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South Africa: Selected Issues

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SOUTH AFRICA

Selected Issues

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Approved by African Department

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South Africa: Basic Data

Area	1,219 million square kilometers
Population (2000)	43.3 million
Population growth rate (2000)	1.3 percent
Employment (1999)	10.4 million
IMF Position (April 30, 2002)	
Quota	SDR 1,868.5 million
Fund holdings of rand	SDR 1,868.1 million
Holdings of SDRs	SDR 222.6 million
Exchange rate (end May 2002)	US$1 = R 9.74

	1997	1998	1999	2000	2001 Est.
National accounts	(Annual percentage change, unless otherwise specified)				
Real GDP	2.6	0.8	2.1	3.4	2.2
Real GDP per capita	0.4	-1.4	-0.1	1.2	0.2
Nominal GDP (billions of rand)	686	740	803	888	975
Nominal GDP per capita (U.S. dollars; at PPP)	7,529	7,509	7,591	7,838	8,031
External sector					
Merchandise exports, f.o.b. 1/	3.0	-6.7	-1.8	10.9	-3.4
Merchandise imports, f.o.b. 1/	4.6	-5.7	-9.9	11.5	-6.2
Real exports of goods and services	5.5	2.5	1.4	8.3	2.4
Real imports of goods and services	5.4	1.5	-7.5	7.2	0.4
Terms of trade	-1.2	-1.1	-3.0	-1.7	1.2
Nominal effective exchange rate 2/	0.4	-11.7	-8.5	-5.1	-14.6
Real effective exchange rate 2/	6.5	-8.9	-5.2	-3.0	-17.0
Money, interest rates, and prices					
Broad money (M3)	17.2	14.6	10.1	7.5	17.0
Bank rate/repurchase rate (period end, in percent)	16.0	19.3	12.0	12.0	9.5
GDP deflator	8.1	7.0	6.3	7.0	7.5
CPI (annual average)	8.6	6.9	5.2	5.4	5.7
Investment and saving	(In percent of GDP)				
Investment (incl. inventories)	16.6	16.7	15.9	15.9	15.3
Gross national saving	15.1	14.9	15.4	15.5	15.2
Foreign saving	1.5	1.7	0.5	0.4	0.1
Government finances 3/					
National government					
Revenue, including grants	23.3	24.4	24.2	23.6	24.8
Expenditure and net lending	27.1	26.7	26.1	25.7	26.3
Overall balance 4/	-3.8	-2.3	-2.0	-2.0	-1.5
National government debt	48.0	48.2	46.5	43.8	43.3
General government balance	-4.3	-2.0	-1.5	-1.7	-1.3
PSBR of the nonfinancial public sector 5/	4.5	3.5	0.6	0.9	0.2
External sector	(In billions of U.S. dollars; unless otherwise specified)				
Current account balance	-2.3	-2.3	-0.6	-0.5	-0.2
Foreign currency-denominated debt	25.2	25.0	23.9	24.9	23.0
Of which: short-term	14.1	14.5	13.5	12.9	11.2
Total external debt/exports of goods and nonfactor services (in percent) 6/	107.2	109.0	115.4	100.7	96.4
Interest payments on debt	3.0	3.0	3.0	2.4	2.2
Overall balance of payments	2.4	-0.7	4.2	0.7	0.7
Gross official reserves	5.8	5.4	7.4	7.5	7.5
(in months of total imports)	2.0	2.0	2.9	2.7	2.9
(in percent of short-term foreign currency debt)	41.4	37.3	54.5	58.4	66.6
Net open forward position of SARB	16.3	22.5	13.0	9.5	4.8

Sources: South African Reserve Bank; IMF, *International Financial Statistics;* and IMF staff estimates.

1/ In U.S. dollars, annual percent change.

2/ Annual average, INS definition.

3/ Fiscal year beginning April 1.

4/ Excludes sales of state assets and the profit/losses from forward market operations of the Reserve Bank.

5/ Excludes sales of state assets but including the profit/losses from forward market operations of the Reserve Bank.

6/ Excluding rand-denominated debt held by non-residents, end of period.

I. Estimation of the Equilibrium Real Exchange Rate For South Africa[1]

1. The real effective exchange rate of South Africa has depreciated by about 40 percent since 1995, almost half of which occurred during 2001. A depreciation of this magnitude begs the question as to what extent it can be considered an equilibrium phenomenon (i.e., consistent with persistent movements in economic variables that regularly affect the real exchange rate) rather than a temporary deviation from equilibrium. The depreciation also raises the question of how long it would take for any temporary deviation to dissipate.

2. This section of the selected issues paper addresses these questions by estimating an equilibrium path for South Africa's real effective exchange rate. After reviewing the existing literature, the paper briefly describes the dynamics of the real exchange rate and its determinants. It then investigates the presence of a long-run relationship (cointegration) between the real exchange rate and certain explanatory variables, estimates the speed at which the real exchange rate converges toward its equilibrium level, and derives measures for the equilibrium real exchange rate and, correspondingly, the gap between the actual and the equilibrium level.

A. Brief Review of the Literature

3. There is a considerable body of literature on the estimation of the equilibrium real exchange rate, some of which has been surveyed in MacDonald (1995) and Rogoff (1996). Most recent papers investigate the presence of a long-run relationship between the real exchange rate and various determinants by making use of cointegration techniques that identify persistent patterns of co-movements among variables.

4. The main explanatory variables identified in the literature for developing countries include commodity price movements (or terms of trade), productivity and real interest rates differentials vis-à-vis trading-partner countries, measures of openness of the trade and exchange system, and the size of the fiscal balance.[2] The rationale for most variables is based on a simple neoclassical theoretical framework that assumes the prices of tradable goods are equalized across countries and, hence, investigates how changes in the real exchange rate arise mainly from relative movements in the price of nontradables across countries. Relaxing the assumption of price equalization should provide richer insights into the transmission mechanisms (as in the presence of imperfect substitutable traded goods across countries, the real exchange rate would also be affected through the relative price of traded goods), but should lead to broadly similar

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[1] Prepared by Luca Ricci. The section draws substantially on work done in collaboration with Ronald MacDonald of Strathclyde University.

[2] Other variables include the extent of net foreign assets, the investment-to-GDP ratio, the net capital inflows-to-GDP ratio.

conclusions (see MacDonald and Ricci (2002)). In either case, our chosen variables explain why the real exchange rate can be expected to vary over time and provide a rationale for deviations from purchasing power parity (PPP).

5. The classic example of an equilibrium deviation from PPP is the Balassa-Samuelson effect (see Balassa (1964); and Samuelson (1964)). If a country experiences an increase in the productivity of the tradable sector (relative to its trading partners), its real exchange rate would tend to appreciate; for given prices of tradables, stronger productivity would induce higher wages, higher prices of nontradables, and, hence, an increase in the consumer price index relative to trading partners.[3]

6. An increase in the world price of the commodities that a country exports would tend to appreciate the real exchange rate. Such an increase would induce a positive wealth effect, which would raise domestic demand and, hence, the price of nontradables (see Diaz-Alejandro (1982)). In principle, this effect should be captured more comprehensively by the terms of trade, as their numerator encompasses all exports—as opposed to only commodity based exports—and their denominator reflects the price of the country-specific imports, as opposed to a generic industrial country export deflator. In practice, few studies find a significant effect of the terms of trade (see, however, Goldfajn and Valdes (1999)), while many researchers find commodity prices to be strongly cointegrated with the real exchange rate of commodity exporters.[4] One rationale for the findings is provided by the relative accuracy of the measurement of commodity prices, as opposed to the arbitrariness involved in the construction of country-specific export and import deflators. Another rationale relates to how frequently commodity price data are made available which may allow financial markets to tailor their financial decisions about the currencies of commodity exporters to the prices of these commodities.

7. The real interest rate differential could represent several factors—aggregate demand, productivity, and persistent monetary policy—all pointing to a positive relationship with the real exchange rate. First, an increase in absorption relative to savings would put upward pressure on the real interest rate in an economy with less than perfect capital mobility. At the same time, the demand for both tradable and nontradable goods would increase, inducing an increase in the price of nontradables, which, in turn, would result in an appreciation of the real exchange rate. Second, real interest rate differentials may also reflect productivity differentials: to the extent that the measure employed to proxy for the Balassa-Samuelson effect is not perfect, the real interest rate differential may help capture this empirically; also, if the productivity of capital raises with respect to trading partners, capital will flow to the home

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[3] For recent empirical evidence on the Balassa-Samuelson effect, see MacDonald and Ricci (2001 and 2002).

[4] See Chen and Rogoff (2002), MacDonald (2001), and Cashin, Cespedes, and Sahay (2002).

country, thereby inducing an appreciation of the real exchange rate.[5] Third, a tightening of monetary policy would raise real interest rates—an outcome that would need to be associated with an expectation of currency depreciation, given the interest parity condition. Hence, the nominal exchange rate would appreciate beyond its long-run value, so as to allow the expected depreciation to occur once the monetary policy shock had disappeared (the "overshooting" effect described in Dornbusch (1976)). In the presence of price rigidities, the real exchange rate would also be appreciated relative to its long-run value (see Obstfeld and Rogoff (1996) for a formal derivation in the new open macroeconomic setup). This last effect could be persistent if the monetary shock—that is, the rise in real interest rates—is persistent: in this sense, the cointegration analysis would capture this effect as part of the "long-run" relation.[6]

8. An improvement in the fiscal balance will have an ambiguous effect on the real exchange rate. On the one hand, a depreciation would tend to occur because the improved fiscal balance would normally induce a less-than-proportional reduction in private saving, so that total domestic demand would decrease while overall savings would increase. [7]As part of the decline in spending falls on nontradable goods, their prices would drop, bringing about a depreciation of the real exchange rate. The effect is likely to be stronger if the fiscal improvement comes from a reduction in government consumption, as opposed to an increase in taxes, to the extent that government consumption falls more intensively on nontradable goods than private spending (in which case, the depreciation would be reinforced in the presence of imperfectly substitutable traded goods).[8] In principle, the fiscal effect should simply be part of the main aggregate demand effect described above; whether the interest rate fully captures both effects is an empirical question. To the extent that it does not, the fiscal balance would enter significantly in the cointegrating relationship. On the other hand, a further effect would operate on the relative price of traded goods in a model which features stock-flow consistency (such as the portfolio balance model). In such a model the current account surplus generated by the initial real

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[5] However, the repayment of the net foreign liabilities accumulated would eventually require a depreciation of the real exchange rate to achieve current account surpluses.

[6] This does not contradict the fact that in the steady state of the economy (the long run, as commonly conceived), the Dornbusch model would not predict an effect of monetary policy on the real exchange rate simply because, by definition, the monetary shock would have vanished in the steady state.

[7] Assuming that Ricardian equivalence does not hold, for example because of uncertainty about the duration of the improvement in the fiscal balance.

[8] See De Gregorio, Giovannini and Wolf (1994) for a theoretical and empirical analysis of the impact of government spending on the real exchange rate. The effect of a reduction of government spending, as opposed to the effect of an increase in taxes, may be stronger also if the larger multiplier effect of the former is not neutralized by the optimal saving choices of consumers.

depreciation would have to be annihilated in the long run by a real appreciation which ensures a sufficient trade deficit to offset the positive net foreign assets.

9. A more open trade regime is likely to be associated with a more depreciated real exchange rate. Trade restrictions increase the domestic price of tradable goods, thereby raising the overall price level and the real exchange rate (see Goldfajn and Valdes (1999)). In the present study, openness is proxied by the ratio of exports plus imports to GDP. Such a measure is widely used, even though it is an imperfect substitute reflecting also a multiplicity of other factors than trade and exchange restrictions. In the context of the present paper, these drawbacks are likely to have a limited impact. In fact, the endogeneity of the openness ratio to the real exchange rate is corrected automatically by the econometric methodology employed. The ratio would also reflect the effect of trade sanctions during the apartheid period, which is likely to induce a similar effect on the domestic price of the tradable goods and, hence, on the real exchange rate.

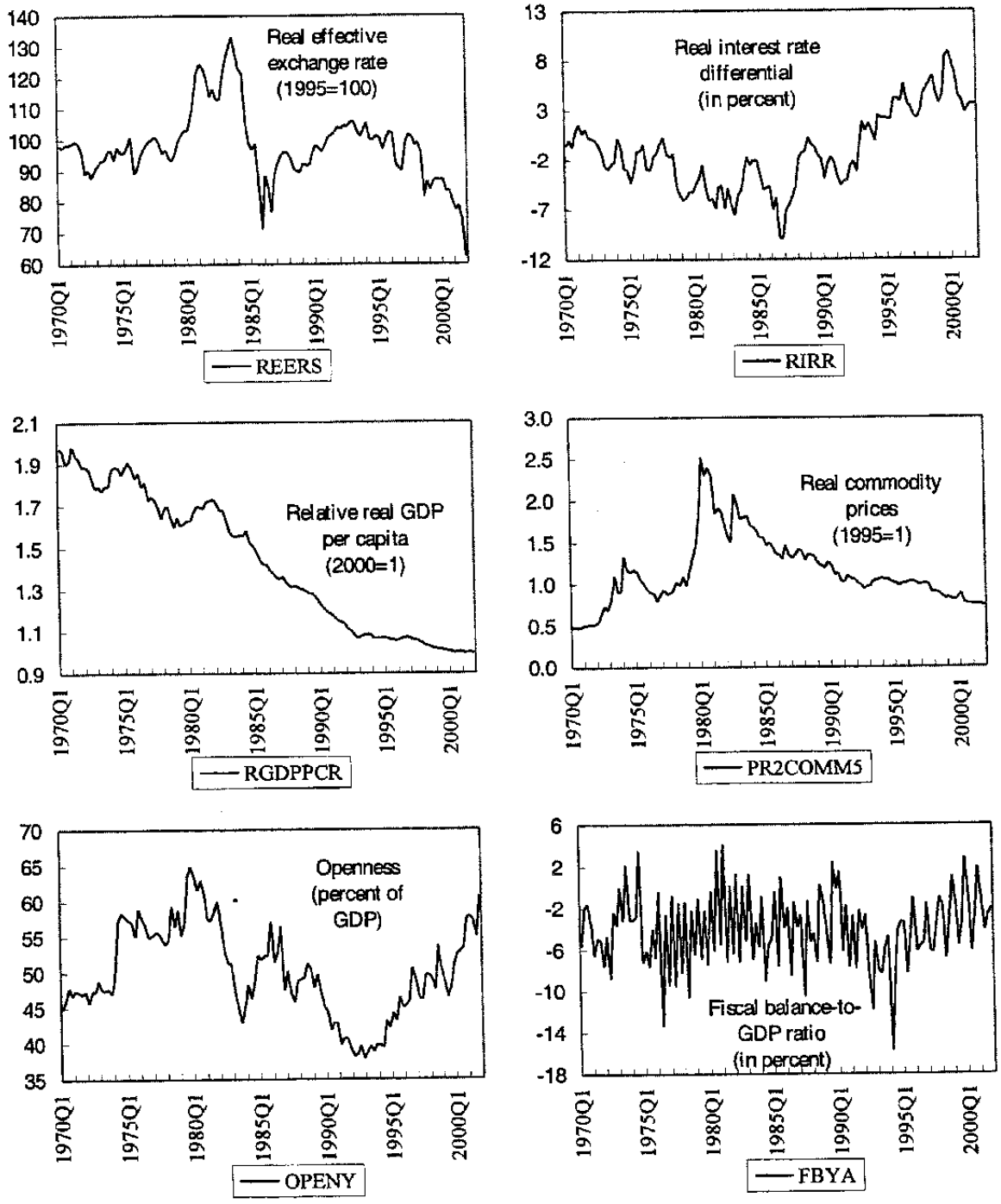
B. Data and Methodology

10. The real effective exchange rate and the main variables employed in the empirical analysis are plotted over the 1970-2001 period in Figure I.1.[9] Some interesting patterns are worth highlighting, particularly for the recent period:

- the significant real depreciation of the rand since 1995, which accelerated in 2001;
- the increase in real interest rates in the 1990s, partly associated with tight monetary policy;
- the persistent decline in real GDP per capita with respect to trading partner countries, throughout the sample period;
- the steady decline in real prices for South Africa main commodity exports since the beginning of the 1980s;
- the decline in openness during the 1980s, in part owing to trade sanctions, and the opening up of the economy since the end of the apartheid; and
- the strengthening of fiscal performance, as measured by the fiscal balance, in the post-apartheid period.

[9] The variable definitions and sources are presented in Appendix I.

Figure I.1. South Africa: The Real Effective Exchange Rate and Its Determinants, 1970-2001



Sources: South African Reserve Bank; Statistics South Africa; and staff estimates.

11. In order to investigate the existence of a long-run relationship (cointegration) between the real effective exchange rate and the variables discussed above, the study employs the Johansen (1995) maximum likelihood estimator, which corrects for autocorrelation and endogeneity parametrically using a vector error-correction mechanism (VECM) specification (see Appendix II for details).[10]

12. In addition to testing for cointegration, the methodology provides estimates of the coefficient of each variable in the long-run relationship, thus permitting the estimation of an equilibrium real exchange rate and a quantification of the gap between the prevailing real exchange rate and its equlibrium level. The methodology also derives estimates of the speed at which the real exchange rate converges to its equilibrium level.

C. Results

13. This section presents the main results from the estimation. Appendix III describes the derivation of the results and documents their robustness.

The Long-Run Relationship

14. There is evidence of cointegration between the real exchange rate and the explanatory variables. Accordingly, the long-run relationship between the real exchange rate and these variables can be identified as follows:

- an increase in the real interest rate relative to trading-partner countries of 1 percentage point is associated with an appreciation of the real effective exchange rate of 5 percent;
- an increase in real GDP per capita relative to trading-partner countries of 1 percent is associated with an appreciation of the real effective exchange rate of between 0.4-0.5 percent;
- an increase in real commodity prices of 1 percent is associated with an appreciation of the real effective exchange rate of 0.6 percent;
- an increase in openness of 1 percentage point of GDP is associated with a depreciation of the real effective exchange rate of 0.01 percent; and
- an improvement in the fiscal balance of 1 percentage point of GDP is associated with a depreciation of the real effective exchange rate of 3 percent.

[10] This methodology is preferred over the standard Engle-Granger single-equation method, as the latter has poor small sample properties and has no correction for autocorrelation and simultaneous equation bias.

Equilibrium Real Exchange Rate

15. The long-run relationship summarized above permits the calculation of an estimate of the equilibrium real exchange rate. Ideally, this measure can be defined as the level of the real exchange rate that is consistent in the long run with the equilibrium values of the explanatory variables, and it can be obtained by evaluating the cointegrating relationship at these equilibrium levels. As evident from Figure I.1, however, these variables can exhibit a substantial degree of "noise" or fluctuations.

16. One way of neutralizing the impact of the temporary fluctuations in the explanatory variables on the evaluation of the equilibrium real exchange rate is the application of smoothing techniques to eliminate short run fluctuations. Figure I.2 shows an example of the equilibrium real exchange rate derived in this manner and compares the outcome with the actual real effective exchange rate.[11]

17. According to Figure I.2, the actual rate appears to have been close to its estimated equilibrium level in 1994-95, but it subsequently depreciated by almost double the equilibrium rate, that is, about 40 percent versus 20 percent, respectively. The decline of the equilibrium level over this period arose from conflicting factors. On the one hand, the decline in commodity prices, the slower productivity growth relative to trading partners, the increase in openness, and the improvement in the fiscal balance accounted for a depreciation of the equilibrium real exchange rate in the order of 15 percent, 3 percent, 11 percent, and 11 percent, respectively. On the other hand, the increase in real interest rate differential partly offset these forces by contributing to an appreciation of 18 percent.

The Gap Between the Real Exchange Rate and its Equilibrium Level

18. At any point in time, the real exchange rate is likely to differ from the equilibrium level either because a change in the explanatory variables alters the equilibrium level or because temporary factors (such as financial market pressure on the rand) move the real exchange rate away from it.

19. One of the aims of the study is to quantify this gap in the fourth quarter of 2001, when the rand rapidly lost value. When the equilibrium values of the explanatory variables are evaluated by smoothing them, as in Figure I.2, the gap is found to be in the order of 20 percent. Alternatively, one can evaluate the deviation of the real effective exchange rate from a notional

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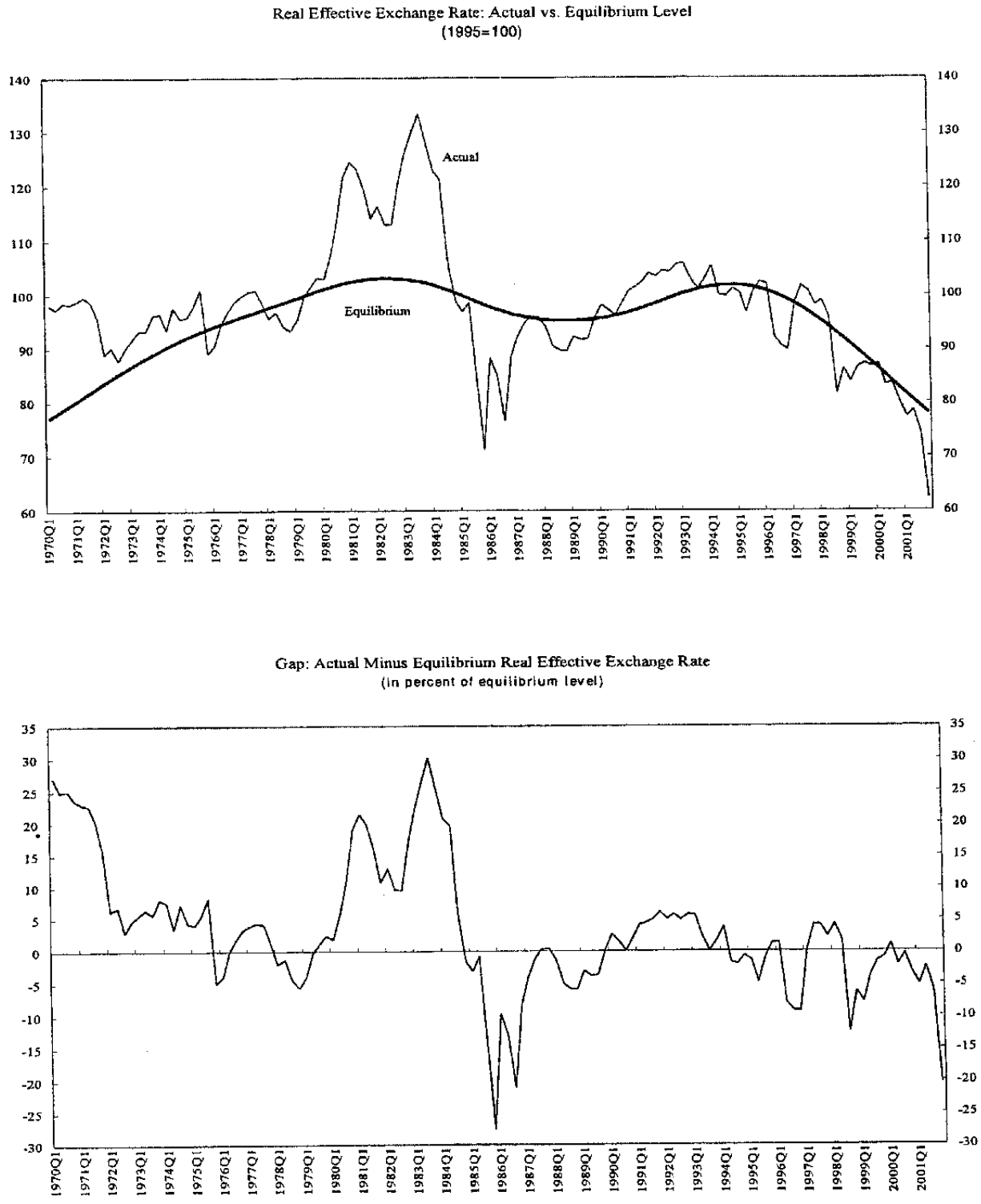
[11] Choosing the degree of smoothing is admittedly arbitrary. The equilibrium real exchange rate in Figure I.2 is derived by applying to the explanatory variables a Hodrick-Prescott filter with a smoothing factor of 10,000. A larger (smaller) factor would generate a smoother (less smooth) equilibrium real exchange rate path. It should be noted that the Hodrick-Prescott filter tend to perform poorly at both ends of the series.

Figure I.2. Actual and Equilibrium Real Effective Exchange Rate, 1970-2001.



equilibrium level, based on a set of economic priors for the equilibrium values of the explanatory variables. Accordingly, a gap of 22 percent would result from the following choices:

- a real interest rate differential of about 250 basis points, that is, roughly the level of the yield spreads in 2001;
- a relative real GDP per capita equal to the actual level in the fourth quarter of 2001 (given that the variable exhibits a clear and relatively smooth trend, its actual value can be considered as a good proxy for its equilibrium value at each point in time);
- a level of real commodity prices equal to the average for the period 1995-2001 (such a choice appears appropriate in light of the quick rebound of commodity prices in 2002);
- a degree of openness equal to the average for the period 1995-2001 (close to 50 percent of GDP); and
- a fiscal deficit of about 2 percent of GDP, which corresponds roughly both to the average level since 1998 and to the authorities' target for the current fiscal year.

20. As the large fluctuations in commodity prices (evident from Figure I.1) are found to contribute heavily to movements in the real exchange rate, it is interesting to evaluate the gap for the fourth quarter of 2001 at the levels of commodity prices prevailing in 1995 or at the end of 2001, while keeping the other variables unchanged at the values indicated above. In the former case, the gap would amount to only 13 percent, while in the latter case the gap would correspond to 28 percent. The difference, about 15 percent, indicates the extent of the real depreciation of the rand since 1995 that can be imputed to the decline in commodity prices, which was in the order of 27 percent.

Speed of Adjustment

21. When a gap between the real exchange rate and its equilibrium level arises, the real exchange rate will tend to converge to its equilibrium level. Depending on the cause of the gap, the adjustment requires that the real exchange rate either moves progressively toward a new equilibrium level, or returns from its temporary deviation to the original equilibrium value. The estimates derived in this study suggest that, on average, about 6 percent of the gap is eliminated every quarter, implying that in the absence of further shocks about half of the gap would be closed within two-and-one-half to three years.

D. Conclusions

22. Drawing on existing literature, this study estimates a long-run equilibrium real exchange rate path for South Africa. The main explanatory variables were found to be commodity price movements, productivity and real interest rates differentials vis-à-vis trading-partner countries, measures of openness, and the size of the fiscal balance. The analysis suggests that in 1995 the real exchange rate was close to its equilibrium level and that about half of its subsequent

depreciation can be accounted for by movements in the explanatory variables. In the fourth quarter of 2001, the average value of the rand (R10.1 per U.S. dollar) appeared to be about 20 percent more depreciated than the level consistent with the equilibrium of the real exchange rate (with that level estimated at R8.4 per U.S. dollar). Different ways of distinguishing between permanent and temporary movements in the explanatory variables provide similar results, with the extent of the estimated gap ranging from 15 percent to 25 percent.[12] These calculations may, however, overestimate the equilibrium exchange rate to the extent that they do not account for structural factors, such as high unemployment and the HIV/AIDS pandemic; taking these into account could generate a smaller gap than that estimated.

23. If the real exchange rate deviates from its equilibrium level owing to temporary factors, it can be expected to revert to equilibrium fairly quickly. The study suggests that, in absence of further shocks, about half of the gap could be eliminated within two-and-one-half to three years.

References

Balassa, Bela, 1964, "The Purchasing-Power Parity Doctrine: A Reappraisal," *Journal of Political Economy*, Vol. 72 (December), pp. 584-96.

Cashin, Paul, Luis Cespedes, and Ratna Sahay, 2002, "Developing Country Real Exchange Rates: How Many Are Commodity Countries?", IMF Working Paper (forthcoming).

Chen, Yu-Chin, and Kenneth Rogoff, 2002, "Commodity Currencies and Empirical Exchange Rate Puzzles," IMF Working Paper, 02/27 (Washington: International Monetary Fund).

De Gregorio, José, Alberto Giovannini, and Holger Wolf, 1994, "International Evidence on Tradables and Nontradables Inflation," *European Economic Review*, Vol. 38 (June), pp.1225-44.

Diaz-Alejandro Carlos, 1982, "Exchange Rate and Terms of Trade in the Argentine Republic, 1913-1976", in *Trade, Stability, Technology, and Equity in Latin America*, ed. by Moises Syrquin and Simon Teitel (New York, New York, Academic Press).

Dornbusch Rudiger, 1976, "Expectations and Exchange Rate Dynamics," *Journal of Political Economy*, Vol. 84 (December) pp. 116-76.

Goldfajn, Ilan, and Rodrigo Valdes, 1999, "The Aftermath of Appreciations," *Quarterly Journal of Economics*, Vol. 114 (February), pp. 229-62.

[12] After a sizable further overshooting, the real exchange rate returned in May 2002 to levels close to the average for the fourth quarter of 2001.

