_{t-1} - b_1 F_{t-1}] + \mu_t \quad \text{[Eq.5]}$$

Where, μ_t is an independent and identically distributed, mean zero, stationary random variable, α is a speed of adjustment parameter, and ε_{t-1} (i.e., $\ln e_{t-1}$-b1F_{t-1}) is a one period lag of the disequilibrium error retained from the static model, [eq.2].

Estimation of [eq.5] involves two steps: obtaining the residual term, $\varepsilon_t = \ln e_t - b_0 - b_1 F_t$, by estimating the static model, [eq.2], and then using the one period lag of the residual, ε_{t-1}, as exogenous variable in [eq.5].

In this approach, commonly known as the two-step EG approach, the static model is estimated by OLS on the basis of the 'superconsistency' assumption of OLS for cointegrated variables[15]. However, in finite samples, it has been shown that the estimated parameter β of the static model is generally biased, and non-normal (Phillips and Durlauf, 1986). Moreover, as Harris (1995:60) has pointed out, when more complicated dynamic models are required to capture the equilibrium relationship between e_t and F_t, estimating the static model, [Eq.1], will push more complicated dynamic terms into the residual term, ε_t, with the result that the latter can exhibit severe autocorrelation.

Banerjee et al (1993) and Inder (1993) suggest that a greater precision in the estimation of β can be achieved by estimating the full model of the dynamics, i.e. by accounting the short run dynamics, in one-step. This approach, referred as one-step Engle-Granger, is the approach used in this study. The one-step ECM can be specified as:

$$\Delta Y_t = \phi_0 + \phi_1 \Delta X_t - (1-\alpha) Y_{t-1} + \phi_2 X_{t-1} + \mu_t$$

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hand, and to avoid cumbersome task, on the other hand, we continue with the Engle-Granger approach assuming weak exogeneity for the investment variable.

[14] According to the Granger representation theorem, if two or more variables are cointegrated then an error correction model (ECM) can represent the short run disequilibrium relationship among them.

[15] The superconsistency assumption states that the OLS estimators of b_0 and b_1 converge to their respective true parameters at a much faster rate than the usual OLS estimators with stationary variables. This implies that the OLS estimators are unbiased and efficient.

Where, $\phi_0 = b_0 (1-\alpha)$, $\phi_1 = \gamma_1 (1-\alpha)$ and $\phi_2 = b_1 (1-\alpha)$. This means that obtaining the long run parameters of the equilibrium relationship requires the transforming of the one-step EG estimators dividing them by the speed of adjustment parameter, $(1-\alpha)$.

4.1.1.2 Step two: Calculating sustainable components of the fundamentals

Following Edwards (1989) and Mongardini (1998), we have used five quarters moving-average technique in order to isolate the permanent components of the exchange rate fundamental variables from their respective transitory components. One major limitation of this technique is that it drops observations from the time series. To overcome this limitation, we have smoothed the data beginning from the first quarter of 1984, thus no observation is dropped from the specified sample period.

4.1.1.3 Step two: Calculating sustainable components of the fundamentals

The third step is to combine the long run parameters of the ECM, obtained from [eq.5], with the sustainable components of the fundamentals in order to derive the equilibrium exchange rate. Then the exchange rate misalignment is computed as the percentage difference between the real exchange rate and the computed equilibrium value, i.e.

$$m_t = \log e_t - \log e_t^*$$

Where, m_t is the exchange rate misalignment index, and e_t and e_t^* are the actual and equilibrium exchange rate respectively.

4.1.2 Estimating the impact of RER misalignment on trade competitiveness

In order to investigate the effect of misalignment on the competitiveness of the South African economy we have established impulse-response analysis and variance decomposition techniques of cointegrated VAR between the exchange rate misalignment index and the two proxies of competitiveness-unit labor cost index and volume of merchandize export. The impulse response analysis shows the behavior of the trade competitiveness proxies in response to a one unit positive shock (change) in the RER misalignment index. For the purpose of calculating the impulse response function we estimated an unrestricted vector autoregressive (VAR) between each proxies of the competitiveness index and the exchange rate misalignment index. Based on the Akaike's and Bayesian information criteria (BIC) the VAR length was chosen to be four[16].

