An analysis of sovereign risk in South Africa with the focus on fiscal determinants

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A B S T R A C T

This paper investigates the sovereign risk premium as an indicator of sovereign risk. An attempt was made to capture evidence that best explains bond yield spreads for the 21-year period after the inception of democracy in South Africa in 1994. Conventional unit root testing techniques were applied, and the results revealed unit roots at monthly, quarterly and annual frequency, warranting further econometric testing. The financial crisis in the period 2007 to 2011 posed a potential significant break in data and was built into the analysis. The results for the crisis period differed substantially from the pre- and post-crisis period and are reported as such. The results reveal a unique combination of explanatory factors (cointegration), but also a special implication for bond yield spreads. They re-affirm the importance of fiscal policy decision making and fiscal balance, taking all factors into account such as long- and short-term interest rates. Current spending and the public sector borrowing requirement have a statistically positive effect on spreads depending on whether they were pre- or post-crisis. The latter could be an indication of investor sensitivity, especially in terms of the way in which the borrowing requirement is utilised and the fact that capital formation is preferred to current spending. Furthermore, the maturity of domestic debt shows up as statistically negative, probably confirming investor interest and thus confidence in the long run, with possible consequences for financial stability as a regional public good.

Key words: policy, sovereign risk, spreads, bond markets

Since the democratisation of South Africa in 1994, the country has been exposed to an array of changes in the global financial arena. Global financial crises have adjusted the 'playing field', with the emphasis now falling and solidified on macroeconomic

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policy. Bond yield spreads between emerging market and industrialised economies have adapted accordingly and opened a debate concerning the factors that best explain risk spreads.

This paper seeks to contribute to existing knowledge in the following ways: firstly, the study attempts to update empirical work that was done by the author in the past and investigates the determinants of sovereign risk with the sovereign risk premium as the dependent variable; secondly, the study tests time-series data on different frequencies, unlike other studies that tend to utilise only annual data, in some instances applicable to a panel of countries.

The paper is divided into four sections. The first section describes the sovereign risk premium and serves as a broad overview of existing studies. The second section proceeds with an analysis of real world changes or trends and concentrates more specifically on South Africa. The third section entails an empirical investigation that proposes a model for explaining sovereign risk (premium) in South Africa. The fourth section deals with the concluding remarks, including possible topics for future research.

Theoretical background: Existing literature

Monetary policy and fiscal policy have become increasingly significant as the main drivers of global financial markets and the economy. Monetary policy, as set by the developed world, is still experimental. The main instruments of monetary policy have been quantitative easing (QE), although recently cancelled by the USA, and zero interest rates. Fiscal policy has been characterised by large deficits with major cuts in government spending and as such has become countercyclical. The intention of fiscal and monetary policy has been to restore the underlying economy to sustainable growth and stabilise financial markets. The irony is that both monetary policy and fiscal policy have raised systemic risks despite the opposite intention. The developed world's government debt continues to rise, while monetary policy appears set at zero interest rates. Higher systemic risk in the developed world has made emerging market economies more attractive as investment destinations, although the austerity measures used by the developed world have become increasingly important as fiscal indicators to the potential investor.

So, what prompted the study initially? Although the answer is straightforward in that the sovereign risk premium in South Africa has changed substantially since 1997, further clarification is required in order to answer the question.

In the current context, it is fitting to start with the factors that best explain the sovereign risk premium. Existing literature can be divided into a number of categories according to the results. Table 1 provides a summary of studies conducted in terms of

these categories and factors that best explain government bond yields and sovereign default risk spreads. Most of the studies are panel data studies applicable to emerging market economies. Classical sovereign default risk determinants are discussed, such as total indebtedness (debt/GDP ratio), debt service burden (debt/exports ratio or debt service-to-GDP ratio), level of hard currency reserves (reserves/import, or reserves/GDP ratio), economic growth and so forth. An attempt has been made to report the most important studies, although these should by no means be regarded as the only findings. However, a discussion of the relationship between sovereign and corporate default risk is not included in this study. For a detailed explanation of the latter, refer to Peter and Grandes (2005).

As shown in Table 1, macroeconomic fundamentals, liquidity and solvency indicators specific to certain groups of countries could be regarded as the main stream of influence on bond yield spreads throughout history. Macroeconomic fundamentals include the following variables: GDP growth, inflation (monetary policy), external debt (solvency), level of economic development (including per capita income, level of crime and corruption) and default history. Liquidity is normally reflected by the size of the foreign currency reserves that countries keep, and lower debt levels are normally regarded as a good measure of solvency. A large volume of research exists on the relationship between yield spreads (interest rates) and levels of debt. The overwhelming result shows a positive relationship between yield spreads and government debt.