Johansen, Soren, 1988, "Statistical Analysis of Cointegration Vectors," *Journal of Economic Dynamics and Control*, Vol. 12 (June-September), pp. 231-54.

—, 1995, *Likelihood-based Inference in Cointegrated Vector Autoregressive Models*, Oxford University Press.

— and Katarina Juselius, 1990, "Maximum Likelihood Estimation and Inference on Cointegration, with Application to the Demand for Money," *Oxford Bulletin of Economics and Statistics,* Vol. 52 (May), pp. 169-210.

MacDonald, Ronald, 1995, "Long-run Exchange Rate Modeling: A Survey of Recent Evidence," *Staff Papers*, International Monetary Fund, Vol. 42 (September), pp.437-98.

—, 2001, "Modelling the Long-run Real Effective Exchange Rate of the New Zealand Dollar," (unpublished; Glasgow, University of Strathclyde).

— and Luca Ricci, 2001, "PPP and the Balassa Samuelson Effect: The Role of the Distribution Sector," IMF Working Paper, 01/38 (Washington; International Monetary Fund).

—, 2002, "Purchasing Power Parity and New Trade Theory," IMF Working Paper, 02/32 (Washington International Monetary Fund).

Obstfeld, Maurice, and Kenneth Rogoff, 1996, *Foundations of International Macroeconomics (Cambridge Massachusetts;* MIT Press).

Rogoff, Kenneth, 1996, "The Purchasing Power Parity Puzzle," *Journal of Economic Literature,* Vol. 34 (June), pp. 647-68.

Samuelson, Paul, (1964) "Theoretical Notes and Trade Problems", *Review of Economics and Statistics*, Vol. 46 (May), pp. 145-54.

Variables: Definitions and Source

The dataset consists of quarterly data from 1970 to 2001 for South Africa and the four major trading partners.[13]

- **LREERS: Real effective exchange rate.** In logarithmic terms. (source: SARB).

- **RIRR: Real interest rate relative to trading partners.** Nominal interest rate on 10 year bond, minus inflation in past four quarters. Foreign variable calculated as the weighted average of four major trading partners, based on the SARB weights for the real effective exchange rate: Germany (proxy for EU, 47 percent), United States (20 percent), United Kingdom (20 percent), Japan (13 percent). Source: SARB and IFS.

- **LRGDPPCR: Real GDP per capita relative to trading partners.** In logarithmic terms. Normalized for each country to 1 in 2000. Foreign variable calculated as above. Source: SARB, IFS, and WB.

- **LPR2COMM5 and other indicators: Real commodity prices.** In logarithmic terms. Six different indicators of commodity prices were constructed, based on three choices of aggregating the main commodities exported by South Africa and two ways of deflating them. The former encompasses weighted averages of the five, three, or single most exported commodity(ies)—excluding diamonds, for which a price series is not available. The latter relates to the price deflator for developed countries exports or to the US CPI level. The combination generates respectively: LPR2COMM5, LPR2COMM3, LPR2GOLD, LPRCOMM5, LPRCOMM3, and LPRGOLD. Source: Cashin, Cespedes, and Sahay (2002), DataStream, and IFS.

Main commodity exported and relative weights

Commodity	Start Date	Source	Weight	Weight (5 comm)	Weight (3 comm)
Gold	1968Q1	DataStream	.604	.710	.903
Coal	1982Q1	CPS	.151	.177	
Iron	1960Q1	CPS	.033	.039	.049
Copper	1957Q1	CPS	.032	.038	.048
Platinum	1976Q1	DataStream	.031	.036	

- **OPENY: Openness.** Ratio of exports and imports to GDP. Source: SARB, IFS.

- **FBYA: Fiscal balance.** Ratio of the annualized fiscal balance to GDP. Source: SARB, IFS.

[13] When data for the fourth quarter of 2001 were not available from official sources, staff estimates were constructed on the basis of available information.

- **NFAY: Net foreign assets**. Ratio of the end of period net foreign assets to GDP. Source: IFS.
- **IY: Investment**. Ratio of gross domestic fixed investment to GDP. Source: SARB, IFS.
- **GY: Government consumption**. Ratio of government consumption to GDP. Source: SARB, IFS.

The Econometric Methodology

The Johansen methodology can be described as follows. Define a vector:

$$\mathbf{x}_t = [lreers, rirr, lrgdppcr, lpr2comm5, openy, fbya]',$$

and assume the vector has a VAR representation of the form:

$$\mathbf{x}_t = \eta + \sum_{i=1}^{p} \Pi_i \mathbf{x}_{t-i} + \varepsilon_t,$$

where η is a (nx1) vector of deterministic variables, ε is a (nx1) vector of white noise disturbances, with mean zero and covariance matrix Ξ, and Π_i is a (nxn) matrix of coefficients. The above expression may be reparameterised into the so-called vector error correction mechanism (VECM) as:

$$\Delta\mathbf{x}_t = \eta + \sum_{i=1}^{p-1} \Phi_i \Delta\mathbf{x}_{t-i} + \Pi\mathbf{x}_{t-1} + \varepsilon_t$$

where Δ denotes the first difference operator, Φ_i is a (nxn) coefficient matrix (equal to $-\sum_{j=i+1}^{p}\Pi_j$), Π is a (nxn) matrix (equal to $\sum_{i=1}^{p}\Pi_i - I$) whose rank determines the number of cointegrating vectors. The presence of cointegration is indicated by the rank of Π:

- If Π is of either full rank, n, or zero rank, Π=0, no cointegration exists amongst the elements in long-run relationship (in these instances it would be appropriate to estimate the model in, respectively, levels or first differences).

- If, Π is of reduced rank, r (where r<n), then there exist (nxr) matrices α and β such that $\Pi=\alpha\beta'$, where β is the matrix whose columns are the linearly independent cointegrating vectors, and the α matrix is interpreted as the adjustment matrix, indicating the speed with which the system responds to last period's deviations from the cointegrating relationships.

The existence of cointegration amongst the variables contained in $\mathbf{x}_t$ can be determined by two tests proposed by Johansen.

- The trace test statistic (TR) for the hypothesis that there are at most r distinct cointegrating vectors is as follows:

$$TR = T\sum_{i=r+1}^{N} \ln(1-\hat{\lambda}_i),$$

where $\hat{\lambda}_{r+1},\ldots,\hat{\lambda}_N$ are the N-r smallest squared canonical correlations between $\mathbf{x}_{t-k}$ and $\Delta\mathbf{x}_t$ series (where all of the variables entering $\mathbf{x}_t$ are assumed to be I(1)), corrected for the effect of the lagged differences of the $\mathbf{x}_t$ process (for details of how to extract the λ's, see Johansen (1988); and Johansen and Juselius (1990)).

- The likelihood ratio (LR) statistic, for testing at most r cointegrating vectors against r+1 is defined as:

$$LR = T\ln(1-\hat{\lambda}_{r+1})$$

Johansen (1995) shows that the TR and LR statistics have non-standard distributions under the null hypothesis. He does, however, provide approximate critical values for the statistics generated using Monte Carlo methods, and these are the critical values used in this paper.

Econometric Results and Their Robustness

The VECM is first estimated with the following variables: the real effective exchange rate, real interest rate relative to trading partners, real GDP per capita relative to trading partners, real commodity prices (choosing the more general one, based on 5 commodities and deflated by the industrial countries export deflator), openness, fiscal balance, and net foreign assets.[14] The specification also includes four lags for the changes in each variable and centered seasonal dummies: such a structure is quite common when employing quarterly data (as discussed below, the lag structure is supported by appropriate tests). Both cointegration tests indicate the presence of one cointegrating vector at the 1 percent significance level (see Table I.1, column 1).[15] The coefficients of the cointegrating vector are plausible, significant, and of the correct sign. All the variables are found to be nonstationary (I(1)) when using the Johansen test (see Table I.2, panel A), which (unlike standard stationarity tests) takes into account the cointegration space. Implicitly, this test indicates that the presence of cointegration is not driven by stationarity of any single variable. Hence the cointegration analysis is both appropriate (as variables are nonstationary) and meaningful (as not driven by stationarity of one variable). However, the exclusion test suggests that the net foreign asset variable can be excluded from the long-run relationship (Table I.2, panel B).

[14] The role of different commodity prices and other variables is also investigated.

[15] The trace-statistic test suggest there may be two cointegrating vectors at the 5 percent significance level.

Table I.1. Selected Results of the VECM

Number of cointegrating vectors:							
Trace Statistic							
5%	2	1	1	1	1	1	1
1%	1	1	1	1	1	1	1
Max Eigenvalue Statistic							
5%	1	1	1	1	1	1	1
1%	1	1	1	1	1	1	1
Estimates of the cointegrating relationship with the real exchange rate							
LREERS(-1)	1	1	1	1	1	1	1
RIRR(-1)	-0.0535 [-7.85598]	-0.047706 [-6.91431]	-0.068573 [-5.61868]	-0.05356 [-6.42599]	-0.078203 [-5.62664]	-0.054493 [-6.40724]	-0.074439 [-5.81651]
LRGDPPCR(-1)	-0.390232 [-3.87974]	-0.460799 [-5.13649]	-0.403931 [-2.86291]	-0.490084 [-4.57869]	-0.447467 [-2.82969]	-0.562839 [-4.98523]	-0.54227 [-3.58551]
OPENY(-1)	0.008975 [3.24353]	0.009428 [3.47218]	0.012296 [2.59027]	0.009557 [2.96564]	0.013258 [2.51623]	0.010332 [3.14147]	0.013806 [2.85605]
FBYA(-1)	0.045003 [5.68254]	0.033599 [4.54515]	0.022858 [1.89394]	0.035709 [4.07041]	0.021772 [1.62000]	0.035842 [4.05215]	0.022409 [1.83578]
LPR2COMM5(-1)	-0.630997 [-10.3961]	-0.615027 [-9.58348]					
NFAY(-1)	-0.013817 [-1.96125]						
LPRCOMM5(-1)			-0.767843 [-7.35953]				
LPR2COMM3(-1)				-0.659817 [-8.65366]			
LPRCOMM3(-1)					-0.844784 [-7.20538]		
LPR2GOLD(-1)						-0.599613 [-8.55933]	
LPRGOLD(-1)							-0.731486 [-7.43721]
C	-4.68285 [-35.0185]	-4.744301 [-35.4487]	-4.963769 [-21.0811]	-4.730184 [-29.6948]	-5.00045 [-19.1115]	-3.950366 [-23.5038]	-4.023879 [-17.9145]
Estimates of the speed of adjustment of the real exchange rate							
CointEq1	-0.045902 [-0.77732]	-0.062045 [-1.08901]	-0.080177 [-2.13716]	-0.040057 [-0.80277]	-0.064994 [-1.93086]	-0.037732 [-0.75915]	-0.068072 [-1.85716]

Note: *t* -statistics in square brackets.

Table I.2. Johansen Test for Stationarity and Exclusion Test C

A. Johansen test for stationarity

Ho: variable are stationary (if corresponding statistic<CHISQ_5)

r	DGF	CHISQ_5	LREERS	RIRR	LRGDPPCR	LPR2COMM	OPENY	FBY	NFAY
1	7	14.07	44.02	52.39	37.04	54.67	45.16	39.10	39.26

B. Exclusion test

Ho: variable can be excluded (if corresponding statistic<CHISQ_5)

r	DGF	CHISQ_5	LREERS	RIRR	LRGDPPCR	LPR2COMM	OPENY	FBY	NFAY	CONST
1	1	3.84	25.68	23.28	9.03	25.32	6.61	16.35	2.61	23.77

The VECM is, therefore, estimated using the the same specification, but without the net foreign asset variable (Table I.1, second column) and indicates evidence of only one cointegrating vector at the 1 percent significance level, with coefficients very similar to the ones derived above. For this new specification, the tests presented in Table I.3 indicate that one cannot reject the hypothesis that the residuals have a normal distribution (panel A), and all four lags in our VECM specification are necessary (the test in Panel B rejects the hypotheses that each of the four lag is jointly insignificant across equations). The lag structure appears to be correct: if a fifth lag is introduced, the test accepts the hypothesis that the additional lag is jointly insignificant across equations (Table I.4). On the basis of these results, Column 2 of Table I.1 is elected as main specification.

Table I.3. VEC tests

Panel A. Main specification. VEC Test for Skewness, Kurtosis, and Normality, of residuals.

Ho: residuals have no Skewness, no-Kurtosis, and are Normal, respectively

Component	Skewness	Chi-sq	df	Prob.
Joint		7.753685	6	**0.2567**

Component	Kurtosis	Chi-sq	df	Prob.
Joint		12.21044	6	**0.0574**

Component	Jarque-Bera	df	Prob.
Joint	19.96413	12	**0.0678**

Orthogonalization: Cholesky (Lutkepohl)

Panel B. Main specification. VEC Lag Exclusion Wald Test

Ho: Lag's coefficient is non-significantly different from 0 (i.e. can be excluded), if p-value> chosen significance level.

	D(LREERS)	D(RIRR)	D(LRGDP PCR)	D(LPR2CO MM5)	D(OPENY)	D(FBYA)	Joint
DLag 1	4.498056	18.24071	2.448025	7.513121	7.848647	45.34592	91.07202
	[0.609599]	[0.005658]	[0.874239]	[0.275985]	[0.249403]	[3.99E-08]	[1.15E-06]
DLag 2	9.210657	2.774706	9.982051	5.095550	3.524574	15.81597	56.20976
	[0.162073]	[0.836546]	[0.125410]	[0.531618]	[0.740697]	[0.014777]	[0.017114]
Dlag 3	16.13210	13.18029	12.30773	24.22684	6.532110	18.38668	94.94145
	[0.013062]	[0.040261]	[0.055445]	[0.000474]	[0.366289]	[0.005335]	[3.29E-07]
Dlag 4	2.632239	20.50243	18.10893	10.73966	5.973728	7.385171	72.33363
	[0.853384]	[0.002253]	[0.005966]	[0.096763]	[0.426140]	[0.286690]	**[0.000311]**
Df	6	6	6	6	6	6	36

Numbers in [ ] are p-values.

Table I.4. Main specifications with 5 lags. VEC Lag Exclusion Wald Test

Ho: Lag's coefficient is non-significantly different from 0 (i.e. can be excluded), if p-value> chosen significance level.

	D(LREERS)	D(RIRR)	D(LRGDPPCR)	D(LPR2COMM5)	D(OPENY)	D(FBYA)	Joint
DLag 1	2.179601	17.63205	1.171042	12.63095	7.784511	47.55450	93.96531
	[0.902462]	[0.007221]	[0.978291]	[0.049285]	[0.254320]	[1.45E-08]	[4.52E-07]
DLag 2	7.401841	3.336949	9.808594	5.097113	2.684678	17.39266	50.92801
	[0.285277]	[0.765521]	[0.132947]	[0.531419]	[0.847254]	[0.007943]	[0.050684]
DLag 3	12.32626	15.12507	9.855341	24.62129	6.815679	22.46238	94.41110
	[0.055074]	[0.019306]	[0.130878]	[0.000401]	[0.338230]	[0.000998]	[3.91E-07]
DLag 4	1.939946	22.24260	14.05577	10.67870	5.030891	7.023891	67.42619
	[0.925138]	[0.001094]	[0.029019]	[0.098829]	[0.539857]	[0.318643]	[0.001157]
DLag 5	1.491801	4.784311	3.733400	4.812298	2.856702	5.512115	27.07062
	[0.960037]	[0.571760]	[0.712702]	[0.568103]	[0.826605]	[0.479994]	**[0.858632]**
Df	6	6	6	6	6	6	36

Numbers in [ ] are p-values.

In order to assess the robustness of the results, several exercises have been performed:

- The main specification is also run with different measures for commodity prices (Table I.2, columns 3-7) and the results are broadly similar. However, if the terms of trade are introduced instead of commodity prices, the measure appears insignificant and alters the overall specification.

- The results are not particularly sensitive to the elimination of either the fiscal balance variable or the measure of openness. However, the results are compromised if both variables above, or any of the three other variables, are dropped.

- Labor productivity in the manufacturing sector (as a ratio of trading partners productivity) does not perform as well as relative real GDP percapita as a proxy for the Balassa-Samuelson effect. This could be due to the large fluctuations in employment in South Africa, which alter the link between labor productivity and total factor productivity.

- Replacing fiscal balance with government consumption alters the results because of the high degree of collinearity between the latter and relative real GDP per capita (-0.9).

- Other variables, such as the ratio of net capital inflows to GDP, or the ratio of gross domestic fixed investment to GDP, are not found to play an additional role.

II. Real Money Demand, Consumer Prices, and the Real Exchange Rate in South Africa[16]

A. Introduction

24. In February 2000, South Africa adopted an explicit inflation-targeting strategy for monetary policy. The CPIX[17] inflation target was set at 3-6 percent (annual average) in 2002 and 2003, and then at 3-5 percent in 2004 and 2005. This change in policy regime comes after a period of disinflation in the 1990s when annual inflation fell from 18 percent in 1991 to 7 percent in 1998. Over the same period there were large fluctuations in money growth and the exchange rate. This section analyzes the relationship between money, prices, and the exchange rate in South Africa using an economic model which incorporates three relationships – money demand, a markup model of the level of CPIX, and the real exchange rate – that together provide an analytical framework for examining the forces that explain the historical fluctuations in the money supply, the real exchange rate, and the level of CPIX.

25. A number of policy issues are discussed as part of the analysis including whether there continues to be a stable relationship between money and prices, so that, potentially, this information can be used to assess the prospects for CPIX inflation. This section also tests whether cost-push factors help to explain CPIX inflation in South Africa. A stable long-run relationship would suggest that policymakers should take into account unit labor costs and production prices when assessing the prospects for CPIX inflation. This section also tests for a real exchange rate relationship so that the role of foreign shocks, which should play an important role in an open economy such as South Africa, is incorporated into the model.

26. This analysis begins by testing whether there exist stable, long-run (cointegrating) relationships for money demand, the real exchange rate and a markup model of CPIX using the Johansen (1988) cointegrating vector autoregression (CVAR) methodology; it then examines the short-run deviation of real money balances, the level of CPIX, and the real exchange rate from their long-run paths given by the cointegrating vectors (see Table II.1 for the cointegrating vectors).[18] An analysis of the short-run deviations reveals that significant excess money balances were building from late 1998, and were associated with an undervalued real exchange rate (relative to its long-run value) and a level of CPIX that was higher than suggested by total unit costs of production. Finally, impulse response functions are examined for three different shocks to assess the model's dynamic properties.

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[16] Prepared by Ashok Bhundia.

[17] CPIX is the consumer price index, excluding interest on mortgage bonds.

[18] If a set of (nonstationary) variables are cointegrated, then there exists an equivalent error-correction representation that characterizes the tendency of the system to converge to its long-run path.

27. The rest of the section is structured as follows: subsection B discusses money demand, the real exchange rate, and the markup model, including a brief survey of some earlier literature; subsection C discusses the methodology, the data and the main results; and subsection D concludes.

B. Background and Theory

28. This section builds on previous work in a number of ways.[19] First, the analysis extends into the latest available data, which include the period of considerable financial market volatility seen in emerging markets during the Asian financial crisis. This allows a test of whether this period of volatility, especially in the rand exchange rate, led to instability in the estimated long-run relationships, or whether the impact was temporary, resulting in short-run (temporary) deviations of real money balances, prices and the real exchange rate from their long-run path. Second, this section tests whether the markup model explains the level of CPIX and third, it uses the CPIX as its measure of consumer prices, because the inflation target in South Africa is expressed in terms of CPIX inflation.

29. The theory underpinning each of the three long-run structural relationships is briefly discussed below:

Long-run money demand

30. The building blocks of money demand theory suggest that the demand for real money balances are a function of a scale variable (y in equation 1) that captures the transactions demand (e.g. real GDP) and the opportunity cost of holding money captured by an appropriate interest rate, R:

$$M - P = \alpha y + \beta r^{own} + \lambda R \qquad (1).$$

31. In the empirical literature a number of refinements have been made to the basic model when using a broad measure of money, such as M3, to include a variable that captures the own rate of return, r^{own}, on those elements that are interest bearing.[20] Because data on the bank deposit rate is available only since 1980, the three-month treasury bill rate is used as a proxy for the own rate of return, r^{own}, because the two interest rates are highly correlated.[21]

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[19] See Jonsson (2001), and DeJaeger and Ehlers (1997) for previous studies which focus on some of the issues discussed in this section.

[20] See Sriram (2000) for a survey.

[21] The correlation between the bank deposit rate and the 3-month treasury bill is 0.91 for the period 1980-2000.

32. Recent studies of money demand in South Africa (see DeJaeger and Ehlers (1997); Jonsson (2001); and Hurn et al. (1992), find that broad money (M3) rather than narrow money has a stable relationship with prices and is a better leading indicator of inflation.

Long run real exchange rate and purchasing power parity (PPP)

33. The PPP model suggests the following relationship (all variables in logarithms):

$$P - P^* = \eta e \qquad (2)$$

where P* is the foreign price level, e is the nominal exchange rate (measured as the nominal effective exchange rate), and P is the domestic price level (CPIX). A coefficient of unity on the exchange rate[22] captures the idea of PPP because it means the exchange rate moves to exactly offset a shock to domestic prices, thereby returning the real exchange back to its PPP level. Most empirical work on the real exchange rate fails to find support for PPP across a variety of countries, using different econometric techniques and sample periods (see Rogoff, 1996). However, support for relative PPP is easier to find in the literature; namely, that changes in the exchange rate are determined in the long run by relative inflation rates. One explanation for the incomplete exchange rate pass-through to the general level of prices might be that a large proportion of goods and services included in consumer price indices are typically nontraded.[23]

Markup Model

34. If we assume long-run homogeneity[24] between CPIX (P), unit labor costs (ULC), and producer prices (P^{in}), the markup model of inflation suggests the following relationship where $\gamma+\kappa=1$[25]:

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[22] In the analysis below, the exchange rate is defined such that an increase in the nominal exchange rate is an appreciation, so that we would expect a coefficient of negative 1 if PPP holds.

[23] Bhundia (see section III of the selected issues paper) and Choudhri and Hakura (2001) find only partial pass-through to consumer prices for South Africa.

[24] In this context, homogeneity assumes a constant markup over total unit costs in the long-run so that the level of CPIX increases (decreases) by the same proportion as the increase (decrease) in total unit costs.

[25] γ and κ are elasticities that relate CPIX to unit labor costs and producer prices, respectively.

$$P = \mu(ULC)^{\gamma}(P^{m})^{\kappa} \qquad (3)$$

35. This relationship states that, in the long run, the general level of prices is a stable markup over total unit costs. Fedderke and Schaling (2001) find evidence for a markup relationship linking output prices (measured using the GDP deflator) to total costs in South Africa with the average markup approximately three times that in the United States.

C. Methodology and Results

36. The cointegrating VAR comprised nine variables, and the Johansen trace test suggested there were four cointegrating vectors (the long-run relationships). Using appropriate restrictions on the cointegrating space, it was possible to identify the following long-run relationships (Table II.1.).

Table II.1. Long-run economic relationships[26]

Model	Long-run money balances					Restriction
1	M = P	GDP	r^{own}	R		Real money balances (accepted)
	1 1.0	0.55	0.003	-0.014		
2	Markup model					
	P = ULC	P^{in}				Linear homogeneity (accepted)
	1 0.31	0.73				
3	Real exchange rate model					
	P = e	P*				PPP (rejected)
	1 -0.86	1.72				

37. A number of inferences can be made from the table.[27] The finding of a stable long-run real money demand relationship supports the hypothesis that money and prices move together in the long-run in South Africa.[28] All the variables have the correct signs in the real

[26] A time dummy from 1994Q1 to 2001Q2 was included as an unrestricted variable to capture the change in regime in 1994 following the end of apartheid.

[27] Identification of the long-run relationships in the cointegrating VAR requires the imposition of restrictions on the estimated cointegrating vectors, and therefore t-statistics are not available for the restricted coefficients. However, the four overidentifying restrictions imposed on the cointegrating space were accepted – $\chi^2(4) = 14.82$ (0.06 probability).

[28] Jonsson (2001) also finds evidence for a stable demand for real money balances (using M3).

money demand equation (model 1), and the income elasticity with respect to real money balances is 0.55, suggesting that, in the long run, there are economies to scale to holding real money balances for transactions purposes. Both the own rate of interest, r^{own}, (three-month treasury bill rate) and R, enter the real money demand equation with the expected signs, indicating that the demand for interest-bearing components of M3 increases with the return on short-term bonds, while the opportunity cost of money rises as the return on longer-term bonds increases.

38. Model 2 is a stable long-run relationship between the price level (CPIX) and total unit costs. Moreover, the restriction of static linear homogeneity was accepted ($\lambda+\kappa=1$ in model 2), indicating that prices in the long run increase in proportion with total unit costs.

39. Model 3 is a stable real exchange rate relationship. However, the restriction of purchasing power parity (PPP) is not accepted by the data, a finding similar to numerous other studies that test for PPP, and is consistent with the fact that the long-run real exchange rate has been on a depreciating trend over the sample period studied in this paper.

Testing the stability of the estimated long-run economic relationships

40. The literature on the empirical modeling of money demand generally finds that periods of structural change caused, for example, by financial liberalization have rendered money demand unstable across a wide range of countries (see Ericsson, 1998 and Sriram, 2000, for a survey).

41. Recursive estimates suggest the parameters are stable across all three estimated long-run cointegrating relationships, even at a statistical confidence level of 1 percent.[29] The recursive estimates of the money demand parameters are stable in the latter part of the 1990s and into 2001 (Figure II.1).

[29] In the early part of a recursive estimation exercise, the estimated parameters are more likely to appear unstable when the data sample is short and there are low degrees of freedom. However, the degrees of freedom constraint eases with each successive recursive estimate, and so the absence of a shift in the latter part of the sample period suggests the estimated parameters are stable.

