

DETERMINANTS OF SOVEREIGN CREDIT RATINGS IN AFRICA

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ABSTRACT

Sovereign credit ratings measure a country's ability to meet its financial obligations. These credit ratings are an indication of the economic, financial and political situation of an economy and signals important information regarding a country's development to governments and international financial markets (Afonso, 2003). It is therefore imperative to consider the specific determinants of these ratings as it influence the decisions of investors and other role players. Most literature focus mainly on the determinants of sovereign credit ratings for developed and developing markets, but are they the same for countries situated in Africa? The main focus of this article is to quantify and weigh the relationship between sovereign credit ratings and their determinants in Africa.

The determinants of sovereign credit ratings will be identified by making use of panel data models and using the ratings of three different rating agencies. Data of 28 African countries is included over a period of five years (from 2007 to 2012). The results confirm the importance of the determinants of credit ratings identified by the seminal work of (Cantor & Packer, 1996). Some differences occur between findings from literature, which mainly focus on developed and developing countries, and the findings of this paper focussing on Africa.

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1. INTRODUCTION

Sovereign credit ratings measure a country's ability to meet its financial obligations. These credit ratings are an indication of the economic, financial and political situation of an economy and signals important information regarding a country's development to governments and international financial markets (Afonso, 2003). According to Afonso, Gomes, and Rother (2011) the determinants of sovereign credit ratings are important because these ratings determine the interest rate that a country qualifies for in international markets and it may also have a constraining effect on the ratings assigned to institutions like banks and companies in the rated country. Agencies very rarely assign a credit rating to a bank, company or local municipality that is higher than that of the home country of the issuer (Cantor & Packer, 1996). The factors and the weightings that rating agencies take into account when determining specific country ratings are subsequently very important to involved role players.

Most research on this topic identifies the determinants of sovereign credit ratings for various countries (developed and developing) around the world. This paper aims to identify the specific determinants of African sovereign credit ratings, since international investors identified Africa as a continent with investment opportunities. The aim is also to determine whether the determinants of sovereign credit ratings for African countries differ between different rating agencies. The study will make use of the credit ratings of two international rating agencies (S&P and Fitch) as well as the ratings of a research entity that is situated in South Africa (NKC). The advantage that NKC has, is that they are based in Africa and has a competitive advantage above the international rating agencies due to first-hand experience of African business and economic environments. Another advantage is that they rate almost all African countries, whereas the other international agencies only rate a limited selection of countries.

Econometric methods used in identifying the determinants are normally very basic and is critiqued by various authors. Data unavailability normally limits or

prescribes the possible methods that can be used to identify these determinants. This study will make use of panel data methods to incorporate more information and account for unobserved country heterogeneity.

The paper is organised as follows: Section 2 covers the literature review of the determinants of credit ratings and econometric methodology used in other studies to determine the rating models. Section 3 discusses the data and methods used in this study. In Section 4 the estimations and the results are presented and Section 5 concludes the paper.

2. LITERATURE REVIEW

Rating agencies evaluate the risk of default by assessing an extensive range of determinants that can be broadly categorised into macroeconomic, government performance, external balance and other explanatory variables (Afonso, Gomes, & Rother, 2007). Considering the vast amount of data that is used to determine credit ratings it is useful to identify a limited selection of variables that explains a country's rating fittingly.

One of the first papers that identified the determinants of country risk ratings by making use of a direct measure of creditworthiness was Feder and Uy (1985). Earlier research on the topic made use of proxy variables related to creditworthiness like risk premiums or credit volumes (see for example Sargen, 1977; Kapur, 1977 and Eaton & Gersovitz, 1981). Feder and Uy (1985) used the *Institutional Investor* ratings to estimate the effect of the identified variables on the creditworthiness of 55 developing countries.