Monetary policy (including exchange rate) regimes could also play a role in determining the sovereign risk spread. An overvalued real exchange rate could increase sovereign spreads, with the magnitude increasing under a fixed exchange rate regime. However, the latter result reverses under a free-floating regime, leading to higher borrowing costs, especially during a crisis period. Fiscal policy variables such as government revenue and expenditure play a role to varying degrees. Evidence shows that current expenditure-based fiscal adjustments reduce sovereign spreads more than revenue-based ones.

Alternative explanatory factors, such as political risk (e.g. elections), are generally viewed as negative in terms of the pricing of sovereign bonds, and pre-election bond spreads are higher than post-election ones. Corruption translates into higher risk premiums and also relates to negative news events (including market sentiment) and the speed at which warning signals (e.g. equity prices and the ratio of broad money to gross international reserves) travel. Early-warning signals become significant in terms of sovereign debt crises through solvency and liquidity factors such as high levels of foreign debt relative to GDP, short-term debt relative to foreign reserves and

Table 1: Existing studies explaining the sovereign risk premium

Categories	**Positive effect**	**Negative effect**
Macroeconomic fundamentals (including solvency)	Edwards (1984; 1986) Boehmer & Megginson (1990) Bayoumi (1995) Cline & Barnes (1997) Min (1998) Alesina, Silvia, Roberto & Fabio (1999) Catão & Sutton (2002) Catão & Kapur (2004) Detragiache & Spilimbergo (2001) Manasse, Roubini & Schimmelpfennig (2003) Bernoth, Von Hagen & Schuknecht (2004) Akitoby & Stratmann (2006) Knoop (2013)	
Liquidity		Edwards (1984) Cline & Barnes (1997) Min (1998) Akitoby & Stratmann (2006)
Monetary policy regimes	Uribe (2002) Wang (2010)	
Fiscal policy	Alesina, Silvia, Roberto & Fabio (1999) Bernoth, Von Hagen & Schuknecht (2004) Akitoby & Stratmann (2006) Hauner & Kumar (2005)	
Political risk (elections)	Jensen, Malesky & Weymouth (2014)	Block & Vaaler (2004)
Corruption (news)	Ciocchini, Durbin & Ng (2003)	
Contagion	Kaminsky & Schmukler (1999) Beirne & Fratzscher (2013)	
Market sentiment	Eichengreen & Mody (1998b)	
Credit ratings		Kaminsky & Schmukler (2000)
External factors	Arora & Cerisola (2001)	Eichengreen & Mody (1998a) Eichengreen & Mody (1998b)

debt service indicators (see Knedlik 2006). This is linked to contagion and increased financial globalisation (financial stability). These factors, in turn, have affected spreads and thus credit ratings, which are regarded as an indicator of a country's ability and willingness to service its debts. Improved credit ratings could, however, also reduce the sovereign risk spread. Changes in a given country's creditworthiness could thus affect the stock and bond markets of other countries, with a high correlation between sovereign spreads of crisis countries and thus contagion among different countries.

External factors (including global events) such as the world interest rate, terms of trade shocks and the stance and predictability of US monetary policy could also play a role in terms of sovereign pricing and thus country risk. The 'herd-like mentality of irrational investors' is also provided as one of the main drivers of sovereign spreads, largely because of the high costs of acquiring and processing information. Recent studies such as those of Wang (2010), Beirne and Fratzscher (2013), Knoop (2013) and Jensen et al. (2014) can be added to the analysis and shed further light on the factors that might influence sovereign risk spreads. The latter focused on the association between authoritarian rule, corporate governance and investment. Existing knowledge is vast, and the discussion has by no means been exhausted. Although a vast amount of literature exists on emerging market bond spreads, most are panel data studies. The base literature that needed to be explored for this article and further literature studies will be included in follow-up research by the author. The reader should be able to form an overview of possible factors that can have an influence on the sovereign risk premium.

The prevailing situation in South Africa

The sovereign risk premium in South Africa has tightened substantially since 1997 with one of the first sovereign bond issues. Although the investigation in this paper emphasises the factors that best explain the sovereign risk premium since 1997, it invariably includes the currency risk premium since 1994 as well.

The sovereign risk premium is measured as the yield differential between South African dollar-denominated debt and US dollar-denominated debt in the 10-year maturity range (SARB 2005: 35). The South African government's 10-year bond yield decreased to 7.46% in November from 7.65% in October 2014. It averaged 10.24% from 1997 until 2014, reaching a record low of 5.77% in May 2013. It rose rapidly during 2008 to more than 10%, and this is accounted for in the analysis. In comparison, the US government's 10-year bond yield decreased to 2.31% in November from 2.33% in October 2014. It averaged 6.37% from 1912 until 2014, reaching a record low of 1.40% in July 2012. The currency risk premium is measured as the differential between

South African government bond yields on Rand-denominated debt issued in the domestic market and dollar-denominated debt issued in the US market in the 10-to-12-year maturity range (SARB 2005: 36).