Figure II.1. Recursive Estimates of the Real Money Demand Parameters

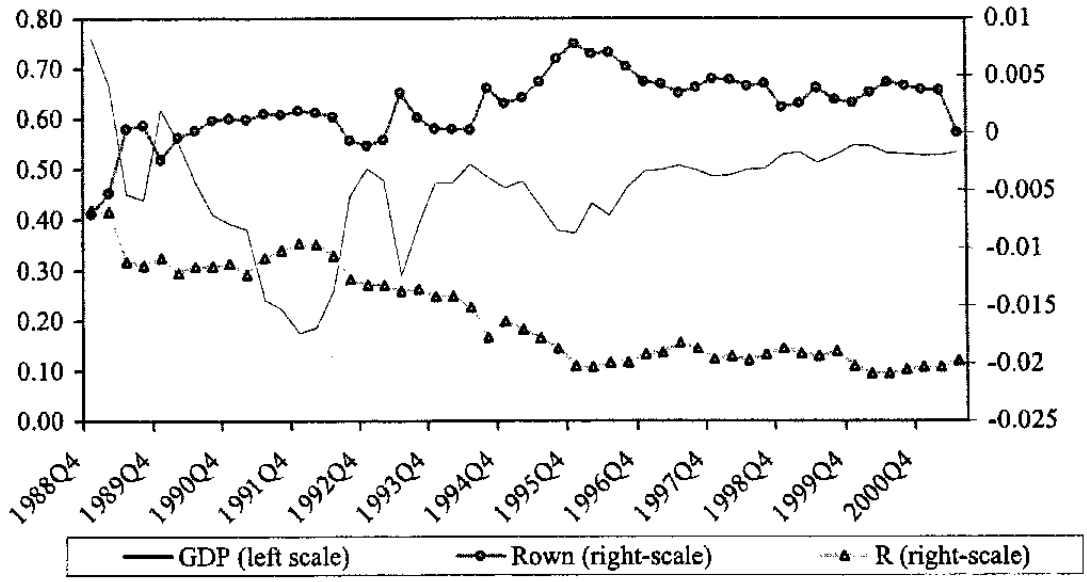
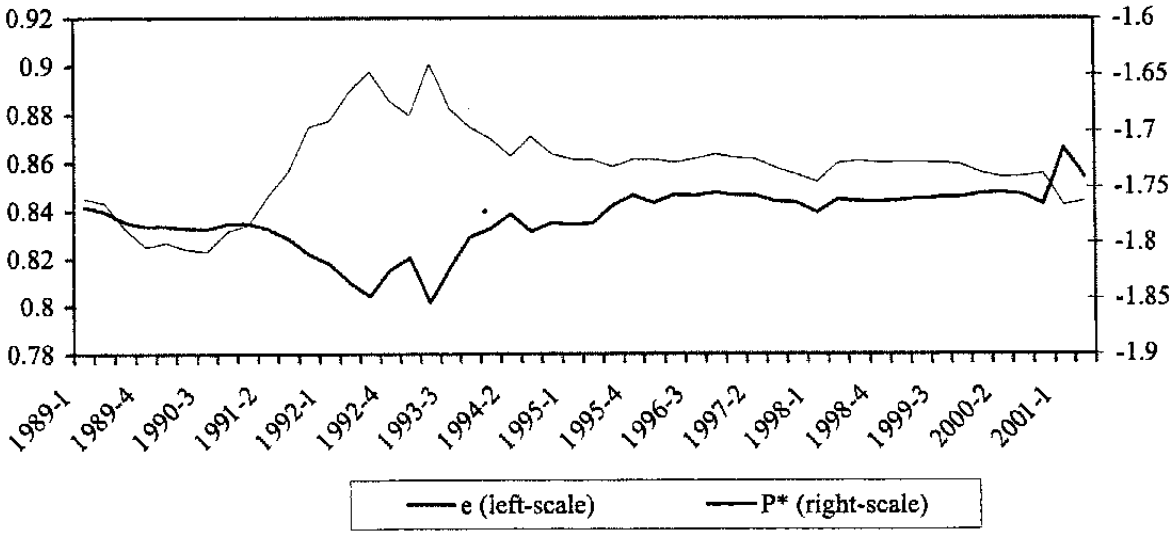
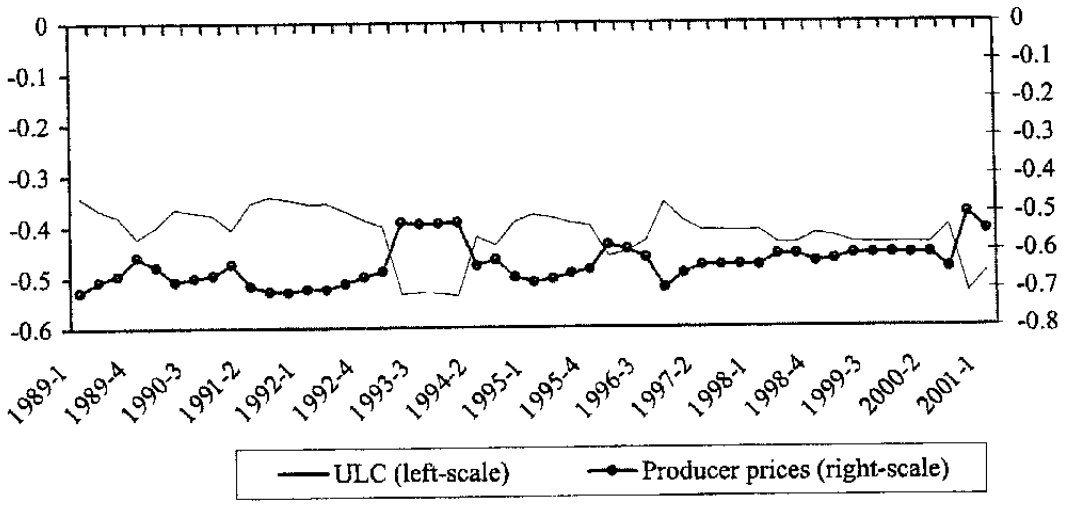


Figure II.2. Recursive Estimates for the Real Exchange Rate Parameters



42. The long-run real exchange rate parameters seem stable since 1994, including around the time of the Asian crisis, when the rand was under pressure, indicating that there was no impact on the long-run path of the real exchange rate.

Figure II.3. Recursive Estimates of the Parameters in the Markup Relationship



43. Recursive estimates of the markup parameters are also stable, suggesting that, in aggregate, the long-run markup over unit costs has been stable.

Deviations from the long-run path

44. At any point in time, real money balances, CPIX, and the real exchange may deviate from their respective long-run paths, but the vector error-correction mechanism (VECM), which govern the dynamics of the model, ensures that these deviations are temporary[30]. Towards the end of the sample, real money balances were approximately 30 percent higher than their estimated long-run value, suggesting the presence of "excess money" in the economy (Figure II.4). At the same time, the real exchange rate was approximately 25 percent below its long-run value (Figure II.5)[31], and the level of CPIX was about 3 percent above its long-run level consistent with the level of total unit costs (Figure II.6).

[30] The VECM estimates are reported in the appendix.

[31] The long-run real exchange rate path is not the same as an equilibrium real exchange rate concept that is modeled and reported in section I because it is not based on judgements about

(continued)

Figure II.4. Percent Deviation in Real Money Balances from Long-Run Path

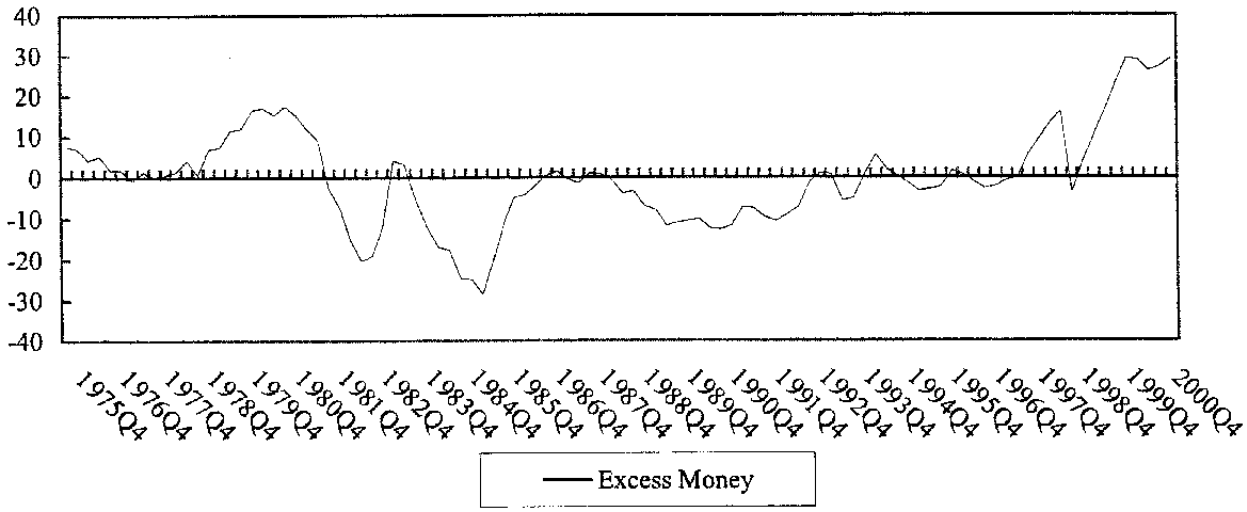
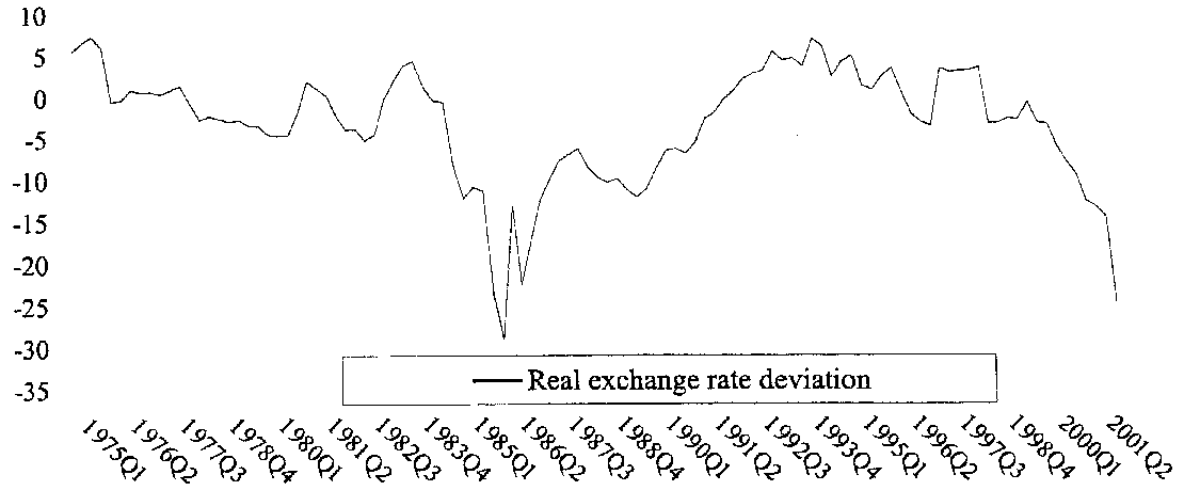


Figure II.5. Percent Deviation of the Real Exchange Rate from its Long-Run Path



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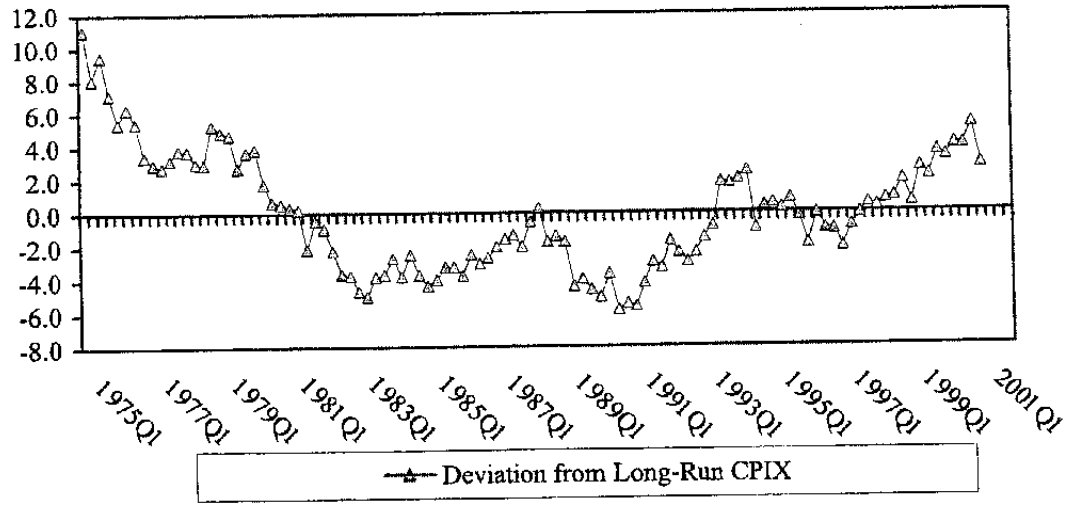
the long-run sustainable path of macroeconomic variables that determine the real exchange rate, consistent with internal and external macroeconomic equilibrium. Consequently, the short-run deviations reported here cannot be compared to the over/undervaluation profile for the real exchange reported in section I of the chapter.

Figure II.6. Percent Deviations from Long-run Price Level: The Cost-Push Model



45. The model cannot be used to draw a causal link between excess money balances, on the one hand, and an undervalued real exchange rate on the other hand, but because the three long-run relationships are identified within the same model, they are jointly determined in a general equilibrium framework. Moreover, over this period, excess real money balances and an under-valued real exchange rate were associated with CPIX above its long-run value. Therefore, when taken together, a plausible interpretation would be that excess money was putting pressure on the exchange rate and, together, they resulted in upward pressure on the price level.

The Impulse Response Analysis

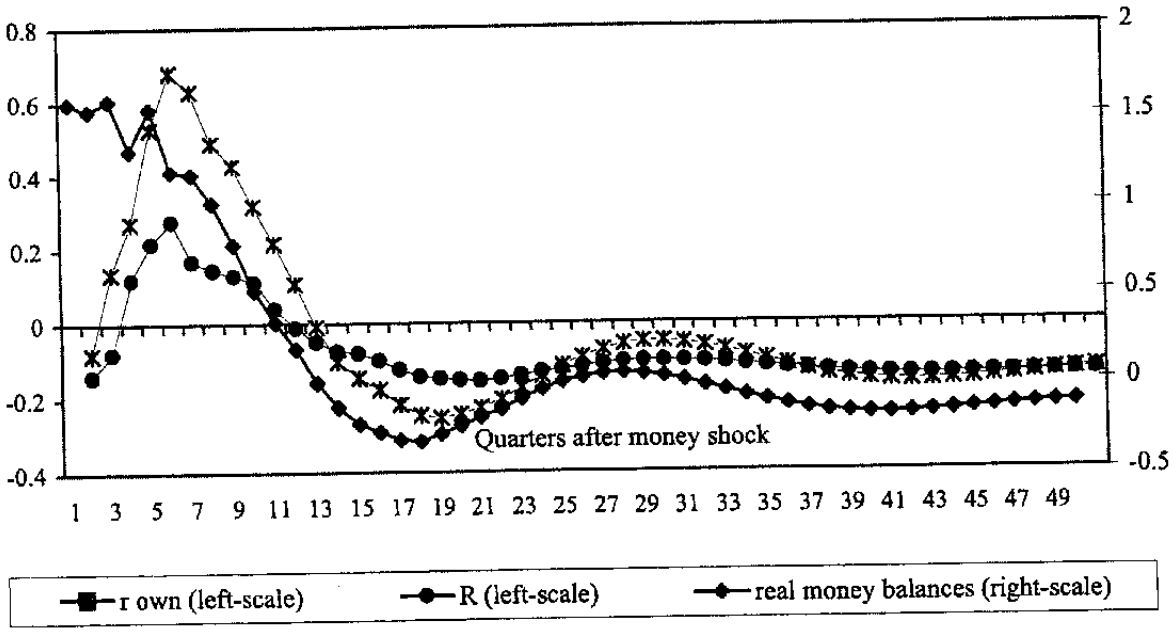
46. The impulse response analysis provides information about the dynamic properties of the VECM and serves two purposes. First, it complements the previous discussion by revealing how variables respond to economic shocks that may, in the first instance, cause them to deviate from their long-run path. Second, it is another check on the model's economic interpretability. In the following analysis, three shocks are considered (each is one standard error in size): a shock to real money balances, a shock to the nominal effective exchange rate, and a shock to unit labor costs. Each impulse response has an interpretation consistent with economic theory.

47. While a shock to real money balances can originate from a number of sources, based on the dynamic responses of the other variables, the shock in Figure II.7 should be interpreted as an exogenous increase in the demand for real money balances.[32] In response to

[32] Money is demand determined in South Africa as the SARB (South African Reserve Bank) sets a policy interest rate and not the supply of money.

this shock, short-term interest rates rise, reflecting a tightening of monetary conditions (the liquidity effect), and, via the expectations theory of the term structure of interest rates, there is a smaller increase in long-term rates, R – the yield curve inverts. The response of output is statistically insignificant over the impulse response period and is not included in Figure II.7.

Figure II.7.Impulse Response Analysis in the Monetary System: A Shock to Money Balances



48. An increase in the nominal effective exchange rate, e, (an appreciation) results in a permanently lower level of CPIX, which adjusts to its new long-run level only gradually (Figure II.8).

The level of CPIX increases in response to a positive shock to unit labor costs. Producer prices increase in the short-run, but then settle to their initial value in the long run (Figure II.9). The rise in unit labor costs is matched by the rise in CPIX, which is consistent with the finding of long-run static homogeneity between total unit costs and CPIX.

Figure II.8. The Real Exchange Rate Impulse Response: A Shock to the Nominal Effective Exchange Rate

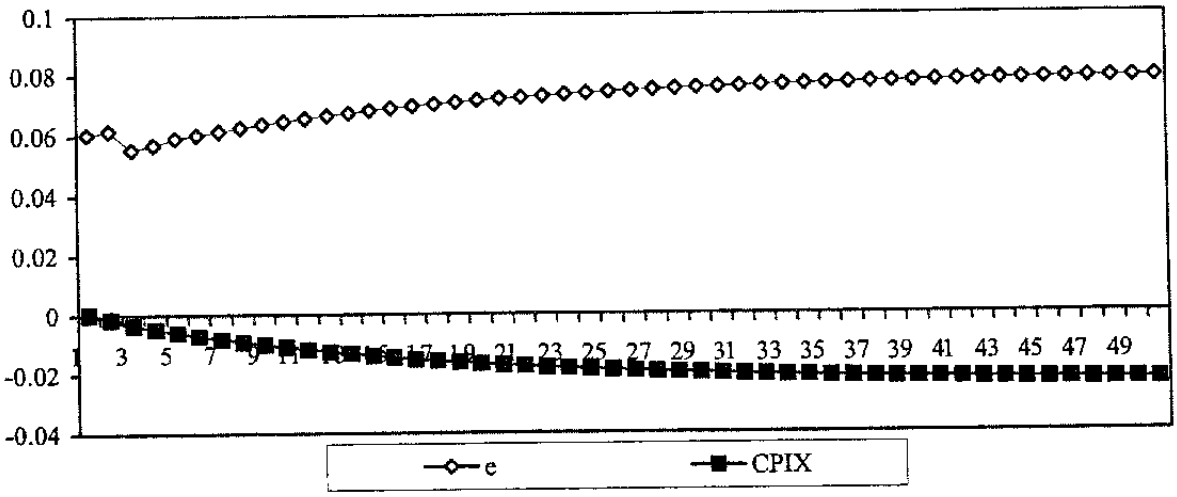
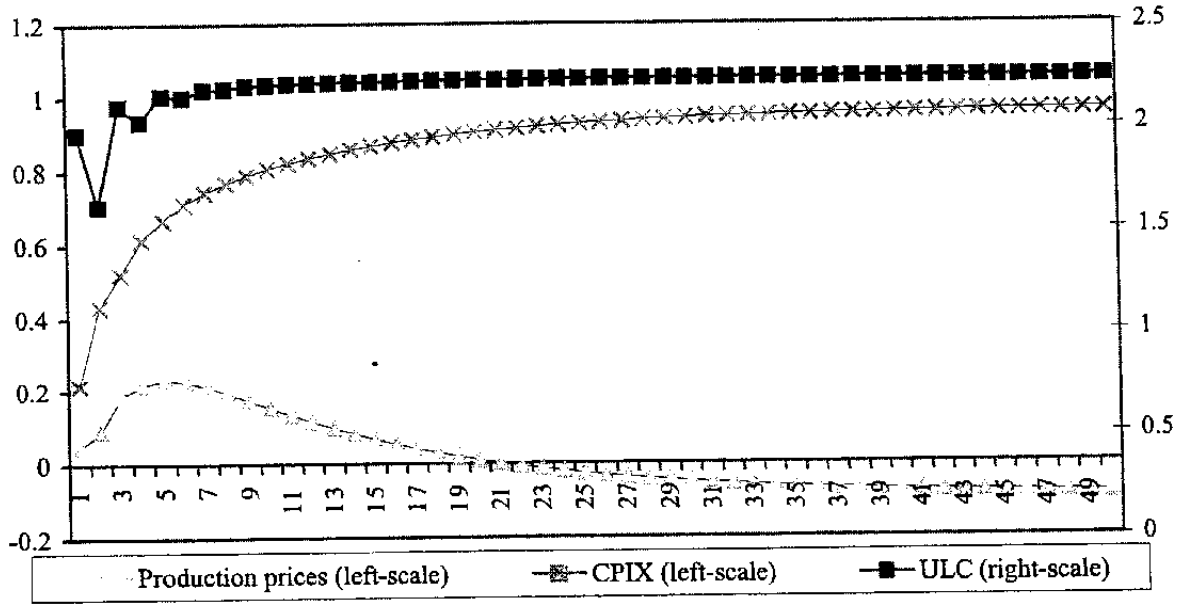


Figure II.9. The Response of CPIX to a Shock to Unit Labor Costs



D. Conclusion

49. This section finds support for a stable long-run real money demand relationship, a stable long-run relationship between total unit cost and the level of CPIX, and a stable long-run real exchange rate relationship. Real money balances, CPIX and the real exchange rate do not appear to have deviated significantly from their respective long-run paths over the period of the Asian financial crisis. However, toward the latter part of the sample, there is evidence of significant excess real money balances, combined with a substantial undervaluation of the real exchange rate (relative to its long-run value); meanwhile the level of CPIX is a little above the level predicted by the long-run markup relationship.

50. From a policy perspective, the results indicate that real money balances continue to be important for understanding long-run developments in the money market in South Africa and that money should be incorporated into any analysis of the prospects for CPIX inflation. The results also show that cost-push factors have played an important role in the determination of CPIX, and that, on average, shocks to the nominal exchange rate have tended to result in a permanent change in the level of the real exchange rate, and an improvement in external competitiveness.

References

Choudhri, Ehsan and Dalia, Hakura (2001), "Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter?" IMF Working Paper 01/194 (Washington: International Monetary Fund)

DeJaeger, C. and Ehlers, R. (1997), "The Relationship Between South African Monetary Aggregates, Interest Rates, and Inflation – A Statistical Investigation," unpublished Johannesburg: South African Reserve Bank, Economics Department.

Ericsson, Neil (1998), " Empirical Modeling of Money Demand," Empirical Economics, Vol. 23, pp. 295-315.

Fedderke, J. and Schaling, E. (2001) "Modelling Inflation In South Africa: A Multivariate Cointegration Analysis," Rand Afrikaans University, Research Paper No. 10

Froot, Kenneth, Kim, Michael, and Rogoff, Kenneth (1995), "The Law of One Price Over 700 Years," NBER Working Paper No. 5312

Hurn, A. and Muscatelli, V. (1992), "The Long-Run Properties of the Demand for M3 in South Africa," South African Journal of Economics, Vol. 60, No. 2, pp. 159-72

Johansen, Soren (1988), "Statistical Analysis of Cointegrating Vectors," Journal of Economic Dynamics and Control, Vol. 12, No. 2/3, pp. 231-54

Jonsson, Gunnar (2001), "Inflation, Money Demand, and Purchasing Power Parity in South Africa," IMF Staff Papers, Vol. 48, number 2, pp. 243-65

Rogoff, Kenneth (1996), "The Purchasing Power Parity Puzzle," Journal of Economic Literature, Vol. 34, No. 2, pp. 647-68

Sriram, Subramanian (2000) " A Survey of Recent Empirical Money Demand Studies," IMF Staff Papers, vol. 47, no. 3, pp. 334-65

Tsikata, Y. (1998), "Liberalization and Trade Performance in South Africa," (unpublished; Washington: World Bank)

The VECM Estimates

The variables correspond to the following names listed in the results table:

CointEq1 to CointEq3 are the real money demand cointegrating equation, the real exchange rate cointegrating equation, and the markup cointegrating equation, respectively. CointEq4 is unrestricted and has no economic interpretation.

LM3 – log of M3
LGDP – log of real GDP
LCPIX – log of CPIX
TREASURY – level of three-month treasury bill interest rate, r^{own}.
BOND – 10-year bond yield, or the opportunity cost variable, R.
LULC – log of unit labor costs
LPRODDP – log of production price index
LPCPIN – log of trade-weighted foreign price level.
LOGE – log of the nominal effective exchange rate.
D - this prefix indicates the first difference of a variable.

Vector Error Correction Estimates

Date: 06/10/02 Time: 19:29
Sample(adjusted): 1975:4 2001:1
Included observations: 102 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:

B(1,1)=1,B(1,3)=-1,B(1,6)=0,B(1,7)=0,B(1,8)=0,B(1,9)=0
B(2,1)=0,B(2,2)=0,B(2,3)=1,B(2,4)=0,B(2,5)=0,B(2,6)=0,B(2,7)=0,
B(3,1)=0,B(3,2)=0,B(3,3)=1,B(3,4)=0,B(3,5)=0,
B(3,8)=0,B(3,9)=0

Convergence achieved after 100 iterations.
Not all cointegrating vectors are identified
LR test for binding restrictions (rank = 4):

Chi-square(8)	14.822
Probability	0.063

Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4
LM3(-1)	1.000	0.000	0.000	-0.470
LGDP(-1)	-0.552	0.000	0.000	0.732
LCPIX(-1)	-1.000	1.000	1.000	18.099

TREASURY(-1)	-0.032	0.000	0.000	0.061
BOND(-1)	-0.001	0.000	0.000	0.024
LULC(-1)	0.000	0.000	-0.314	-13.577
LPRODDP(-1)	0.000	0.000	-0.735	-1.330
LPCPIN(-1)	0.000	-1.730	0.000	-2.353
LOGE(-1)	0.000	0.855	0.000	2.772
C	-0.133	-0.505	-0.004	-22.240

Error Correction Equations	D(LM3)	D(LGDP)	D(LCPIX)	D(TREASURY)	D(BOND)	D(LULC)	D(LPRODDP)	D(LPCPIN
CointEq1	-0.070	0.053	0.022	8.687	3.446	-0.005	-0.020	0.028
	0.039	0.018	0.017	2.293	1.616	0.037	0.017	0.014
	[-1.79789]	[2.89932]	[1.30522]	[3.78785]	[2.13227]	[-0.12549]	[-1.18219]	[2.02181]
CointEq2	-0.023	-0.022	-0.044	3.672	3.285	-0.065	-0.076	0.024
	0.031	0.015	0.014	1.838	1.295	0.029	0.013	0.011
	[-0.72726]	[-1.51391]	[-3.19560]	[1.99754]	[2.53646]	[-2.22082]	[-5.65575]	[2.21548
CointEq3	0.140	0.001	-0.116	-20.115	-9.827	0.022	0.220	0.006
	0.118	0.056	0.051	6.940	4.890	0.111	0.051	0.041
	[1.18278]	[0.02354]	[-2.25754]	[-2.89850]	[-2.00972]	[0.20229]	[4.34577]	[0.14039
CointEq4	0.009	0.002	0.002	-0.840	-0.301	0.051	-0.003	0.008
	0.014	0.006	0.006	0.796	0.561	0.013	0.006	0.005
	[0.64833]	[0.31307]	[0.26207]	[-1.05588]	[-0.53736]	[4.03903]	[-0.45485]	[1.71644
D(LM3(-1))	0.171	0.019	-0.065	13.478	6.107	-0.120	0.024	-0.058
	0.118	0.055	0.051	6.916	4.873	0.111	0.050	0.041
	[1.45320]	[0.35072]	[-1.25937]	[1.94888]	[1.25319]	[-1.08712]	[0.48090]	[-1.40597
D(LM3(-2))	0.129	-0.042	-0.048	1.648	10.458	-0.019	0.104	0.03
	0.120	0.056	0.052	7.042	4.962	0.113	0.051	0.04
	[1.08104]	[-0.75313]	[-0.91730]	[0.23395]	[2.10775]	[-0.16534]	[2.01956]	[0.82879
D(LGDP(-1))	0.353	0.077	-0.037	21.186	5.366	-0.441	-0.082	-0.00
	0.256	0.121	0.112	15.082	10.626	0.241	0.110	0.09
	[1.37528]	[0.63647]	[-0.33495]	[1.40477]	[0.50494]	[-1.82802]	[-0.74278]	[-0.08547

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D(LGDP(-2))	0.365	0.020	0.101	8.624	5.366	0.164	0.248	0.020
	0.252	0.118	0.110	14.794	10.424	0.236	0.108	0.088
	[1.45012]	[0.16830]	[0.91750]	[0.58291]	[0.51483]	[0.69320]	[2.30275]	[0.22625
D(LCPIX(-1))	0.140	0.014	-0.149	41.468	26.026	-0.624	-0.218	-0.132
	0.376	0.177	0.164	22.087	15.563	0.353	0.161	0.131
	[0.37214]	[0.08035]	[-0.91295]	[1.87748]	[1.67232]	[-1.76780]	[-1.35706]	[-1.00512
D(LCPIX(-2))	-0.348	-0.238	-0.145	-8.356	-12.070	-0.320	0.026	0.286
	0.332	0.156	0.145	19.518	13.752	0.312	0.142	0.116
	[-1.04948]	[-1.52645]	[-1.00108]	[-0.42812]	[-0.87766]	[-1.02481]	[0.18591]	[2.46702
D(TREASURY(-1))	-0.001	0.001	-0.001	0.398	-0.064	-0.001	-0.001	-0.001
	0.002	0.001	0.001	0.136	0.095	0.002	0.001	0.001
	[-0.39909]	[1.14804]	[-1.47706]	[2.94017]	[-0.67065]	[-0.41380]	[-1.39847]	[-1.72980
D(TREASURY(-2))	-0.002	-0.001	0.000	0.247	0.034	-0.003	0.000	0.002
	0.002	0.001	0.001	0.144	0.102	0.002	0.001	0.001
	[-0.77290]	[-0.79315]	[-0.21427]	[1.71318]	[0.33001]	[-1.11589]	[-0.12936]	[2.30064
D(BOND(-1))	0.000	0.001	0.002	0.085	0.080	0.004	0.002	0.001
	0.003	0.002	0.001	0.196	0.138	0.003	0.001	0.001
	[0.00249]	[0.59684]	[1.11611]	[0.43377]	[0.58086]	[1.27807]	[1.41331]	[0.77828
D(BOND(-2))	-0.003	0.003	0.000	-0.149	-0.077	0.001	0.000	-0.001
	0.003	0.001	0.001	0.186	0.131	0.003	0.001	0.001
	[-0.87134]	[1.82252]	[0.13433]	[-0.80222]	[-0.58910]	[0.19684]	[-0.35376]	[-1.33253
D(LULC(-1))	0.298	0.017	0.071	-6.888	-0.192	0.089	0.102	0.000
	0.170	0.080	0.074	10.017	7.058	0.160	0.073	0.059
	[1.75173]	[0.20772]	[0.95786]	[-0.68770]	[-0.02722]	[0.55545]	[1.39743]	[-0.00652
D(LULC(-2))	0.191	-0.058	0.042	1.049	0.252	0.300	0.154	-0.017
	0.125	0.059	0.054	7.337	5.169	0.117	0.053	0.044
	[1.52856]	[-0.98133]	[0.76538]	[0.14294]	[0.04883]	[2.55960]	[2.88721]	[-0.37947
D(LPRODDP(-1))	-0.074	-0.235	0.136	-25.167	-6.593	0.262	-0.047	0.113
	0.265	0.125	0.116	15.600	10.992	0.249	0.114	0.093
	[-0.27810]	[-1.88506]	[1.17201]	[-1.61324]	[-0.59983]	[1.05099]	[-0.41656]	[1.22450
D(LPRODDP(-2))	0.130	-0.041	-0.047	10.344	6.292	-0.071	-0.139	0.077
	0.271	0.127	0.118	15.924	11.220	0.254	0.116	0.095
	[0.48157]	[-0.31927]	[-0.39996]	[0.64959]	[0.56079]	[-0.27910]	[-1.20195]	[0.81740
D(LPCPIN(-1))	-0.076	0.092	0.026	9.909	7.546	-0.506	0.092	0.406