[16] The intuition is to assure a Gaussian error term in the VAR.

4.3 The Result

Table 1: The ECM

one-step Engle-Granger ECM		
	Coefficient	t-statistics
Constant	17.42	3.90
Adjustment Speed		
$\log(REFFR_{t-1})$	-0.42	-5.35
Long-Run Parameters		
$\log(TOT_{t-1})$	1.60	3.42
$Log(GCN_{t-1})$	0.61	2.70
$Log(INV_{t-1})$	-0.52	-2.39
$Log(OPEN_{t-1})$	1.30	3.26
$Log(RESBAl_{t-1})$	-1.32	-3.01
$TECH_{t-1}$	7.33	3.39
Short-Run Parameters		
$\Delta\log(TOT)$	-0.05	-0.11
$\Delta\log(GCN)$	0.52	3.04
$\Delta\log(INV)$	-0.83	-2.75
$\Delta\log(OPEN)$	-0.19	-0.81
$\Delta\log(RESBAL_{t-2})$	0.12	0.88
$\Delta TECH$	8.98	3.73
Dummies		
Dum98	-0.24	-2.95
Dum00	-0.17	-6.05
Dum92	-0.10	-2.11
Dum85	-0.26	-3.32
Diagnostic Tests		
Adjusted R^2 = 0.6764; F(17,60) = 8.7478 [0.0000]; σ = 0.0574; DW = 2.0372; LM 1-5 F(5,55) = 1.4433 [0.2294]; ARCH 5 F(5, 50) = 1.8693 [0.1154]; X_i^2 F(13,47) = 1.3930 [0.1768]; RESET F(1, 59) = 0.1719 [0.6894]; Normality $\chi^2(2)$ = 4.1433 [0.1260]		

Table 1 shows the estimated parsimonious Error Correction Model of the real exchange rate. The result is satisfactory by all of the diagnostic tests shown at the bottom of table1. The tests cover: the adjusted R^2 that measures the goodness-of-fitness of the model showing that 67.64 percent of variations in RER is explained by the fundamentals. An F-test that all the right-hand side variables except the constant term have zero parameter elasticities. σ is the standard deviation of the regression.

DW is the Durbin-Watson statistic test for first order autocorrelation (which is strictly not applicable in the presence of a lagged dependent variable). The LM test shows the Breusch-Godfrey test for serial autocorrelation up to the fifth lag obtained by regressing the residual from the original model on all the regressors of the model and lagged residuals. The ARCH test is a test for autoregressive conditional heteroscedasticity up to the fifth lag, obtained by regressing the squared residuals from the model on their lags (here up to the fifth lag) and a constant. The X_i^2 test shows White's heteroscedasticity test obtained by regressing the squared residuals on the level and square of the regressors of the original model. The RESET test is Ramsey's general test of mis-specification obtained by adding powers of the fitted values from the model. The last test is the Jarque-Bera test for normality of the distribution of the residual term. None of the diagnostic tests except the F-test that all the elasticities are zero, are significant at 95 percent critical values suggesting that the model is correctly specified.

The estimated long run parameters of the model fairly corroborate the theoretical model. The speed of adjustment is fairly fast showing that 42 percent of the disequilibrium in exchange rate is offset by short run adjustments in each period. This coefficient is significant at 5 percent level and has the right sign indicating that negative short run adjustments correct positive deviations from the equilibrium.

The elasticity of the RER with respect to the terms of trade is found to be 1.60 in the long run showing that a percentage improvement in terms of trade appreciates the real effective exchange rate by 1.60 percent. This result is consistent with the bulk of the literature showing that the income effect of this variable dominates the substitution effect.

In line with the literature, the estimated elasticity for the government consumption (GCN) variable is positive and significant indicating that the larger share of government consumption is on nontradables. The estimated coefficient shows that the exchange rate appreciates by 6.1 percent in response to 10 percent increase in GCN.

The coefficient of INV, the ratio of investment to gross domestic product, is negative and significant indicating that the exchange rate depreciates by 5.2 percent in response to 10 percent increase in INV. This result is consistent with the theory that an increase in investment shifts consumption towards traded goods (Edwards, 1989).