Emerging market borrowers, whether private or public, normally pay a considerable risk premium over comparable risk-free assets (such as US treasury securities). The cost of local-currency-denominated debt will thus be equal to the risk-free rate plus the total risk premium (currency risk and sovereign or default risk premium).

In order to fully grasp the narrowing gap between bond yields up to 2013, an understanding of what determines or explains government bond yields is required. Nominal long-term yields have two components, namely the real yield and a measure of expected inflation. The former component is determined by the demand for credit and the balance of global savings and investment. The demand factors are the size of the government's borrowing requirement and the demand for bond finance in the corporate sector. The supply of funds in international bond markets is determined by the following six main factors: the level of global savings; short-term interest rates; the expected risk-adjusted rate of return on alternative financial assets (including equities); inflation expectations; the pattern of demand by institutional investors; and expected changes in bond yields. For South Africa, one consequence of the supply of and demand for credit has been significant currency weakness. The Rand 'benefited' from yield-seeking capital inflows, which distorted financial markets. The Johannesburg Stock Exchange (JSE) also 'benefited' from these inflows by setting record highs, despite pressure on earnings. Interest rates have been cut to levels last seen in the 1970s, yet the economy has struggled to attain 2% growth.

Several factors could keep longer-dated bond yields at low levels: (1) emerging markets have been investing in hard-currency government bonds to build reserves (excess liquidity); (2) at a time when bond supply is slowing in many countries, there is greater liquidity; (3) more investors are trading in bonds (from excess savings), thereby reducing their prices; and (4) investors are more confident that future inflation will not erode returns unexpectedly because more central banks have credibility, thus reducing the risk premium required to hold longer-dated bonds (Llewellyn 2006). It is therefore realistic to conclude that South African bond yields correlate with global bond yields (especially US bond yields). Factors affecting global bond yields would therefore also affect the local market. The interrelationship between long-term bond yields and future inflation has been well documented in South Africa's economic literature (see Abedian & Biggs 1998). Apart from liquidity, the possible drivers of risk spreads could include credit ratings of a country, the volume of debt (currency risk), external influences such as contagion, as well as technical features such as maturity of debt and duration (modified duration).

By 2014, South Africa's credit rating had been downgraded by all four rating agencies (Moody's Investors Service, Fitch Ratings, Standard & Poor and Ratings & Investments). Sovereign ratings measure the risk of a country's defaulting on its foreign currency debt service obligations. Determining factors in a rating include the ability of an economy to generate foreign currency, the magnitude of short-term debt, total debt stock and the level of international reserves, as well as the ratio of external debt to current account receipts.

The budget balance plays a determining role in terms of debt levels, but other factors such as economic stability, extraordinary receipts and payments, the absolute level of interest rates and exchange rates could also have an impact. Further factors such as improved economic growth and gross capital formation, increased tax revenue supported by a well-established tax collection system, favourable fiscal balances and public debt burdens have also added to the country's positive ratings. Improved ratings in the past have led to lower debt service costs with more resources available for public service and infrastructure delivery. However, South Africa's vulnerability is caused by a triple deficit. The Rand has weakened significantly. Easy inflows of foreign capital could quickly become outflows. This feeds back into the economy with higher prices and places pressure on households, which in turn places pressure on tax collections. Systemic risks in the developed world have become a real issue that has to be taken into account.

An empirical model to explain the sovereign risk premium

This section focuses on the factors that best explain the sovereign risk premium. Sovereign risk is ultimately important for the potential investor, and from there the importance of fiscal variables and the influence of these variables on the sovereign risk premium and thus bond yield spreads. The discussion thus far suggests a theoretical model that underpins an empirical model similar to a typical portfolio model, which means that different risk premia need to be accounted for, in the following way (see Edwards 1984, for derivations):

$$LogS_t = Log(1+r) + \sum_{K=12}^{n} \beta_K X_K \tag{1}$$

where S_t is the secondary market spread over the risk-free world interest rate in year t, X_K are the determinants of the default probability and b_K are the corresponding coefficients, therefore

$$LogS_t = \alpha + \beta X_t + \varepsilon_t \tag{2}$$

where e_t is the disturbance term.

The regression can be derived from the above two equations. Here an attempt is made to capture a combination of variables that best explains the sovereign risk premium in South Africa. Indicators of creditworthiness such as liquidity and solvency are included, but also macroeconomic fundamentals with separate policy (fiscal and monetary) variables. Policy measures can be adjusted in reaction to increasing spreads.

The following variables are considered determinants of the default probability and included in the X_t vector (monthly frequency): the yield on 10-year South African government bonds (BY); short-term interest rates such as the repo rate (ST_RATE); government revenue (LGOV_REV); government expenditure (LGOV_EXP); total debt and maturity (TOT_DEBT and MATURITY); the composite emerging markets bond spread (S_COMP); composite leading business cycle indicator (LCYCLE); foreign exchange reserves (LFOREX_RES); and a contagion dummy (CONTA_DUM). Most of the variables such as government revenue, government expenditure, total debt and gross domestic product are all in nominal terms.

