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Exploring Determinants of Long-Term Interest Rates

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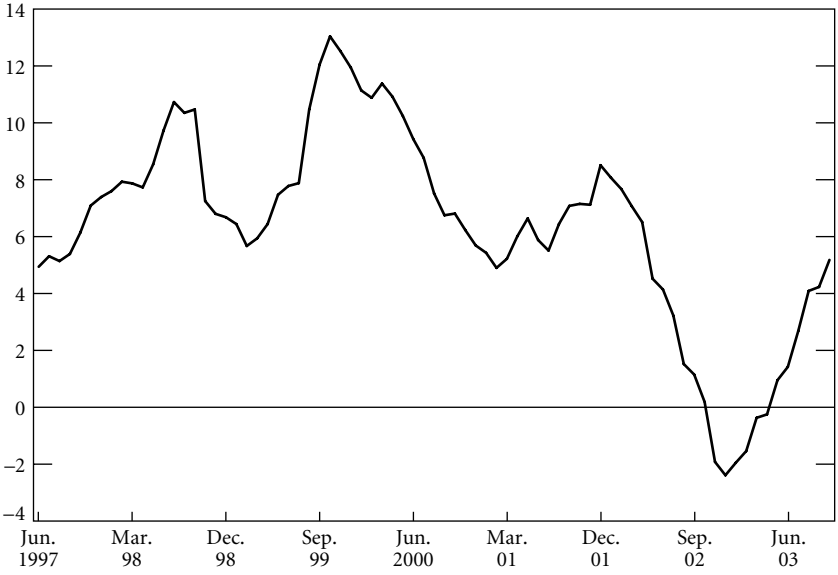
In South Africa, long-term interest rates have often been high in real terms and relatively volatile, although they declined somewhat in recent years (Figure 13.1). This chapter attempts to show that this decline is due not only to an improved external capital market but also to the strong progress made in macroeconomic management. In particular, the implementation of policy measures, such as dismantling the forward book of the South African Reserve Bank (SARB), strengthening the fiscal position, and adopting an inflation-targeting framework has aided external sustainability as well as fiscal and inflation performance. These factors in turn have helped ease pressure on domestic interest rates.

South Africa is a small open economy with a large and well-developed financial sector and a relatively open capital account (at least for nonresidents; see Chapter 8).[1] For such an economy, arbitrage conditions would imply that the level of long-term domestic interest rates are determined by several factors, namely the foreign interest rate, the default risk premium, the currency premium, as well as the effects of remaining capital controls and other effects of imperfect asset substitution.

While foreign interest rates (say U.S. rates on government bonds) constitute a benchmark for risk-free investment, country risk premium can be proxied by sovereign spreads, which mainly capture the perceived risk of South Africa defaulting on its debt (the spreads may also reflect liquidity

[1]During 2000–02, 20 percent of the total value added came from the financial, insurance, and real estate sector (South African Reserve Bank, 2003).

Figure 13.1. Long-Term Real Interest Rate[1]
(In percent)



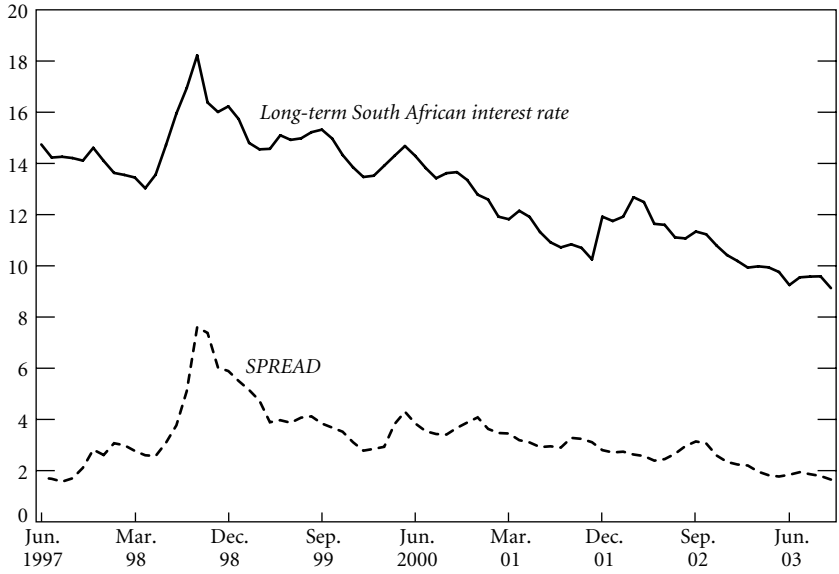
Source: South African Reserve Bank.
[1]Long-term interest rate on government bonds minus one-year CPI inflation.

risk). Such spreads have historically constituted a significant component of domestic long-term interest rates (Figure 13.2). Currency premium is the difference between the domestic currency and foreign currency borrowing costs faced by a common borrower. It compensates the investor mainly for anticipated currency movements but also for their variability. The presence of exchange controls can also affect domestic interest rates by maintaining the demand for domestic financial assets at relatively high levels, thus pushing domestic interest rates down. Due to the imperfect substitutability of South African assets versus foreign assets, South African interest rates could also respond to shifts in the supply of domestic assets.