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	0.335	0.157	0.146	19.680	13.866	0.314	0.143	0.117
	[-0.22707]	[0.58503]	[0.17735]	[0.50349]	[0.54422]	[-1.60794]	[0.63794]	[3.47287
D(LPCPIN(-2))	0.258	-0.215	0.035	-16.891	-8.870	-0.204	0.076	-0.027
	0.308	0.145	0.134	18.130	12.774	0.290	0.132	0.108
	[0.83753]	[-1.48408]	[0.26225]	[-0.93165]	[-0.69440]	[-0.70269]	[0.57526]	[-0.25329
D(LOGE(-1))	0.015	-0.008	0.008	-5.868	-5.297	-0.009	0.043	-0.017
	0.046	0.022	0.020	2.732	1.925	0.044	0.020	0.016
	[0.32691]	[-0.36663]	[0.38017]	[-2.14774]	[-2.75151]	[-0.20333]	[2.14631]	[-1.07274
D(LOGE(-2))	0.046	0.034	-0.008	-1.537	-3.298	0.000	0.024	-0.023
	0.039	0.018	0.017	2.312	1.629	0.037	0.017	0.014
	[1.17240]	[1.85283]	[-0.47252]	[-0.66449]	[-2.02399]	[0.00110]	[1.41173]	[-1.70310
C	0.010	0.024	0.037	-0.952	-1.091	0.057	0.028	-0.004
	0.018	0.009	0.008	1.066	0.751	0.017	0.008	0.006
	[0.52647]	[2.85682]	[4.69113]	[-0.89260]	[-1.45165]	[3.31985]	[3.58170]	[-0.63797
TIMEDUM	0.000	-0.001	-0.001	-0.037	-0.013	-0.002	-0.001	0.000
	0.001	0.000	0.000	0.031	0.022	0.000	0.000	0.000
	[0.74062]	[-3.02975]	[-3.50118]	[-1.19257]	[-0.60043]	[-3.43687]	[-3.33773]	[-0.36982
R-squared	0.277	0.403	0.596	0.522	0.362	0.512	0.648	0.655
Adj. R-squared	0.064	0.227	0.477	0.381	0.173	0.368	0.545	0.553
Sum sq. resids	0.025	0.005	0.005	85.879	42.635	0.022	0.005	0.003
S.E. equation	0.018	0.008	0.008	1.049	0.739	0.017	0.008	0.006
F-statistic	1.302	2.289	5.007	3.699	1.921	3.555	6.250	6.434
Log likelihood	279.635	356.555	364.327	-135.958	-100.245	285.957	366.031	386.97
Akaike AIC	-5.012	-6.521	-6.673	3.136	2.436	-5.136	-6.706	-7.11
Schwarz SC	-4.395	-5.903	-6.055	3.754	3.054	-4.519	-6.089	-6.49
Mean dependent	0.034	0.005	0.028	0.040	0.022	0.028	0.026	0.00
S.D. dependent	0.018	0.010	0.011	1.333	0.813	0.021	0.011	0.00

Determinant Residual Covariance	0.000
Log Likelihood	2060.771
Log Likelihood (d.f. adjusted)	1937.637
Akaike Information Criteria	-33.052
Schwarz Criteria	-26.566

III. Exchange Rate Pass-Through in South Africa[33]

A. Introduction

51. This section presents an empirical analysis of the degree of exchange rate pass-through to the consumer price level in South Africa. In particular, the section focuses on the pass-through over the time horizon of monetary policy (around two years).[34] The South African Reserve Bank (SARB) has moved to an inflation-targeting framework, and 2002 is the first year in which it must achieve an explicit inflation target; however, this task has been complicated by the rapid depreciation of the rand in the last quarter of 2001, which has resulted in a pickup in CPIX inflation in early 2002.[35]

52. The important question for the SARB is to what extent, and how quickly, the exchange rate depreciation in the last quarter of 2001 is likely to pass through to consumer prices.

53. The results suggest that exchange rate pass-through to CPIX is low to moderate, and the profile increases gradually over time.[36] Specifically, the model estimates suggest that, on average, eight quarters after a shock to the nominal effective exchange rate, the level of CPIX increases by 0.12 percent for every 1 percent depreciation in the nominal effective exchange rate, giving a pass-through elasticity of 12 percent.

54. The rest of the section is organized as follows: subsection B describes the model and the estimation methodology; subsection C reports the impulse response analysis and calculates pass-through elasticities at different time horizons for CPIX; and subsection D concludes.

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[33] Prepared by Ashok Bhundia.

[34] In South Africa, the policy interest rate—the repurchase rate—is estimated to have maximum impact on future inflation at about the two-year horizon. See Box 1 in the South African Reserve Bank (2001).

[35] The target is set at 3-6 percent (annual average basis) CPIX inflation in 2002 and 2003, and 3-5 percent in 2004 and 2005. The CPIX is the CPI, excluding interest on mortgage bonds.

[36] As a robustness check, the exercise was repeated for core CPI, and headline CPI, and it was found that the pass-through profile was not significantly different from the results for CPIX.

B. Model and Estimation

55. The model is taken from McCarthy (1999) with prices set at each of three different stages in a stylized distribution chain – import, production, and consumption – for goods and services. In addition, the model controls for oil prices by including an oil price equation (in U.S. dollars); fluctuations in the output gap by including an output gap equation; and for the exchange rate. The ordering of the variables determines the sequence in which the different shocks –oil, output gap, exchange rate, import-price inflation, producer price inflation, and consumer inflation – are transmitted at time t through the system. In this model, oil price and output gap shocks are assumed to be most exogenous, and so the oil inflation equation is ordered first followed by an output gap equation. Next, the nominal effective exchange rate equation is included, followed by the three price inflation equations in the sequence mentioned above. This ordering means that an oil price shock affects all other variables in the system at time t, but shocks to other variables affect oil prices in South Africa with a lag of at least one period. By the same logic, within the period, output gap shocks affect all variables ordered after it, but not oil price inflation.[37]

56. The model is estimated as a vector autogression (VAR) so that all variables are considered endogenous. All variables are in logarithms. To deal with the problem of nonstationarity, they are expressed in first difference, except for the output gap, which is stationary.

C. Impulse Response Results and Exchange Rate Pass-Through Calculations

57. The pass-through of exchange rate fluctuations to CPIX at time t is calculated using the following ratio:

$$\text{Pass-through elasticity at time } t = 100^{*} \frac{\text{percent change in the level of CPIX } t \text{ periods after shock}}{\text{initial percentage shock to the exchange rate}}$$

The numerator is the percentage change in the CPIX between period 0 and t, and the denominator is the percentage change in the nominal effective exchange at time 0 (the initial shock).

[37] The estimated pass-through coefficients were very similar across different orderings of the variables, indicating that the chosen model ordering is robust to alternatives.

Figure III.1. Pass-through in the CPIX Inflation Model

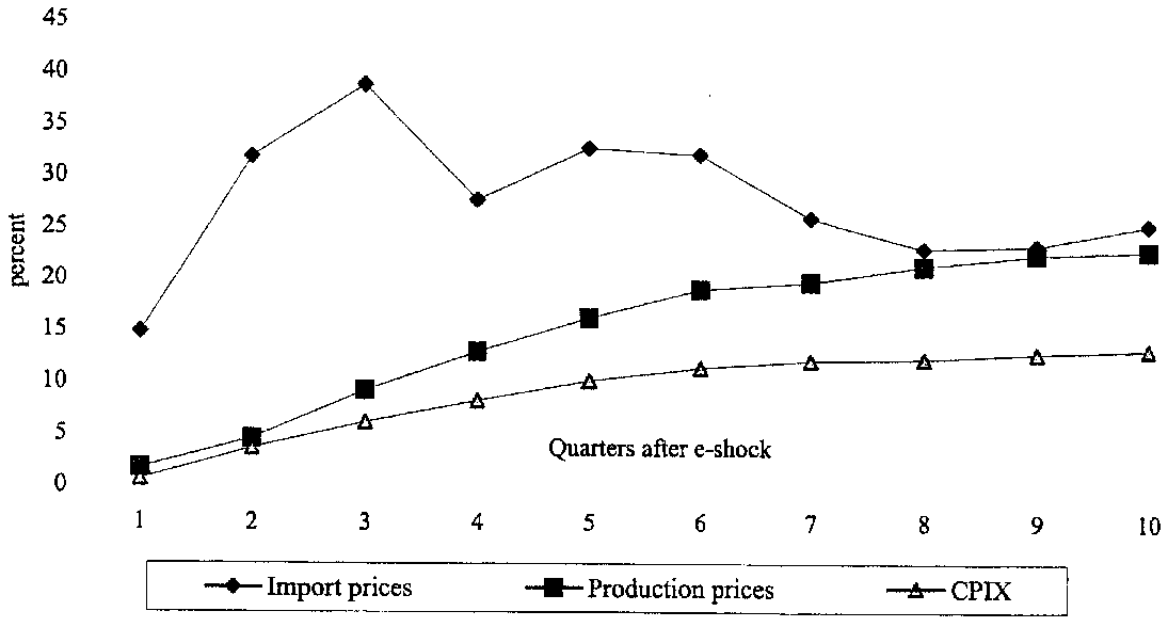

Table III.1. Pass-through elasticity to the level of CPIX (percent)

	t = 4	t = 8	t =10
CPIX	8.3	12.3	13.2

58. An initial shock to the nominal effective exchange rate feeds through to the level of CPIX gradually, with the rate of increase slowing over time (Figure III.1 and Table III.1). This deceleration is also observed in pass-through profiles for import and producer prices. More than half the pass-through is seen by the first year, and it reaches approximately 12 percent eight quarters after the shock. Choudhri and Hakura (2001) find pass-through in South Africa to be 7 percent after two years for headline CPI, an estimate that is somewhat lower than the 12 percent found in this study. However, both estimates suggest that pass-through over the monetary policy horizon has, on average, been moderate.

D. Conclusions

59. Results from the VAR analysis suggest that the pass-through is relatively low over the two-year horizon when the SARB monetary policy tool, the repurchase rate, has most impact on inflation. Based on these results, the impact of currency depreciation in the fourth quarter of 2001 on inflation over 2002 and 2003 may be moderate. However, the degree of pass-through during any particular episode of currency fluctuations will depend fundamentally on the source of the shock. Therefore, it is important to identify the source of the exchange rate shock before taking a view about the expected degree of pass-through and setting the appropriate stance for policy. For example, an increase in the rate of growth of South Africa's money supply relative to the rest of the world would be expected to result in depreciation pressure on the nominal exchange rate (other things equal), and eventually pass-through into higher domestic prices. Conversely, a real shock such as a slow down in total factor productivity growth in South Africa relative to the rest of the world, would be expected to result in a depreciated real exchange rate either via a lower nominal exchange rate, or via a combination of a depreciated nominal exchange rate and lower domestic prices vis-à-vis its trading partners.

References

Choudhri, Ehsan, and Dalia Hakura, 2001, "Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter?" IMF Working Paper 01/194 (Washington: International Monetary Fund)

McCarthy, Jonathan, 1999, "Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in Some Industrialized Economies," BIS Working Paper No.79 (Basle: Bank for International Settlements)

South African Reserve Bank, 2001, Monetary Policy Review (October).

IV. Potential Output and the Sources of Growth[38]

60. The policy outlook for a country depends importantly on both near- and long-term prospects for real output growth. Near-term prospects can be measured by potential output growth and the output gap (measured as the difference between actual and potential output), which, in conjunction with other indicators, provide an indication of the intensity of resource utilization and of inflationary pressures. Longer-term growth prospects are based on the full utilization of factors of production and the output gains that arise as these factors are more efficiently utilized, for example through structural reforms.

61. This section provides estimates of potential real GDP growth in South Africa based on alternative methodologies, including a production function approach that is standard in the literature.[39] The estimates suggest that during 1994–2001, potential output growth has been around 2½–2¾ percent annually, and that in 2001 the output gap was around zero. The estimates of the output gap are reasonably closely correlated over time with inflation and capacity utilization, which are other indicators of the intensity of resource utilization.

62. To shed light on South Africa's longer-term growth prospects, the section analyzes the sources of real GDP growth in the country building on previous work by the staff (see IMF, 1998). A striking fact is that the average annual growth rate of real GDP has increased significantly since 1994, rising from 1 percent in 1980-93 to 2.7 percent in 1994-2001.[40] The increase can be attributed principally to total-factor-productivity (TFP) growth—or improvements in efficiency and technology—rather than to increases in the factors of production. If the TFP growth rates experienced since 1994 are sustained, and labor-market rigidities are eased sufficiently so that employment rises in step with future increases in the labor force, then the economy could achieve growth rates around 5 percent over the longer term.

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[38] Prepared by Vivek Arora, Ashok Bhundia, and Gustavo Bagattini.

[39] See U.S. Congressional Budget Office (2001) and DeMasi, Chan Lau, and Keenan (1999) for a description of the production-function approach and estimates based on alternative methodologies for the United States, respectively.

[40] Statistical tests for a structural break in the real GDP series indicated a break in 1993. The recent data also reflect a statistical revision in June 1999, which implemented the 1993 *System of National Accounts* and resulted in an upward revision in measured annual real GDP growth during 1994-98 from 2.2 percent to 2.7 percent.

A. Potential Output and the Output Gap

Potential output growth: alternative methodologies

63. A number of methodologies can be used to estimate potential output growth, ranging from purely statistical approaches to more structural methods such as the production function approach. Since each of these approaches has problems, it is useful to examine the results based on a variety of measures. The results suggest that the average annual growth rate of potential GDP in 1994-2001 was roughly 2½–2¾ percent (Table IV.1).[41] This represents a substantial pick-up from 1980-93, when potential growth was only around 1–1¼ percent.

Table IV.1. Estimates of Potential Output Growth (in percent)

Method/source	Average for the period	
	1980-93	1994-2001
Authors' estimates		
Hodrick-Prescott filter	1.2	2.5
Structural VAR	1.1	2.7
Production function	1.0	2.8 [1]
Other estimates		
SARB (Hodrick-Prescott filter) [2]	1.3	2.4

Sources: Authors' estimates and South African Reserve Bank.

[1] 1995-2001, because of a sustained increase in the estimated potential growth rate starting in 1995.
[2] SARB (South African Reserve Bank).

64. A common technique used for detrending economic time series is the Hodrick-Prescott (HP) filter.[42] In the context of the real GDP series, the HP filter derives a "trend" output such that it minimizes a weighted average of the gap between actual output and trend output and the rate of change in trend output. Trend output growth on this basis was 2½ percent during 1994–96. A disadvantage of the HP filter is that the end points of the filtered trend output series tend to be sensitive to the last few observations in the sample. However, estimates based on a Kalman filter, which is not susceptible to the end-point problem, were similar to the HP estimates.

[41] Due to data availability, the analysis in this section is based on annual data for 1980-2001.

[42] See Hodrick and Prescott (1997).

65. The growth rate of potential output can also be estimated by a structural vector autoregression (VAR), such as the Blanchard-Quah bivariate decomposition in which output is divided into its trend and cyclical components. In addition to using the information contained in the real output series, as is done by the HP filter, the Blanchard-Quah decomposition incorporates information from cyclical variables such as inflation. The Blanchard-Quah approach allows the trend component of output to be stochastic, but does not restrict it to be a random walk, which is consistent with the belief that the permanent component of output is driven in part by supply shocks such as technological innovation. Based on the Blanchard-Quah decomposition, potential output growth was estimated to be 2¾ percent in 1994–2001.

66. A key shortcoming of statistical detrending techniques is that they do not have an economic basis, in the sense that the estimated productive limits of the economy are not based on the available factors of production. In contrast, a production-function approach explicitly models output in terms of the factors of production (capital and labor) and TFP. This approach requires the assumption of a functional form for the aggregate production function and the construction of a series for potential labor and TFP. A standard assumption for the functional form is a Cobb-Douglas production function, with constant shares over time for labor and capital.[43]

67. The production-function approach to estimating potential output growth involves three key steps. First, TFP growth is derived as the difference between observed real GDP growth and the weighted sum of employment and capital growth.[44] Second, the potential growth rates of TFP and employment are derived by assuming that TFP and employment were at their potential levels in 1981 and 1996, which appear to have been cyclical peaks, and assuming that the potential growth rates are equal to the trend (HP) growth rates between those peak years.[45] Finally, potential GDP growth is estimated as potential TFP growth plus

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[43] See IMF (1998) for an analysis of GDP growth in South Africa based on a Cobb-Douglas production function, and U.S. Congressional Budget Office (2001) and DeMasi, Chan Lau, and Keenan (1999) for an analysis for the United States. The shares of labor and capital in the production function were based on their shares in national income—55 percent and 45 percent, respectively. The use of national-income shares has been criticized by Sarel (1997), as discussed below, but the results do not vary significantly with alternative assumptions regarding the labor and capital shares.

[44] The weights are equal to the labor and capital shares in the production function. Employment is used as the labor variable in the production function because it is employment, rather than the total labor force, that has contributed to past production.

[45] It would have been preferable to estimate potential employment based on its economic determinants rather than on statistical time trend techniques such as HP filters. However, such estimation was impeded by data limitations, in particular breaks in the employment series in the mid-1990s. These also hindered estimation of a NAIRU for South Africa, as

(continued)

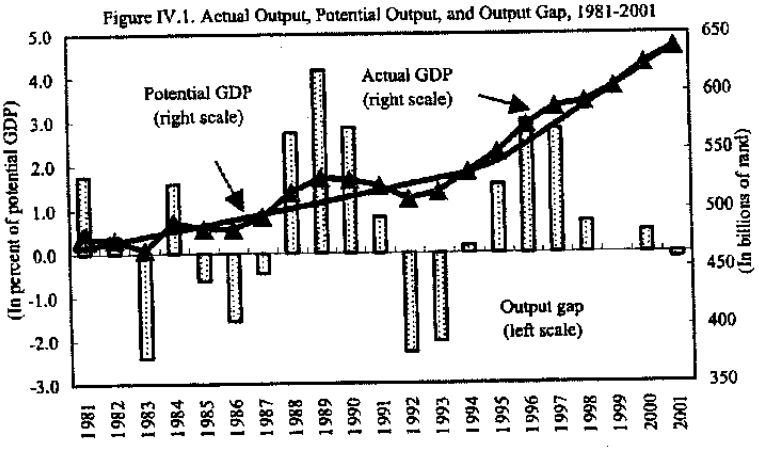
the weighted sum of the growth in potential employment and the capital stock.[46] Based on the production-function approach, annual potential output growth was estimated to be 2¾ percent during 1994–2001.

68. While all of the methodologies used above result in potential GDP growth rates of 2½–2¾ percent during 1994-2001, it should be noted that since the estimations are based on historical data they build in the labor-market and other rigidities that existed in the past. Looking ahead, reforms that contribute to an easing of these rigidities could lead to an increase in potential output growth.

Output gap

69. The level of potential output can be determined by applying the estimated growth rate of potential, based on the production-function approach, to the level of actual output in a base year in which output is judged to have been close to potential based on other indicators of resource utilization.[47] Real GDP appears to have been close to its potential level in 1999, as evidenced by low inflation and an absence of other indications of resource underutilization or overutilization as reflected in, for example, a capacity utilization rate that was very close to its long-run average. The output gap derived from this potential output series was around zero in 2001 (Figure IV.1).

Figure IV.1. Actual Output, Potential Output, and Output Gap, 1981-2001



tests for a Phillips-curve relationship failed to find any robust inflation-unemployment relationship after controlling for other factors. For the period through 1991, Chadha (1995) found that the high unemployment in South Africa was largely structural rather than cyclical in nature.

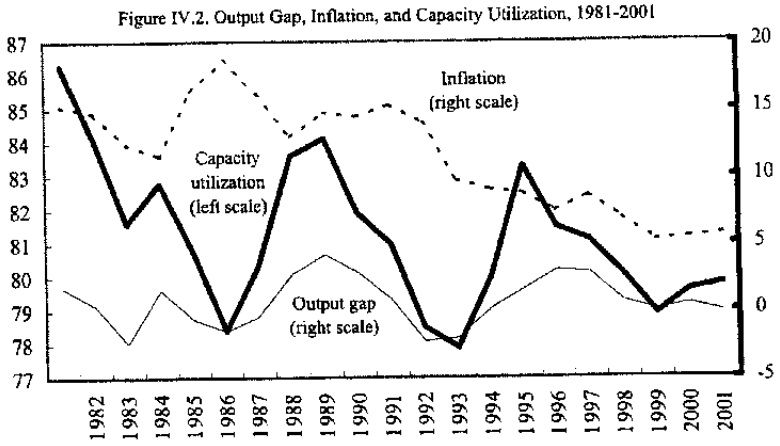
[46] The capital stock is used in its actual rather than smoothed form because it is assumed to be fully utilized. Also, it is lagged one period. These are standard assumptions (e.g., see CBO, 2001).

[47] The production-function method is used because it has the strongest economic basis. However, as noted, the results are not significantly different than those based on the other approaches.

Correlation with other measures of resource utilization

70. The estimated output gap is positively correlated with changes in CPI inflation, with a lag of one year, and with deviations in manufacturing capacity utilization around a long-run average (Figure IV.2).[48] This suggests that the output gap may be a useful indicator for gauging the intensity of resource utilization in the economy and the building of inflationary pressures.

Figure IV.2. Output Gap, Inflation, and Capacity Utilization, 1981-2001



B. Sources of Growth

71. The analysis suggests that the significant increase in real GDP growth after 1994 relates principally to a substantial increase in TFP growth rather than to greater factor accumulation (Table IV.2).[49] The significance of the prominent role of TFP in South Africa's recent growth performance is that GDP growth can generally be sustained over longer periods of time when it is based on improvements in technology and efficiency—which are embodied in TFP—rather than on factor accumulation, which is subject to inherent limits based on demographics and diminishing returns.

Table IV.2. Contributions to Growth, 1980-2001

	1980-93	1994-2001	1980-2001
Real GDP growth (in percent)	1.0	2.7	1.7
Contributions (in percentage points)			
Capital	0.9	0.6	0.8
Labor	0.1	-0.9	-0.3
TFP	0.0	3.0	1.1

Sources: Statistics South Africa; and authors' estimates.

[48] The correlation coefficients are 0.41 and 0.64, respectively.

[49] This reinforces the conclusion of the previous staff study on the subject of growth accounting which found that TFP growth turned around during the early 1990s and bolstered a flagging growth performance (see IMF, 1998). The data for the subsequent period indicate that the increase in TFP growth has been sustained and has contributed to a substantial increase in real GDP growth.

72. The decline in the contributions to growth of capital and labor during 1994–2001 relative to the previous period reflects a continuation of the slowing in factor accumulation that started in the 1980s. Average annual growth in the capital stock declined from just over 2 percent during 1980–93 to 1.3 percent during 1994–2001. Employment actually shrank during 1994–2001, as the positive annual average growth of 0.2 percent during 1980–93 was replaced by negative growth of 1.6 percent.[50] As a result, the contribution to GDP growth of capital and labor together fell from 1 percentage point annually during 1980–93 to negative 0.3 percentage points during 1994–2001.

73. The decline in the contribution from factor accumulation was more than offset by a substantial increase in TFP growth.[51] The turnaround in TFP performance in the recent period reflects in part the policy and institutional changes during the period (see IMF, 1998). International trade and investment offer important vehicles for technological spillover effects, and greater private sector participation in the economy increases the scope for technological innovation. In South Africa, the scope for such effects has increased with the increasing openness of the economy; a rising share of equipment and machinery in total investment; and a greater share of investment, including in equipment and machinery, being accounted for by the private sector (Table IV.3).

Table IV.3. Selected Factors Affecting TFP Growth, 1980-2001 (in percent)

	1980-93	1994-2001
Share of trade in real GDP	34.2	46.6
Share of equipment and machinery in investment	35.4	50.4
Share of private business sector in investment	60.1	72.1
Share of private business sector in investment in equipment and machinery	61.8	73.1

Sources: South African Reserve Bank; and authors' estimates.

[50] See Lewis (2001) for a discussion of some of the factors behind the employment decline.

[51] This general conclusion is robust to alternative assumptions regarding the shares of capital and labor in output. The use of national-income-based shares is sometimes criticized in part because it assumes that capital and labor markets are perfectly competitive. In South Africa, with large imperfections in labor market, the assumption may be unrealistic. However, an alternative estimate of the labor share based on Sarel (1997), which uses a disaggregated approach and adjusts for market imperfections, is 0.68 instead of 0.55. Under this alternative assumption, it is still true that the turnaround in GDP growth in the recent period owed to TFP growth, whose annual contribution increased from 0.2 percentage points in 1980–93 to 3.4 percentage points in 1994–2001.

74. The growth accounting exercise can be extended to estimate the economy's long-run growth prospects. In the neoclassical growth model, the steady state capital-labor ratio is constant and the growth rate of output is equal to the rate of TFP growth plus employment growth.[52] If the recent rates of TFP growth (3 percent) are maintained and if, with labor-market reforms and other institutional changes, the prospective annual labor-force growth of 2 percent is fully absorbed into employment, then the long-run real GDP growth rate could be 5 percent (Table IV.4).[53] If the labor-market changes are sufficient to absorb only half of the increase in the labor force, then growth could be 4 percent. However, if the labor-market changes are sufficient only to stop the contraction in employment—which would still represent a substantial improvement over the recent experience—then GDP growth would remain at 3 percent.

Table IV.4. Long-Run Growth Prospects (Annual GDP growth rate, in percent)[1]

Under baseline labor-force growth with employment growth equal to:			Under depressed labor-force growth with employment growth equal to:		
Labor-force growth	0.5*Labor-force growth	Zero	Labor-force growth	0.5*Labor-force growth	Zero
5	4	3	4	3½	3

[1]Authors' calculations. All scenarios assume annual TFP growth of 3 percent. Baseline and depressed labor-force growth rates are assumed to be 2 percent and 1 percent, respectively.

75. In addition, it is possible that labor-force growth may be lower than currently projected, for example on account of the HIV/AIDS pandemic (see, for example, United Nations, 2002). If the labor force grows only half as fast as currently projected, then GDP growth could fall in the 3–4 percent range based on alternative assumptions about labor-market conditions. [54]

[52] The production function is $Y = A.K^{\alpha}L^{1-\alpha}$, where Y represents real GDP; A, K, and L represent TFP, capital, and employment, respectively; and α and $(1-\alpha)$ represent the shares of capital and labor in output. The growth rate of output is thus:
$\Delta Y/Y = \Delta A/A + \alpha.\Delta K/K + (1-\alpha).\Delta L/L$. In the steady state, if the capital-labor ratio is constant (as it is in the neoclassical growth model), then $\Delta Y/Y = \Delta A/A + \Delta L/L$.

[53] In this scenario, growth rates could be even higher than 5 percent if labor-market and other reforms are substantial enough to generate employment growth that absorbs not only increases in the labor force, but also the currently unemployed, resulting in a decline in the unemployment rate.

[54] All of these conclusions are based on a neoclassical growth model. In an endogenous growth model, the steady state is characterized by a constant capital-output ratio and output

(continued)

76. These estimates suggest a wide range of possibilities for long-run output growth. However, the estimates all suggest that there is scope for output growth to increase to substantially higher levels provided that a strong effort is made to improve labor market conditions. In addition, the outlook depends crucially on maintaining high rates of TFP growth, which in turn depends on the extent of market-related activity, private-sector participation, skills development, and innovation.

References

Chadha, B., 1995, "Disequilibrium in the Labor Market in South Africa," *IMF Staff Papers*, Vol. 42, No. 3, pp. 642-669.

De Masi, P., J. Chan-Lau, and A. Keenan, 1999, "Measures of Potential Output, NAIRU, and Capacity Utilization," in *United States—Selected Issues*, IMF Staff Country Report No. 99/101.

