Determinants of sovereign credit ratings in an emerging economy: A case of South Africa

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by

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ABSTRACT

The author attempts to identify and measure determinants of sovereign credit ratings for emerging markets as rated by the three leading ratings agencies, namely:- Fitch, Moody's, and Standard and Poor's. Sovereign credit ratings have a vital role in capital mobilisation and portfolio inflows as they dictate the cost and eligibility of borrowing in the global capital markets. The sovereign credit ratings also act as a ceiling for sub-sovereign borrowers' foreign currency ratings, and as suggested by available literature and empirics, sub-sovereigns can never be rated above their sovereign.

Emerging markets now account for 40 percent of the world GDP, up from around 20 percent two decades ago. However, despite the strong foreign investment inflows to emerging markets, according to Standard and Poor's 2016 report, 9 of the top 20 emerging market sovereigns had negative outlook on their credit ratings, thus indicating a possible downgrade over the next two years.

Since 2010, South Africa's sovereign foreign currency ratings have generally been stable to negative, with some downgrades in 2013 and 2015. For the past decade, South Africa has moved from BBB+ to BBB- as at end of 2016. Drawing on the literature, the analysis shows a formalised relationship between certain economic variables and the sovereign credit ratings. Economic variables like economic growth, exchange rate and the country's external balance of payments have a positive impact on credit ratings, whilst a negative relationship exists between sovereign ratings and variables like inflation and external debt. Based on these findings, a case can be made in assisting emerging and developing countries to obtain and or achieve investment grade credit ratings, not just for central government borrowing, but for local and other sub-sovereign entities' access to international capital markets. Improved ratings can also be useful for securitization and in leveraging official aid and improved borrowing terms for emerging and developing markets.

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GLOSSARY OF TERMS

ADF	Augmented Dickey Fuller
AE	Advanced Economies
ARDL	Autoregressive Distributed Lag
ECM	Error Correction Model
EME	Emerging Markets Economies
Fitch	Fitch Ratings
GDP	Gross National Product
IMF	International Monetary Fund
Moody's	Moody's Investor Services
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PP	Phillips and Peroni
S&P	Standard and Poors' Global Ratings
SA	South Africa
SARB	South African Reserve Bank
US	United States of America
DBRS	Dominion Bond Rating Service

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CHAPTER ONE
INTRODUCTION

1.1 Background of the study research area

Globally, credit ratings date back to the 1850s, when the United States (US) railroad companies in their quest to expand into the "wild west" became part of a large bonded debt market to fund their expansion (Grier & Katz, 1976). Due to a massive wave of corporate activity in the railroad business, European investors started demanding third party and independent credit information for the US companies they invested in (Katz, 1974). With what started off as simple credit reporting, later became the publication of statistics and specialized financial data. The credit ratings have greatly evolved to being the focused opinions of credit worthiness that we have today, and a key element in modern financial markets.

In 2010, the number of credit ratings agencies had grown to over 70 (IMF, 2010). However, credit rating is still a highly concentrated industry, and to this day the global market is dominated by the "big three", controlling a total 95 percent of the industry, namely Fitch Ratings (Fitch), Standard and Poor's Global Ratings (S&P) and Moody's Investor Services (Moody's). The highly concentrated market structure is attributed to the historical reputation built upon by these three agencies over a long period of time, hence creating a high entry barrier for new entrants (Chen, 2016). According to these credit rating agencies, their aim is to provide the investing public an independent assessment and opinion of relative credit risk for specific debt instruments, including credit quality of governments and their debt issues (S&P, 2011).

Most investors, including institutional and private equity, have often relied upon these credit ratings on their assessment of credit worthiness of borrowing countries. Credit quality has a bearing on the cost of borrowing. Apart from credit assessment and cost, today sovereign credit ratings also act as a moral suasion for governments to apply prudent and robust economic policies to achieve and maintain good ratings. Sovereign credit ratings have a subsequent and direct impact on credit ratings assigned to individual borrowers within the boundaries of their respective countries. Thus credit rating agencies rarely assign better or higher ratings to private companies or government institutions above that of the sovereign (Moody's, 2015).

Over the years, the sovereign credit ratings assigned to advanced economies, emerging markets and developing countries have charted different paths. Years of socio-political reforms and strengthened macroeconomic fundamentals have improved the sovereign credit ratings of most emerging market economies (Borio and Parker, 2004). During the 2007/8 global financial crisis and the subsequent euro debt crisis, the average of the foreign currency sovereign credit ratings of 28 advanced economies as assigned by the three leading credit ratings agencies deteriorated by two full rating notches from AA+ to AA-, while the average of the similar ratings assigned to 68 emerging market countries were mostly stable (Amstad and Parker, 2015).

Table 1: Movements in sovereign credit ratings, 2007 – 2015

		Number of countries	Average rating		Notch change,[1] 2007-2015
			Mid-2007	October 2015	
Overall	AE	28	AA+	AA-	-2.1
	EME	69	BBB-	BB+	-0.2
Asia-Pacific	AE	5	AA+	AA+	-0.2
	EME	12	BBB-	BBB	0.6
Americas	AE	2	AAA	AAA	-0.2
	EME	20	BB	BB	0.2
Europe	AE	20	AA+	A+	-2.9
	EME	20	BBB	BBB-	-0.9
Sub-Saharan Africa	EME	8	BB	BB	-0.3
Middle East and North Africa	AE	1	A-	A+	1.3
	EME	9	BBB+	BBB	-0.5

[1] A notch is the difference between ratings grades, AAA and AA+, A- and BBB+

Source: BIS Quarterly Review

The post financial crisis era has seen most advanced economies bear the brunt of a sovereign credit ratings decline. As shown in Table 1 above, Europe recorded the highest downgrades for both advanced and emerging market economies between 2007 and 2015. Emerging markets in the Sub-Saharan, Middle East and North Africa had modest ratings adjustments, which were largely attributed to developments in the fiscal and macroeconomic environments. Some of the changes in the credit ratings have been driven by the evolving methodology and approach to the measurement of sovereign credit risk (Amstad and Parker,

2015). The rating agencies have moved to a more quantitative input-approach compared to prior years.