Since sovereign bonds in a well-functioning economy are generally considered the safest among all classes of asset and serve as a benchmark asset for pricing other risks, the analysis presented here relates to long-term government bond yields. In sum, the long-term interest rate on government bonds in South Africa can be considered as approximately determined by the following functional relation:

$$RIR = f(USI, SPREAD, CP, EC, IS),$$

Figure 13.2. Long-Term South African Interest Rate Versus *SPREAD*
(In percent)



Sources: South African Reserve Bank; and J.P. Morgan.

where *RIR* is the long-term rand interest rate and the variables inside the function "*f*" represent, respectively, *USI*, the long-term U.S. interest rate; *SPREAD*, the sovereign spread[2]; *CP*, the currency premium; *EC*, the effect of exchange controls; and *IS*, other effects of imperfect asset substitutability.

Although the precise functional form is generally quite complicated, in this exercise we will assume for simplicity an additive relationship. We can approximate the relationship as follows: [3]

$$RIR \equiv USI + SPREAD + RESIDUAL.$$

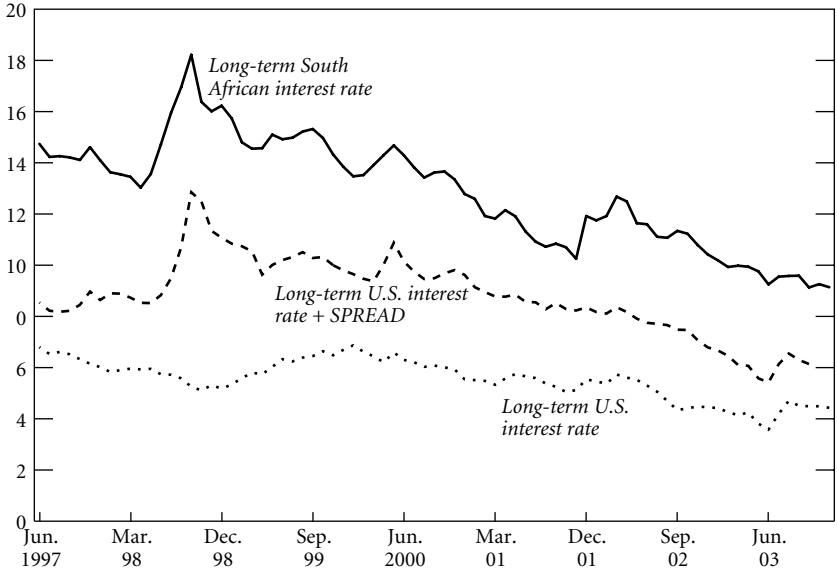
where $RESIDUAL = CP + EC + IS$.

Figure 13.3 presents a breakdown of the long-term South African interest rates in its three main components: *USI*, *SPREAD*, and *RESIDUAL*. This chapter empirically investigates the determinants of *SPREAD* and of *RESIDUAL* in order to shed light on the factors that drive the long-term interest

[2]Data for the sovereign spread for South Africa are available only since 1997.

[3]Given that data on only the first two components are available, it is therefore useful to treat the three remaining components as residual.

Figure 13.3. Components of Long-Term South African Interest Rates
(In percent)



Source: South African Reserve Bank.

rate. It first provides a brief review of literature on risk and currency premia in developing and emerging market countries. Next, it discusses the variables and data used in this study, followed by a review of the results. The chapter concludes by highlighting the policy implications of our findings.

Literature Review

A number of studies have analyzed the determinants of default risk and sovereign spreads in developing and emerging market countries. A first wave was prompted by the sovereign debt defaults of the 1980s. Based on pooled cross-section data from 19 countries, Edwards (1984) demonstrates that risk characteristics captured by a selected set of aggregate variables, such as debt-GNP, debt-service, and reserve-GNP ratios, as well as growth and inflation are reflected in sovereign spreads. Alesina and others (1992) provide empirical evidence from 12 member countries of the Organization for Economic Cooperation and Development (OECD) confirming the claim that a higher level of public debt increases the probability of a "confidence crisis" and gives rise to a higher risk premium.