Contradictory to the bulk of the empirical evidence as pointed out by Edwards (1989) and Elbadawi and Soto (1995), the coefficient of the openness variable, OPEN, is appeared to be positive and significant. This result shows that the income effect of trade liberalization has dominated the substitution effect and reflects the fact that the trade liberalization and the subsequent integration of South Africa to the rest of the world, from its previously isolated status has led to a large net influx of capital.

The estimated coefficient for the domestic resource balance (RESBAL) is significant at 5 percent level and shows that the real effective exchange rate depreciates by 1.32 percent in response to a percentage increase in domestic absorption. This result is consistent with the findings obtained by Edwards (1989), Elbadawi and Soto (1995) and Baffes et al (1999) and shows that a decrease in net capital inflows (which induces an increase in resource balance)[17] results in an equilibrium depreciation.

The technological advancement variable that is used to proxy the Ricardo-Balassa-Samuelson effect is statistically significant and positive, as expected by the theoretical model. The result shows that a percentage improvement in production technology appreciates the RER by 7.33 percent in the long run and by 8.98 percent in the short run. The result suggests that technological and productivity growth have a dominant effect on both long run and short run movements of the real exchange rate.

The short-run parameters of Table1 show the short run impact of the fundamentals on the RER (in the estimation of equilibrium exchange rate the short-run parameters are not of interest, but they are included in the model for measurement precision in obtaining the long-run parameters). The short-run dynamics of the ECM also include four dummy variables that are established on the basis of a CUSUM and a one-step-ahead residual forecast test of parameter stability.[18] The dummies are statistically significant and capture quantitatively unexplained factors that impacted the RER depreciation. The first dummy, Dum98 that assigns 1 for 1998:3 and 1999:1, coincides with the contagion of the Asian financial crisis and the subsequent huge outflow of capital. Whereas, the other dummy variables-Dum00 (assigning 1 for 2000:2), Dum92 (assigning 1 for 1992:4), and Dum85 (assigning 1 for the 1985:1 and 1986:3)-can be regarded as outlier dummies.

4.3.1 Estimating the equilibrium exchange rate

Combining the long run parameters of the ECM with the sustainable components of the fundamentals, which are computed by five quarters moving average, derives the ERER. The resulting ERER index can be specified as:

$$\log(ERER)=17.42 + 1.60\log(TOT^{*}) + 0.61\log(GCN^{*}) - 0.52\log(INV^{*}) + 1.30\log(OPEN^{*}) - 1.32\log(RESBAL^{*}) + 7.33(TECH^{*})$$

Where the asterisks over the variables indicate that they are the sustainable components of the fundamentals.

[17] see Baffes et al, 1999:438

[18] This is routinely done by several econometric softwares and involves recursive least squares to the model over successive time periods by increasing the sample period by one additional observation for each of the estimations.

Figure 1. South Africa: The logarithm of actual vs. equilibrium effective exchange rate
(1995:1-2000:4)

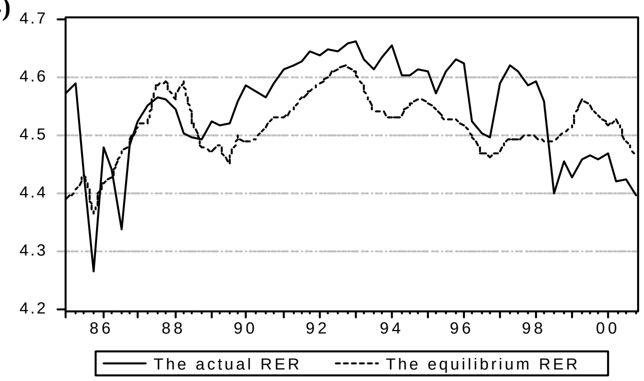
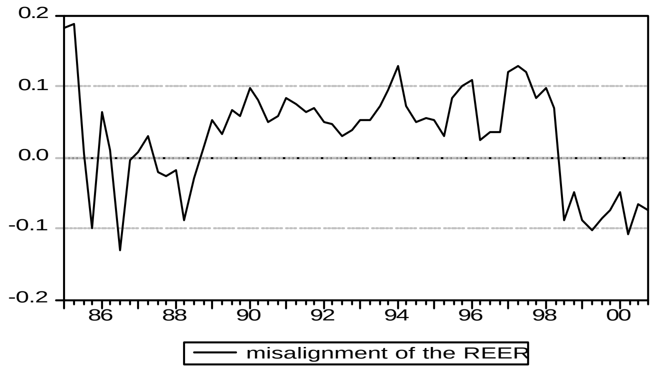