In South Africa, the first sovereign credit ratings were issued in 1994 by Fitch, soon after attaining its independence from the apartheid government. The new government had to immediately raise funds to address the socio-economic consequences of apartheid. That sort of funding was not domestically available; it required the deeper pockets of the international capital markets, and that year South Africa was issued a "BB" non-investment grade rating by Fitch, with S&P and Moody's following suite later on the same year (Fitch, 2010).

Almost two decades after South Africa's first assigned sovereign ratings and its subsequent strides in improving them, in 2015 South Africa was downgraded by Fitch to the lowest investment grade BBB- (SARB, 2015). S&P maintained the same investment grade cut-off throughout the year (S&P, 2015). Since then, South Africa has been grappling with retaining its investment grade ratings status. However in 2016, even though S&P maintained its credit ratings for Africa's most industrialized economy to BBB-, it changed its ratings outlook to negative.

For the purposes of this study, the focus is on the determinants of sovereign credit ratings assigned to an emerging economy, using South Africa as a case study. The study also suggests, with great significance, that ratings assigned by Fitch, Moody's and S&P can be explained by a small string of well-defined factors. These factors have been weighed equally consistent by the three leading rating agencies over time, and account for the lion's share of ratings differentials between countries.

1.2 Problem Statement

Previous studies have shown that sovereign credit ratings capture and reflect the shifts in the macroeconomic fundamentals (Poon, 2003; Mora, 2006; Ratha et al, 2007). These quantitative factors, thus economic growth, inflation, level of economic development and government debt can provide a strong position on a country's willingness and ability to meet its financial obligations (Brooks et al, 2004; and Gaillard, 2009).

For a long time most emerging markets, especially in Africa have failed to achieve investment grade ratings, provided they have managed to get ratings in the first place. The negative impact of poor quality credit ratings has been felt then, and is still being felt now. The vast of these countries on the continent and beyond are falling short in accessing cheaper and or affordable funding for development. To the few well rated, credit ratings keep deteriorating. As of 2015, only 4 emerging market countries in Africa had an investment grade rating (S&P, 2015; Moody's, 2015; Fitch, 2015).

South Africa, as one of the few investment-grade rated emerging countries in Africa, has not been spared from the implications of sovereign risk and bad credit ratings. As South Africa's sovereign credit ratings continue to decline and or trade on negative outlook, there is an urgent need for a more prudent policy framework which will build business confidence in the country.

The decline in SA's sovereign credit ratings since late 2012 and early 2013, have triggered a rise in real bond yields and a general increase in the government's interest expense as a percentage of its total debt. During the 12 months to September 2015, the SA government debt servicing bill increased to R131 billion (StatsSA, 2015), which led to the introduction of new taxes like sugar tax as a funding mechanism, and the introduction of expenditure cuts in other areas.

Also with rising bond yields, there is accompanying inflationary pressure in the economy; and an increase in inflation have a corresponding push in nominal bond yields. With changes in debt ratios, the government may be pushed to borrow more to fund its runaway expenditure, and with such a bad fiscal norm, a further credit rating downgrade may be looming.

1.3 Research Objectives and hypothesis

The objective of the research is to establish the significance of each of the determinants of sovereign credit ratings assigned by the three leading credit rating agencies as established by their global risk architecture in an emerging market economy.

Most of the studies on sovereign credit ratings have only tested the immediate ephemeral impact of sovereign credit ratings, whilst neglecting the combined and individual effects of its

determinant factors on the credit ratings themselves. In order to close that knowledge gap, the study systematically tests three hypotheses;

Hypothesis 1 – Long term economic prospects (economic growth and development). According to Mellios and Paget-Blanc (2006), a high and stable growth rate decreases relative debt burden, hence long term economic growth and development should positively impact sovereign credit ratings. The study therefore hypothesizes that;

H_O: economic prospects do not have a statistically significant impact on sovereign credit ratings assigned by the credit rating agencies.

H_A: economic prospects have a statistically significant impact on sovereign credit ratings assigned by the credit rating agencies.

Hypothesis 2 – Stability and flexibility of fiscal and monetary policies.

Fiscal and monetary policies encapsulate the level of government spending flexibility, which has a bearing on the potential to mobilise revenue and in turn service debt, (Cantor and Parker, 1996). The study therefore hypothesizes that;

H_O: Inflation, fiscal balance and the real exchange rate do not have a statistically significant impact on sovereign credit ratings assigned by the credit rating agencies.

H_A: Inflation, fiscal balance and the real exchange rate have a statistically significant impact on sovereign credit ratings assigned by the credit rating agencies.

Hypothesis 3 – Long term external debt, current account surplus and credit ratings history.

External debt is viewed as a source of instability and may ultimately increase credit risk, thus the probability of default, (Mulder and Perrelli, 2001). Also, according to Cantor and Parker (1996), ratings quality is first determined by any previous and current credit defaults. The study therefore hypothesizes that;

H_O: External debt, current account surplus and credit ratings history do not have a statistically significant impact on sovereign credit ratings assigned by the credit rating agencies.

H_A: External debt, current account surplus and credit ratings history have a statistically significant impact on sovereign credit ratings assigned by the credit rating agencies.