In the mid-1990s increased financial globalization and a significant amount of capital flow into emerging market countries initiated debates as to whether and by how much the U.S. monetary policy stance influenced sovereign bond spreads. Kamin and von Kleist (1999), using launch spreads of bank loans and sovereign bonds, showed that country-specific factors, such as public external debt and fiscal deficits, are the main determinants of spreads, with no significant effect coming from the stance of U.S. monetary policy. On the other hand, Arora and Cerisola (2001) analyzed secondary bond market data and found that, in addition to domestic factors, a tightening of U.S. monetary policy increases the spread of sovereign bonds in emerging market countries. Studies by Eichengreen and Mody (1998) and Min (1998) analyzed cross-country data and established that country-specific factors, such as debt stock, fiscal deficit, and inflation, significantly influence sovereign spreads. On the basis of a sample of Latin American and East Asian countries, Eichengreen and Mody found that an increase in U.S. treasury interest rates reduce the launch spreads on the new bond issues.

Unlike sovereign spreads, currency premia in emerging market and developing economies have received limited attention. Werner (1996) defines the currency premium for Mexico as the difference between the peso-denominated interest rate and the dollar-denominated interest on Mexican bond (hence same as our *RESIDUAL* above) and shows that a poor fiscal position, such as a high domestic debt stock, increases the premium. Schmukler and Servén (2002) examine the behavior of currency premia under currency boards in Argentina and Hong Kong SAR and establish that domestic economic performance, political stability, and external crises can increase the premium.

With specific reference to South Africa, Jonsson (2001) and Vocke (2002) conducted studies on sovereign spreads, and Grandes, Peter, and Pinaud (2003) on the currency premium. Until recently, one unique feature about the South African foreign exchange market was the historical involvement of the SARB in the forward exchange market. At times this practice led to large contingent liabilities for the SARB from exposure in the forward market[4] and created a long-standing source of external vulnerability. Using monthly data on the spread of long-term rand-denominated bonds over U.S. treasuries of similar maturities and after controlling for other determinants, Jonsson (2001) found that the size of the SARB's forward book significantly affected

[4]The net open forward position (measured as the difference between net international reserves and the open forward book) bottomed out at a record level of negative $23 billion in October 1998. This amount was more than tenfold larger than the SARB's gross reserves. The forward book was dismantled in early 2004.

South Africa's risk premium. Furthermore, the level and average maturity of external debt stock as well as the contagion from the emerging financial market (as proxied by the Emerging Market Bond Index (EMBI) spreads) influenced risk premium. Vocke's (2002) study, based on pooled cross-country studies, showed that, in addition to contagion factors, the inflation differential from the target (as a proxy for the credibility of the monetary policy) significantly affects the risk premium. Grandes, Peter, and Pinaud (2003) perform an extensive study to investigate the determinants of currency premia computed from one-month and one-year forward premia. They find that misalignment of the real effective exchange rate, the net open forward position (NOFP), and deviations from inflation targets are significant factors affecting the short-term currency premium.

Data

The analysis is conducted on the basis of monthly data.[5] A precise definition of all variables is provided in the Appendix. Due to availability of the spread measure (see below), the sample in all the regressions for the determinants of the sovereign spread ranges from June 1997 to June 2003. Due to limited availability of data on the inflation expectations (see below), the sample in all the regressions for the determinants of the residual ranges from March 2000 to June 2003.

To analyze the sovereign risk premium component of the domestic interest rate, we focus on a long-term foreign-currency-denominated bond.[6] Given that spreads are measured between two dollar-denominated bonds, *SPREAD* captures only the default risk, not foreign exchange risks. One can broadly classify the sources of the sovereign risk premium into two groups: external and country-specific factors. Box 13.1 discusses the determinants of *SPREAD*. As indicated above, *RESIDUAL* is calculated as the long-term rand-denominated bond yield adjusted for both the long-term U.S. interest rate and the sovereign spread, and is regressed on potential determinants of the remaining components. Box 13.2 presents detailed discussion of the rationale behind the variables employed.

[5]The only two series not available monthly are nominal GDP (used as denominator to normalize fiscal variables) and real GDP growth. The corresponding quarterly series were converted into monthly frequency by cubic spline interpolation.

[6]In 1997 South Africa issued a U.S. dollar-denominated bond maturing in 2017. The sovereign spread *(SPREAD)* with respect to a synthetic U.S. treasury bond of similar maturity is computed daily by Merrill Lynch. We calculate monthly averages to smooth out daily fluctuations.

Box 13.1. Variables for the Analysis of *SPREAD*

External factors encompass supply conditions in the global capital market or contagion effects, as shifts in global risk aversion and common investment linkages among emerging market countries help transmit risks in one emerging market country to another. The J.P. Morgan's Emerging Market Bond Index spread *(EMBISP)* is used as the proxy for external factors. *EMBISP* also captures idiosyncratic factors not related to global factors.