Hodrick, R., and E. Prescott, 1997, "Postwar U.S. Business Cycles: An Empirical Investigation," *Journal of Money, Credit, and Banking,* Vol. 29, pp. 1-16.

International Monetary Fund, 1998, *South Africa—Selected Issues,* Section II, "Growth Accounting," pp. 38-48.

Lewis, J., 2001, "Policies to Promote Growth and Employment in South Africa," Informal Discussion Paper on Aspects of the Economy of South Africa, No. 16, The World Bank.

Sarel, M., 1997, "Growth and Productivity in ASEAN Countries," IMF Working Paper, WP/97/97.

United Nations, 2002, World Urbanization Prospects: The 2001 Revision, (New York: The United Nations).

U.S. Congressional Budget Office, 2001, "CBO's Method for Estimating Potential Output: An Update," (Washington, DC: CBO).

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growth is given by $\Delta Y/Y = [(\Delta A/A)/(1-\alpha)] + \Delta L/L$. There are no diminishing returns to capital and long-run growth is thus higher. Under the same assumptions as above on labor-force growth and labor-market reforms, this model would suggest that long-run GDP growth rates could be in the 5½–7½ percent range. However, such high growth rates should be considered only a theoretical possibility at this stage, given that they have not been observed over sustained periods in South Africa in the past and the many assumptions that are involved.

V. Alternative Medium-Term Scenario[55]

77. The staff's medium-term scenario is based on a projection for annual real GDP growth of about 3 percent during 2003–07.[56] The scenario assumes the continuation of current policies, including sound fiscal policy, with budget deficits of about 2 percent of GDP on average, the achievement of the CPIX[57] inflation target, starting in 2003, and steady, but modest, progress with structural reforms. These structural reforms include the gradual removal of rigidities in the labor market along with training efforts to improve job skills, continued trade liberalization, and the restructuring and privatization of public enterprises. The scenario is based on annual world real GDP growth of 4–4½ percent through the medium term, consistent with the assumptions in the most recent *World Economic Outlook.*

78. Accelerating the pace of implementation of economic reform in some areas could yield higher real output growth under an alternative medium-term scenario. Structural reforms can raise real output growth through contributions from increases in labor, capital inputs, and total factor productivity (TFP). The alternative medium-term scenario assumes not only higher growth contributions from employment creation and investment than under the baseline medium-term scenario, but also in comparison with economic growth during 1994–2001, which was mainly based on strong growth in TFP as a result of trade liberalization and labor shedding.[58]

79. Strengthening efforts to improve the functioning of the labor market could lower the cost of labor; which could, in turn, raise employment growth and reduce the number of unemployed. In particular, further progress in lowering labor costs by streamlining arbitration and conciliation procedures and by allowing for more autonomy in setting wages—along with greater flexibility of work practices—could increase the demand for labor. Efforts to enhance job training and the development of professional skills are likely to make an equally important contribution to employment creation by increasing labor productivity and raising the employability of those who are currently unemployed.

80. Investment will also contribute to real economic growth as the profitability of investment rises with falling labor costs. However, investment that is not induced by

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[55] Prepared by Matthias Vocke.

[56] The impact of HIV/AIDS on medium-term economic growth is highly uncertain. Estimates of the decline in annual output growth range from ½ to 2½ percentage points. See Box 6 in the Staff Report for the 2002 Article IV Consultation, SM/02/176.

[57] The CPIX is the consumer price index excluding interest on mortgage bonds.

[58] See Section IV of this selected issues paper for a discussion of the sources of growth during 1980–2001 and of the medium-term outlook.

favorable labor market conditions may substitute capital for labor, thereby contributing to growth, but not to employment creation. Increasing inflows of foreign direct investment (FDI) may also raise TFP growth as spillovers improve production technology and skill development. Furthermore, accelerating the pace of privatization and achieving the official inflation target would help to raise investor confidence. Lower inflation may also result in making prices a more reliable indicator for scarcity, which could improve the functioning of markets and possibly result in higher TFP growth.[59]

81. Trade liberalization largely drove TFP growth—and, thereby, real GDP growth—during the 1990s. Efforts to further lower tariffs could induce higher real GDP growth, albeit on a smaller scale. The reduction in the average (unweighted) tariff rate from 30 percent in 1990 to its present level of 7 percent was the main factor behind the TFP contribution to growth of 3 percentage points during 1994–2001. However, the impact of tariff reduction on TFP growth seems to be smaller at lower average tariff rates.[60] It is important to note, however, that further trade liberalization needs to be complemented by comprehensive labor market reforms and skill enhancements to create employment along with economic growth.

82. In sum, while difficult to quantify, the growth effects resulting from the timely implementation of comprehensive reform efforts in the areas of labor markets and trade liberalization under continued sound fiscal and monetary policies are likely to increase annual real GDP growth to about 5 percent over the medium term (Table V.1). The alternative medium-term scenario assumes an additional contribution of labor to economic growth of 1–1½ percentage points over the medium term, based on timely and comprehensive labor market reforms. The scenario assumes capital accumulation will also make a contribution to real GDP growth of 1–1½ percentage points over the medium term. Additional reductions in tariff rates, as well as privatization and education efforts, are assumed to increase TFP's contribution to real GDP growth by about ½–1 percentage point over the medium term.

83. Since the increase in real growth would be largely labor-driven, it would result in lower unemployment. Investment as a share of GDP would rise earlier and more strongly than under the baseline medium-term scenario and would reach 16.7 percent by 2007. Gross national savings as a share of GDP would fall initially, reflecting strong import growth, before rising to 15.9 percent by 2007. Higher export-oriented investment would increase real growth rates of both imports and exports. Investment growth, partly stemming from capital inflows, would result in a current account deficit of 0.8 percent of GDP by 2007. The path of

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[59] See, for example, Ghosh and Phillips (1998), "Warning: Inflation May Be Harmful to Your Growth," *Staff Papers*, International Monetary Fund, Vol. 45, pp. 672-710.

[60] See "Trade Liberalization and Productivity in South Africa" in *South Africa—Selected Issues*, IMF Staff Country Report No. 00/42, by José Fajgenbaum and others (Washington: IMF, 2000) for details.

inflation is projected to remain unchanged under the alternative medium-term scenario, consistent with the successful implementation of inflation targeting.

Table V.I. South Africa: Selected Economic and Financial Indicators, 2000-07 (Alternative Scenario)
(Annual percentage change, unless otherwise specified)

	2000	2001	2002	2003	2004	2005	2006	2007
		Est.			Staff projections			
National income and prices								
Real GDP	3.4	2.2	2.5	3.0	3.7	4.4	5.0	5.0
Real GDP per capita	1.2	0.2	0.5	1.0	1.8	2.5	3.1	3.1
CPI (annual average)	5.4	5.7	7.9	6.0	4.9	4.3	3.8	3.9
CPIX (annual average)	8.3	6.9	8.0	6.0	5.0	4.5	4.0	4.0
Labor market								
Unemployment rate (official definition; in percent)	26.3	28.8	29.6	30.2	29.1	28.0	27.0	26.0
Nominal unit labor costs (formal nonagricultural)	2.9	5.9	6.5	5.0	3.4	2.6	2.3	2.2
External sector								
Exports (goods and services) volume	8.3	2.4	2.2	1.7	1.8	2.2	2.4	2.6
Imports (goods and services) volume	7.2	0.4	-0.3	1.8	2.4	2.2	2.1	2.0
Current external balance (in percent of GDP)	-0.4	-0.1	0.7	0.4	0.3	0.0	-0.3	-0.8
Investment and saving								
Investment (including inventories; in percent of GDP)	15.9	15.3	15.1	15.1	15.2	15.5	16.0	16.7
Gross national saving (in percent of GDP)	15.5	15.2	15.8	15.5	15.5	15.5	15.7	15.9

Sources: South African Reserve Bank; IMF, International Financial Statistics; and staff estimates and projections.

References

Ghosh, A., and S. Phillips, 1998, "Warning: Inflation May Be Harmful to Your Growth," *Staff Papers*, International Monetary Fund, Vol. 45, pp. 672-710.

International Monetary Fund, 2000, "Trade Liberalization and Productivity in South Africa," in *South Africa—Selected Issues*, IMF Staff Country Report 00/42, by José Fajgenbaum and others, Washington D.C.

VI. Government Debt Dynamics

84. Largely reflecting the authorities' success in consolidating the fiscal position, the debt dynamics in South Africa are comfortable. At around 40 percent of GDP, the debt ratio is not unduly high, but more importantly, given the strength of the fiscal position, the debt ratio should continue to decline over the medium term. Under the baseline projections, it should fall steadily over the foreseeable future, dropping to below 30 percent of GDP by 2012/13. Even under an adverse scenario, in which macroeconomic and fiscal outcomes are assumed to be weaker than in the baseline, the debt ratio would still be manageable.

85. This section examines the medium to long term government debt dynamics, particularly the sensitivity of the results to changes in key assumptions. An assessment of the debt outlook is important for assessing the sustainability of the fiscal stance, as well as for identifying potential fiscal vulnerabilities. Stress testing, or sensitivity analysis, is important given the inherent uncertainty involved in making long run projections. It serves as a tool for explicitly recognizing the uncertainty regarding the future path of key macroeconomic and fiscal variables, and at the same time understanding how such uncertainty affects debt prospects.

86. Section A develops and discusses the analytical framework for assessing the debt outlook. Section B examines the recent history of fiscal policy in South Africa and provides some international comparison of debt ratios. Section C discusses the baseline projections and the sensitivity analysis. The final section summarizes the main results. An appendix on projections and sensitivity analyses provides more details on the macroeconomic and fiscal assumptions used in the analysis.

A. Analytical Framework

87. The debt to GDP ratio is influenced by a variety of factors other than fiscal policy. Indeed, it is often the case that these factors exert a stronger influence on the debt ratio than fiscal policy itself. In a sense to be made more precise below, fiscal policy refers to above-the-line movements in primary government expenditure and revenue, or equivalently the primary balance. While movements in the primary balance are an important determinant of the evolution of the debt ratio, it is important to be cognizant of the other forces at play.

88. A convenient analytical framework can be derived from decomposing the government's intertemporal budget constraint.[61] To fix ideas, government debt evolves according to the equation,

$$(1) \qquad B_t = (1 + r_t)B_{t-1} + G_t - T_t + O_t$$

[61] Chalk and Hemming (2000) provide an overview of fiscal sustainability, and Fischer and Easterly (1990) a general discussion of the government budget constraint.

where B_t is government debt at the end of the period, r_t is the average interest rate on government debt, G_t is primary government expenditure, T_t is total revenue, and O_t are other factors (to be discussed below) that influence the debt. All variables are expressed in nominal terms. The primary deficit is key for the evolution of debt in the above decomposition, and is defined as $D_t \equiv G_t - T_t$. Since debt is usually expressed as a ratio to GDP, it is convenient to rewrite equation (1) in terms of GDP ratios,

$$(2) \qquad b_t = \frac{(1+r_t)}{(1+\eta_t)} b_{t-1} + d_t + o_t$$

where small case letters represent the ratios to GDP, and η_t is the growth rate of nominal GDP. Finally, equation (2) is rearranged to yield the change in the debt ratio, denoted by $\Delta b_t = b_t - b_{t-1}$, as,

$$(3) \qquad \Delta b_t = \frac{(r_t - \eta_t)}{(1+\eta_t)} b_{t-1} + d_t + o_t$$

The equations above identify the main factors that influence the debt ratio as the interest-growth differential, the primary balance, and other' factors.[62] Equation (3) can be expressed most plainly as,

(4) Change in debt ratio = (interest-growth differential) + (primary balance) + (other).

Each of these factors is discussed below.

89. The primary balance can be viewed as the fiscal policy variable. It captures how fiscal policy directly influences the debt ratio, and reflects the above-the-line adjustment effort of the government. The primary balance is also affected by the state of the macroeconomy, through both automatic stabilizers and discretionary changes in tax and spending policy. Projected changes in the primary balance, therefore, need to be justified in terms of policy efforts by the authorities or macroeconomic developments. In the long run, however, it should be the authorities' policy efforts that dominate changes in the primary balance, as macroeconomic developments are generally more pertinent from a cyclical perspective.

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[62] The interest-growth differential is roughly equal to the actual expression in equation (3)—that is $r_t - \eta_t \cong \frac{r_t - \eta_t}{1+\eta_t}$ provided that η_t is not too large—and thus provides a convenient way to approximate the true impact of interest rates and growth.

90. The interest-growth differential is often as important, or even more important, than fiscal policy in influencing the debt ratio. The interest-growth differential tends to fluctuate significantly, and is subject to what appear to be long lasting shocks. For example, the movement in the interest-growth differential for selected OECD countries is subject to significant year-to-year fluctuations as well as more lasting movements (Figure VI.1, the specific experience with South Africa is discussed below).[63] The swings in the differential, upwards of 10 percentage points in the case of Italy, are substantial and have significant consequences for the debt ratio. For example, an increase of 10 percentage points for a country with a 40 percent debt-to-GDP ratio (such as South Africa), has an impact equivalent to a 4 percent of GDP deterioration in the primary balance.[64] The interest-growth differential is thus an important variable to examine for the sensitivity analysis.

91. The other factors that can exert a strong influence on the debt ratio include the stock of debt operations, exchange rate movements, or privatization. Stock of debt operations would include events like the assumption of provincial debt in 1994/95 that increased the debt ratio without showing a corresponding above-the-line deficit. In other countries, bank restructuring costs are often shown below-the-line, such that there is a rapid accumulation of debt that is not matched by any corresponding deficits. Exchange rate movements cause the foreign debt to be revalued and can also lead to sharp changes in the debt ratio—this is less important for South Africa as the foreign debt is not unduly large. Privatization proceeds can also be used to reduce the debt ratio without a corresponding above-the-line transaction.[65]

92. The treatment of privatization proceeds points to a more general caveat that the analysis focuses on government debt rather than net worth. In particular, government assets, including financial assets, are not factored into the analysis. Privatization, therefore, which if carried out at a fair market price could leave government net worth unchanged, may show up as a reduction in government debt. However, the focus on government debt, rather than net worth, is the conventional method for carrying-out medium term debt projections, in part due to data restrictions. In the future, however, as practices become consistent with the guidelines in the GFS Manual 2001, studies such as this may be able to employ more of a balance sheet or net worth approach.

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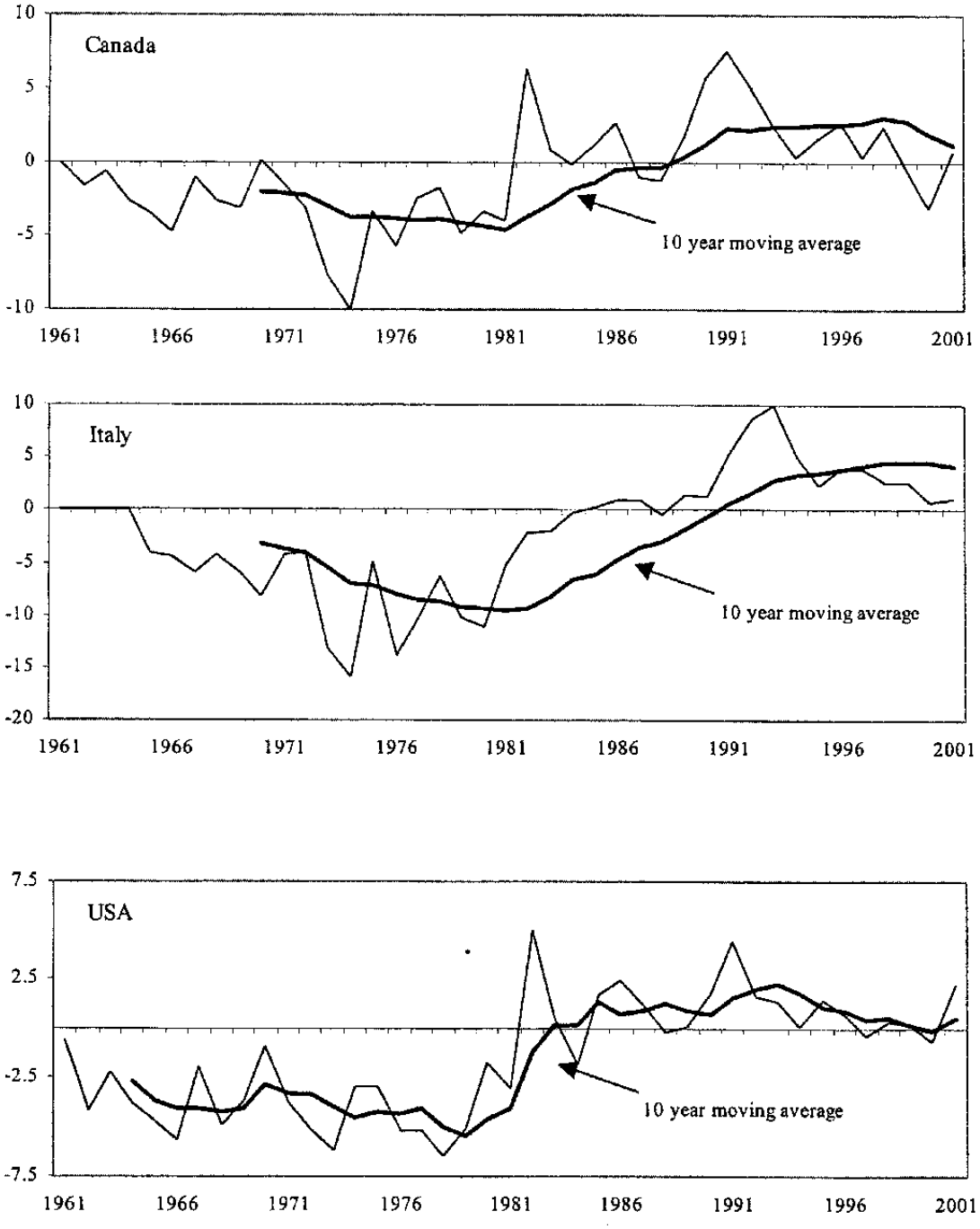
[63] Ball, Elmendorf, and Mankiw (1998) discuss this in more detail, focusing on the United States data.

[64]The interest-growth differential functions much like the effect of the interest rate on the debt *ratio*.

[65] Although the Government Finance Statistics (GFS) Manual of 1986 technically called for privatization proceeds to be recorded as revenue, recent practice had anticipated the changes introduced in the revised GFS Manual (released in 2001) and treated such proceeds as financing.

Figure VI.1. Selected Countries: Interest Rates and Growth, 1961-2001
(Interest-growth differential)



Source: OECD; and staff calculations.

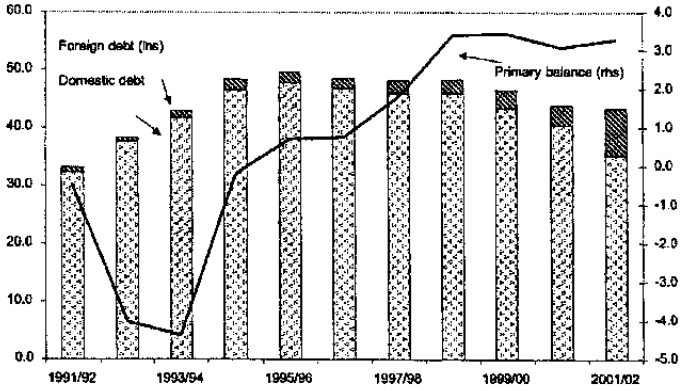
B. Background: Recent History and International Comparisons

Recent history

93. South Africa has undertaken a substantial fiscal consolidation since 1994. The overall balance has improved by nearly 8 percentage points of GDP since 1993/94, as the deficit shrank from over 9 percent of GDP in 1993/94 to around 1½ percent of GDP in 2001/02 Table VI.2). Most of this improvement is accounted for by expenditure restraint, as non-interest expenditure declined by 5 percentage points of GDP. Improvements in the revenue-to-GDP ratio account for the remaining 3 percentage points of GDP.

94. Despite the improvement in the fiscal position, the debt ratio has remained fairly stable. In particular, at around 43 percent of GDP, the debt ratio in 2001/02 is roughly the same as it was in 1993/94 (Table VI.2 and Figure VI.2). In part this reflects the fact that the fiscal position was initially weak and thus contributed to a build-up of debt, which was slowly reduced. Indeed, the debt ratio peaked at just under 50 percent of GDP in 1995/96 and has been on a downward trajectory since then. However, as noted above, the primary balance tells only part of the story, and the framework for decomposing changes in the debt ratio can be applied to provide a more comprehensive explanation. The decomposition is presented in Table VI.2 (section III).

Figure VI.2. South Africa: Debt and Primary Balance, 1991/92-2001/02
(In percent of GDP)



95. The decomposition reveals that the primary balance contributed to a substantial reduction in debt, which was largely offset by the interest-growth differential and other factors. During 1993/94-2001/02, the cumulative contribution of the primary balance to reducing the debt ratio was around 16 percentage points of GDP.[66] During this period, the interest-growth differential contributed a cumulative increase in the debt ratio of 5½ percentage points of GDP and the other factors an increase of 11 percentage points of GDP.

96. The interest-growth effect has contributed to an increase in the debt ratio in most years. In particular, since 1996/97 interest rates have always been higher than the growth rate. The year-to-year fluctuations in the interest-growth effect tend to be driven by changes in nominal GDP growth, as the average interest rate on debt generally moves gradually. In

[66] That is, if the primary balance were the only force at work, the debt ratio would have fallen from 43 percent of GDP in 1993/94 to 27 percent of GDP in 2001/02.

any year, only a fraction of the debt is refinanced so it can take many years for a change in interest rates to translate into lower average interest rates on debt. Looking forward, this would imply that a period of falling inflation could in the short run widen the interest-growth differential as nominal GDP would tend to fall in line with inflation, while it could take several years for the average interest rate on debt to come down.

97. The other factors had a strong negative contribution to the debt ratio, despite the inclusion of privatization proceeds. Since 1997, the cumulative amount of privatization proceeds transferred to the budget is just under 2 percent of 2001/02 GDP. While this has contributed to a decline in the debt ratio, in any given year it was swamped by other considerations. The big increases occurred in 1994/95, 1995/96, and 2001/02: in 1994/95, under the terms of the 1993 Constitution, the national government assumed the debt of the former regional authorities; in 1995/96, the government issued bonds to the South African Reserve Bank to compensate for losses on the Gold and Foreign Exchange Contingency Reserve; and in 2001/02 the depreciation of the rand caused a revaluation of foreign debt.

International comparisons

98. International comparisons of government debt statistics need to be interpreted carefully. For various reasons, the government debt data may not be comparable across countries, including due to differences in the coverage of the government sector and the definition of government debt. A bank restructuring, for example, may be carried out by a non-government public body (such as the central bank) implying that the corresponding debt may not be included in the government debt statistics. Even when the data are comparable, it is not clear how to interpret differences across countries. There could be valid economic reasons for why the debt should be higher in one country than in another. With these caveats, it may nonetheless be informative to look at some cross country comparisons.

99. The government debt ratio in South Africa is not out of line with that of other emerging market economies. The median gross government debt in 2001 for a sample of countries is 54 percent of GDP, compared with 43 percent of GDP in South Africa. The ten year high in these countries is 63 percent of GDP, compared with 50 percent of GDP in South Africa. Looking at general government net debt, for which data are available on more countries, provides a similar picture. The median net debt in 2001 is 42 percent of GDP, and the 10 year high is 56 percent of GDP.[67]

[67]Net debt is not calculated for South Africa but would likely be roughly the same as gross debt. The main difference would be that cash balances maintained by the government would be subtracted, but these have generally been below 1 percent of GDP at year-end. Also, the South Africa debt ratios refer to the national government, but as discussed in the technical appendix the general government debt would be only marginally higher.

100. The median debt ratios in the OECD countries are quite similar to those in the emerging market sample (Table VI.4). Many OECD countries have debt ratios that are more than double those in South Africa, with the 2001 gross debt-to-GDP ratios exceeding 100 percent in Belgium, Italy, and Japan. The net debt ratios in the OECD are lower, but the median is still 40 percent of GDP, which again is roughly in line with the debt ratio in South Africa.

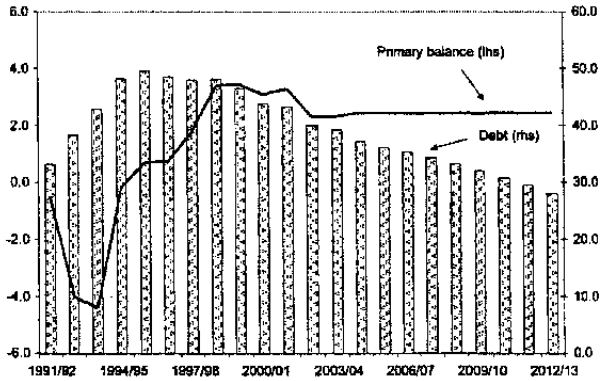
C. Projections

101. The debt ratio for South Africa is projected out to 2012/13 under a variety of macroeconomic and fiscal assumptions.

Baseline

102. Under the baseline assumptions, the debt dynamics are relatively favorable. The debt-to-GDP ratio would steadily decline, falling below 30 percent of GDP by 2012/13 (Figure VI.3). The underlying fiscal and macroeconomic assumptions are summarized below and discussed in more detail in the appendix.

Figure VI.3. South Africa: Baseline Scenario, 1991/92-2012/13 (In percent of GDP)



103. The fiscal assumptions are based on a continuation of the policies outlined in the Budget Review 2002. The Budget Review 2002 includes three year forecasts—the present budget plus the subsequent two years—and these figures are used as the basis for the fiscal projections. In particular, the primary surplus is held constant at the authorities' projected 2004/05 level of 2.4 percent of GDP. This seems reasonable, if not conservative, in light of the recent history as the primary surplus has exceeded 3 percent of GDP in each of the preceding four years (1998/99-2001/02).

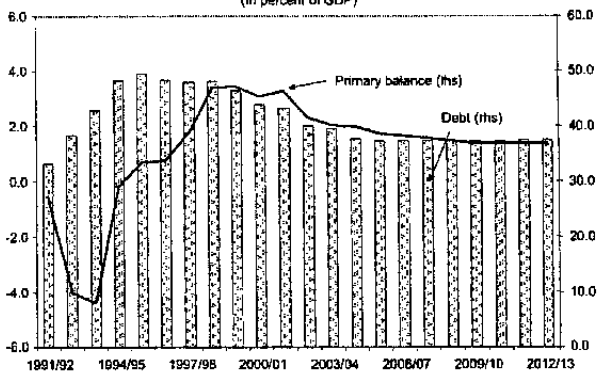
104. The macroeconomic assumptions are fairly conservative. Nominal GDP growth is projected to gradually fall to around 6¾ percent in 2012/13, from nearly 10 percent in 2001/02, consistent with a gradual reduction in inflation. This would be consistent with real GDP growth and GDP deflator inflation each converging to just over 3 percent. Given that it would take time for the decline in inflation to translate into lower average interest rates on debt (as noted), the interest-growth differential is projected to peak at around 4 percent before gradually converging to 3.4 percent. Based on recent history, this is relatively conservative, as between 1992/93 and 2001/02 there was only one year when the interest-growth differential exceeded 3.4 percent of GDP (and one year when it equaled 3.4 percent). In fact, the average during the past 10 years is 1.3 percent. Finally, the real effective exchange rate is projected to remain constant.

105. The decomposition of the changes in the debt ratio highlights the conservative assumptions regarding interest rates and growth. The interest-growth differential contributes to an increase in the debt ratio of over 1 percent of GDP throughout most of the projection

period (Table VI.3). The assumptions, therefore, build in the idea that South Africa will not be able to simply grow out of its debt, but rather will have to pay it down through primary surpluses.

106. Under an alternative scenario of a somewhat more relaxed fiscal stance, the debt dynamics are still manageable. Instead of assuming a constant primary balance, this scenario assumes a constant overall balance. The primary surplus, therefore would gradually deteriorate as the interest savings are used to boost noninterest expenditure (Table VI.3 and Figure VI.4). Noninterest expenditure converges to a level that is 1 percent of GDP above that in the baseline scenario, implying a primary surplus that is 1 percent of GDP smaller. With this more relaxed fiscal position, the debt ratio would quickly stabilize at around 37 percent of GDP.