Figure 2. South Africa: Real Effective Exchange Rate Misalignment (1985:1 – 2000:4)



Two distinct natures of the misalignment episode can be discerned from figure 2. The first is the overvaluation episode that ranges between 1988:3-1998:2, while the second episode is the period of undervaluation that constitutes two distinct periods ranging from 1985:1-1988:1 and 1997:2-2000. The first episode had been characterized by a relatively calm and stable political condition while political instability of the mid-1980s that includes the debt crisis of 1985 and the gold price shock of the 1980s[19] and the financial crisis of the late 1990s characterized the second episode. For example in the second half of 1997 alone, the country experienced a speculative short-term capital outflow close to 5.8 rand (South Africa Foundation, 1998:5).

4.3.2 The Effect of Misalignment on Competitiveness

4.3.2.1 The Impulse Response Analysis

Figure 3 and Figure 4 show the response of trade competitiveness to a positive one standard deviation shock in real exchange rate misalignment, respectively using unit labor cost and volume of merchandize export as proxies. In figure 3 the positives shock in exchange rate misalignment, which is an overvaluation, results in a

[19] See Kahn (1994:6).

significant increase in the long-run elasticity of the unit labor cost. However, in the first two quarters that can be perceived as the short run elasticities the effect of the misalignment on unit labor cost is small. After the second quarter the increase in unit labor cost is relatively significantly large, reaching 0.18 percent in the sixth quarter. Similarly, Figure 4 shows the response of merchandise export to one standard deviation shock in real exchange rate misalignment. In the short run, especially from the second to the sixth quarters the export of merchandize goods increases by average of 0.15 percent. However, from the sixth quarter onwards the export declines by a sustainable average of 0.16 percent.

In general, the results from both figure 3 and figure 4 are consistent with the literature and show that an increase in RER misalignment results in a significant and persistent deterioration of the trade competitiveness of the South African economy with a time lag of 2 to 6 quarters.

Figure 3. South Africa: Response of unit labor cost to a shock in real exchange rate misalignment (percent).

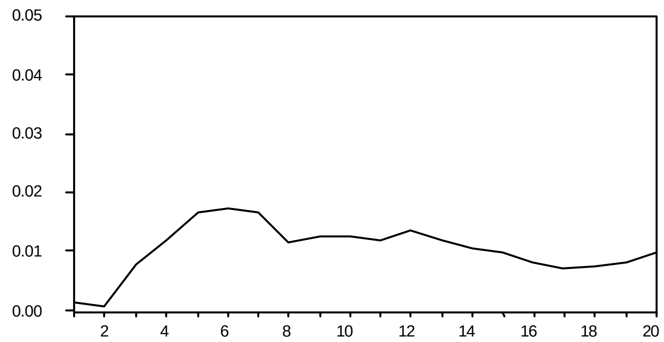
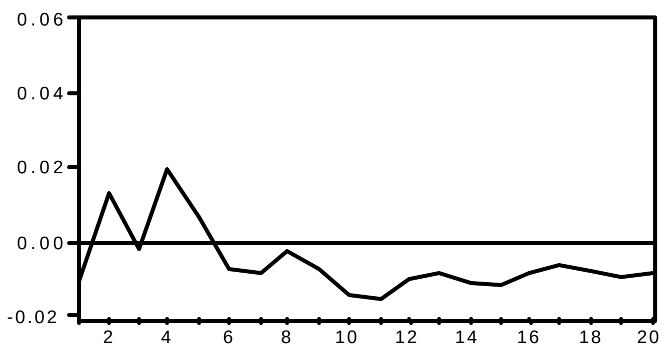


Figure 4. South Africa: Response of merchandize export to a shock in real exchange rate misalignment (percent).