Country-specific factors encompass fiscal performance, the extent of reserves, and short-term external liabilities, as well as overall monetary and economic performance. As measures of fiscal performance, we first employ a similar set of variables as those adopted by Jonsson (2001), namely: foreign currency debt in millions of U.S. dollars *(DEBTF)*, domestic currency debt as a ratio to GDP *(DEBTDGDP)*, and the corresponding maturities *(MATURITYF* and *MATURITYD)*. The only difference with respect to the approach in Jonsson (2001) is to normalize domestic debt by GDP, rather than converting it in U.S. dollars. Higher debt should be associated with higher risk. The effect of maturity on spread is theoretically ambiguous as discussed by Feder and Ross (1982). On the one hand, better macroeconomic policy conditions are associated with both lower spread and the ability to issue at longer maturities, generating a negative correlation between spread and maturity. On the other hand, however, for given macroeconomic and policy circumstances, investors require a higher risk premium for longer maturities simply because the probability of default over a longer horizon is higher. In alternative specifications, we substitute the four debt indicators above with a flow concept: the fiscal balance as a ratio to GDP *(NETBR)*, where a positive balance implies a surplus.

As measures of reserves and short-term external liabilities, we use several alternative indicators: the size of the forward book *(FORWB)*, the level of net international reserves (not accounting for the forward book, *NIR)*, the size of gross international reserves *(GFEXRSV)*, the net open forward position *(NOFP)*, all in millions of U.S. dollars, and the ratio of gross reserves to short-term debt including the forward book *(RESDEBT)*.

Other variables relate to monetary and economic performance. Exchange rate depreciation *(EXCHDEPR)* increases the local currency value of government's foreign currency liabilities and can make it more difficult to repay the debt, thus increasing risk. Inflation (*INFL*) can affect the sovereign spread through two opposite channels. On the one hand, higher inflation can lead to a larger currency depreciation and—through a higher difficulty of repayment—a higher risk premium. On the other hand, inflation helps erode the real value of government debt, thus reducing the risk of default (see Vocke, 2002). Better economic performance brings higher revenue and reduces the need for the government to resort to default, and thus should lower the sovereign spread. Higher growth *(GROWTH)* tends to improve overall fiscal performance and lower risk. Other measures of performance, such as coincidental indicators and capacity utilization, were not significant.

All variables appear in logarithmic terms, to evaluate elasticities, with the exception of debt maturities, the *NOFP*, and those measured as growth rates (inflation, depreciation, and output growth).

Box 13.2. Variables for the Analysis of *RESIDUAL*

It is quite challenging to disentangle the effect of currency premium, exchange controls, or imperfect asset substitutability.

Economic theory suggests that the currency premium should be mainly driven by the expected change in the exchange rate, as the risk component (as captured by the variability of exchange rate changes) is likely to increase with the expected change. There are two primary reasons for an expected change in the rand–U.S. dollar exchange rate: to compensate for the inflation differential between South Africa and the United States and to correct for a real exchange rate misalignment. We compute the expected inflation differential *(INFLDIFFB)* as the gap across the two countries in the difference between the yield on the nominal long-term bond and the yield on the inflation-indexed bonds of comparable maturity.[1] The real effective exchange rate *(REER)* appreciation is entered in the regressions to capture short-term misalignment; a real exchange rate appreciation perceived as transitory can be expected to lead to future depreciation and hence a higher currency premium. However, a change in the exchange rate is not expected to be reverting if either the exchange rate is perceived as a random walk or if the change is perceived as justified by fundamentals.

Fiscal and economic performance variables could also affect expected currency movements—to the extent they are not already accounted for in the expected inflation differential—or the willingness to hold South African bonds—to the extent there is imperfect substitutability of assets. Fiscal performance is measured by stock variables (foreign currency and domestic currency debt, *DEBTF* and *DEBTDGDP*, respectively) and flow variables (fiscal balance to GDP, *NETBR*). Better economic performance (proxied by coincident indicator index *(INDCOIN)*, capacity utilization *(CAPUTIL)*, or output growth *(GROWTH)*) could reduce the currency premium, as it is generally associated with an appreciation of the real exchange rate or a stronger preference to hold the country's assets. Since there was a significant exchange control relaxation in February 2003, we try to control for the one-off effect of liberalization by introducing a dummy *(EXCON0203)*. Liberalization of exchange control will tend to raise the domestic interest rate by providing alternative investment opportunities in foreign assets.