1.4 Justification of the Research

Most studies on the impact and determinants of sovereign credit ratings have largely focused on developed and advanced economies (Canter and Parker, 1996; Poon, 2003; Mora, 2006; Rath, De and Mohapathra, 2007). Although still very limited, there are some studies which have covered emerging markets in general (Ozmen and Sahinbeyoglu, 2009; Cavallo et al, 2004), but a focus on emerging African countries has largely been ignored. Also, the extent of impact of these well-defined determinants of sovereign credit ratings on a country's assigned ratings has scarcely been studied.

Some studies have argued that quantitative factors alone, may not present a complete and comprehensive picture on the probable drivers of a country's sovereign credit risk (Gaillard, 2009), but qualitative aspects like policy consistency, transparency and the establishment of independent institutional structures also impact on sovereign's credit ratings. This study looks at the framework commonly used by the three main credit ratings agencies – Fitch, S&P and Moody's, which control a combined 95 percent of the credit ratings market, to assess eight economic variables and the impact they have on sovereign credit ratings in an emerging economy.

The study seeks to address the knowledge gap on what determines a negative or positive rating from a set of macroeconomic factors, and also identify the variables that have more weight in the determination of sovereign credit ratings as assigned by the three leading rating agencies.

South Africa, as one of the emerging economies, was used as a case due to the availability and easy access to information. The study has a potential to assist policy makers throughout the region to work on certain economic fundamentals in order to improve their ratings, which will better securitize their markets and help leverage official aid by improving their respective countries' borrowing terms.

1.5 Scope of the study

The scope of the research was limited to the determinants of 'long term foreign currency' sovereign credit ratings in emerging markets. The difference between local and foreign currency sovereign credit ratings is mainly driven by transfer risk, hence foreign currency ratings are typically lower that domestic or local currency ratings. A sample of annual data covering the period 1994 to 2016 was used to analyse a set of macro-economic factors and the impact they have had on South Africa's long term foreign currency sovereign credit ratings.

The data analysis was modelled from the studies carried by Cantor and Parker (1996), Mellios and Paget-Blanc (2006) and Mora-Jensen (2013) to test six of South Africa's economic variables against sovereign credit ratings. The analysis was conducted using an ARDL model of a time series nature.

1.6 Organisation of the study

The study is organised into five chapters. The first chapter introduces the background, thus emergency and growth of the sovereign credit ratings industry, its size and market structure. The objective and scope of the study, and gaps in existing literature and empirics is also outlined in chapter one. Chapter two details the existing literature and theoretical framework on the definition, rating scales and determinants of sovereign credit ratings. The chapter further explores related studies done by other researchers on the determinants of sovereign credit ratings. Chapter three defines the analytical framework for the determinants of sovereign credit ratings and quantitative modelling tools used in relation to the empirical analysis. Chapter four documents the results of the empirical analysis, and chapter five concludes with a summary of the key findings and major contributions of the study, also with suggestions for future research areas.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

In this review, the global history of sovereign credit ratings, with reference to the three founding and leading global rating agencies and their current relevance is introduced. Also a section of the credit ratings history of South Africa is explored. This further leads to an exploration of definitions of sovereign credit ratings, ratings scales and related drivers. Relevant existing literature and empirical work on the determinants of sovereign credit ratings is examined and discussed.

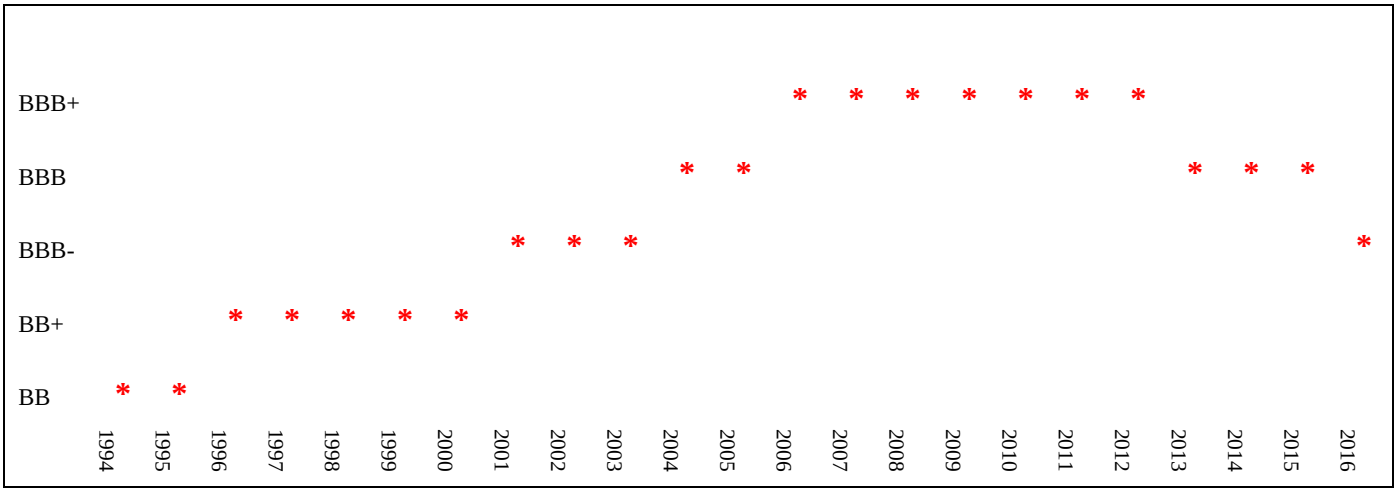
2.2 Sovereign credit ratings history

Sovereign credit ratings predate the World War 1 era, when the United States was issued the first long term rating by Moody's, driven by a sudden growth in the US capital markets (Levey, 2002). By 1929, 21 national governments had been rated by S&P, mostly from Europe and South America. Only the US and Argentina had an "A" grade, China a "B" and most European and South American countries were in the speculative grade (S&P, 2007). There wasn't much activity outside the industrialized countries until the birth of emerging economies as a source of growth in the 1990s, which became heavily involved in converting bank loans and issuing debt on the international capital markets to fund their growth (Cantor and Parker, 1996).