A macro-finance model was also considered, namely the Bernanke-Reinhart-Sack Model (Bernanke et al. 2005). This model explains the yield curve with five macroeconomic variables included (the federal funds rate, the deviation of employment from trend measured by an HP filter, the year-on-year percentage change in core personal consumption expenditures deflator, the Blue Chip survey of inflation expectations for the upcoming year, and the rate of the Eurodollar futures contract with four quarters to expiration). Although the model does not explain the sovereign risk spread per se and is not applicable to an emerging market economy, it could, with some modification, be utilised in the current context.

The model in this paper was also expanded for verification on an annual basis and various explanatory variables were added, for example, gross domestic product; gross capital formation; the domestic and foreign supply of bonds; the government deficit; short-term interest differences; and money supply growth differences between South Africa and the USA.

Equation 2 translates into the following basic equation, expressed as logarithms, where applicable:

$$S_t = \alpha + B_1 by + B_2 st\_rate + B_3 gov\_rev + B_4 gov\_ex + B_5 tot\_debt + B_6 maturity + B_7 S\_comp + B_8 cycle + B_9 forex\_res + B_{10} conta\_dum + \varepsilon_t \quad (3)$$

Variables such as the inflation and interest rate differentials between South Africa and the USA were added, but without significant results.

Data sources

The empirical work investigates, among other things, the factors that best explain the sovereign risk premium in South Africa. It uses data that span the period December 1994 to December 2006, January 2006 to December 2011, and then until September 2014. The data set for the dependent variable comprises the stripped spread obtained from the Emerging Markets Bond Index Global (EMBI Plus and EMBI Global) for South Africa. The JP Morgan EMBI Global tracks total returns for traded external debt instruments in emerging markets issued by sovereign and quasi-sovereign entities, and is an expanded version of the JP Morgan EMBI Plus Index. The EMBI Global covers more eligible instruments than the EMBI Plus by somewhat relaxing the strict EMBI Plus limits on secondary market trading liquidity. It includes US-dollar-denominated Brady Bonds, loans and Eurobonds, which must have an outstanding face value of at least US$500 million (with maturity of more than two and a half years) and verifiable daily prices and cash flows. The EMBI Global is a market capitalisation weighted index with the country's spread computed as the weighted average of the spreads of the included bonds. The bond spread is measured against a comparable US government bond.

Table 2: Summary of variables

Dependent variable	
S_COMP	Emerging markets bond spread
Explanatory variables	
ST_RATE	Short term rate interest rates
GOV_REV	Government revenue
GOV_EXP	Government expenditure
MATURITY	Maturity of domestic government debt
TOT_DEBT	Government debt
FOREX	Foreign exchange reserves
GROSS_CAP_FORM	Gross capital formation
NBR	Net borrowing requirement
INT/EXPORT_EARN	Interest/Export earnings
(INFLATION_RATE	Inflation rate (CPI)
CUR_SPENDING/GDP	Current spending/Gross domestic product

The following time series were obtained from the SARB *Quarterly Bulletin*, namely the bond yield [BY] on 10-year government bonds; the net borrowing requirement [NBR]; the composite leading business cycle indicator [CYCLE]; current spending [CUR_SPEND]; foreign exchange reserves [LFOREX_RES]; government

revenue [GOV_REV]; government expenditure [GOV_EXP]; gross capital formation [GROSS_CAP_FORM]; inflation rate [INFL_RATE]; maturity of domestic government debt [MATURITY]; and government debt [TOT_DEBT]. The interest to export earnings ratio [INT_EXP] and short-term interest rates [ST_RATE] were obtained from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). A summary of all the important variables are provided in Table 2 for clarification.

Empirical results

Tables 4 and 5 present the empirical results with different combinations of variables included, as indicated in equation 3. The latter is done to control for possible collinearity, among other factors. Before the determination of regressions, it is imperative to first check the order of integration of the different variables. Several methods are suggested in the literature for testing unit roots in time series. The augmented Dickey-Fuller (Dickey & Fuller 1979) or ADF test was used. To test for unit roots at various frequencies, equation 4 is estimated using the ordinary least squares method:

$$y_{6,t} = \sum_{s=1}^{11} \delta_s D_{s,t} + \beta T + \pi_1 y_{1,t-1} + \pi_2 y_{2,t-1} + \pi_3 y_{3,t-1} + \pi_4 y_{3,t-2} + \pi_5 y_{4,t-1} + \pi_6 y_{4,t-2}$$

$$+ \pi_7 y_{5,t-1} + \pi_8 y_{5,t-2} + \pi_9 y_{6,t-1} + \pi_{10} y_{6,t-2} + \pi_{11} y_{7,t-1} + \pi_{12} y_{7,t-2} + \sum_{i=1}^{\rho} \varphi_i y_{6,t-i} + \varepsilon_t \quad (4)$$