Feder and Uy (1985) utilised a simple OLS model by transforming the rating data logistically. They identified debt to GNP, international reserves to imports, the average exports growth rate, the average GDP growth rate, terms of trade, export vulnerability to external shocks, GNP per capita, dummy variables for oil exporters, political turmoil and debt service difficulties as possible determinants. Their results indicate that all the proposed

determinants are statistically significant with the expected signs, but that the elasticities computed from the model were quite low.

Cosset and Roy (1991) extended the article by Feder and Uy (1985) by making use of the ratings by *Institutional Investor* and *Euromoney* and focusing on developed and less developed countries. Similar to Feder and Uy (1985), Cosset and Roy (1991) also makes use of logistic transformation of the data for the individual OLS estimation on each rating. They found that country risk ratings respond to some of the variables suggested by theory (GNP per capita, propensity to invest, net foreign debt to exports) and that the same variables are significant for both indicators.

In a seminal paper, Cantor and Packer (1996) present the first systematic investigation of the determinants of sovereign credit ratings by making use of two leading U.S. rating agencies, Moody's and S&P's. They identified several significant variables (per capita income, GDP growth, inflation, fiscal balance, external balance, external debt, economic development and default history) that determine credit ratings by making use of sample correlation statistics by broad letter category as well as an OLS multiple regression with credit ratings as dependent variable. Cantor and Packer (1996) assign numerical values to specific ratings, for example S&P's credit ratings were converted as follows: B- = 1, B = 2 and so on through to AAA = 16. They also found that the same significant variables (per capita income, GDP growth, inflation, external debt, economic development, default history) determine ratings by both Moody's and S&P's although the weights of the variables for the two ratings are different.

Mulder and Perrelli (2001) also focused on Moody's and S&P and made use of pooled ordinary least square (POLS) regressions and feasible generalized least squares (FGLS) panel data regressions. FGLS was used to accommodate for high levels of autocorrelation and corrections were done for heteroskedasticity as well. They focused solely on a set of emerging market economies. Their results show that the ratio of investment to GDP has the most significant impact on rating changes across countries (Mulder & Perrelli,

2001). Other important determinants identified include the ratio of debt to exports and rescheduling history.

Eliasson (2002) made use of S&P credit ratings for emerging markets in both a static and dynamic context and used only macroeconomic indicators as explanatory variables due to the unavailability of objective socio-political variables. She used a random effect panel data model that allowed for country-specific omitted variables. The static results show that a small number of macroeconomic variables (generally the same variable as identified by Cantor and Packer, 1996) explain a significant part of the model (Eliasson, 2002).

Afonso (2003) identified GDP per capita, external debt, level of economic development, default history, real growth rate and the inflation rate as the most relevant in determining country credit ratings. A total of 81 developed and developing countries were used in this study and the ratings by S&P and Moody's were again used as measures for credit ratings. The ratings in this study were converted linearly, logistically as well as exponentially (Afonso, 2003). The author found that the logistically transformed model delivered slightly better results especially for countries on the upper end of the rating scale. According to Afonso (2003:17) this confirms "*general knowledge that rating agencies prove right evaluating developed sovereign risks, while their abilities to rate developing countries is not as good.*" Furthermore, Afonso (2003) could not confirm that the two rating agencies used the same variables in their analyses.

Rowland (2004) tested for significant differences between his results and those of Cantor and Packer (1996). The author included the same variables as Cantor and Packer (1996) but focused solely on developing countries. His results are similar to Cantor and Packer (1996) indicating that rating agencies (he also made use of Moody's and S&P) use related criteria when evaluating developed and developing countries.

All research conducted in this field focus on either developed or developing countries or a combination of the two with none focusing exclusively on African countries. The lack of reliable data for African countries available might play a significant role in this shortcoming. It would be very informative to see if the same determinants are significant for African countries as for other developing countries and for developed countries.

All rating agencies that were used in the literature were international agencies situated in other parts of the world. Ferri (2004) found evidence of absolute underinvestment of rating agencies in less developed countries. This study will compare the determinants identified in literature by making use of S&P and Fitch's credit ratings to the significant determinants identified by making use of a South African based research unit NKC Independent Economists (NKC).