South Africa's sovereign credit ratings date as far back as 1994, when Fitch Ratings first issued the country's first sovereign ratings soon after independence. The country's sovereign credit ratings as issued by the three leading ratings agencies generally remained stable from 1994 to 2000 as speculative non-investment grade. In 2001, Fitch and S&P upgraded South Africa's sovereign ratings to match Moody's on a lower investment grade status. The country's ratings kept improving up until 2013, and to this date, since then, South Africa has been experiencing deteriorating quality of its ratings.

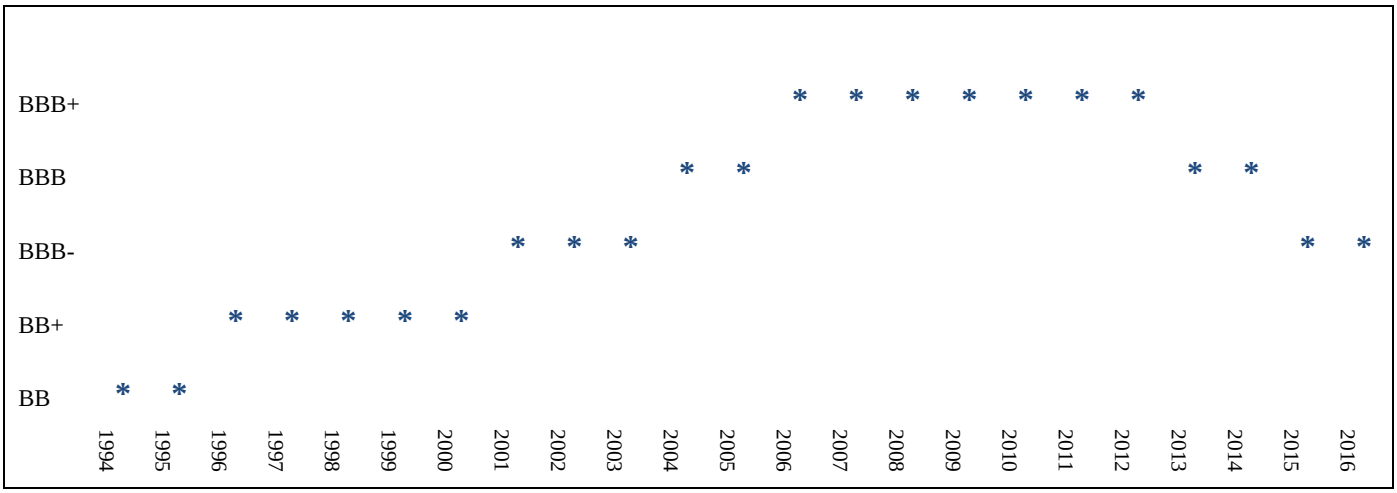
Figure 1 and 2 show South Africa's sovereign credit ratings history for ratings issued by Fitch and S&P respectively.

Figure 1: South Africa's sovereign credit ratings history since 1994



Source: Fitch Ratings

Figure 2: South Africa's sovereign credit ratings history since 1994



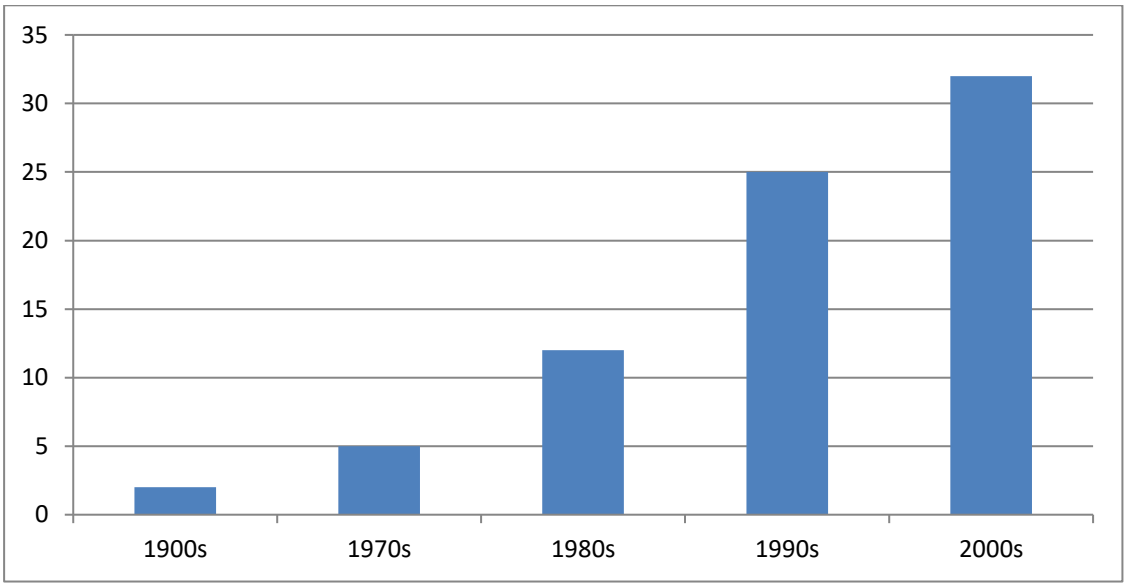
Source: S&P

2.3 Definition and measurements of sovereign credit ratings

Sovereign credit ratings as defined by Cantor and Parker are assessments of the relative likelihood of a borrower defaulting on its obligations. Hooper et al (2008) go on further to state that sovereign credit ratings are opinions by credit rating agencies, on the ability and willingness of sovereign governments in meeting their financial commitments in full and on time as per the initial agreement. Once a national government has been rated, most studies have revealed that corporations or their respective financial instruments may not be issued with ratings above or better than that assigned to its country of domicile (Brooks et al, 2004; Kaminsky et al, 1998; and Cantor et al, 1996).