Jonsson (2001) assumes that the domestic-currency- and foreign-currency-denominated South African bonds are perceived as carrying the same default risk. If this is not the case, the variables discussed above—and particularly the fiscal ones—may affect the default risk differential between the two classes of assets.

[1]The sample period for break-even inflation series for South Africa is limited to March 2000–June 2003.

Methodology and Results

Simple OLS is used to estimate the regressions. We test the stationarity of the residuals and do not reject the hypothesis of stationarity for all regressions.[7]

The regressions for the spread include a lagged dependent variable to account for serial correlation (in the nondynamic specifications the Durbin-Watson statistic was below 1) and time dummies to account for special episodes such as the 1998 and 2001 currency crises (an F-test rejects the hypothesis that the dummies have equal coefficients). Given the dynamic specifications, the overall impact of variables can be assessed as the respective coefficient divided by the complement to 1 of the coefficient of log(*SPREAD*(–1)).

Unlike the *SPREAD* regressions, the regressions for *RESIDUAL* did not present serial correlation issues (the Durbin-Watson statistic was well above 1), so it was not necessary to include an autocorrelation term. Given the short sample period—constrained by the availability of the inflation expectations measure—and the presence of a dummy capturing the reduction in exchange controls, annual time dummies are not included in the regressions.

Determinants of *SPREAD*

The results under alternative specifications with various measures of foreign exchange exposures from regressing the log of *SPREAD* are reported in Table 13.1. The key findings are as follows:

- Emerging market lending conditions significantly affect the spread in South Africa. The elasticity of the South African spread with respect to the EMBI spread *(EMBISP)* is somewhat less than one (about 0.8), implying that the potential for contagion effect in South Africa is relatively limited compared with other emerging market economies.[8] This may also reflect the fact that *EMBISP* captures also idiosyncratic risks.
- Higher net international reserves reduce the spread. For example, the effect on the spread of a 10 percent change in the ratio of the gross for-

[7]Due to the limited sample period, the Johansen VECM-based cointegration test is very unstable and is therefore not employed.

[8]For example, in the column 1 regression, the effect of the *EMBISP* can be calculated by dividing its coefficient (0.44) by 1 minus the coefficient of log(*SPREAD*(–1)), that is, dividing by (1 – 0.47), which delivers around 0.82.

Table 13.1. Determinants of *SPREAD*
(Dependent variable: log(SPREAD); sample: 1997:06–2003:06)

Constant	–1.377	–0.492	–0.407	–1.348
	0.102	0.699	0.640	0.187
LSPREAD(–1)	0.467	0.414	0.426	0.452
	0.000	0.000	0.000	0.000
LEMBISP	0.436	0.489	0.453	0.440
	0.000	0.000	0.000	0.000
LDEBTF	0.208	0.100	0.200	0.123
	0.212	0.595	0.244	0.500
DEBTDGDP	0.386	0.635	0.469	0.694
	0.525	0.305	0.458	0.247
MATURITYF	0.006	0.006	0.006	0.006
	0.130	0.136	0.112	0.152
MATURITYD	–0.001	0.004	–0.002	0.005
	0.925	0.599	0.681	0.501
INFL	–0.001	0.006	0.001	0.003
	0.851	0.367	0.881	0.697
EXCHDEPR	0.007	0.006	0.007	0.006
	0.000	0.003	0.001	0.004
GROWTH	–0.062	–0.042	–0.054	–0.040
	0.012	0.101	0.026	0.135
LFORWB	0.292			
	0.000			
LGFEXRSV		–0.277		
		0.105		
LRESDEBT			–0.219	
			0.002	
NOFP				–0.011
				0.007
Adjusted R^2	0.955	0.950	0.955	0.950
D-W	1.474	1.237	1.400	1.350

Source: Author's calculations.
Note: P-values (based on heteroskedasticity-corrected standard errors) are reported below coefficients. Shaded numbers represent variable coefficients with significance level of 10 percent or higher.

eign reserves to short-term debt (including the forward book) will reduce the spread by 4 percent, respectively. These results are consistent with those found by earlier studies.[9]

- Regarding the other variables, higher growth is significantly associated with a reduction of the spread. An increase in real GDP growth by

[9]In particular, alternative linear specifications with variables expressed in levels instead of logarithmic terms confirm the important result that Jonsson (2001) found for the forward book: a $1 billion increase in the forward book increased the spread by 9–16 basis points.