3. DATA AND METHODS

3.1 Data

NKC is a political and economic research unit based in South Africa. They analyse the political and macroeconomic environment of the African continent. NKC has developed a sovereign risk ratings model and is able to assess countries not rated by leading credit rating agencies such as Fitch or S&P. Where those ratings are available, NKC gives its own comparative rating (NKC, 2013).

NKC has extensive access to informational resources on the continent and rate 28 African (currently and from the sample period of 2007) countries whereas S&P rates 12 from 2007 and 17 currently; Fitch 12 from 2007 and 16 currently and Moody's rate only 6 from 2007 and 13 currently. In this article we will use the ratings from NKC as main source since the focus of this paper is on Africa. In the case where we compare ratings we will focus only on Fitch and S&P ratings because Moody's rate only 6 African countries in the sample period. The agencies use the same symbols (from A to D) in assessing credit

risk in their credit ratings. The top rating is “AAA” and the bottom “D” (the lower the rating the bigger the probability of default and vice versa). These rating agencies furthermore make use of arithmetical symbols (+ and -) to differentiate between sovereign states in the same category (but this is not applicable to the highest and lowest categories, AAA and D). Sovereign states rated above “BBB” are considered investment grade and those rated below are considered speculative grade.

This paper examines what the determinants are of sovereign credit ratings in Africa. We construct a panel of 28 African countries for the time period 2007-2012 on an annual basis. The sample was selected for countries for which adequate data were available. The data for the ratings and other explanatory variables was sourced from the NKC data base and the ratings for the other rating agencies were sourced from Bloomberg. Throughout the analysis the dependant variable is the sovereign credit rating.

To quantify the rating categories there is a choice between a linear or non-linear transformation. A linear transformation assumes that the distance between ratings categories are identical whereas for a non-linear transformation it is different. Technically it means that, for example, a country will experience increased difficulties on international debt markets if a country has a rating change from investment grade to speculative grade. Therefore these difficulties are captured as “uneven steps”, although according to (Eliasson, 2002) it is unlikely that there is a difference between these categories. Some research findings don’t find significant differences between the two transformations (see for example Beers & Cavanaugh, 1998 and Ferri, Liu & Stiglitz, 1999). For the purpose of this paper the linear transformation will be used.

The credit ratings were transformed into a linear scale (Cantor & Packer, 1996) with D assigned a 1, through to AAA assigned a value of 26. The ratings are on a quarterly basis and the annual averages were used in the analysis.

This paper includes a selection of explanatory variables as possible determinants of ratings in Africa. The choice of variables was based on literature by Cantor and Packer (1996); Mulder and Perrelli (2001); Rowland and Torres (2004); Mellios and Paget-Blanc (2006) and Afonso *et al.* (2011). The choice of variables was also limited to data availability. Details of the data are presented in Table 1 below.

Table 1: Description of explanatory variables

Variable name	Definition	Unit of measurement	Expected relationship
GDP growth	Annual real growth on a year on year basis	Percent	High economic growth implies easier service of debt burden (+)
Fiscal balance	Budget balance to GDP	Percent	Large deficit absorbs savings; inability to service debt (-)
External balance	Current account to GDP	Percent	A large deficit implies reliance on funds abroad. Leads to growing debt, over-consume (-) or rapid accumulation of investment, leading to higher growth and improved sustainability (+).
External debt	External debt to exports	Percent	Higher debt, higher risk of default (-)
	External debt to GDP	Percent	(-)
Investment	Foreign direct investment to GDP	Percent	Higher ratings attract foreign capital, showing possible future growth (+)
Inflation	Annual consumer price inflation	Percent	High inflation indicates structural problems in government finances. Dissatisfaction with high inflation from

			the public may lead to political instability (-) or reducing real stock of outstanding debt (+)
Foreign reserves	Foreign reserves to GDP		High foreign reserves indicate possible means to service debt (+)
International reserves	International reserves to imports		(+)
Per capita income	GDP per capita	Dollar terms	Higher per capita income indicates a larger potential tax base (government income to service debt). Also a proxy for political instability (+)

3.2 Method of research

Rating observations are ordinal and have certain restrictions on the applicable econometric method. An ordered probit regression model would be the most appropriate model although this method cannot account for unobserved country heterogeneity (Eliasson, 2002). The asymptotic properties of this model do not generalise for small samples and estimation for only a cross section of countries is a problem (Afonso, *et al.*, 2011). A panel data model would account for this heterogeneity and because there are only a few observations with many countries, this model would maximise the observations - pooling observations of cross sections over several time periods.