Figure VI.4. South Africa: Constant Overall Balance, 1991/92-2012/13
(In percent of GDP)

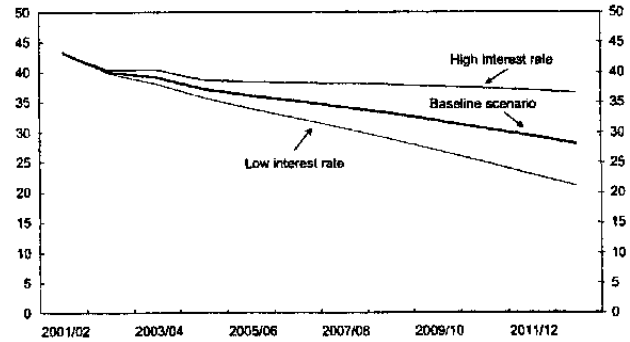


Sensitivity analysis

107. The sensitivity analysis suggests that the debt dynamics should be manageable even if macroeconomic developments are significantly worse than envisaged. Such stress testing is important given the uncertainty inherent in making such long-term projections. Moreover, as evidenced by the OECD data presented earlier, significant and lasting shifts in key macroeconomic variables (such as the interest-growth differential) are possible. The following summarizes how the results are affected by changing the assumptions, relative to the baseline scenario, regarding interest rates, growth, and the exchange rate (see appendix for further details).

108. Even with a sizeable increase in the interest rate, the debt ratio would still gradually decline. In this scenario, the average interest rate on debt is raised by 200 basis points relative to the baseline starting in 2002/03. This increases the 2012/13 debt ratio by around 8½ percentage points of GDP, but it still would be below 40 percent of GDP (Figure VII.5). More importantly, the debt ratio would be on a steadily, albeit gradually declining, path demonstrating that the debt-dynamics would still be sustainable. The higher interest rate causes the interest-growth differential to converge to 5.3 percent—well above its 10 year average. In the case of a 200 basis point decline in the interest rate, the debt ratio falls to just above 20 percent of GDP in 2012/13.

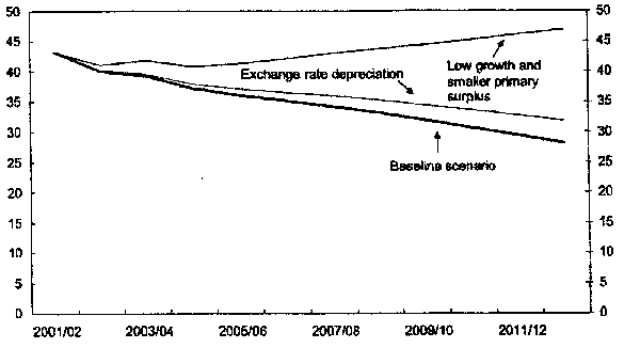
Figure VI.5. South Africa: Debt Projections, 2001/02-2012/13 (In percent of GDP)



109. The sensitivity to changes in GDP growth are very similar to that of the interest rate. A 2 percentage point change in the nominal GDP growth rate looks virtually identical to the above figure—the 2012/13 debt ratio differs by less than 2 percent of GDP in both cases.[68] This result, however, is due to the assumption that the primary balance is not affected by growth. However, a slowdown in growth might be expected to lead to a deterioration in the primary balance, say due to a reduction in revenue stemming from automatic stabilizers.[69] The symmetry to the interest rate sensitivity, therefore, derives from the fact that the impact on the interest-growth differential is similar (it would be identical except that the interest-growth differential is technically defined as $\frac{r-\eta}{1+\eta}$).

110. There would have to be an increase in the interest-growth differential larger than assumed above to make the debt dynamics unsustainable. Assuming that the 'other' factors do not contribute to movements in the debt ratio, the required increase in the interest-growth differential can be analytically solved for. In particular, rearranging equation (3) with o_t set to zero and defining sustainability as a nonincreasing debt ratio (such that $\Delta b_t = 0$), reveals that $\frac{r-\eta}{1+\eta} = -\frac{d}{b}$. If we take the primary surplus to be 2.4 percent of GDP and the debt ratio to be 40 percent of GDP, then the interest-growth differential would have to exceed 6 percent to make the debt-dynamics unsustainable without further fiscal adjustment. However, if the 2001/02 primary surplus of 3.3 percent of GDP is used in the calculation, the interest-growth differential would have to deteriorate to over 8 percent.

Figure VI.6. South Africa: Debt Projections, 2001/02-2012/13 (In percent of GDP)



111. Combining slower growth with weaker fiscal performance still leaves the debt ratio at a manageable level. As suggested above, slower growth could be accompanied by a deterioration in the fiscal position. The stress test in this case permanently lowers the growth

[68] A 2 percentage point reduction in nominal GDP growth is significant, as this is tantamount to reducing real growth by the same amount. Such a reduction would imply that real GDP growth would fall to around 1 percent per year.

[69] This case is looked at below, but is less likely to occur in South Africa. The implicit assumption in the revenue projections is that the authorities continue to boost revenue through administrative improvements and use the extra revenue to finance tax reductions such that the revenue-to-GDP ratio stays constant. Following this logic, a decline in revenue buoyancy related to slower growth would translate into fewer tax cuts rather than a lower revenue-to-GDP ratio (see appendix).

rate by 2 percentage points, which is assumed to cause a permanent reduction of 0.7 percent of GDP in the primary surplus. Even with these assumptions, the debt ratio would still be well below 50 percent of GDP by 2012/13, and be roughly equivalent to the ratios prevailing in the mid-1990s. The steadily increasing debt ratio suggests that there would be a need for some fiscal adjustment. However, even if adjustment was postponed to the end of the projection period, a 1 percent of GDP consolidation in the primary balance would be sufficient to put the debt ratio back on a steadily declining path (even with growth remaining at the lower level).

112. Finally, the debt-dynamics are not overly sensitive to assumptions regarding the exchange rate. This stems from the relatively small share of foreign currency debt; at end 2001/02 it accounted for less than 20 percent of total debt. Assuming that the real effective exchange rate depreciates by 5 percent per year—rather than staying constant—results in only a modest increase in the 2012/23 debt ratio (Figure VI.6). While the sensitivity of the results clearly depends on assumptions about the composition of future financing and the degree of depreciation, exchange rate movements would not appear to be a significant concern at this juncture.

D. Conclusions

113. The debt dynamics in South Africa are manageable and should remain so even if there are adverse macroeconomic and fiscal developments. This outlook largely derives from the strength of South Africa's present fiscal position. Even with the relaxation envisaged in 2002/03 budget, the primary surplus is set to remain at just under 2½ percent of GDP. With the debt ratio at around 40 percent of GDP, such a primary surplus is more than sufficient to ensure a declining debt ratio. Moreover, the position is such that even long lasting adverse macroeconomic shocks could be weathered with little to no need for future fiscal adjustment. These results, however, are predicated on South Africa maintaining its fiscal prudence.

Technical Appendix

114. This appendix discusses the coverage of the government sector, the sources of data, and provides more details on the projections and sensitivity analyses.

Coverage and data

115. The analysis focuses on the national government main budget. Other parts of the government sector, such as the social security funds, extrabudgetary institutions, provincial, and municipal governments are excluded. Of these, however, only the municipal governments have outstanding debt and the amount, at around 2 percent of GDP, is not that large. Going forward, the provincial governments may also begin to borrow, but there are tight restrictions on such borrowing and over the medium-term neither provincial nor municipal government borrowing is likely to be a major source of fiscal vulnerability for the national government.

116. The nonfinancial public enterprises are also excluded from the projections as are contingent liabilities. The main contingent liabilities are government guaranteed debt, which, as of end-March 2002, amounted to 7 percent of GDP. These guarantees are almost exclusively to either public enterprises or other parts of the government sector. Although not a contingent liability, the balance on the Gold and Foreign Exchange Contingency Reserve Account is also excluded—at end-March 2002 the balance was around 3 percent of GDP.[70] Regarding the nonfinancial public enterprises, while they can and have borrowed, their net borrowing requirement has actually been negative in the past few years.

117. Most of the borrowing activity of the recent past has been by the national government, a trend that is projected to continue over the medium-term framework included in the budget. In 1999/2000 and 2000/01 the public sector borrowing requirement (PSBR) was actually smaller than that of the national government, as the other public sector entities have negative borrowing requirements (see Table VI.1). Looking forward, the borrowing requirements of the other levels of government are projected to remain quite small, suggesting that debt accumulation outside of the national government is not expected to be significant. This further underscores the appropriateness of concentrating the analysis on the national government.

[70] The balance is periodically settled by the government issuing bonds to the South African Reserve Bank.

Projection details

118. The baseline scenario serves as the reference point for the subsequent scenarios and thus is where most of the key assumptions are made. The macroeconomic and fiscal assumptions are set out in Table VI.5. Nominal GDP growth is projected to gradually decline, due mainly to a projected decline in inflation. Consistent with what would likely be the concomitant fall in nominal interest rates, the average interest rate on outstanding debt is also projected to gradually decline. The average interest rate for 2002/03-04/05 was based on the projections in the medium term framework included in the Budget Review 2002. The gradual decline, therefore, is not projected to begin until 2005/06 onward.

Table VI.1. South Africa: Public Sector Borrowing Requirement, 1997/98-2004/05
(In percent of GDP)

	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
PSBR	4.5	3.5	0.6	0.9	1.2	1.4	1.6	1.7
National government	3.4	2.0	1.3	1.9	0.7	1.1	1.5	1.3
Local govts. and local enterprises	0.1	0.1	-0.3	-0.3	0.2	0.1	0.1	0.3
Non-financial public enterprises	0.2	1.2	-0.3	-0.6	0.3	0.0	0.0	0.1
Other	0.9	0.1	-0.2	-0.1	0.0	0.2	0.0	0.0

Sources: Budget Reviews 2001 and 2002; and staff estimates.

119. The fiscal projections are based on Budget Review 2002, which covers until 2004/05. From then onward, revenue, non-interest expenditure, and thus the primary balance are held constant at the 2004/05 shares of GDP. As noted in the text, these values are somewhat conservative based on recent history, but nonetheless, would seem to represent the authorities' revealed preference. Consistent with recent performance and the authorities' intention laid out in GEAR, the revenue ratio is kept below 25 percent of GDP. This would suggest that any revenue gains, say from administrative improvements, would be returned via lower tax rates—similar to what has happened in 2001/02 and 2002/03. As regards financing, it is assumed that 80 percent is domestic and the remaining 20 percent foreign from 2005/06 onwards. It is assumed, therefore, that there would be no further privatization proceeds—any further privatization proceeds would simply lower the borrowing requirement and therefore the debt ratio by a corresponding amount.

120. The details of most of the other scenarios are also presented in Table VI.5. The constant overall balance scenario and the high growth rate scenario are excluded to economize on space. Most of the details of the former are in Table VI.4, and the latter closely resembles the low interest rate scenario.

Table VI.2. South Africa: Fiscal Performance and Debt, 1991/92-2001/02
(In percent of GDP)

	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02
I. Fiscal indicators											
Revenue	22.7	21.8	21.8	22.6	22.3	23.0	23.3	24.4	24.2	23.6	24.8
Expenditure	27.1	30.1	30.9	27.6	26.8	27.6	27.1	26.7	26.1	25.7	26.3
o/w: Interest	4.0	4.3	4.7	4.9	5.2	5.3	5.5	5.7	5.4	5.1	4.8
Overall balance	-4.5	-8.4	-9.1	-5.1	-4.5	-4.6	-3.8	-2.3	-2.0	-2.0	-1.5
Primary Balance	-0.5	-4.0	-4.4	-0.2	0.7	0.7	1.8	3.4	3.4	3.1	3.3
Debt	33.2	38.3	42.9	48.3	49.6	48.5	48.0	48.2	46.5	43.8	43.3
Domestic	32.3	37.6	41.7	46.5	47.6	46.7	45.9	46.0	43.3	40.3	35.1
Foreign	0.9	0.6	1.2	1.8	1.9	1.8	2.1	2.2	3.1	3.5	8.1
II. Interest and growth (in percent)											
Average interest rate	...	14.5	14.2	12.7	12.2	12.0	12.6	12.7	12.2	12.1	11.9
Nominal GDP growth	...	10.7	16.3	12.3	13.4	12.8	10.1	7.7	8.9	11.0	9.6
Interest-growth differential 1/	...	3.4	-1.8	0.4	-1.0	-0.6	2.3	4.7	3.0	1.0	2.1
III. Contributions to debt											
Increase in the debt ratio	...	5.1	4.6	5.4	1.3	-1.1	-0.5	0.2	-1.7	-2.6	-0.6
Primary deficit	...	4.0	4.4	0.2	-0.7	-0.7	-1.8	-3.4	-3.4	-3.1	-3.3
Interest-growth	...	1.1	-0.7	0.2	-0.5	-0.3	1.1	2.2	1.4	0.5	0.9
Other (residual)	...	-0.1	0.9	5.0	2.5	0.0	0.2	1.3	0.3	0.0	1.8
Memorandum:											
GDP, FY basis (R billions)	344	381	443	497	564	636	700	754	821	912	999

Sources: Budget Reviews 2000, 2001, and 2002; staff estimates and calculations.

1/ Defined as the difference between the average interest rate and the nominal GDP growth rate, divided by one plus the nominal GDP growth rate (see text).

Table VI.3. South Africa: Fiscal Projections, 2002/03-2012/13
(In percent of GDP)

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
I. Baseline scenario											
Revenue	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Expenditure	26.7	26.4	26.3	26.0	25.8	25.7	25.5	25.3	25.2	25.1	24.9
Non-interest	22.2	22.2	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1
Interest	4.5	4.3	4.2	3.9	3.8	3.6	3.4	3.2	3.1	3.0	2.9
Overall balance	-2.2	-1.9	-1.8	-1.5	-1.3	-1.2	-1.0	-0.8	-0.7	-0.5	-0.4
Primary Balance	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Debt	40.0	39.2	37.2	36.1	35.2	34.2	33.2	32.0	30.7	29.4	28.1
Increase in the debt ratio	-3.2	-0.8	-2.0	-1.1	-0.9	-0.9	-1.1	-1.2	-1.2	-1.3	-1.3
Primary deficit	-2.3	-2.3	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Interest-growth	0.2	1.0	1.4	1.2	1.4	1.4	1.3	1.1	1.1	1.1	1.0
Other (residual)	-1.1	0.5	-0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
II. Constant overall balance											
Revenue	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Expenditure	26.7	26.7	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
Non-interest	22.2	22.5	22.5	22.8	22.9	23.0	23.1	23.1	23.1	23.1	23.1
Interest	4.5	4.3	4.2	4.0	3.9	3.8	3.7	3.6	3.6	3.6	3.6
Overall balance	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2
Primary Balance	2.3	2.0	2.0	1.7	1.6	1.6	1.5	1.4	1.4	1.4	1.4
Debt	40.0	39.5	37.7	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.4
Increase in the debt ratio	-3.2	-0.5	-1.8	-0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Primary deficit	-2.3	-2.0	-2.0	-1.7	-1.6	-1.6	-1.5	-1.4	-1.4	-1.4	-1.4
Interest-growth	0.2	1.0	1.4	1.3	1.5	1.5	1.4	1.3	1.3	1.3	1.3
Other (residual)	-1.1	0.5	-1.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Sources: Budget Review 2002; staff estimates and projections

Table VI.4. Selected Countries: Government Debt (In percent of GDP)

	General Government Gross Debt		General Government Net Debt	
	2001	10 year high	2001	10 year high
I. WEO Data				
Argentina	...	...	58.4	58.4
Brazil	59.1	59.1	55.8	55.8
Czech	...	...	18.8	18.8
Egypt	72.4	80.6	19.9	22.1
Estonia	...	...	4.6	8.0
Hungary	...	...	58.5	87.9
India	...	...	90.1	90.1
Korea	8.4	8.4	...	...
Latvia	15.2	15.2	15.2	17.0
Lebanon	169.6	169.6	160.9	160.9
Malaysia	66.8	66.8	...	...
Mexico	48.6	54.9	42.0	50.0
Poland	42.4	88.8	36.0	88.8
Median	53.9	63.0	42.0	55.8
II. OECD Data 1/				
Australia	26.2	43.3	11.8	27.3
Austria	61.5	69.2	46.1	50.5
Belgium	105.4	134.1	98.4	126.0
Canada	98.3	120.0	59.7	88.0
Denmark	46.2	83.8	22.8	46.2
Finland	42.1	58.0	-35.8	-13.3
France	64.9	65.0	42.2	42.6
Germany	60.9	63.2	41.5	45.4
Greece	99.8	111.3	n.a.	...
Iceland	46.4	59.3	27.3	39.7
Ireland	32.1	93.6	32.1	93.6
Italy	107.7	124.0	95.5	110.7
Japan	132.0	132.0	58.7	58.7
Korea	17.5	19.8	-32.9	-15.2
Luxembourg	4.5	6.2	n.a.	...
Netherlands	53.9	77.6	40.9	55.3
New Zealand	43.0	70.6	19.4	48.0
Norway	27.1	40.8	-70.8	-31.2
Portugal	52.8	64.2	52.8	64.2
Spain	71.4	86.9	39.9	56.6
Sweden	56.2	77.9	4.2	22.7
United Kingdom	52.2	61.4	30.5	41.9
United States	57.6	75.8	41.1	59.7
Median	53.9	70.6	39.9	48.0

Sources: OECD and WEO.

1/ The OECD series used are general government gross and net financial liabilities.

Table VI.5. South Africa: Debt Projection Assumptions, 2002/03-2012/13 (In percent of GDP, unless otherwise noted)

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
I. Baseline scenario and assumptions											
Revenue	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Expenditure	26.7	26.4	26.3	26.0	25.8	25.7	25.5	25.3	25.2	25.1	24.9
Non-interest	22.2	22.2	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1
Interest	4.5	4.3	4.2	3.9	3.8	3.6	3.4	3.2	3.1	3.0	2.9
Overall balance	-2.2	-1.9	-1.8	-1.5	-1.3	-1.2	-1.0	-0.8	-0.7	-0.5	-0.4
Financing	2.2	1.9	1.8	1.5	1.3	1.2	1.0	0.8	0.7	0.5	0.4
Domestic	-0.7	1.3	2.2	1.2	1.1	0.9	0.8	0.6	0.5	0.4	0.3
External	1.6	0.9	-1.5	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1
Other	1.3	-0.3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross loan debt	40.0	39.2	37.2	36.1	35.2	34.2	33.2	32.0	30.7	29.4	28.1
Domestic	30.9	29.7	29.7	28.8	28.0	27.1	26.2	25.2	24.2	23.1	22.0
Foreign	9.1	9.5	7.5	7.3	7.2	7.1	6.9	6.8	6.6	6.4	6.1
Memorandum items:											
Primary deficit	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Nominal GDP growth (percent change)	11.2	8.8	7.8	7.8	7.0	6.7	6.7	6.7	6.7	6.7	6.7
Average interest rate on debt (percent)	11.7	11.6	11.6	11.4	11.1	10.9	10.6	10.4	10.4	10.4	10.3
Domestic interest rate (percent) 1/	12.0	12.0	12.0	11.8	11.5	11.3	11.0	10.8	10.8	10.8	10.8
Foreign interest rate (percent) 1/	10.0	10.0	10.0	9.8	9.5	9.3	9.0	8.8	8.8	8.8	8.8
Interest-growth differential (percent)	0.4	2.5	3.5	3.3	3.9	3.9	3.7	3.4	3.4	3.4	3.4
Increase in debt (percentage points)	-3.2	-0.8	-2.0	-1.1	-0.9	-0.9	-1.1	-1.2	-1.2	-1.3	-1.3
Interest-growth factor	0.2	1.0	1.4	1.2	1.4	1.4	1.3	1.1	1.1	1.1	1.0
Primary balance	-2.3	-2.3	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Other	-1.1	0.5	-0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
II. Low growth and lower revenue											
Revenue	23.8	23.8	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9
Expenditure	26.8	26.6	26.6	26.5	26.5	26.5	26.4	26.4	26.5	26.6	26.6
Non-interest	22.2	22.2	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1
Interest	4.6	4.4	4.6	4.4	4.4	4.4	4.4	4.3	4.4	4.5	4.6
Overall balance	-3.0	-2.8	-2.8	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.7	-2.8
Financing	3.0	2.8	2.8	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.8
Domestic	-0.9	1.9	3.5	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2
External	2.2	1.3	-2.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6
Other	1.8	-0.4	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross loan debt	41.0	41.8	40.8	41.3	42.1	42.9	43.7	44.5	45.2	46.1	46.9
Domestic	31.3	31.1	32.9	33.2	33.7	34.3	34.8	35.3	35.9	36.4	37.0
Foreign	9.8	10.7	7.9	8.1	8.4	8.6	8.9	9.1	9.4	9.6	9.9
Memorandum items:											
Primary deficit	1.6	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Nominal GDP growth (percent change)	9.2	6.8	5.8	5.8	5.0	4.7	4.7	4.7	4.7	4.7	4.7
Average interest rate on debt (percent)	11.7	11.6	11.5	11.4	11.1	10.9	10.6	10.4	10.4	10.4	10.4
Domestic interest rate (percent) 1/	12.0	12.0	12.0	11.8	11.5	11.3	11.0	10.8	10.8	10.8	10.8
Foreign interest rate (percent) 1/	10.0	10.0	10.0	9.8	9.5	9.3	9.0	8.8	8.8	8.8	8.8
Interest-growth differential (percent)	2.3	4.4	5.4	5.3	5.9	5.9	5.7	5.4	5.4	5.4	5.4
Increase in debt (percentage points)	-2.2	0.8	-1.0	0.5	0.8	0.8	0.8	0.7	0.8	0.8	0.9
Interest-growth factor	1.0	1.8	2.3	2.2	2.4	2.5	2.4	2.4	2.4	2.5	2.5
Primary balance	-1.6	-1.7	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8
Other	-1.6	0.6	-1.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
III. Real exchange rate depreciation											
Revenue	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Expenditure	26.8	26.5	26.4	26.1	26.0	25.8	25.7	25.5	25.4	25.3	25.3
Non-interest	22.2	22.2	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1
Interest	4.6	4.3	4.3	4.0	3.9	3.7	3.6	3.4	3.3	3.3	3.2
Overall balance	-2.3	-2.0	-1.8	-1.6	-1.4	-1.3	-1.2	-1.0	-0.9	-0.8	-0.7
Financing	2.3	2.0	1.8	1.6	1.4	1.3	1.2	1.0	0.9	0.8	0.7
Domestic	-0.7	1.3	2.3	1.3	1.2	1.0	0.9	0.8	0.7	0.7	0.6
External	1.6	0.9	-1.6	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1
Other	1.3	-0.3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross loan debt	40.2	39.6	37.9	37.1	36.6	36.0	35.3	34.4	33.6	32.7	31.8
Domestic	30.9	29.7	29.9	29.0	28.2	27.5	26.7	25.8	24.9	24.0	23.1
Foreign	9.3	9.9	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.7	8.7
Memorandum items:											
Primary deficit	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Nominal GDP growth (percent change)	11.2	8.8	7.8	7.8	7.0	6.7	6.7	6.7	6.7	6.7	6.7
Average interest rate on debt (percent)	11.7	11.7	11.6	11.4	11.2	10.9	10.6	10.4	10.4	10.3	10.3
Domestic interest rate (percent) 1/	12.0	12.0	12.0	11.8	11.5	11.3	11.0	10.8	10.8	10.8	10.8

Table VI.5 (continued). South Africa: Debt Projection Assumptions, 2002/03-2012/13 (In percent of GDP, unless otherwise noted)

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
IV. High interest rate											
Revenue	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Expenditure	27.5	27.2	27.2	26.9	26.8	26.7	26.6	26.5	26.4	26.4	26.4
Non-interest	22.2	22.2	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1
Interest	5.3	5.0	5.1	4.8	4.7	4.6	4.5	4.4	4.4	4.3	4.3
Overall balance	-3.0	-2.7	-2.6	-2.4	-2.3	-2.2	-2.1	-2.0	-1.9	-1.9	-1.8
Financing	3.0	2.7	2.6	2.4	2.3	2.2	2.1	2.0	1.9	1.9	1.8
Domestic	-0.9	1.8	3.3	1.9	1.8	1.7	1.7	1.6	1.5	1.5	1.5
External	2.2	1.3	-2.3	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4
Other	1.8	-0.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross loan debt	40.3	40.4	38.7	38.3	38.2	38.1	37.9	37.6	37.3	37.0	36.6
Domestic	30.7	30.0	31.1	30.7	30.6	30.4	30.2	29.8	29.5	29.2	28.8
Foreign	9.7	10.4	7.6	7.6	7.6	7.7	7.8	7.8	7.8	7.8	7.8
Memorandum items:											
Primary deficit	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Nominal GDP growth (percent change)	11.2	8.8	7.8	7.8	7.0	6.7	6.7	6.7	6.7	6.7	6.7
Average interest rate on debt (percent)	13.7	13.6	13.5	13.4	13.1	12.9	12.6	12.4	12.4	12.4	12.4
Domestic interest rate (percent) 1/	14.0	14.0	14.0	13.8	13.5	13.3	13.0	12.8	12.8	12.8	12.8
Foreign interest rate (percent) 1/	12.0	12.0	12.0	11.8	11.5	11.3	11.0	10.8	10.8	10.8	10.8
Interest-growth differential (percent)	2.3	4.4	5.3	5.2	5.8	5.8	5.6	5.3	5.3	5.3	5.3
Increase in debt (percentage points)	-2.9	0.0	-1.7	-0.3	-0.1	-0.1	-0.2	-0.3	-0.3	-0.3	-0.4
Interest-growth factor	1.0	1.8	2.1	2.0	2.2	2.2	2.1	2.0	2.0	2.0	2.0
Primary balance	-2.3	-2.3	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Other	-1.6	0.6	-1.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
V. Low interest rate											
Revenue	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Expenditure	26.0	25.7	25.5	25.2	25.0	24.8	24.6	24.3	24.2	24.0	23.9
Non-interest	22.2	22.2	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1
Interest	3.8	3.5	3.4	3.1	2.9	2.7	2.5	2.3	2.1	2.0	1.8
Overall balance	-1.5	-1.2	-0.9	-0.7	-0.5	-0.2	0.0	0.2	0.3	0.5	0.6
Financing	1.5	1.2	0.9	0.7	0.5	0.2	0.0	-0.2	-0.3	-0.5	-0.6
Domestic	-0.5	0.8	1.2	0.5	0.4	0.2	0.0	-0.1	-0.3	-0.4	-0.5
External	1.1	0.6	-0.8	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1
Other	0.9	-0.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross loan debt	39.7	38.0	35.8	34.0	32.3	30.6	28.8	26.9	25.0	23.0	21.0
Domestic	31.2	29.4	28.5	26.9	25.6	24.2	22.7	21.1	19.5	17.9	16.3
Foreign	8.5	8.6	7.3	7.0	6.8	6.5	6.2	5.8	5.5	5.1	4.7
Memorandum items:											
Primary deficit	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Nominal GDP growth (percent change)	11.2	8.8	7.8	7.8	7.0	6.7	6.7	6.7	6.7	6.7	6.7
Average interest rate on debt (percent)	9.7	9.6	9.6	9.4	9.1	8.9	8.6	8.3	8.3	8.3	8.3
Domestic interest rate (percent) 1/	10.0	10.0	10.0	9.8	9.5	9.3	9.0	8.8	8.8	8.8	8.8
Foreign interest rate (percent) 1/	8.0	8.0	8.0	7.8	7.5	7.3	7.0	6.8	6.8	6.8	6.8
Interest-growth differential (percent)	-1.4	0.7	1.6	1.5	2.0	2.0	1.8	1.6	1.6	1.5	1.5
Increase in debt (percentage points)	-3.6	-1.7	-2.2	-1.8	-1.6	-1.7	-1.8	-1.9	-1.9	-2.0	-2.0
Interest-growth factor	-0.6	0.3	0.6	0.5	0.7	0.7	0.6	0.4	0.4	0.4	0.4
Primary balance	-2.3	-2.3	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Other	-0.7	0.3	-0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
VI. Low growth											
Revenue	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Expenditure	26.8	26.6	26.5	26.3	26.2	26.2	26.1	26.0	25.9	25.9	25.9
Non-interest	22.2	22.2	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1
Interest	4.6	4.4	4.5	4.2	4.2	4.1	4.0	3.9	3.9	3.8	3.8
Overall balance	-2.3	-2.1	-2.0	-1.8	-1.7	-1.6	-1.5	-1.4	-1.4	-1.4	-1.4
Financing	2.3	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.4	1.4	1.4
Domestic	-0.7	1.4	2.5	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.1
External	1.7	1.0	-1.7	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Other	1.4	-0.3	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross loan debt	40.8	40.8	39.5	39.2	39.2	39.2	39.1	39.0	38.7	38.5	38.3
Domestic	31.5	30.9	31.7	31.4	31.3	31.2	31.0	30.8	30.6	30.3	30.1
Foreign	9.3	9.9	7.8	7.9	7.9	8.0	8.1	8.1	8.2	8.2	8.2
Memorandum items:											
Primary deficit	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Nominal GDP growth (percent change)	9.2	6.8	5.8	5.8	5.0	4.7	4.7	4.7	4.7	4.7	4.7
Average interest rate on debt (percent)	11.7	11.6	11.6	11.4	11.1	10.9	10.6	10.4	10.4	10.4	10.4
Domestic interest rate (percent) 1/	12.0	12.0	12.0	11.8	11.5	11.3	11.0	10.8	10.8	10.8	10.8

References

Ball, Laurence, Douglas W. Elmendorf, and N. Gregory Mankiw, 1998, "The Deficit Gamble," *Journal of Money, Credit, and Banking 30* (1998), pp. 699–720.