According to S&P Global (2016), sovereign credit ratings are forward looking opinions about a sovereign with respect to the overall country's creditworthiness. These opinions reflect the rating agencies' view of the country's ability and willingness to meet its financial commitments as they become due. Credit ratings are defined by Moody's as simple grades by which future relative creditworthiness of sovereigns, institutions and securities are gauged. Since John Moody devised the first bond rating definitions in 1909, Moody's ratings have expanded to 32 grades, with the number growing by the years in response to increasing depth and breadth of the global capital markets (See *figure 3*).

Figure 3: Rating system outstanding by decade



Source: Moody's Investor Services

Moody's, Fitch and S&P assign and publish two kinds of sovereign credit ratings, and these are long term and short term obligation ratings. These obligations are further analyzed separately for both local and foreign currency. These rating agencies also provide auxiliary signals about credit risk through the use of rating outlooks and watchlist designations (Moody's, 2007)

Credit ratings are generally classified into two broad categories, investment grade and non-investment grade, also known as speculative grade or "junk" status. S&P and Fitch ratings usually aim at measuring the likelihood of default (S&P, 2007; Fitch 2010), and unlike Moody's, the two agencies are concerned less about the time the issuer is in default, the

recovery value or the expected default position. Moody's focuses beyond default probability, by taking into account what is likely to occur if and when an issuer goes into default.

S&P and Fitch use a risk grading scale slightly different to Moody's. The two agencies use ordinal scales ranging from AAA, signaling extremely strong capacity to meet financial obligations, to D, where an issuer has defaulted on one or more of its obligations, for long term ratings (S&P, 2010; Fitch 2011). Plus (+) or minus (-) signs are also used between rating categories AAA to CCC as modifiers of relative status within those categories (Gaillard, 2009).

Table 2 below shows long term sovereign credit rating scales from all three leading rating agencies.

Table 2: Agency long term sovereign credit rating scales

S&P	Fitch	Moody's	Rating description	Corresponding numbers
AAA	AAA	Aaa	Prime	20
AA+	AA+	Aa1	High grade	19
AA	AA	Aa2		18
AA-	AA-	Aa3		17
A+	A+	A1	Upper medium grade	16
A	A	A2		15
A-	A-	A3		14
BBB+	BBB+	Baa1	Lower medium grade	13
BBB	BBB	Baa2		12
BBB-	BBB-	Baa3		11
BB+	BB+	Ba1	Non-investment grade speculative	10
BB	BB	Ba2		9
BB-	BB-	Ba3		8
B+	B+	B1	Highly speculative	7
B	B	B2		6
B-	B-	B3		5
CCC+	CCC+	Caa1	Substantial risks	4
CCC	CCC	Caa2		3
CCC-	CCC-	Caa3		2
CC	CC	Ca	Extremely speculative	1
C	C		Default imminent	1
RD	DDD	C	In default	0
SD	DD			0
D	D			0

Source: (Fitch 2010; Moody's 2007; S&P 2007)

Moody's highest long term issuer credit ratings start from Aaa, regarded as extremely strong capacity to repay debt, to the lowest speculative grade C (Moody's, 2007). Moody's long term ratings are further enriched through modifiers 1, 2 and 3 for ratings between Aa to Caa to enhance relative ranking within those categories (Moody's, 2007; Gaillard, 2009). Although the three agencies use different ratings symbols, the correspondence that exists between these ratings allows for the transformation of rating notches to numbers.

2.4 Determinants of sovereign credit ratings

The existing theoretical framework on sovereign credit ratings is driven primarily by sovereign debt and default (Eaton and Gersonvitz, 1981). Sovereign credit ratings address two aspects in debt settlement, thus ability and willingness. Ability, which is the first theoretical aspect described by Mellios and Paget-Blanc (2006) as the debt servicing capacity approach, is the unintended deterioration of the sovereign's capacity to service debt which could ultimately lead to its default. According to Haque et al (1996)'s theoretical approach, the sustainability of debt determines the probability of default, and sustainability may be driven by macroeconomic factors, economic policy, currency crises, short term budget mismanagement and internal or external shock. Emerging market countries like Brazil, Russia, South Korea and Turkey, which experienced sovereign crises in recent years illustrate debt servicing difficulties spanning from the countries' rescheduling of their sovereign debts to outright defaults (Mellios and Paget-Blanc, 2006).