4.3.2.2 Variance Decomposition Analysis

Figure 5 and Figure 6 present the forecast variance decompositions that are another important ways of assessing the relative importance of a shock in real exchange rate in accounting for variation in trade competitiveness at various time horizons. Consistent with the above finding, the exchange rate misalignment accounts for a smaller variation in both unit labor cost and merchandize export in the short run, average of two quarters. However, in long time horizon the exchange rate misalignment accounts for about 20 percent of the variation in unit labor cost and merchandize export. This result can be interpreted as revealing that movements in exchange rate misalignment accounts for about 20 percent of the long run variation in trade competitiveness of the South African economy.

Figure 5. South Africa: variance of unit labor cost due to real exchange rate misalignment (percent)

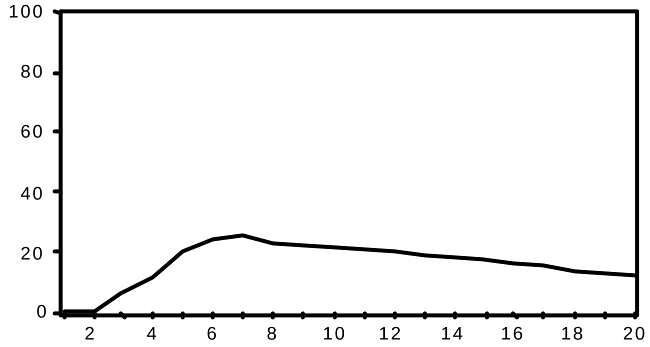
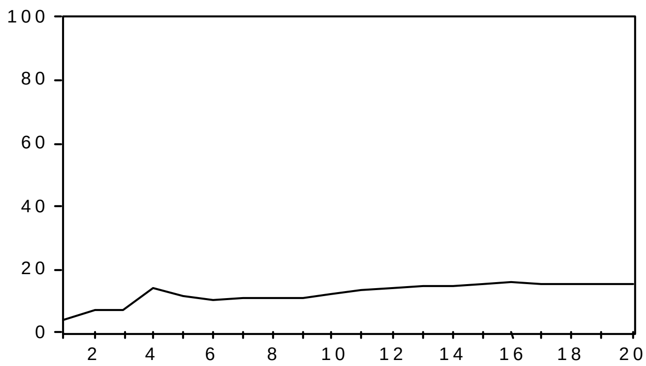


Figure 6. South Africa: Figure 5 variance of merchandize export due to real exchange rate misalignment (percent)



5. CONCLUSION AND RECOMMENDATION

The result from the empirical estimations show that the real exchange rate had been overvalued from the second quarter of 1988 until the 2^{nd} quarter of 1998. Whereas, the real exchange rate was undervalued from the 2^{nd} quarter of 1985 to the 2^{nd} quarter of 1988 and from 2^{nd} quarter of 1998 to 2000. The overvaluation episode of the misalignment had been characterized by periods of relative political stability, removal of the sanction and integration of the South African economy into the global market. In contrast, political and social unrest and Periods of international financial crisis that have impacted the South African economy characterize the two distinct episodes of the currency undervaluation. Revealing that exchange rate misalignment accounts for about 20 percent of the variation in unit labor cost and volume of merchandise export in South Africa, the study confirmed the incapacitating effect of exchange rate misalignment on a country's long-term trade competitiveness. Moreover, in line with the economics literature, the result shows that the effect is felt only through a time lag of about four quarters.

Achieving a higher level of export and investment has been considered as a vital strategy for a sustainable level of growth. As a result, a number of developing countries have adopted an export-led growth strategy with the desire of building a vibrant and competitive economy. One such example in South Africa is the GEAR (The Growth, Employment and Redistribution) strategy, which among other things opts to build a dynamic and competitive private sector and to expand employment through export promotion.

In this regard, the role that exchange rate policy plays in the expansion of export is widely discussed in the economics literature. However, a number of recent studies have underlined that the time-series movements of the real exchange rate alone can not provide adequate information for policy purposes as it does not consider the path of the equilibrium exchange rate. The results of this research disclose that exchange rate misalignment substantially debilitates the trade competitiveness of the South African economy. Moreover, consistent with the 'trade-hysteresis' literature, this study shows that the impact of the misalignment on trade competitiveness is felt over prolonged periods, albeit through time lags. Therefore, policy makers should regularly monitor the real exchange rate path and should incorporate 'getting the real exchange rate right' as part of the trade policy strategy.

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