Table 13.2. Determinants of *SPREAD*: Robustness
(Dependent variable: log(*SPREAD*); sample: 1997:06–2003:06)

Constant	–0.059	0.744	0.354	0.245
	0.831	0.180	0.233	0.448
LSPREAD(–1)	0.487	0.467	0.464	0.502
	0.000	0.000	0.000	0.000
LEMBISP	0.400	0.415	0.411	0.376
	0.000	0.000	0.000	0.000
NETBR	–0.035	–0.036	–0.035	–0.040
	0.143	0.134	0.135	0.126
INFL	0.002	0.006	0.003	0.004
	0.810	0.384	0.670	0.593
EXCHDEPR	0.006	0.005	0.006	0.005
	0.003	0.024	0.006	0.025
GROWTH	–0.056	–0.048	–0.051	–0.049
	0.013	0.057	0.027	0.057
LFORWB	0.155			
	0.080			
LGFEXRSV		–0.207		
		0.156		
LRESDEBT			–0.114	
			0.080	
NOFP				–0.007
				0.208
Adjusted R^2	0.949	0.948	0.950	0.947
D-W	1.219	1.115	1.177	1.200

Source: Author's calculations.

Note: P-values (based on heteroskedasticity-corrected standard errors) are reported below coefficients. Shaded numbers represent coefficients with significance level of 10 percent or higher.

1 percentage point would lead to a 6 percent to 9 percent reduction in the spread. A depreciation of the exchange rate by 1 percentage point is associated with a 1 percent increase in the spread. Due to the possible reverse causality effects, however, the effects of these two variables on the spread could be lower than the estimates reported here. The remaining variables are not found to be significant.

We try to assess the sensitivity of our findings reported in Table 13.1 by running regressions with another measure of fiscal position, the net borrowing requirement of the government. The results, reported in Table 13.2, remain very robust, although the effect of reserve variables is somewhat lower.

It is particularly interesting that none of the fiscal variables seem to affect the spread. The fact that foreign currency government debt stock does not enter significantly in the regression may simply be due to the rel-

atively small share of foreign debt in South Africa's total debt stock. However, the fact that domestic currency debt (which fluctuates around 36 percent of GDP) is not significant may reflect a more important effect: that international financial markets discriminate between the local currency and foreign currency denomination of a given borrower, so the extent of domestic currency issuances is not perceived as affecting the probability of default of foreign currency issuances.

Determinants of *RESIDUAL*

Table 13.3 reports the regression results for *RESIDUAL*. Several conclusions emerge from the analysis:

- The expected inflation differential is the key driver of currency premium. The elasticity of the *RESIDUAL* with respect to inflation expectations is around 1.[10]
- A rise in domestic debt stock, as expected, increases *RESIDUAL*. Higher domestic debt increases the incentive for inflationary financing and, thus, can raise the currency premium. An increase in the debt to GDP ratio by 1 percentage point seems to raise the *RESIDUAL* by 2–3 percent. To the extent that the inflation expectation measure already captures the effect on debt on the currency premium via the potential for inflationary financing, the effect of debt should correspond to either a supply effect associated with the imperfect substitutability of South African rand-denominated debt with respect to U.S. debt denominated in U.S. dollars (even when controlling for risk and currency factors) or to a different perception of risk for foreign currency and domestic currency South African bonds. One may wonder why foreign currency debt is not significant, if there is imperfect substitutability. Two possible explanations come to mind. The stock of foreign debt may be too small to have an effect. Or South African local currency debt and foreign currency debt may again be associated with a different degree of imperfect substitutability versus international bonds (perhaps because of a different perception of default risk). This explanation is consistent with the argument that developing countries suffer from "original sin," that is, have a hard time borrowing in local currency (see Hausmann and Panizza, 2003).

[10]If the regressions are estimated using levels instead of logs, we find that an increase of 1 percentage point in inflation increases *RESIDUAL* by around 60–70 basis points.

Table 13.3. Determinants of *RESIDUAL*
(Dependent variable: log(RESIDUAL); sample size: 2000:03–2003:06)

Constant	0.759	1.790	–0.246	–0.894	–0.115	–2.328
	0.681	0.595	0.874	0.579	0.977	0.063
LINFLDIFFB	0.922	0.898	0.832	1.071	1.061	0.955
	0.000	0.000	0.000	0.000	0.000	0.000
LREER	–0.075	–0.101	–0.054	0.278	0.440	0.488
	0.829	0.770	0.889	0.240	0.076	0.027
EXCON0203	0.295	0.280	0.311	0.294	0.212	0.258
	0.010	0.017	0.011	0.002	0.001	0.004
LDEBTF	0.229	0.102	0.088			
	0.244	0.428	0.500			
DEBTDGDP	2.399	2.859	2.804			
	0.070	0.031	0.028			
NETBR				0.047	0.042	0.036
				0.198	0.213	0.352
INDCOIN	–0.015			–0.012		
	0.252			0.081		
CAPUTIL		–0.028			–0.032	
		0.501			0.418	
GROWTH			0.019			0.033
			0.602			0.301
Adjusted R^2	0.813	0.805	0.802	0.785	0.770	0.768
D-W	1.425	1.450	1.490	1.393	1.244	1.309

Source: Author's calculations.