Chalk, Nigel, and Richard Hemming, 2000, "Assessing Fiscal Sustainability in Theory and Practice," IMF Working Paper 00/81 (Washington: International Monetary Fund).

Fischer, Stanley, and William Easterly, 1990, "The Economics of the Government Budget Constraint," The World Bank Research Observer, Vol. 5, No. 2, pp. 127-142. (Washington: The International Bank for Reconstruction and Development/The World Bank).

VII. Determinants of Foreign Direct Investment in South Africa[71]

A. Introduction and Summary

121. Foreign direct investment (FDI) has played a considerable role in the development of South Africa's economy in the past. In more recent years, however, FDI has remained at relatively low levels compared to other emerging market countries. Despite improvements in macroeconomic conditions and South Africa's advantages in terms of natural resources and market size, foreign investors have shown limited interest in acquiring, creating, or expanding domestic enterprises. Annual FDI inflows to South Africa averaged less than 1 percent of GDP during 1994-2000, compared with 3-5 percent in a group of comparator countries (listed in Box VII.1).

122. It is generally considered that foreign investment can act as a catalyst for investment and economic development in South Africa. The significance of FDI for engendering growth was particularly stressed in the Growth, Employment and Redistribution Strategy (1996) and has been reiterated in official statements since then. As private investment has been inhibited by South Africa's low saving rates, foreign investment can help address the saving deficiency and promote economic growth. The role of FDI is also buttressed by developments in the growth literature that highlight the dependence of growth on the rate of technological progress and the empirical belief that FDI, by triggering a diffusion of new technologies and management practices to host countries, can support a faster pace of economic growth. Borensztein, de Gregorio, and Lee (1995), McMillan (1999), and Mody and Murshid (2002) show that FDI can "crowd-in" domestic investment as efficiency spillovers make private investment more profitable.

123. In addition to its positive impact on growth, FDI has been presented as a vehicle for strengthening South Africa's international reserves. In its recent report, Standard & Poor's underscores the need to improve the country's ability to attract FDI to allow for a sustained improvement in South Africa's weak external position. In recent years, the South African Reserve Bank (SARB), considering FDI resilient to swings in market sentiment, has used these flows to reduce the net open forward position (NOFP).[72] Market analysts have suggested that higher FDI levels could set the stage for the removal of the remaining capital controls.

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[71] Prepared by Athanasios Arvanitis.

[72] The empirical evidence for the relative volatility of FDI and other forms of capital is mixed. Claessens, Dooley, and Warner (1995) conclude that FDI can be as volatile as other types of flows. For South Africa, Nowak (2001) shows that, while FDI is less volatile than other capital flows, it does not exhibit any persistence over time.

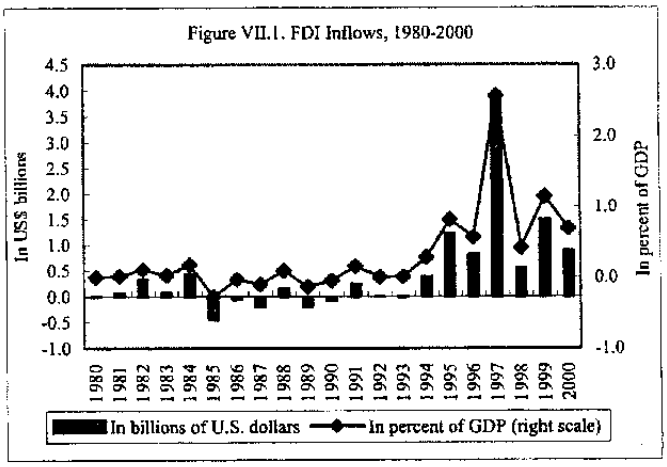
124. Given FDI's potentially important role to South Africa's economy, this section seeks to:

- describe historical trends and characteristics of FDI to South Africa;
- compare South Africa with a group of countries with similar credit characteristics to put South Africa's FDI position in perspective; and
- discuss a simple framework to examine factors that are empirically important in attracting FDI to emerging market countries and derive implications for South Africa.

B. Trends and Characteristics of FDI

FDI in South Africa

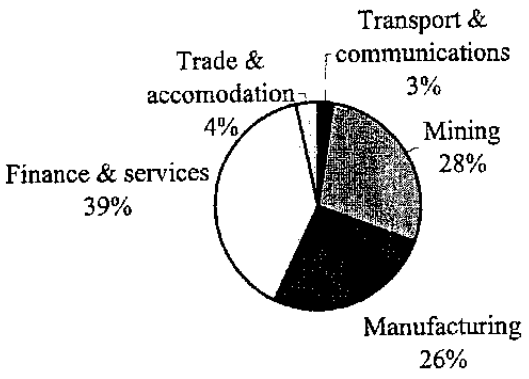
125. Over the last 20 years, South Africa has attracted very little foreign investment (Figure VII.1). For much of the time, this was due to political developments. The imposition of trade and financial sanctions on South Africa in the mid-1980s, the subsequent financial crisis, the implementation of capital controls, and the moratorium on payments to external creditors effectively cut off South Africa from the international capital markets. Cumulative FDI inflows in 1980-93 amounted to just over US$0.3 billion. After 1993, FDI increased significantly and peaked at about 2.5 percent of GDP in 1997 (largely due to the partial sale of Telkom). However, FDI has not been persistent, averaging just under 1 percent of GDP during 1994-2000.



126. In terms of sectoral distribution, the FDI inflows have been relatively diversified. Contrary to what one would expect, the role of natural resources is less important, despite South Africa's large mineral reserves.[73] Nonmining activities have drawn more than 70 percent of the FDI inflows, suggesting that the main aim of foreign investment in South Africa has been to capture domestic and regional markets (Figure VII.2.).

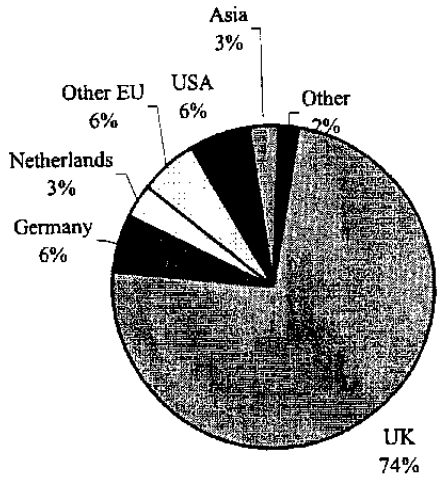
[73] In contrast, more than 60 percent of FDI in Africa is allocated to oil and natural resources, (UN Conference for Trade and Development (UNCTAD) estimates).

Figure VII.2. FDI by Sector

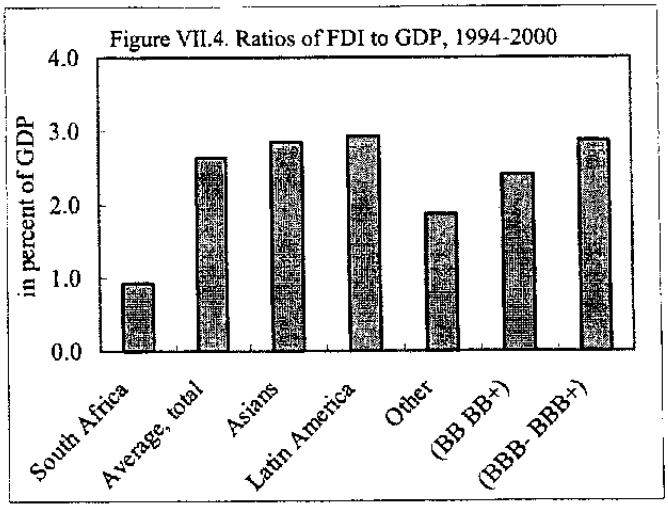


127. The European Union has been the largest investor accounting for about 90 percent of total FDI inflows. Investment from the United Kingdom outstrips investment from any other country and account for three-fourths of the total (Figure VII.3). The United States and Asian countries complete the list of investors in South Africa.

Figure VII.3. FDI by Origin



128. In terms of the forms of FDI, a large part is investment in existing assets. Cross border mergers and acquisitions are increasingly prominent, accounting for more than 60 percent of total.[74] The restructuring and divestiture of state assets continue to be important levers to attract FDI, as evidenced by the partial sale of Telkom in 1997 and South African Airways in 1999. "Greenfield" investment is relative uncommon in South Africa.[75]



Comparison with other countries

129. The reduction of macroeconomic imbalances in the last several years has helped South Africa capture some of the FDI flows to emerging markets. Notwithstanding recent trends, South Africa receives far less FDI than countries with broadly similar credit risk characteristics (Box VII.1). As a percent of GDP, South Africa receives about one-third of the flows to similar Asian or Latin American countries. South Africa also attracts less FDI than countries with a noninvestment credit rating (Figure VII.4).

130. Not surprisingly, FDI has added modestly to capital formation in South Africa. FDI as a share of gross fixed investment over the 1994-2000 period is under 6 percent, compared with about 10 percent in Asian countries and 14 percent in Latin America ones (Table VII.1). More important, the ratio of investment to GDP, at just 16 percent, is one of the lowest among the countries in the sample. Significantly higher investment rates are unlikely to be supported by future domestic savings. Private domestic savings declined from 16 percent of GDP in 1998 to under 14 percent in 2001. Total domestic savings remained broadly stable at about 15 percent of GDP, largely due to higher public savings. Public savings are unlikely to increase further in the future. Even if the recent decline in private savings is reversed, external capital is still likely to be needed to supplement the domestic savings required for higher investment and growth. To this end, the role of FDI both as a source of growth and source of capital is becoming increasingly important.

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[74] The more important mergers and acquisitions were the investment by Petronas' in Engen, Dow Chemicals' in Sentrachem, Coca Cola's in SA Bottling.

[75] Greenfield investment refers to investment executed in an area where no other company or production operations currently exist.

Box VII.1. Comparator Countries and Sovereign Credit Ratings

BBB+	Korea, Poland
BBB	China, Malaysia, Tunisia
BBB-	Egypt, Mexico, **South Africa**, Thailand
BB+	Uruguay
BB	Colombia, Costa Rica, Guatemala, India, Morocco, Panama, Philippines

Notes: Ratings are Standard & Poor's sovereign ratings for long-term currency risk as of April 2002. The list excludes newly independent European countries, owing to the unavailability of data prior to 1992, and oil-producing small countries.

C. Determinants of FDI

131. The theoretical foundation of the location pattern of FDI is rather fragmented. Several theories have been put forward to explain FDI based on corporate strategies and investment decisions of firms facing worldwide competition and in the context of choosing to operate in a foreign location instead of exporting or entering into a licensing agreement with a local producer.[76] Shatz and Venables (2000) use two types of distinct theoretical models: a horizontal FDI model, in which the motive for FDI is to reduce the cost involved in supplying the market (domestic market-oriented flows), and a vertical FDI model, where the motive is to take advantage of the low cost of production in a particular location (export-oriented flows). Both horizontal and vertical FDI models explain that FDI tends to cluster around a certain location (agglomeration) as linkages among firms create incentives for them to locate close to each other.

132. These models as well as Lim (2001) and Basu and Srinivasan (2002) suggest that five broad categories of factors are important for influencing FDI. These comprise market demand and size, agglomeration infrastructure, cost-related locational factors, the investment environment, and country risk. Box VII.2 indicates variables that have been used in the literature to proxy these factors.

Empirical methodology

133. Within this framework, a panel data analysis is adopted to examine the determinants of FDI. The panel covers 17 countries over the 1984-99 period. The data sources are the

[76] A summary of the recent literature on FDI is included in Lim (2001).

IMF's WEO/IFS databases and the World Bank's World Development Indicators database. As discussed above, the country size is determined by the number of countries with a sovereign credit rating between BB and BBB+ in early 2002. The dependent variable is the ratio of gross FDI to GDP.

134. Two types of equations are estimated, one using the full sample of annual data, and one with three-year averages to explore longer-run relations. The equations are estimated using both OLS with the White correction for heteroschedasticity and with generalized least squares (GLS) estimation, allowing for fixed effects in the cross section. A fixed-effects estimation allows for country-specific factors to drive FDI in individual countries; these effects are captured in the respective intercepts of the equations. Overall, a relatively large share of the variation in FDI can be explained by a small number of factors (Table VII.2). The results are fairly robust across the two specifications (three-year and annual data). As expected, the GLS approach, which adjusts for group wise heteroschedasticity, gives stronger results.

Box VII.2. Possible Determinants of FDI

Factors	Proxies Used
Market demand and market size	GDP per capita Population GDP growth
Agglomeration	Infrastructure (highway per square kilometer, telephone lines) Degree of industrialization (domestic investment) Level of foreign investment (cumulative FDI)
Cost-related locational factors	Dollar wages, unit labor costs, quality of labor Cost of capital (lending rates) Foreign exchange rate Level of taxation
Investment environment	Openness (trade)
Country risks	Political risk index Financial risk index

135. The GDP growth rate was used to proxy for potential market demand and the log of GDP per capita to proxy for market size. To avoid endogeneity problems (a larger market size may attract FDI that increases GDP) we lagged these variables by one period.[77] The results showed that countries with high growth rates tended to attract more FDI. Given the relative persistence in growth rates, firms observing high growth rates could expect high future growth rates and thus establish their presence in fast-growing countries. The GDP per capita variable had negative effects on FDI. This outcome was unexpected and probably due to the specific country sample. Nonetheless, some studies have used the inverse of per capita GDP as a proxy for the return to capital (the return on capital is higher in capital-scarce countries, which tend to be poor).[78] In this context, per capita GDP can be expected to be inversely related to FDI.[79]

136. Agglomeration factors and infrastructure development were proxied by telephone lines per 1,000 people. Across all equations, the impact is positive and significant, indicating that the quality of infrastructure is a dominant factor influencing FDI.

137. Cost-related location factors were captured by a labor quality variable. Two reasons motivated this decision. First, data on wages were not available for many countries. Second, recent studies have shown that although raw labor costs are not a significant attractor of FDI, labor quality is.[80] We proxied labor quality by illiteracy rates, and they were inversely related to FDI.

138. We used the ratio of tax revenue to GDP to proxy fiscal burden. As expected, the coefficient was negative and significant.

139. The variability of the real exchange rate is expected to influence the choice for location of the production of a multinational company. The conventional belief is that exchange rate volatility affects sales and, influences the location decision of firms that want to capture/serve domestic markets.[81] The standard deviation of the level of the real effective exchange rate (REER) and of the change in the REER were used to measure exchange rate variability in the regressions. The first definition proved to be significant and had a positive effect on FDI.

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[77] Lagged values are also indicative of information available to market participants.

[78] Asiedu (2002).

[79] The inverse relationship may also reflect a perception that investment risk rises as per capita GDP declines.

[80] Lim (2001).

[81] Golgberg and Kolstad (1994).

140. The degree of trade openness is positively and significantly correlated with FDI, supporting the arguments that trade liberalization, by reducing trade and administrative barriers, improves the business environment and attracts FDI.

141. Country risk, as proxied by the International Country Risk Guide (ICRG) or the Investment Profile index, had mixed results and was not significant in several equations. This is hardly surprising, since the sample consists of countries with similar risk ratings.

D. Implications for South Africa

142. Several conclusions emerge from the analysis:

- Given South Africa's low levels of domestic savings and investment, higher FDI inflows are critical to spur growth.

- The degree of infrastructure development, trade liberalization, skills availability, and potential market size are among the important factors for determining FDI in a group of countries comparable to South Africa.

- South Africa has some room to go before it reaches the performance of comparator countries. Table VII.3 indicates that South Africa has lower rates of growth, less trade openness, less deep telecommunication infrastructure, weaker labor skills, and uncompetitive taxation. In part, this explains why South Africa scores below other countries in cross-country FDI comparisons.

- The empirical analysis also suggests that fixed effects for South Africa are significant and negative. This suggests that other omitted factors, unique to South Africa are important in influencing firms' investment decisions. The statistically significant negative value of the intercept in South Africa's equation implies that other factors reduce the ratio of FDI to GDP by 1.0-1.5 percentage points relative to other countries.

- Recent business surveys have identified crime as the leading constraint on investment, followed by the cost of capital, labor regulations, and skills shortages.[82] To the extent that these factors are perceived to be less of a problem in other countries, there would be perceived costs to investing in South Africa and would be reflected in the negative fixed effects coefficient.

143. The authorities recently announced a comprehensive industrial strategy to promote investment in an environment of macroeconomic stability. This strategy includes initiatives to address the skills shortage in South Africa and accelerate the implementation of the

[82] GJMC-World Bank Survey 1999, and World Business Environment Survey, 2000.

free trade agreements with the European Union and other Southern African Development Community (SADC) members. The empirical analysis presented here suggests that these measures go in the right direction, and that their timely implementation would have a positive impact on future FDI.

References

Asiedu, Elizabeth, 2002, "On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different?," *World Development*,Vol. 30, (January) pp. 107-19.

Basu, Anupam, and Krishna Srinivasan, 2002, "Foreign Direct Investment in Africa: Some Case Studies", IMF Working Paper 02/61 (Washington, International Monetary Fund).

Borensztein, Eduardo, Jose de Gregorio, and Jong-Wha Lee, 1995, "How Does Foreign Direct Investment Affect Economic Growth?," NBER, Working Paper No. 5057 (Cambridge, Massachusetts: National Bureau of Economic Research).

Claessens, Stijn, Michael Dooley, and Andrew Warner, 1995, "Portfolio Capital Flows: Hot or Cold?," HIID Working Paper No. 501 (Cambridge, Massachusetts: Harvard Institute for International Development).

Goldberg, Linda, and Charles Kolstad, 1994, "Foreign Direct Investment, Exchange Rate Variability and Demand Uncertainty," NBER, Working Paper No. 4815. (Cambridge, Massachusetts: National Bureau of Economic Research)

Lim, Ewe-Ghee, 2001, "Determinants of, and the Relation Between, Foreign Direct Investment and Growth: A Summary of the Recent Literature," IMF Working Paper 01/175. (Washington: International Monetary Fund)

McMillan, Margaret, 1999, "Foreign Direct Investment: Leader or Follower?," Discussions Paper Series No. 99-01 (Medford, Massachusetts: Department of Economics, Tufts University).

Mody, Ashoka, and Antu Murshid, 2002, "Growing Up with Capital Flows," IMF Working Paper 02/75 (Washington: International Monetary Fund).

Nowak, Michael, 2001, "The Volatility of Capital Flows in South Africa: Some Empirical Observations," Paper presented at the Bureau of Economic Research Conference (Stellenbosch, South Africa).

Shatz, Howard, and Anthony Venables, 2000, "The Geography of International Investment," World Bank Policy Research Working Paper No. 2338 (Washington: World Bank).

World Bank 2001, *Global Development Finance*, (Washington: World Bank).

Table VII.1. FDI as a Source of Capital, 1994-2000
(Averages, in percent)

	Total Investment/GDP	FDI/Total Investment	Private Investment/Total Investment
China	35.2	14.1	...
Colombia	18.9	14.8	61.1
Costa Rica	19.0	18.1	83.4
Egypt	19.9	5.6	71.3
Guatemala	15.3	6.8	82.7
India	23.8	2.4	70.3
Korea	32.9	2.4	83.4
Malaysia	34.9	16.3	63.4
Mexico	19.5	14.4	81.3
Morocco	21.9	6.9	85.6
Panama	24.3	29.1	82.1
Philippines	21.7	11.1	76.6
Poland	22.4	10.9	85.4
Thailand	31.6	11.7	67.5
Tunisia	25.1	9.2	81.2
Uruguay	14.3	5.7	78.1
Average, total	23.8	11.2	76.9
Average, Asia	30.0	9.7	72.2
Average, Latin America	18.5	14.8	78.1
Average, other	22.3	8.2	80.9
Average (BB-BB+)	19.9	11.9	77.5
Average (BBB-BBB+)	27.7	10.6	76.2
South Africa	15.9	5.8	84.1

Source: IMF, World Economic Outlook database.

Table VII.2. Regression Results --Dependent Variable: FDI as a Percent of GDP
(White heteroschedasticity-consistent *t*-statistics in parentheses)

	Based on Three-year Average				Based on Annual Data			
	GLS		GLS		GLS		OLS	
	coeff	*t*-stat	coeff	*t*-stat	coeff	*t*-stat	coeff	*t*-stat
Log GDP per capita, lagged	-0.0083	(-6.201)						
Growth, lagged			0.0347	(10.073)	0.0357	(7.801)	0.0406	(1.832)
Illiteracy ratio	-0.0003	(-7.138)	-0.0001	(-2.851)	-0.0001	(-3.491)	-0.0006	(-2.735)
REER volatility	0.0001	(9.269)	0.0001	(8.508)	0.0001	(4.929)	0.0000	(-0.019)
Trade openness	0.0333	(8.722)	0.0330	(11.107)	0.0294	(9.468)	0.0310	(3.931)
Tax revenue to GDP	-0.0166	(-5.624)	-0.0260	(-9.551)	-0.0207	(-6.208)	-0.0281	(-1.912)
Telephone lines per 1,000	0.0002	(12.901)	0.0001	(9.393)	0.0001	(16.477)	0.0001	(4.272)
Country risk, ICRG	0.0003	(0.707)			0.0006	(2.087)	0.0022	(0.922)
Constant, South Africa	-0.0095	(-3.701)	-0.0149	(-6.123)	-0.0152	(-5.903)	-0.0090	(-0.661)
Adj R^2	0.44		0.46		0.45		0.46	
Number of observations	102		102		272		272	
DW	1.82		1.81		1.26		0.95	

Table VII.3. Differences Between South Africa and Comparator Countries
(Averages over 1994-99)

Variables	South Africa	Average, Asia	Average, Lat-Am.	Average, Others	Avg (BB-BB+)	Avg (BBB-BBB+)
GDP per capita (in US$ dollars)	3,291	3,079	3,523	1,982	2,527	3,415
GDP growth rate	0.03	0.06	0.04	0.05	0.04	0.05
Openess to trade ratio	0.47	0.86	0.53	0.60	0.57	0.77
Tax to GDP ratio	0.28	0.20	0.23	0.31	0.22	0.25
Phones per 1,000 population	109	129	133	90	99	143
Illiteracy rate (in percent)	16.03	15.34	11.53	33.89	20.62	16.48

VIII. Sovereign Risk Spreads Under Inflation-Targeting[83]

144. Sovereign risk spreads have become an important and widely used indicator for assessing macroeconomic conditions and the external vulnerability of emerging market countries. Understanding the determinants of sovereign risk spreads is also an important prerequisite for designing and implementing economic policies aimed at reducing debt service payments and smoothing the path of public expenditure by sustaining or enhancing access to capital markets. In addition, risk spreads are a key determinant of long-term interest rates. Therefore, the information these spreads provide about financial markets' perceptions of economic policy can be beneficial for future economic policy decisions.

145. During past episodes of emerging market crisis in South Africa and elsewhere, sharp currency depreciations have generally been accompanied by rising sovereign risk spreads.[84] In contrast, the sharp depreciation of the rand in late 2001 was accompanied by a narrowing of South African risk spreads. Hence, economic and financial market developments during the most recent depreciation raise questions about the usefulness of sovereign risk spreads as vulnerability indicators and their interpretation. Answering these questions requires an analysis of the determinants of South African risk spreads.

146. This section assesses the usefulness of sovereign risk spreads as a vulnerability indicator after the introduction of inflation targeting in South Africa in February 2000 and describes the implications for economic policy. An assessment of the determinants of sovereign risk spreads suggests that spreads reflect the performance of monetary policy vis-à-vis inflation targets. It also suggests that, with a credible commitment of the South African Reserve Bank (SARB) to its inflation target, rand-denominated spreads may, in fact, become a better indicator of vulnerability than U.S. dollar-denominated spreads.

147. After a brief review of the literature, the section compares the currency depreciations of 1998 and 2001 with regard to sovereign risk spreads behavior and the different macroeconomic responses. The section then takes a closer look at movements in sovereign risk spreads after the introduction of inflation targeting and empirically investigates the determinants of sovereign risk spreads in inflation-targeting countries, including South Africa. The last part of the section suggests implications for economic policy.

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[83] Prepared by Matthias Vocke.

[84] Currency depreciations increase the government's stock of foreign-currency-denominated debt in domestic currency terms, which raises the default risk. In consequence, buyers of foreign-currency-denominated sovereign bonds will expect higher yields, which are reflected in higher sovereign spreads.

A. Brief Review of the Literature

148. Most of the literature on the presence and determinants of sovereign risk spreads emerged during the past decade, motivated by financial crises in emerging market countries and in the European Monetary System (EMS). Previous research was largely focused on risk premia within currency unions, [85] due to both methodological problems in comparing risk premia across currencies and the relatively low level of foreign bond financing by emerging market countries. Alesina and others (1992) were among the first to present an analysis aimed at a truly international comparison of sovereign risk spreads. The study relates levels of public debt to sovereign risk premia through the emergence of a "confidence crisis" and finds some empirical evidence in support of its hypotheses among OECD countries, but the comparability of results for individual countries remains limited due to the measurement of sovereign risk spreads across national currencies.

149. The more recent availability of reliable time-series data on foreign-currency bond yields of emerging market countries has led to a larger number of studies on the determinants of sovereign risk spreads of these countries. Arora and Cerisola (2001) examine the sovereign risk spreads in several emerging market countries. They conclude that country-specific variables, such as net (or gross) foreign assets, public external debt, and fiscal deficits, explain a significant proportion of sovereign risk spread volatility. Studies by Eichengreen and Mody (1998), Kamin and von Kleist (1999), and Min (1998) obtain similar results.

150. Arora and Cerisola (2001) also find the stance and predictability of U.S. monetary policy to be an important determinant of sovereign risk spreads in emerging market countries. Their findings indicate that the level of U.S. interest rates has a direct positive effect on sovereign bond spreads. In contrast, earlier analyses by Dooley, Fernandez-Arias, and Kletzer (1996) and by Calvo, Leiderman, and Reinhart (1996) found a significant negative impact of industrial-country interest rates on sovereign risk spreads in emerging market countries, while Kamin and von Kleist (1999) found no significant impact at all.

151. Kamin and von Kleist (1999) find important regional differences in sovereign risk spreads of emerging market countries, even after controlling for risk and maturity. They include credit ratings to explain risk spreads on both bonds and loans and obtain significant results. However, other empirical results on the value of credit ratings in explaining sovereign risk spreads are mixed. While findings by Cantor and Packer (1996) provide empirical support for credit ratings assigned by both Standard & Poor's and Moody's as a determinant of sovereign risk spreads, other studies reached different conclusions. The infrequent change in sovereign credit ratings suggests that their value is limited for explaining changes in sovereign risk spreads on the basis of monthly data.

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[85] See, for example, Cottarelli and Mecagni (1990) or Goldstein and Woglom (1992).

B. Spread Behavior During the Currency Depreciations of 1998 and 2001

152. Spreads are most commonly and accurately measured as the difference in yields between U.S. dollar-denominated South African government bonds and U.S. Treasury bonds of similar maturity. The spread reflects different risk factors, including credit risk, portfolio risk,[86] and illiquidity risk. Since a debtor's share in the bond market and the liquidity of secondary market trading generally remain stable over shorter periods, the market's valuation of the default risk largely determines movements in spreads.[87] South Africa has issued four U.S. dollar-denominated bonds, with different maturities, that can be used to construct sovereign risk spreads. This analysis uses the bond maturing in 2017, as credit risk increases with time and the secondary market for this bond is sufficiently liquid.

153. South African spreads moved in opposite directions during the sharp depreciations of 1998 and 2001. They increased by almost 400 basis points between end-April and end-August 1998, while the rand depreciated by 28 percent in nominal terms against the U.S. dollar. In contrast, the rand depreciated by 26 percent against the U.S. dollar between end-September and end-December 2001, but U.S. dollar-denominated South African bond spreads narrowed by about 40 basis points (Figures VIII.1 and VIII.2). The two currency depreciations were also associated with very different macroeconomic outcomes.[88]

154. The fall in sovereign risk spreads during the 2001 currency depreciation reflects low and decreasing external vulnerability. Lower external vulnerability during 2001, compared with 1998, largely stemmed from the implementation of sound macroeconomic policies, in particular a significant reduction in the net open forward position (NOFP)—of more than two-thirds since December 2000—and strong fiscal performance.[89] During the 1998 currency depreciation, the high and increasing NOFP was a significant factor behind the increase in external vulnerability and sovereign risk spreads.[90]

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[86] The increase in expected returns that is associated with an increase in a debtor's share in global debt markets and bond portfolios and the resulting rebalancing of optimally-diversified portfolios is referred to as "portfolio risk".

[87] To exclude the effects of short-term distortions in secondary market prices of bonds, the analysis uses monthly averages to calculate spreads.