Equation 4 is the augmented Dickey-Fuller auxiliary regression for a zero frequency unit root. In order to render the residuals from this equation, white noise, lagged $y_{8,t}$, is incorporated on the right-hand side. The estimated coefficients of this model facilitate testing for seasonal unit roots by examining the significance of the parameter $\pi_i (i = 1,2,3.....11)$, where T is the deterministic time trend, $D_{s,t}$ is the orthogonolised seasonal dummy variable, and ε_t is the error term. A variable X_t is considered unit-root non-stationary if the hypothesis that X_t has a unit root is not rejected by the ADF test. Table 3 shows the test results for determining whether the variables have a unit root. No trend or intercept was used in the test equation. All variables are included as proxy estimation for the regressions.

Table 3: ADF test for unit roots in variables

Variable	ADF test statistic	5% critical value	Order of integration, I(d)
LS	-0.704	-1.943	
D(LS)	-12,441	-1.943	I(1)
BY	-1.182	-1.943	
D(BY)	-9.636	-1.943	I(1)
ST_RATE	-1.348	-1.943	
D(ST_RATE)	-9.364	-1.943	I(1)
LGOV_REV	10.635	-1.943	
D(LGOV_REV)	-1.716	-1.943 (-1.615)*	I(1)
LGOV_EXP	11.194	-1.943	
D(LGOV_EXP)	-2.358	-1.943	I(1)
LMATURITY	-1.456	-1.943	
D(LMATURITY)	-14.347	-1.943	I(1)
LTOT_DEBT	5.434	-1.943	
D(LTOT_DEBT)	-5.647	-1.943	I(1)
LS_COMP	-1.230	-1.943	
D(LS_COMP)	-13.221	-1.943	I(1)
CYCLE	0.731	-1.943	
D(LCYCLE)	-5.383	-1.943	I(1)
LFOREX_RES	-1.998	-1.943	I(0)

Notes: The Schwartz information criterion (SIC) was used to automatically select the number of lags in the test equation. The sample period was from January 1994 to December 2006. L = logarithms and D = first-level differences. * Significant at 10% critical value.

The results show that all the variables are integrations of order one, I(1), although the composite leading business cycle indicator was treated as exogenous. The conventional unit root-testing techniques such as the ADF and Phillips Perron tests do not always account for seasonality in data. The test equation ultimately includes the intercept, seasonal dummies and the trend to verify results. Considering the volatility (including sensitivity) of monthly data and the difficulty in mapping financial market movements into real activity, the final long-run equations are also based on theoretical inference. It is necessary to test for cointegration of the variables because the data are non-stationary. Multi-cointegration was found to be irrelevant. Research has shown that some economic variables expressed in nominal terms such as money, prices, wages and some stock variables may be better characterised as I(2) series (Engsted, Gonzalo & Haldrup 1997).

Table 4: : Cointegrating vectors

Sample: January 1994 to December 2006, and January 2007 to December 2013 (although not reported)				
Included observations: 126 after adjustments				
Trend assumption: Linear deterministic trend in the data				
Series: S BY ST_RATE GOV_EXP TOT_REV MATURITY TOT_DEBT S_COMP				
Exogenous series: LFOREX_RES CYCLE CONTA_DUM				
Lags interval (in first differences): 1 to 6				
Hypothesis No. of CE(s)	**Eigenvalue**	**Likelihood ratio**	**5% critical value**	**Prob.****
None *	0.424353	69.58484	46.23142	0.0000
At most 1 *	0.331298	50.70457	40.07757	0.0022
At most 2 *	0.255926	37.24748	33.87687	0.0190
At most 3 *	0.240750	34.70343	27.58434	0.0051
At most 4 *	0.186723	26.04215	21.13162	0.0094
At most 5 *	0.122937	16.52821	14.26460	0.0216
At most 6 *	0.076843	10.07439	3.841466	0.0015
*(**) denotes rejection of the hypothesis at the 0.05 level				

The Johansen cointegration test was utilised to determine the number of cointegrating equations (CEs) in the system (S BY ST_RATE GOV_EXP TOT_REV MATURITY TOT_DEBT S_COMP FOREX_RES CONTA_DUM CYCLE). Lag length criteria indicate that eight lags in the VAR render the residuals white noise, although studies show that the lag length can range between four and eight lags, hence the choice of six lags. The trace and maximum eigenvalue statistics indicate seven cointegrating equations (Table 4).