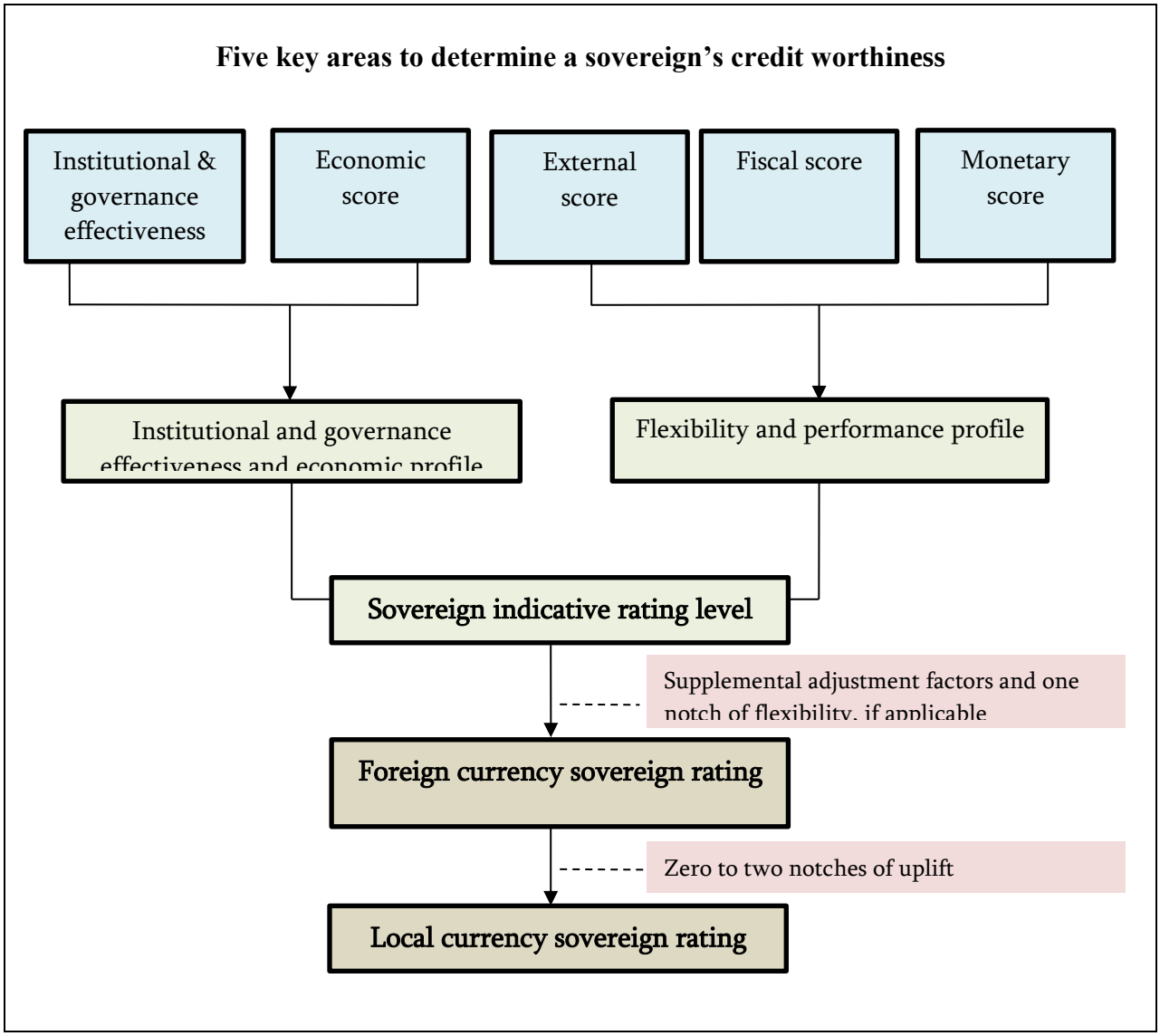
Willingness to pay debt on the other hand is incentivized primarily by the need to maintain a good reputation and preserving future access to capital markets (Eaton and Gersovitz, 1981). A model developed by Bulow and Rogoff (1989) reflects the threat of future sanction should a country fail on its debt commitment, restructure or default. The choice should be ultimately made by the borrowing country on the costs and benefits of restructuring, rescheduling or defaulting. Thus, the probability of default becomes an increasing function of variables inciting a country to default; and a decreasing function of variables raising the cost of default Mellios and Paget-Blanc (2006).

According to economic theory, variables that increase the probability of default are the level of economic growth and development, general increase in price level of goods and services within the borrowing country, real exchange rate, ratio of foreign debt to GDP and default

history. These economic variables are common on both willingness and ability of a country to service its debt on time and in full.

Moody's (2011) rating methodology measures capacity to settle debt based on economic strength and susceptibility to event risk, and its willingness based on the strength of its institution. S&P focuses on 5 key areas which speak to two economic profiles, institutional and governance effectiveness, and flexibility and performance, (Karaaslan & Özden, 2016) (see Figure 4 below). Other agencies' sovereign rating methodologies group risk variables into 6 quantitative and qualitative factors, namely, fiscal management and policy, debt and liquidity, economic structure and performance, monetary policy and financial stability, balance of payments and political environment (DBRS, 2016).

Figure 4: S&P Sovereign crediting rating framework



Source: S&P Global Ratings

In their study, Cantor and Packer (1996) used eight macroeconomic factors to test their impact on sovereign credit ratings for 49 advanced and developing countries. They used the 1995 data to run a regression analysis of the average of Moody's and S&P ratings against economic development, economic growth, inflation, external debt, and an indicator for default history as independent variables that determine sovereign credit ratings. Their results show that a set of 8 macroeconomic variables chosen explain 90 percent in sample variation of sovereign credit ratings as assigned by Moody's and S&P. However, Cantor and Parker (1996) fail to address the impact of these macroeconomic variables on individual countries or group of countries of the same economic structure.

Juttner and McCarthy (2000) replicated Cantor and Parker's model for the period 1996 to 1998. Their study noted that the findings by Cantor and Parker (1996) had less explanatory power during the 1997 financial crisis experienced by emerging market countries like Brazil, Russia and Thailand. They concluded that the relationship between ratings and economic variables is not stable over time. The study was further replicated by Monfort and Mulder (2000), using 1994 to 1999 sample data from 20 emerging market countries. Their study covered the 1997 Asian economic crisis, and their results confirmed the findings of Juttner and McCarthy, noting the autocorrelation displayed by estimates. The study finally suggested that sovereign ratings reflect a high degree of inertia and appears to follow only unexpected developments in variables.

However, in Mulder and Perrelli (2001) study of 25 developing and emerging market countries for the period 1992 to 1999, the results show that 6 static economic variables, similar to those in Cantor and Parker's study, explained a large part of ratings variations. Their major contribution to other previous studies was that the key variable which explains ratings was investment to GDP ratio which speaks to the country's liquidity profile, as opposed to economic growth and inflation.