Note: P-values (based on heteroskedasticity-corrected standard errors) are reported below coefficients. Shaded numbers represent variable coefficients with significance level of 10 percent or higher.

- The dummy for the elimination of capital controls is positive and significant, suggesting that the lifting of controls indeed leads to an increase in interest rates.[11]

Owing to a lack of long series for inflation expectation measures, actual inflation is often used as a proxy in standard economic literature. But this can generate misleading results. When estimating the same regressions using the realized inflation *(INFLDIFF)* over the last 12 months, instead of the expected inflation through break-even inflation *(INFLDIFFB)*, we find the model suffers from noticeable misspecification. As shown in Table 13.4, most coefficients become quite unstable and the R-squared can go as low

[11]Note that alternative measures of real economic activity such as growth, the coincident indicator of economic activity, or capacity utilization do not appear to be significant. Also, we do not find an expectation of reversion to purchasing power parity, as the coefficient on the real exchange rate is generally not significant.

Table 13.4. Determinants of *RESIDUAL*: Using Actual Inflation
(Dependent variable: log(RESIDUAL); sample size: 2000:03–2003:06)

Constant	13.900	20.764	5.038	12.024	2.691	3.796
	0.000	0.001	0.029	0.011	0.903	0.031
LINFLDIFF	0.385	0.320	0.088	0.405	0.101	0.105
	0.012	0.022	0.144	0.125	0.330	0.127
LREER	–1.321	–1.371	–0.544	–0.519	0.198	0.183
	0.002	0.005	0.331	0.329	0.706	0.601
EXCON0203	0.335	0.219	0.378	0.274	0.066	0.385
	0.023	0.039	0.020	0.074	0.509	0.010
LDEBTF	0.604	0.075	0.280			
	0.108	0.791	0.242			
DEBTDGDP	6.421	8.273	5.312			
	0.002	0.000	0.003			
NETBR				–0.015	–0.014	–0.039
				0.798	0.806	0.492
INDCOIN	–0.079			–0.065		
	0.056			0.128		
CAPUTIL		–0.172			0.021	
		0.011			0.868	
GROWTH			0.142			0.208
			0.018			0.001
Adjusted R^2	0.538	0.511	0.584	0.165	0.024	0.407
D-W	1.097	1.449	1.416	0.694	0.576	1.175

Source: Author's calculations.

Note: P-values (based on heteroskedasticity-corrected standard errors) are reported below coefficients. Shaded numbers represent variable coefficients with significance level of 10 percent or higher.

as 0.02. Hence, actual inflation cannot be used as a proxy for expected inflation in estimating the determinants of *RESIDUAL*.

In light of the focus of the previous analysis on reserves, one may wonder if the various reserves measure help explaining the *RESIDUAL*, as found in Grandes, Peter, and Pinaud (2003). Table 13.5 shows the specification in column 1 of Table 13.3, with various reserve measures. It is evident that in our specifications these measures do not provide much additional explanatory power.[12]

Conclusions

Long-term interest rates in South Africa have been declining in recent years. This chapter shows that such a decline was due not only to external

[12]The anomaly with the net international reserves measure persists.

Table 13.5. Determinants of *RESIDUAL*: Role of Reserves?
(Dependent variable: log(RESIDUAL); sample size: 2000:03–2003:06)

Constant	0.671	2.698	0.141	0.791	0.777
	0.728	0.169	0.948	0.687	0.677
LINFLDIFFB	0.941	0.826	0.974	0.918	0.917
	0.000	0.000	0.000	0.000	0.000
LREER	–0.053	–0.121	–0.089	–0.078	–0.084
	0.890	0.701	0.807	0.829	0.808
EXCON0203	0.295	0.251	0.306	0.295	0.295
	0.011	0.029	0.014	0.014	0.012
LDEBTF	0.150	0.254	0.103	0.244	0.249
	0.644	0.173	0.772	0.503	0.489
DEBTDGDP	2.585	0.890	2.527	2.368	2.368
	0.038	0.437	0.068	0.060	0.079
INDCOIN	–0.015	–0.028	–0.016	–0.015	–0.015
	0.285	0.034	0.241	0.262	0.255
LFORWB	–0.059				
	0.726				
LNIR		0.373			
		0.006			
LGFEXRSV			0.232		
			0.633		
LRESDEBT				–0.008	
				0.951	
NOFP					–0.002
					0.926
Adjusted R^2	0.807	0.836	0.808	0.807	0.807
D-W	1.442	1.679	1.499	1.421	1.419

Source: Author's calculations.