Contagion could have played a role, and a dummy variable (CONTA_DUM, 1997:12-1999:01=1; 2000:04-2002:03=1 and 2008) was used to capture these effects, chosen according to the analysis by Pretorius and De Beer (2003). The dummy accounts for the crisis period in Zimbabwe from December 1997 to January 1999, and a further proliferation of circumstances before and after the Zimbabwean elections in June 2000. Further events such as September 11, 2001 (9/11) caused financial market turmoil, and the financial crisis of 2007 to 2011 had to be discounted. The contagion dummy was included as an exogenous variable to the system.

A vector error correction model (VECM) is specified and estimated if the variables are non-stationary and cointegrated. The error correction terms (ECT) are included in the model in order to capture the short-run deviations of the series from the long-run equilibrium path (see Table 5 for the different cointegrating equations):

$$\Delta S_t = \delta_0 + \sum_{s=1}^{k1} \delta_{1s} \Delta S_{t-s} + \sum_{s=2}^{k2} \delta_{2s} \Delta BY_{t-s} + \sum_{s=3}^{k3} \delta_{3s} \Delta ST\_RATE_{t-s} + \sum_{s=4}^{k4} \delta_{4s} \Delta GOV\_REV_{t-s} +$$
$$\sum_{s=5}^{k5} \delta_{5s} \Delta GOV\_EXP_{t-s} + \sum_{s=6}^{k6} \delta_{6s} \Delta TOT\_DEBT_{t-s} + \sum_{s=7}^{k7} \delta_{7s} \Delta MAT_{t-s} +$$
$$\sum_{s=8}^{k8} \delta_{8s} \Delta S\_COMP_{t-s} + \sum_{s=9}^{k9} \delta_{9s} \Delta CYCLE_{t-s} + \sum_{s=10}^{k10} \delta_{10s} \Delta FOREX\_RES_{t-s} +$$
$$\sum_{s=11}^{k11} \delta_{11s} CONTA\_DUM_{t-s} + \gamma_7 Z_t + u_t \tag{5}$$

where Z_t represents the error correction term for the determinants, and γ is the speed of adjustment, that is, how the variable S_t changes in response to disequilibrium. As mentioned, the ECM equation (5) contains both dynamic short-run changes and long-run adjustment processes for the determinants of the sovereign risk spread.

The seven cointegrating equations are as follows:

$$\gamma_1 Z_{t-1} = \ln\_S\_COMP_{t-1} + 0.016 + 0.159 \ln\_S_{t-1} \tag{6}$$
(0.846)

$$\gamma_2 Z_{t-1} = BY_{t-1} + 0.109 + 3.316 \ln\_S_{t-1} \tag{7}$$
(2.426)

$$\gamma_3 Z_{t-1} = ST\_RATE_{t-1} + 0.0215 - 3.133 \ln\_S_{t-1} \tag{8}$$
(-2.438)

$$\gamma_4 Z_{t-1} = \ln\_GOV\_EXP_{t-1} - 0.004 + 0.065 \ln\_S_{t-1} \tag{9}$$
(2.782)

$$\gamma_5 Z_{t-1} = \ln\_TOT\_REV_{t-1} - 0.004 + 0.024 \ln\_S_{t-1} \tag{10}$$
(0.956)

$$\gamma_6 Z_{t-1} = \ln\_MAT_{t-1} + 0.001 - 0.144 \ln\_S_{t-1} \tag{11}$$
(-3.192)

$$\gamma_7 Z_{t-1} = \ln\_TOT\_DEBT_{t-1} - 0.002 + 0.023 \ln\_S_{t-1} \tag{12}$$
(2.463)

Table 5 represents the cointegrating relationships found in the system and reports the estimations based on equations 6 to 12.