As a first point of departure, to build the body of knowledge around credit ratings in Africa, the purpose of this paper is to determine which of the explanatory variables identified in literature determine sovereign credit ratings in Africa. For this purpose a static panel model is preferred since it will increase the number of observations. A dynamic panel data model would be considered when the goal is to describe rating changes over time (Eliasson,

2002), the time series in this research is too short to capture changes therefore timing is not a fundamental issue. Incorporating forward-looking behaviour is an important aspect to study, but it is not the purpose of this study. If agencies behave forward looking they still consider current information, which is captured in this model (Afonso *et al.*, 2011).

3.3 The econometric framework

The standard panel model can be specified as follows:

$$y_{it} = \alpha + \beta X_{it} + \mu_{it}$$

Where y_{it} is the dependent variable at time (t) for a certain cross section (i), α is the intercept term and β is a $k \times 1$ vector of parameters to be estimated on the $k \times 1$ observations of the explanatory variables (X), t is 1,...T and I is 1,...N (Brooks, 2008).

Following (Afonso, *et al.*, 2011) our model can be specified as:

$$R_{it} = \beta X_{it} + \gamma Z_i + a_i + \mu_{it}$$

Where R_{it} is the rating per country (i) over time (t), obtained by the linear transformation, X_{it} is a vector of time varying variables (determinants), Z_i is a vector of time invariant variables and a_i is the individual effects for each African country and μ_{it} independent disturbances across countries and across time.

In this paper this specification will be used in three ways; pooled OLS, fixed effects and the random effects estimation. The choice of our final model will be based on a few considerations that follow. The notion is that the random effects model is more appropriate when the cross section in the sample have been randomly selected from the population, but a fixed effect model is more appropriate when the sample effectively constitute the entire population. In this situation, typically when the cross sections (N) is large and time periods (T) is small, there is a difference between the fixed effects and random effects results (Baltagi, 2008). Since there are fewer parameters to be estimated, the random effects should produce more efficient estimators than the fixed effects, however if the country specific error is correlated with the regressors,

the random effects estimators are biased and inconsistent and the fixed effects more efficient Baltagi (Brooks, 2008). When T is large and N small there is little difference between the random and fixed effects and then fixed effects are preferred on computational convenience (Baltagi, 2008).

The analysis will start with the pooled model as first point of reference to establish which explanatory variables are possibly the determinants of ratings in Africa. The fixed effects model will follow and allows cross-section heterogeneity and assumes a different intercept for each country included in the sample. The F-test for fixed effects will be conducted to establish whether the fixed effects model is indeed different to the pooled OLS. This would imply whether the country dummies are significantly different from each other. The random effects model also allows for the cross section heterogeneity but the difference from the fixed effects models is that it assumes that these effects are generated by a specific distribution; therefore each effect is not modelled explicitly. This avoids the loss of degrees of freedom, such as in the case of the fixed effects model (De Wet & Van Eyden, 2005). The Hausmann test will be conducted to determine whether there is correlation between the country specific error and the regressors of the random effects model.

4. RESULTS

In this paper we used a panel of 28 African countries with a sample from 2007-2012 on an annual basis. The countries included are Algeria, Angola, Benin, Botswana, Cameroon, DRC, Egypt, Ethiopia, Gabon, Ghana, Kenya, Lesotho, Libya, Malawi, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Swaziland, Tanzania, Tunisia, Uganda, Zambia and Zimbabwe.