Note: P-values (based on heteroskedasticity-corrected standard errors) are reported below coefficients. Shaded numbers represent variable coefficients with significance level of 10 percent or higher.

factors such as an improvement in overall emerging market sentiment and to a decline in U.S. interest rates, but also to an improvement in the South African economic and financial environment.

In particular, an increase in the net international reserve coverage reduces the sovereign risk premium. Hence, the dismantling of the forward book removed an important source of external vulnerability and contributed to a reduction in domestic long-term interest rates. The benefits (and costs) of holding international reserves were discussed in Chapter 11.

Improved growth performance also seems to reduce spreads. It is possible that a reduction in the spread may in turn induce higher growth through a reduction in long-term real interest rate. Policy measures leading to either improved growth performance or lower spread are likely, therefore, to generate a mutually reinforcing process.

Our results also show that the expected inflation differential between South Africa and the United States is a key driver behind the currency premium and, hence, domestic interest rates. As a consequence, the successful implementation of the inflation targeting framework can be considered as instrumental in consolidating the recent improvements in the inflation performance and in maintaining low inflation expectations (see Chapter 12). By bringing down inflation, the SARB may actually lower the risk associated with exchange rate depreciation (in addition to the expected depreciation itself). This would result in a reduction of real interest rate. Furthermore, it suggests that under a completely credible regime of inflation targeting, lowering inflation may not only be associated with limited output costs in the short run, but it may also spur growth in the long run.

Domestic currency debt tends to raise long-term interest rates, although not via a higher sovereign spread on foreign currency bonds. This result seems to suggest that domestic currency debt and foreign currency debt are perceived as carrying a different default risk (even when controlling for currency premia factors).

Appendix. Definitions and Sources of Variables

The variables were obtained from SARB databases unless specified otherwise. The sample range is from June 1997 to June 2003, unless otherwise noted. Quarterly data were converted to monthly frequency by the cubic spline interpolation method. Any variable starting with L refers to the log of the variable (e.g., *LSPREAD* refers to the log of *SPREAD*).

SPREAD: Sovereign spread on a U.S. dollar-denominated bond issued by South Africa maturing in 2017. Monthly averages computed from daily data.

RESIDUAL: South Africa long-term interest rate minus the sum of *USINT* and *SPREAD* (see below). Monthly averages computed from daily data.

A. Global factors

USINT: U.S. long-term interest rates from the U.S. government bond maturing in 2015.

EMBISP: Emerging market bond spread. Stripped spread from EMBIGlobal composite index of J.P. Morgan. Monthly averages computed from daily data.

B. External sector variables

DEBTF: Total amount of outstanding marketable foreign currency-denominated bonds issued by the national government. In billions of dollars. Computed by dividing the end-of-period foreign debt stock in rand by end-of-period rand-U.S. dollar exchange rate.

MATURITYF: Average maturity of *DEBTF*. In months.

FORWB: Open forward book of the SARB. In billions of U.S. dollars.

NIR: Net international reserves. In billions of U.S. dollars. Generated by dividing end-of-period net official reserves by end-of-period rand–U.S. dollar exchange rate.

GFEXRSV: Gross gold and other foreign reserves. In billions of dollars.

RESDEBT: Gross reserve (*GFEXRSV*) to total short-term external debt and the open forward book.

NOFP: Net open forward position. In billions of U.S. dollars. (*NIR-FORWB*)

C. Monetary and exchange rate variables

INFL: Inflation (*CPIX*). 12-month end-of-period rate.

INFLDIFF: Difference between annualized 12-month inflation rates in South Africa and the United States.

INFLDIFFB: Difference between the break-even inflation in South Africa and the United States from inflation-indexed bonds.

EXCHDEPR: Nominal monthly depreciation of the rand–U.S. dollar exchange rate. Computed from end-of-period rate. Lagged one period.

REER: Real effective exchange rate.

EXCON0203: Dummy to capture the effect of removal of exchange control in February 2003.

D. Fiscal variables

DEBTDGDP: Total amount of outstanding marketable domestic-currency-denominated bonds issued by the national government. As a ratio to GDP.

MATURITYD: Average maturity of *DEBTD*. In months.

NETBR : Net borrowing requirement of the government. Seasonally adjusted and in percent of GDP. A positive value corresponds to a surplus.

E. Real variables

GROWTH: Real GDP growth. Seasonally adjusted quarterly growth rate. Cubic spline interpolation used to generate monthly series.

CAPUTIL: Capacity utilization index. Monthly series.

INDCOIN: Coincident monthly indicator index. Monthly series.

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