McKenzie (2002), unlike most studies which focused on the variables that seem relevant to explain the variables' impact on sovereign credit ratings, he chose an alternative approach of using a principal component analysis (PCA), to identify variables that affect sovereigns' default. His study identified twelve variables from a data set of 46 factors that were common in countries which defaulted to the International Bank for Reconstruction and Development (IBRD). His analysis, later on replicated by Mellios and Paget-Blanc (2006), suggested that

the most common twelve factors leading to the defaults were GDP growth, inflation, economic development, current account, foreign debt to GDP, real exchange rate, default history, debt to GDP ratio, reserves to imports ratio, investment to GDP ratio and the corruption index.

Similar tests were done by Afonso (2003) and MacFadden et al (2005) using 2001 data, and showed that economic growth and development was the major driver of sovereign ratings in advanced economics whilst external debt had a huge impact for emerging markets and developing economies.

Another benchmark model of determinants of sovereign ratings was conducted by Borio and Parker (2004), by introducing controls of other factors affecting country risk in order to identify what debt intolerance, original sin and currency mismatch contribute to credit quality. They obtained an adjusted R-squared of 0.9 with seven controlled economic variables covering a period of 1996 to 2003. Their conclusions were, debt intolerance is worse where a country has a history of mismanaging the economy, and original sin, which implies that a country with less ability to borrow in their own currency has a higher inherent risk, leading to poor ratings. Also, according to Borio and Parker (2004), countries with national income and growth which is more sensitive to exchange rate depreciation are most likely to suffer severe ratings downgrades in the event of a shock.

A number of empirical studies have examined the impact of macroeconomic factors on sovereign ratings (Cantor and Parker, 1996; Juttner and McCarthy, 2000; Mulder and Perrelli, 2001 and Afonso, 2003). In all these studies the selection on independent variables has largely been driven by the rating agencies' methodology and by theoretical drivers of sovereign default (Mellios and Paget-Blanc, 2006).

Mellios and Paget-Blanc (2006), using PCA, following the study by McKenzie (2002), suggested an additional factor: - regulatory quality, accountability, rule of law and political stability, which captures the country's willingness to pay debt. Their analysis covers 2003 ratings of 86 countries and 49 economic and political factors for the year 2002. They then assessed the effects of the 13 variables on ratings through a linear regression and an ordered logistic model. Their findings were also consistent with other researchers like Cantor and Parker (1996), suggesting that real exchange rate, inflation, government surplus and default

history are variables with high impact and most significant to variations in sovereign credit ratings. The two also argued that the logistic model have better results compared to those provided by the OLS regression model.

Bissoondoyal-Bheenick et al (2006), through their ordered-probit and scenario-based approach, have further re-affirmed Cantor and Parker's findings, by adding a technological advancement proxy, and observing its significance, together with economic growth and inflation, as major determinants of sovereign credit ratings. Gaillard (2009) argues that in as much as quantitative macroeconomic factors significantly determine sovereign credit ratings; there are also other qualitative factors which are highly impactful. Gaillard mentioned a very important facet in today's operational environment: the political-economy factor, and further argued that the rating agencies also factor-in their own perceived judgements with regards to the political environment when conducting the sovereign ratings process.

Another study carried out by Gultekin-Karakas et al (2011), found that, holding macroeconomic factors constant, high income countries are more likely to get higher ratings compared to low income countries. However, the authors were criticised for ignoring default history and the degree of institutional strength. Bartels and Weder di Mauro (2013) also noted that Moody's and S&P rate emerging market countries lower than does Feri, a European based rating agency; suggesting the existence of some form of herding behaviour in ratings changes or adjustments.

According to Kiff et al (2012), various credit rating agencies ordinarily limit their time horizon to between 2 to 3 years, and their assigned ratings are said to reflect creditworthiness within that period. Their study concluded that perceived vulnerability to periodic downturns within the ratings period, but not the current state, determines to a greater extent, the variability of sovereign ratings. Dembiermont et al (2015), in their study of general government debt, suggested that complications in government debt as measured by public debt stocks in subnational authorities and state-owned institution has heavy implications on sovereign credit ratings. They alluded their evidence to some emerging market economies with very low levels of debt such as Hong Kong and Saudi Arabia, which are rated very highly.

Following Amstad and Parker (2015), at least 4 risk factors have gained ground in ratings methodology over the years, whilst one has fallen out. According to their theory, monetary policy regimes have come into sharper focus, together with currency internationalization, contingent liabilities due to event risk and financial cycles, as the main driving forces behind sovereign ratings shifts. The two postulate that positive economic indicators like per capita GDP is now of less emphasis than the growth performance and potential, as well as outlook.

In conclusion, the existing theoretical literature and empirical evidence indicate that a number of economic factors determine sovereign credit ratings, as initially identified by Cantor and Parker (1996), and later validations by Juttner and McCarthy (2000), Afonso (2003), and MacFadden et al (2005). Also some publications drawn upon Fitch Ratings (Fitch, 2010), Moody's Investor Services (Moody's, 2007) and S&P Global Ratings (S&P, 2007) indicate that the agencies' own judgements and opinions play a role in determining ratings. A qualitative opinion on a developed country's ability to service its debt can never be the same as that given to developing country, hence most of these studies ignore that very important factor by combining developed and developing countries under one study. According to Cantor and Parker (1996), 6 economic factors: per capita income, GDP growth, inflation, external debt, level of economic development and default history, explain 92 percent of the variability in Moody's and S&P's average sovereign credit ratings, suggesting the unexplained 8 percent is determined by the agencies' judgements and opinions.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The chapter provides the basis for the chosen empirical analysis. It defines the research design and data sources to be used in the study. The chapter further defines key terms and describes variables which form part of the analytical framework for the determinants of sovereign credit ratings and the quantitative modelling tools used in relation to the empirical analysis and testing.