The dependent variable for the first set of estimations is the NKC credit ratings with the identified explanatory variables. The pooled OLS, fixed effects and random effects model is presented in Table 2 below. All models were corrected for heteroscedasticity.

Table 2: Results of the panel data model (NKC rating: dependent variable)

	Pooled	Fixed effects	Random effects
Variable	Coefficient	Coefficient	Coefficient
Current account to GDP	0.0799 ***	0.0099	0.0168 *
Inflation	-7.78E-10 ***	-3.53E-10 ***	-3.71E-10 ***
Debt to exports	1.98E-05 ***	-3.57E-06	5.48E-06
Debt to GDP	-0.0596 ***	0.0001	-0.0268 **
FDI to GDP	0.2314 ***	0.0131	0.0124
Fiscal balance	0.0008 ***	0.0003 ***	0.0005 ***
Income per capita	1.58E-06 ***	2.35E-06 ***	1.48E-06 ***
GDP growth	-0.2765 ***	-0.1728 ***	-0.1941 ***
International reserves to imports	-0.0004 ***	-0.0002 ***	-0.0003 ***
Foreign reserves to GDP	-0.0011	-0.0556 ***	-0.0261 **
Intercept	15.61964 ***	15.00573	15.3560 ***
Total panel observations	166	166	166
Observations	6	6	6
Cross sections	28	28	28
Adjusted R-squared	0.4604	0.9435	0.5445
S.E. of regression	2.6877	0.8696	0.9662
Durbin-Watson stat	0.331176	1.4069	1.0285
F-statistic fixed effects		50.095513 ***	
Hausman-test random effects			46.343911 ***

*, **, *** 10%, 5%, 1% level of significance, respectively

In the models all the explanatory variables were included that was identified in the literature (and available). In the pooled model all the variables are significant except for foreign reserves to GDP. When the fixed effects model was estimated the significance of the variables changed. The F-statistic of

the fixed effects indicated that the fixed effects are not redundant and therefore the country effects are significant. The coefficients for inflation, fiscal balance (unexpected sign), income per capita, GDP (unexpected sign), international reserves (unexpected sign) and foreign reserves (unexpected sign) were significant. The current account, debt ratios and the FDI/GDP ratio were insignificant.

The random effects model results were similar to the fixed effects model (significance and signs) although the current account balance to GDP became significant (unexpected sign) as well as the debt to GDP ratio with the expected sign. The random effects model is the preferred model since the Hausman test showed no correlation between the country specific errors and the regressors and the cross sections is large (N) and the time period is small.

According to the results from the random effects model the main determinants of sovereign credit ratings in Africa are the external balance, inflation, debt to GDP, the fiscal balance, income per capita, GDP growth, international reserves to imports and foreign exchange reserves to GDP. These determinants are in line with the findings in literature Cantor and Packer (1996); Eliasson (2002); Afonso (2003); Afonso *et al.* (2011); Mellios and Paget-Blanc (2006); Rowland and Torres (2004) and Rowland (2004) although the signs are different for a few of the variables, which might be attributed to the fact that the focus is on African countries and most literature focus on developed and developing countries.

The determinants which are significant with the expected signs are the external balance, inflation, income per capita and debt to GDP. The external balance is significant contrary to Cantor and Packer (1996) and the sign is positive. According to Afonso *et al.* (2011) a higher current account deficit might mean higher ratings since it could indicate growth prospects and foreigners are willing to cover the deficit through loans and investment. Due to the growing investment opportunities in Africa it seems as a plausible explanation. The African continent is a volatile environment, politically and the two proxies for political stability i.e. inflation and income per capita are

significant with the expected signs. Debt to GDP is significant showing a negative sign, therefore higher debt means lower ratings.