[88] See Box 2 in the Staff Report for the 2002 Article IV Consultation (SM/02/176) for a further comparison of the currency depreciations.

[89] The SARB's credible announcement that the NOFP would be reduced to zero by March 2003 has further improved financial markets' perceptions regarding South Africa's external vulnerability.

[90] Jonsson (2001) provides empirical evidence in support of this view.

Figure VIII.1. Nominal Rand/U.S. dollar Exchange Rate
(In percent change from beginning of year)

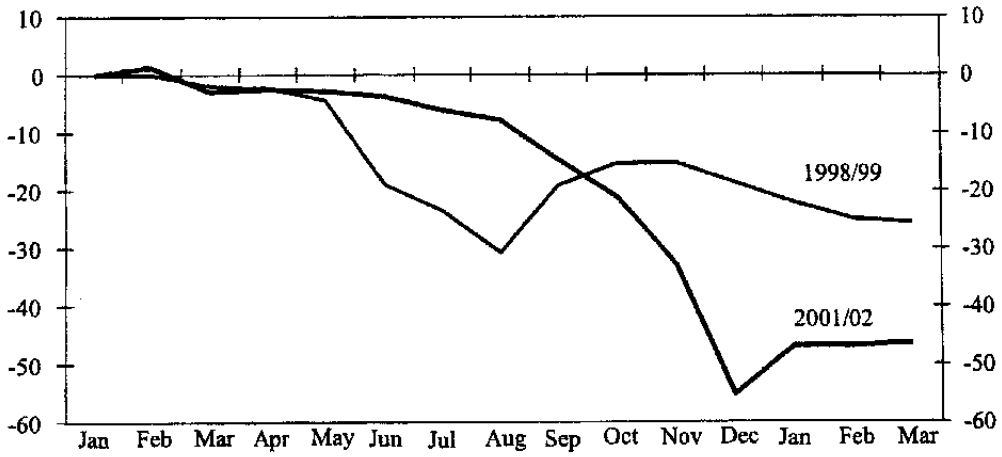
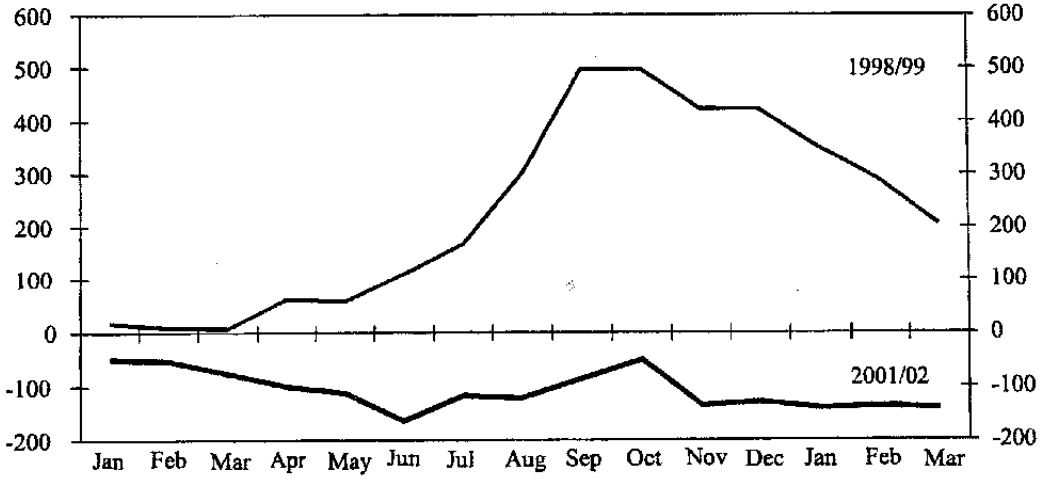


Figure VIII.2. Sovereign Risk Spreads
(In basis point change from beginning of year)



155. The shift in monetary policy from supporting exchange rate stability to committing to an inflation target has allowed for the significant reduction in the NOFP and the related decrease in external vulnerability. During the 1998 currency depreciation, the SARB used sterilized intervention to support the rand, leading to an increase in the NOFP from US$13 billion in April 1998 to US$23 billion in October 1998. Since committing itself to inflation as the primary target of monetary policy in February 2000 in the context of its inflation-targeting strategy, the SARB has refrained from supporting the rand. This change in policy has enabled the SARB to significantly reduce the NOFP from US$9 billion at end-March 2001 to less than US$3 billion at end-May 2002.

156. After the adoption of an inflation-targeting policy, changing risk perceptions may have been translated to a larger extent into exchange rate fluctuations and to a lesser extent into sovereign risk spread movements, suggesting a decline in the usefulness of U.S. dollar-denominated sovereign risk spreads as a vulnerability indicator. Evidence from average monthly volatilities, which are calculated as standard deviations, shows a significant increase in exchange rate volatility by 78 percent from the 1998 depreciation to the 2001 episode, while the volatility of sovereign bond spreads declined by 7 percent (Table VIII.1).

Table VIII.1. Developments in Exchange Rate and Sovereign Risk Spread Volatility

	Percentage Change in Average Volatility Between May–August 1998 and October–December 2001	Percentage Change in Average Volatility Between August 1997–January 2000 and February 2000–April 2002
Nominal exchange rate (R/US$)	+ 78.2	+ 48.8
Sovereign risk spread	- 7.1	+ 17.3

Sources: Datastream; and IMF staff calculations.

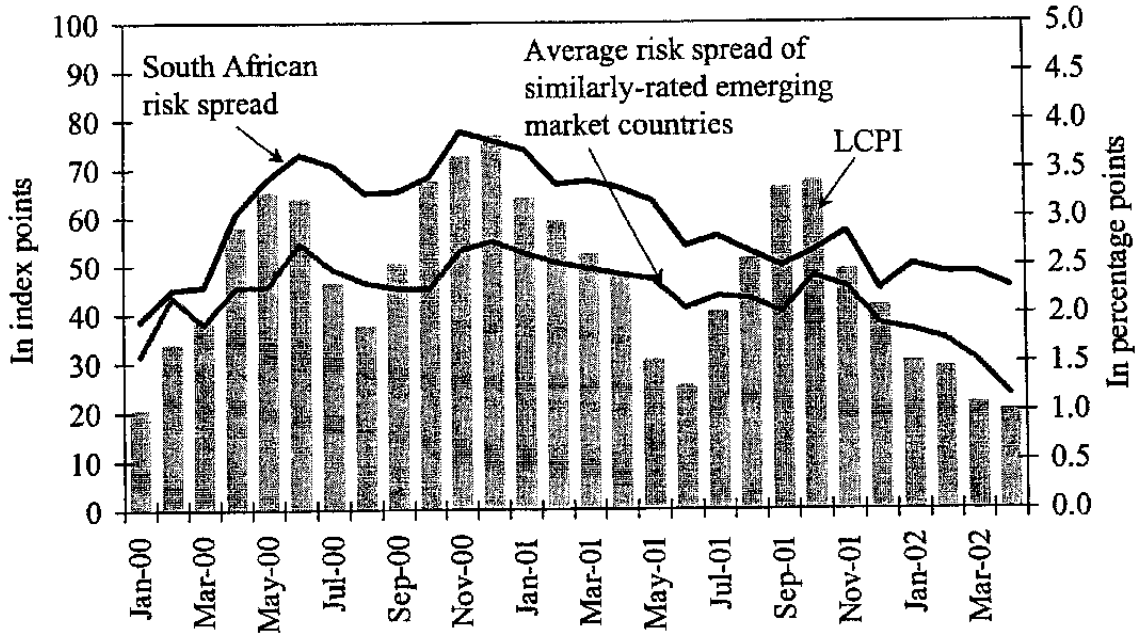
157. In sum, the decline in sovereign risk spreads during the currency depreciation of 2001—and in their volatility relative to the 1998 episode—suggests not only reduced vulnerability, but also a somewhat lower reliability of spreads as a vulnerability indicator after the introduction of a credible inflation targeting policy. This is because changing risk perceptions generally get reflected less in sovereign risk spreads when monetary policy becomes less discretionary, as binding monetary policy rules deprive governments of the

option of inflationary financing during episodes of financial distress.[91] If inflation is continuously kept at low rates within a defined target range, dampened inflation expectations will mitigate downward pressures on the nominal exchange rate that would otherwise raise sovereign risk spreads.

C. A Closer Look at the Sovereign Risk Premium

158. Movements in sovereign risk spreads of emerging market countries are highly correlated with changes in global risk aversion (Figure VIII.3). J.P. Morgan Chase's liquidity and credit premia index (LCPI) provides a comprehensive quantification of global risk aversion. It captures not only credit spreads, but also the liquidity premia demanded in U.S. financial markets,[92] which are considered to be an important indicator of risk appetite. It is, therefore, somewhat broader-based than other measures, such as, for example, an emerging market bond index.[93] Figure VIII.3 shows developments in the LCPI and in

Figure VIII.3. Global Risk Aversion and Sovereign Risk Spreads
(January 2000–April 2002)



[91] See Vocke (1999) for empirical evidence.

[92] These liquidity premia are calculated as the spread between the yields of U.S. Treasury bonds and U.S. swap rates.

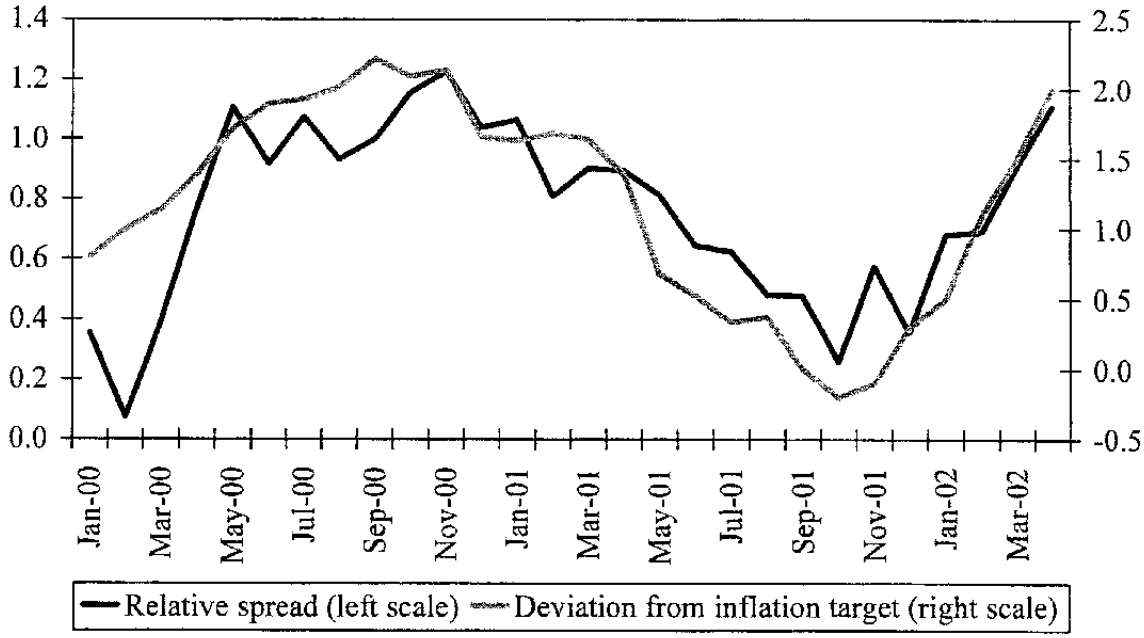
[93] See IMF (2001), p.5, for a detailed discussion of the LCPI.

sovereign risk spreads between January 2000 and April 2002. Spreads are shown for South Africa and for a group of emerging market countries with ratings similar to that for South Africa.[94]

159. South Africa's risk spread was higher than the average risk spread for the group of countries in the same rating category for the entire period shown in Figure VIII.3, and the difference between the two spreads varied considerably, ranging from 7 basis points in February 2000 to 122 basis points in November 2000. The difference between the spreads increased in particular at times of rising global risk aversion, except for the latest rise in the LCPI, during which the gap actually narrowed.

160. The credibility of South Africa's monetary policy—or, more precisely, the achievement of the inflation target—seems to be among the main forces driving movements in the gap between the spreads of South Africa and the peer group of countries (Figure VIII.4). Figure VIII.4 shows the evolution of the gap between the spreads and the deviation of the actual inflation outcome (CPIX) from the upper end of the target range of 3–6 percent for

Figure VIII.4. Inflation Performance and the Difference in Sovereign Risk Spreads, January 2000-April 2002
(In percentage points)

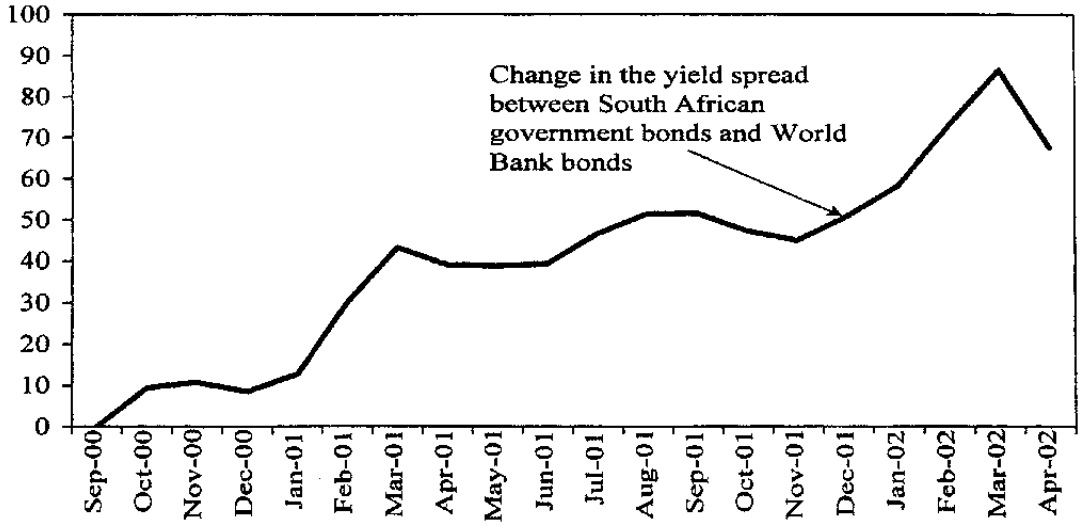


[94] South Africa is rated Baa2 by Moody's and BBB– by Standard & Poor's for its foreign-currency-denominated debt. The benchmark has been calculated as the unweighted average of sovereign yield spreads for Chile (Baa1; A–), Malaysia (Baa2; BBB), Mexico (Baa3, BB+), and Korea (Baa2; BBB+) for similar maturities.

2002.[95] Both series show considerable co-movements over the period from February 2000 (when inflation targeting was introduced) until April 2002. The high correlation of more than 0.7 between the inflation gap and the gap in sovereign risk spreads suggests that South Africa may be paying a premium—relative to similarly rated countries—on its U.S. dollar-denominated debt, as long as its monetary policy has not yet successfully implemented the new regime and actual inflation has not fallen into the defined target range.

161. As U.S. dollar-denominated spreads declined under the operation of the inflation-targeting regime, rand-denominated spreads may contain more information about sovereign default risks and external vulnerability. The assumption of a higher importance of rand-denominated spreads under inflation targeting stems largely from the loss of access to inflationary finance and, therefore, a higher risk of outright default.[96] Indeed, the average yield on South Africa's long-term rand-denominated government bonds increased by as much as 68 basis points relative to the yield of rand-denominated World Bank bonds between September 2000 and April 2002 (Figure VIII.5).[97]

Figure VIII.5. Rand-Denominated Sovereign Risk Spreads
(Basis point change since September 2000)



[95] Actual CPIX inflation (the consumer price index, excluding interest on mortgage bonds) is lagging by one month in Figure VIII.4 to take into account the delay in the publication of inflation numbers.

[96] Furthermore, South Africa's official external debt currently amounts to only about 8 percent of GDP, compared with official domestic debt of more than 30 percent of GDP.

[97] Data on World Bank rand-denominated yields before September 2000 are unavailable through Datastream.

162. Until January 2002, the World Bank Group paid a higher yield than the South African government on rand-denominated bonds, despite a significantly better credit rating for rand-denominated debt (World Bank: Aaa/AAA; South Africa: A2/A-). While South Africa may be better known to investors in the market for rand-denominated bonds than the World Bank and its bonds may have more liquid secondary markets, South Africa's relatively low financing cost may be explained by taking into account the greater possibility to resort to inflationary finance under the previous monetary policy regime of money-supply rules. With the implementation of the inflation-targeting framework, the relative yield spread has widened in favor of the World Bank, thereby better reflecting the credit ratings of the two debtors (Figure VIII.5).

D. Results on the Determinants of Sovereign Risk Spreads from Econometric Analysis

163. The econometric analysis uses panel data on four inflation-targeting countries[98] to conduct pooled regression analysis on the determinants of sovereign risk spreads, using monthly data on the LCPI, the gap between actual inflation and the targeted inflation rate, the ratio of reserves to imports, total external debt as a percentage of GDP, net foreign assets as a percentage of GDP, the fiscal balance as a percentage of GDP, and the credit rating assigned by rating agencies as explanatory variables. While the LCPI is used to proxy global risk aversion, the credit rating is supposed to capture the sum of country-specific risk components. The estimation period ranges from February 2000, when inflation targeting was introduced by the SARB, to December 2001.

164. The summary of estimation results shows that sovereign risk spreads under inflation targeting are driven by the gap between the actual inflation and the targeted rate of inflation, changes in global risk aversion, the ratio of reserves to imports, and credit ratings (Table VIII.2).[99] The results suggest that each percentage point by which actual inflation exceeds the target range is reflected in a rise in the sovereign risk premium of 13-15 basis points on average across the sample. Also, a one-month increase in the import coverage of international reserves lowers the spread considerably, by between 43 and 88 basis points, depending on the specification of the model. In contrast, a rise in global risk aversion by 10 LCPI index points leads to an increase in the risk premium by only about 1-2 basis points. Overall, the results suggest that the performance of monetary policy vis-à-vis its inflation

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[98] These countries include South Africa, New Zealand, Poland, and Thailand. Many other countries, such as Korea, Mexico, and Hungary have not been included in the panel, as these countries have moved to inflation targeting too recently or are just about to introduce it. For some other countries, such as Chile or the Czech Republic, no appropriate data on U.S. dollar-denominated spreads are available.

[99] The coefficients of other explanatory variables were not statistically significant and are not reported in Table VIII.2.

target is among the most important factors driving foreign-currency-denominated sovereign risk spreads.

165. Not surprisingly, many conventional determinants of sovereign risk spreads, such as external debt, net foreign assets, or the fiscal deficit as percentages of GDP have no explanatory power for sovereign risk spreads. The failure of these variables to influence U.S. dollar-denominated risk spreads over the sample period confirms the decline in usefulness of foreign-currency spreads as a vulnerability indicator under inflation targeting. At the same time, the *R*-squared values reported in Table VIII.2 suggest that fluctuations in the explanatory variables capture 77–90 percent of the volatility in sovereign risk spreads.

166. Changes in global risk aversion, as measured by the LCPI, are likely to affect mostly the sovereign risk spreads of the somewhat lower-rated emerging market countries in the sample, such as South Africa and Thailand. Pooled regression analysis allows to estimate individual coefficients for all countries in the sample. The estimation results are shown in the third column of Table VIII.2. They suggest that changes in global risk aversion had a statistically significant impact on sovereign risk spreads in South Africa and Thailand, but not in New

Table VIII.2. Determinants of Sovereign Bond Spreads under Inflation Targeting

	Model 1	Model 2	Model 3
Inflation gap	14.942*** (11.54)	13.152*** (35.29)	14.850*** (29.47)
Gross reserves to imports	-87.221*** (-4.21)	-55.029*** (-3.00)	-43.781** (-2.15)
LCPI	0.207** (2.02)	0.324*** (6.34)	
Credit rating	7.684*** (4.59)		
Constant term	170.541*** (12.48)	232.700*** (6.34)	217.424*** (5.34)
LCPI – New Zealand			-0.485 (-1.06)
LCPI – Poland			0.081 (1.13)
LCPI – South Africa			2.833** (2.205)
LCPI – Thailand			0.635*** (8.52)
Adjusted *R*-squared	0.776	0.895	0.871
Number of Observations	92	92	92

Source: IMF staff estimates.

Explanation: ***, **, and * indicate statistically significant results at the 1, 5, and 10 percent confidence level respectively; t-statistics are reported in parentheses.

Zealand and Poland. The results indicate that a rise in global risk aversion by 10 LCPI index points would increase South Africa's risk spreads by about 28 basis points.[100]

E. Implications for Economic Policy

167. Poor performance under an inflation-targeting monetary policy framework increases the cost of official external borrowing through a rise in U.S. dollar-denominated sovereign bond spreads. The rise in spreads stems from a higher risk of currency depreciation, which corresponds to the option of providing inflationary finance in a situation of financial distress to avoid sovereign default. If the inflation target is met, the sovereign risk premium seems to partly shift from U.S. dollar-denominated spreads to rand-denominated spreads, thereby increasing the cost of domestic borrowing. For public debt management, this may suggest that it is desirable to correspondingly shift from domestic- to foreign-currency borrowing to keep the overall debt service at the lowest possible levels.

168. While U.S. dollar-denominated spreads still reflect external vulnerability to some extent, they have also become an indicator for monetary policy performance under inflation targeting. Meanwhile, most conventional vulnerability indicators, such as net foreign assets in percent of GDP, the fiscal balance in percent of GDP, and the ratio total external debt to GDP, seem empirically less meaningful in explaining U.S. dollar-denominated spreads under inflation targeting. However, the empirical results suggest that the reserves-to-imports ratio remains an important determinant of sovereign spreads.

169. The considerable disinflation from the introduction of inflation targeting until October 2001—although this may have led to higher spreads on rand-denominated government bonds—has also successfully guided inflation expectations in the South African economy, which, in turn, has induced a decline in long-term real interest rates. The benefits from growth-enhancing effects of this decline overcompensate for the rise in borrowing costs the government may face in the domestic debt market.

170. Some of these effects have been partly reversed since, starting in September 2001, the depreciation of the rand led to higher inflation starting in December 2001. But the results of this study should encourage the South African authorities to continue their policy of disinflation under the inflation-targeting framework and counter the adverse inflation effects of the recent currency depreciation.

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[100] The strong response of South African spreads to changes in global risk aversion can partly be attributed to the outstanding depth and liquidity of South African financial markets relative to those in other emerging market countries, inducing emerging market investors to trade South African assets first for liquidity considerations.

References

Alesina, A., M. DeBroeck, A. Prati and G. Tabellini, 1992, "Default Risk on Government Debt in OECD Countries," *Economic Policy*, No.15, p. 427-63.

Arora, V., and M. Cerisola, 2001, "How Does U.S. Monetary Policy Influence Sovereign Spreads in Emerging Markets?," *Staff Papers*, Vol. 48, No. 3, pp. 474-98, International Monetary Fund.

Calvo, G., L. Leiderman, and C. Reinhart, 1996, "Inflows of Capital to Developing Countries in the 1990s," *Journal of Economic Perspectives*, Vol. 10, No. 2, pp. 123-39.

Cantor, R., and F. Packer, 1996, "Determinants and Impact of Sovereign Credit Ratings," Federal Reserve Bank of New York, *Economic Policy Review*.

Cottarelli, C., and M. Mecagni, 1990, "The Risk Premium on Italian Government Debt," *Staff Papers*, Vol. 37, No. 4, pp. 865-80, International Monetary Fund.

Dooley, M., E. Fernandez-Arias, and K. Kletzer, 1996, "Is the Debt Crisis History? Recent Private Capital Inflows to Developing Countries," *World Bank Economic Review*, Vol. 10, pp. 27-50.

Eichengreen, B., and A. Mody, 1998, "What Explains Changing Spreads on Emerging Market Debt: Fundamentals or Market Sentiment?," NBER Working Paper No. 6408, National Bureau of Economic Research.

Goldstein, M., and C. Woglom, 1992, "Market-Based Fiscal Discipline in Monetary Unions: Evidence from the U.S. Municipal Bond Market," in Canzoneri, M.B., V. Grilli, and P.R. Masson (eds.), *Establishing a Central Bank: Issues in Europe and Lessons from the U.S.*, pp. 228-60.

Greene, W.H., 1997, *Econometric Analysis*, 3rd edition, Englewood Cliffs, NJ.

International Monetary Fund, 2001, Emerging Market Financing. Quarterly Report on Developments and Prospects November 2001.

Jonsson, G., 2001, "The Risk Premium in South African Long-Term Interest Rates," in *South Africa—Recent Economic Developments*, pp. 28-51, SM/01/79, International Monetary Fund.

Kamin, S., and K. von Kleist, 1999, "The Evolution and Determinants of Emerging Market Credit Spreads in the 1990s," Working Paper 68, Bank for International Settlements.

Min, H., 1998, "Determinants of Emerging Market Bond Spreads: Do Economic Fundamentals Matter?," Working Paper 1899, World Bank Development Research.

Vocke, M., 1999, "Default Risk Premia on Sovereign Debt. An Analysis on Default Risk and Devaluation Risk for Selected OECD Countries," Ph.D. Dissertation.

Data Description

Data on sovereign risk spreads for each country were constructed on the basis of sovereign bond yield data obtained from Datastream. Country-specific data were based on information provided by national authorities. Several data series were available on a monthly basis, but some were available only on a quarterly basis, and a few only on an annual basis. Quarterly and annual data were converted to a monthly basis using a cubic spline interpolation.

Data definitions are as follows:

Net foreign assets (NFA)	NFA of the banking system, in percent of GDP.
Fiscal balance	Budget balance of the central or federal government, defined in percent of GDP.
Gross reserves to imports	Gross international reserves as a percent of imports of goods and nonfactor services.
Debt-service ratio	External debt service as a percent of exports of goods and nonfactor services.
Central government debt	External debt of the central or federal government, in percent of GDP.
Total external debt	External debt of the private and public sectors, in percent of GDP.
Inflation gap	Difference between the targeted inflation rate (or the upper band of the target range, where applicable) and the actual inflation rate.
Credit rating	Assigned numerical value that is proportional to the average yield spread in the respective rating category.

Econometric Model and Methodology

The general form of the estimated model can be written as:

$$(1) \qquad y_{it} = \alpha_i + \chi_{it}^{'} \beta_i + \varepsilon_{it}$$

where y_{it} is the dependent variable, ε_i is the individual effect, which is taken to be constant over time t and specific to the individual cross-sectional units i, and x_{it} and β_i are k-vectors of non-constant regressors and parameters for $i = 1, 2,..., N$ cross-sectional units. Each cross-section unit is observed for dated periods $t = 1, 2,..., T$.

Heterogeneity over the cross-section is common in panel data analysis and suggests the application of fixed or random effects approaches.[101] The panel estimation uses a weighted least squares regression technique with estimated cross-section weights. This is done with a Generalized Least Squares (GLS) regression that uses estimated cross-section residual variances. The use of cross-section weights assumes the presence of cross-section heteroskedasticity in the data. Indeed, we cannot exclude the possibility of heteroskedasticity over the cross-section of our panel data.

In our analysis, we assume the residuals to be cross-section heteroskedastic and contemporaneously uncorrelated. In consequence, the residual covariance matrix can be written as:

$$(2) \qquad \Omega = \begin{bmatrix} \sigma_1^2 I_T & 0 & \cdots & 0 \\ 0 & \sigma_2^2 I_T & \cdots & 0 \\ & & \ddots & \\ 0 & \cdots & 0 & \sigma_N^2 I_T \end{bmatrix}$$

Any contemporaneous correlation of the residuals would indicate a misspecification of the estimated model since the residuals systematically pick up effects that are supposed to be captured by one of the explanatory variables.

To obtain cross-section specific weights, covariances σ_i^2 are estimated from a regular pooled OLS regression. These estimated variances are computed as:

$$(3) \qquad \hat{\sigma}_i^2 = \sum_{t=1}^{T_i} \left(y_{it} - \hat{y}_{it} \right)^2 / T_i \ ,$$

where y_{it} are the OLS fitted values for the dependent variable in the pooled estimation of the model.

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[101] See Greene (1997), chapter 14, for a detailed discussion of these empirical approaches.

Since heteroskedasticity may be present to some degree, White's heteroskedasticity consistent covariance estimates are computed for all pooled specifications of the model. The White covariance matrix is based on a variance estimator that can be written as:

$$\text{var}(b) = \frac{NT}{NT-K}\left(X^{|}X\right)^{-1}\left(\sum_{i,t} u_{it}^2 x_{it} x_{it}^{|}\right)\left(X^{|}X\right)^{-1} \tag{4}$$

where K is the total number of estimated parameters. While this variance estimator is robust to heteroskedasticity within each cross-section, it does not account for the possibility of contemporaneous correlation across cross-sections.

The relatively short time-series dimension of the panel data used in this study largely excludes the possibility that autocorrelation of the residuals leads to spurious regression results.