Table 5: : Results of error correction equations

Variables/ equations	Error correction regression coefficients						
	Δ (S_COMP$_t$)	**D(BY$_t$)**	**Δ (ST_RATE$_t$)**	**Δ(GOV_EXP$_t$)**	**Δ(TOT_REV$_t$)**	**Δ(MAT$_t$)**	**Δ (TOT_DEBT$_t$)**
D(S_COMP$_t$)	-2.087735	-0.356626	-1.335556	-0.117381	0.065942	-0.112445	-0.011864
	(0.43827)	(1.63731)	(1.99316)	(0.16107)	(0.18713)	(0.06266)	(0.02047)
	[-4.76358]*	[-0.21781]	[-0.67007]	[-0.72877]	[0.35239]	[-1.79462]	[-0.57944]
D(BY$_t$)	0.044678	-0.876983	-0.475164	0.001903	0.049130	-0.007705	-0.000496
	(0.06327)	(0.23635)	(0.28772)	(0.02325)	(0.02701)	(0.00904)	(0.00296)
	[0.70619]	[-3.71050]*	[-1.65148]	[0.08185]	[1.81877]	[-0.85183]	[-0.16787]
D(ST_RATE$_t$)	0.070087	0.072100	-0.451087	0.007080	0.019942	0.011868	0.000257
	(0.04039)	(0.15088)	(0.18367)	(0.01484)	(0.01724)	(0.00577)	(0.00189)
	[1.73539]	[0.47787]	[-2.45595]*	[0.47700]	[1.15644]	[2.05543]*	[0.13612]
D(GOV_EXP$_t$)	3.720702	7.243907	15.02256	-3.765447	-3.306628	-0.141328	0.260059
	(2.33269)	(8.71460)	(10.6086)	(0.85728)	(0.99598)	(0.33349)	(0.10898)
	[1.59502]	[0.83124]	[1.41607]	[-4.39230]*	[-3.31996]*	[-0.42378]	[2.38636]*
D(TOT_REV$_t$)	-0.156350	3.547217	0.566300	1.806422	-5.642672	0.084626	0.088498
	(2.29880)	(8.58797)	(10.4545)	(0.84483)	(0.98151)	(0.32865)	(0.10739)
	[-0.06801]	[0.41304]	[0.05417]	[2.13821]*	[-5.74896]*	[0.25750]	[0.82405]
D(MATURITY$_t$)	-2.725596	-13.92766	-5.226948	-1.487992	-0.030971	-0.904620	-0.066826
	(2.25088)	(8.40895)	(10.2365)	(0.82722)	(0.96105)	(0.32179)	(0.10516)
	[-1.21090]	[-1.65629]	[-0.51062]	[-1.79879]	[-0.03223]	[-2.81118]*	[-0.63550]
D(TOT_DEBT$_t$)	5.955553	-8.920627	-0.363636	-8.765869	5.711018	-0.552202	-1.160267
	(7.11507)	(26.5809)	(32.3579)	(2.61485)	(3.03790)	(1.01720)	(0.33240)
	[0.83703]	[-0.33560]	[-0.01124]	[-3.35234]*	[1.87992]	[-0.54287]	[-3.49060]*

* Denotes significance at a 5% level.

** The representations of the VECM are available from the author on request.

The seven error correction coefficients, namely $g_i Z_t$, are statistically significant at a 5% level (Table 5). These equations need further explanation, and from the results it is evident that any deviation of the estimated error correction terms from their equilibrium path will be restored at the following rates per month: (1) for the emerging markets bond spread equation at 208.8%; (2) for the bond yield equation at 87.7%; (3) for the short-term rate equation at 45.1%; (4) for the government expenditure equation at 377.4%; (5) against 564.3% for the government revenue equation; (6) for the debt maturity equation at 90.5%; and (7) for the government debt equation at 116.1%. Reverse causality could arise when governments change their fiscal policy in response to changes in spreads (Akitoby & Stratmann 2006), and Granger multivariate causality could become a reality in the long run in South Africa.

The emerging markets bond spread equation (DS_COMP_t) and the fiscal policy-related equations such as the ($DGOV\_EXP_t$), ($DTOT\_REV_t$) and ($DTOT\_DEBT_t$) explain most of the variation in sovereign spreads, namely about 80%, 97%, 98% and 79%, respectively. The emerging markets bond spread (DS_COMP_t) relates to the importance of the global environment in which South Africa operates. The government expenditure, government revenue and government debt equations ($DGOV\_EXP_t$, $DTOT\_REV_t$ and $DTOT\_DEBT_t$) deliver the expected signs, showing that an increase in these variables leads to a larger sovereign risk spread. The results tie in with those of Nyamongo, Sichei and Schoeman (2007) and the so-called "fiscal synchronisation hypothesis" that is rejected in the short run and confirm the fact that expenditure decisions are made in isolation from revenue decisions. The latter suggests that should government expenditure explode relative to government revenue on a month-to-month basis, higher levels of exposure to potential budget deficits are a reality. However, evidence of fiscal synchronisation in the long run implies that government expenditure and government revenue decisions are not made in isolation and the fiscal authority is in full control of the principal instruments of fiscal policy. Furthermore, the maturity of domestic debt shows up as statistically negative, probably confirming investor interest and thus confidence in the long run, with consequences for financial stability as a regional public good. The latter also confirms prudent debt management in South Africa, reducing the default risk over the longer run (CREFSA 1997; Abedian & Biggs 1998).

The bond yield equation (DBY_t) and short-term rate equation (DST_RATE_t) deliver similar signs and confirm the results on the sovereign risk spread. However, the results confirm the importance of fiscal policy decision-making and the fact that a fiscal balance could signal a smaller sovereign risk spread, taking all the other factors into account. The sovereign risk spread mainly moves as a result of the latter

factors, but also the remaining factors, namely the long-term bond yield (DBY_t) and short-term rates such as the repurchase rate (DST_RATE_t). Contrary to the norm, the exogenous variables such as the contagion dummy, the leading business cycle indicator and foreign exchange reserves (liquidity indicator) are mostly insignificant.