Significant variables with an unexpected sign are GDP growth (-), the fiscal balance (+), foreign reserves to GDP (-) and international reserves to imports (-). As Cantor and Packer (1996) explains ratings may not have a clear relation to GDP growth since many developing economies tend to grow faster than developed economies. This is typically the case in Africa at the moment where some countries grow rapidly. Cantor and Packer (1996) also mention that there might not be a clear relationship between ratings and fiscal and external balances. Our findings show this where the fiscal balance and reserve ratios are significantly determining the ratings however with the unexpected signs. This could mean that these countries are trying to improve their credit standings and therefore have more conservative fiscal policies and since most African countries are low-rated countries the supply of international capital may be restricted for some low-rated countries. This reflects some endogeneity in fiscal policies and international capital flows according to (Cantor & Packer, 1996).

In the second part of the analysis, three rating agencies' were compared. The same explanatory variables were used but only 14 countries were included (the countries all three rated since 2007, namely Angola, Cameroon, Egypt, Gabon, Ghana, Kenya, Morocco, Mozambique, Nigeria, Rwanda, South Africa, Tunisia, Uganda and Zambia). Each rating was quantified according to the linear method. The results are presented in Table 3 below.

Table 3: Comparison between three rating agencies

	NKC	FITCH	S&P
Variable	Coefficient	Coefficient	Coefficient
Current account to GDP	-0.0205	-0.0238	-0.0489
Inflation	-0.0333	0.0135	0.0356 ***
Debt to exports	0.0001	-0.0020 ***	0.0039
Debt to GDP	-0.0338 **	0.0125	-0.0024

FDI to GDP	-0.0482	***	-0.0020		0.0064	
Fiscal balance	-0.0298	***	0.0085		0.0333	
	1.74E-					
Income per capita	06	***	1.91E-06	***	3.73E-06	***
GDP growth	-0.0518	**	0.0368		0.0597	
International reserves to imports	0.0094		-0.0015		0.0115	**
Foreign reserves to GDP	-0.0386		0.0609	***	0.0235	
Intercept	14.9324	***	12.3332	***	11.0414	***
Total panel observations	84		74		72	
Observations	6		6		6	
Cross sections	14		14		14	
Adjusted R-squared	0.9117		0.9823		0.9316	
S.E. of regression	0.6123		0.3177		0.5856	
Durbin-Watson stat	1.3848		1.2851		1.3474	
F-statistic fixed effects	30.3110	***	30.3110	***	47.9712	***
Hausman-test random effects	8.7891		10.0000		10.5574	

*, **, *** 10%, 5%, 1% level of significance, respectively

The fixed effects model was the preferred model, the F-statistic indicated that the county effects were significant and the Hausmann test showed that the country effect errors are correlated with the regressors.

Income per capita is the only variable that is significant for all three rating agencies and the current account to GDP is not significant for any of the agencies. The majority of significant determinants for the three rating agencies differ quite substantially from each other. In addition to per capita income that is significant for the NKC ratings, four other variables are also significant (debt to GDP, FDI to GDP, fiscal balance and GDP growth). Debt to exports and foreign reserves to imports are also significant for Fitch ratings and inflation and international reserves to imports are significant for S&P ratings.

5. CONCLUSION

The purpose of this paper was to identify the determinants of sovereign credit ratings for African countries. We made use of the ratings of two main international rating agencies (S&P and Fitch) as well as the ratings of a South African based research unit (NKC), for the period 2007 to 2012. Regarding the methodological approach, we used a static panel model (with pooled OLS, fixed effects and random effects estimation) to identify the explanatory variables that influence the sovereign credit ratings in Africa.

The evidence reveals that sovereign credit ratings in Africa respond to some of the variables suggested by the literature. According to the results from the random effects model (preferred model) the main determinants of sovereign credit ratings in Africa are the external balance, inflation, debt to GDP, the fiscal balance, income per capita, GDP growth, international reserves to imports and foreign exchange reserves to GDP.

It is also clear that different credit rating agencies derive their credit ratings of the assessed African countries in different ways although they agree mostly on the ratings of the sovereign states. This is in line with the results of Afonso (2003) seeing that it can't be confirmed if the three rating agencies used the same variables in their analyses.

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