The data were run again for 1998 to 2014, but with an estimated vector auto regression (VAR). All the expected signs were the same for the fiscal variables with the exception of government revenue, which turned up negative. This variable is negatively correlated with the sovereign spread (EMBI Plus), that is, if the spread widens, less revenue is accumulated, which makes economic sense. The crisis period from 2007 to 2011 differed substantially from the pre- and post-crisis period. Government debt is positively related to the sovereign spread, that is, if the spread widens, government debt increases. Foreign exchange and interest expenditure of government are the same, that is, they are positively related to the sovereign spread. The rest of the variables such as the bank rate and the bond yield are negatively related to the sovereign spread. The post-crisis period (2011–2014) also differed. The foreign exchange and interest expenditure of government became negatively related to the sovereign spread, whereas government revenue became positively related to the sovereign spread.

As a robustness check of the results, alternative specifications were used, and the model was estimated with alternative measures of solvency and liquidity. However, no real significance emerged. To further check the above-mentioned results, the model was extended to annual data frequency from 1994 to 2014 using the Engle and Yoo (1991) three-step approach. The long-run equilibrium equation was therefore followed by the estimation of an error correction model (ECM) to capture the short-run effects. The last step was to use the ECM to estimate the final long-run equilibrium equation.

The estimated long-run model and the calculated t-values are summarised in Table 6. Economic evaluation of the relationship indicates that the variables, with some exceptions, have the expected sign and are statistically significant at the 5% level.

A similar exercise to that in Table 6 was done in terms of currency risk spreads, but was not reported because of the emphasis on sovereign risk spreads. The currency risk premium was also included as a driver of the sovereign risk spread, but with no significant results. The results reported in Table 6 confirm the importance of the fiscal variables, although a one percentage point increase in the inflation rate could lead to about 0.19% increase in spreads. The latter is also confirmed by the bond yield, which could serve as an indicator of inflation expectations.

Table 6: The Engle and Yoo (1991) long-run equation – Dependent variable: Sovereign risk spread (DS)

Explanatory variable	Coefficient	Standard error	t-ratio
D(BY)	0.425653	0.103373	4.12*
D(CUR_SPEND/GDP)	0.282269	0.122724	2.30*
D(GROSS_CAP_FORM)	-5.218158	1.648851	-3.16*
D(NBR)	0.473149	0.231234	2.05*
D(INT/EXPORT_EARN)	-0.397561	0.132599	-2.99*
D(INFLATION_RATE)	0.194053	0.051432	3.78*
LOG(FOREX_RES)	0.685245	0.209329	3.27*
CONTA_DUM	-1.143177	0.371857	-3.07*

* Significant at the 5% level

Although, in some instances, the signs delivered unexpected outcomes, such as the liquidity indicator (total foreign exchange reserves), the results do confirm the importance of liquidity in investors' decisions. Current spending and the public sector borrowing requirement have a statistically positive effect on spreads. The latter could be an indication of investor sensitivity, especially in terms of the way in which the borrowing requirement is utilised and the fact that capital spending is preferred to short-term current spending. According to Akitoby and Stratmann (2006), "there are reasons to believe that the financial market's treatment of spending and revenue decisions would be influenced by the initial conditions of fiscal and debt variables". The time series utilised in this study are different for an emerging market, hence the unique findings.

Policy implications and concluding remarks

This paper explored the determinants of the sovereign risk premium in South Africa. The results reveal a unique combination of explanatory factors with definite implications for bond yield spreads. Cointegration analysis and error correction modelling were employed, and the results confirm the importance of fiscal policy decision-making and fiscal balance, taking all factors into account, such as long- and short-term interest rates. Although government expenditure, government revenue and government debt delivered the expected signs, indicating that an increase in these variables could lead to a widening sovereign risk spread, the results are further expanded and verified on an annual basis. Current spending and the public sector

borrowing requirement have a statistically positive effect on spreads. The latter could be an indication of investor sensitivity, especially in terms of the way in which the borrowing requirement is utilised and the fact that capital spending is preferred to short-term current spending. Furthermore, the maturity of domestic debt shows up as statistically negative, probably confirming investor confidence over the long term.

The main findings of the paper seem to acknowledge the importance of fiscal policy and the vulnerability (sensitivity) of investors to policy changes. The study suggests policy implications, especially regarding the attraction of foreign portfolio investment. Firstly, macroeconomic stabilisation (including sound policy measures) through prudent debt management takes precedence over and above foreign exchange reserve management. Secondly, capital formation and the delivery of quality services for business seem to be essential to potential investors.

The financial crisis in the period 2007 to 2011 posed a potential significant break in data and was built into the analysis. The results were run again for 1998 to 2014. The crisis period differed substantially, as did the post-crisis period, and both are reported. It could be argued that the sovereign risk determinants are important for financial stability as a regional public good in southern Africa as a whole to ensure its attractiveness as an investment destination. However, further exploration of the research findings is essential.

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