3.2 Research design and data sources

The research will employ secondary data as the principal approach through theoretical and empirical analysis. The secondary data set will cover 23 years of which long term sovereign credit ratings were issued to South Africa by all three leading rating agencies:- Moody's, S&P and Fitch, covering the period 1994 to 2016. South Africa has been chosen as it is a classic representative of both, an emerging market and a developing economy, due to the close resemblance of its political economy to that of the rest of Africa, and its financial economy to that of the emerging markets. Also the availability and easy access of reliable data has made South Africa an ideal sample of the market under study.

3.3 Regression Model

One dependent variable and six independent explanatory variables are described and the measures that represent these variables in the study are identified for quantitative analysis. Also, the relationship between each independent variable and the impact on the country's willingness and ability to service its debt is explained.

The mathematical equation for examining the determinants of sovereign credit ratings in South Africa is adapted from the studies by Cantor and Parker (1996), Afonso (2002) and Mellios and Paget-Blanc (2006).

$$Rating_t = Infl_t + EDebt_t + EBal_t + GDP_t + RExR_t + FiscBal_t + \varepsilon_t \ldots 1$$

The definition and measurement of the variables are discussed below;

Sovereign credit ratings: the average of the ratings assigned that year by Fitch, Moody's and S&P quantified through linear transformation. As used in Cantor and Parker (1996), and also as assigned by the major credit rating agencies, each rating will assume values of 1 to 24 as follows; C/D/D = 1, C/SD/DD/ = 2, .., and Aaa/AAA/AAA = 24. SA's average rating for a particular year will be the mean of the three numerical values representing Moody's, Fitch and S&P as applied in Moon and Stotsky (1993), Cantor and Parker (1996) and Afonso (2002).

Gross domestic product (GDP) growth: a measure of economic growth, which is the annual real GDP growth on a year on year basis, measured as a percentage. A high growth rate decreases the relative debt burden, and lightens insolvency problems (Mellios and Paget-Blanc, 2006). Also an increasing rate of economic growth entails easier servicing of debt over time (Cantor and Packer, 1996). A weaker GDP growth weakens public finances and ultimately institutional strength and funds available to service debt (Moody's, 2007).

External debt service: that is the percentage of foreign currency debt service relative to exports. There is a positive relationship between debt burden and risk of default. When exports decrease, the foreign currency debt position worsens, hence the country's likelihood to default.

Real exchange rate: measured against the dollar position. As the yearly average real exchange rate depreciates, so is the risk of default in servicing foreign currency debt.

Inflation: is the percentage rate of the annual consumer price index, which indicates the structural position of the government's finances and policies. Also a proxy of policy consistency and stability, in the event a government is struggling to meet its financial obligations, what sort of measures will it take, and in what direction will be captured by the CPI.

External balance: measured as a percentage of the average annual current account surplus relative to GDP, which also measures the level of reliability to external remittances. A huge current account deficit implies a high probability of default.

Fiscal balance: measured as a percentage of average annual national government budget surplus to GDP, hence a huge surplus indicates greater ability to service and meet current obligations without crowding out private investments and domestic savings.

Default History: measures credit reputation by using an indicator variable to note whether South Africa defaulted on any of its debts on that year. Default history is key and has been evident on both theoretical and empirical evidence that creditors often consider in their consideration and pricing decision (Eaton, 1996; Cantor and Parker, 1996 and Ozler, 1991).

Table 3: Independent variables and their expected signs

Independent variable	Variable Symbol	Unit of measurement	Sovereign credit rating
Gross domestic product	GDP	%	Positive (+)
External debt	EDebt	%	Negative (-)
Real exchange rate	RExR	Numeric	Positive (+)
Inflation	Infl	%	Negative (-)
External balance	EBal	%	Positive (+)
Fiscal balance	FiscBal	%	Positive (+)

3.4 Analytical framework

In data analysis, several studies have determined sovereign credit ratings as quantitative dependent variables, using linear and classic regression models and time series analysis (Cantor and Parker, 1996; Mora, 2006; Ratha et al, 2011, while other studies have determined the ratings as qualitative dependent variables, thereby using binary choice models (Mora, 2006 and Gaillard, 2009).

3.4.1 Unit root test (Augmented Dickey-Fuller)

The study falls within the time series framework. To avoid a spurious regression, since the OLS relies on the stochastic process being stationary, a unit root test was conducted prior to running any regression model. Also non-stationary variables in OLS models invalidates the hypothesis tests about the regression parameters, hence a unit root test can be a way to select the correct regression model.

The objective of the unit root test by Dickey and Fuller (1984) tests is to test the null hypothesis that $\rho = 1$, in variables like;

$$\Delta Infl_t = \rho Infl_{t-1} + (constant/time\ trend) + \mu_t$$

against the one-sided H_1 $\rho < 1$. Thus, we have;

H_0: series contains a unit root,

H_1: series is stationary

The stationarity or non-stationarity of a series can strongly influence the series' behaviour and properties, and also a high R^2 could result from two variables trending against each other even though the two are entirely unrelated.

3.4.2 Autoregressive Distributed Lag (ARDL) Model

In this study, an ARDL model is employed on six explanatory variables to analyze and measure their significance and impact on long term foreign currency sovereign credit ratings.

$$\Delta Ratings_t = \beta_0 + \Sigma\ \beta_1 \Delta Ratings_{t-i} + \Sigma\gamma_2 \Delta Infl_{t-j} + \Sigma\gamma_3 \Delta EDebt_{t-j} + \Sigma\gamma_4 \Delta EBal_{t-j} + \Sigma\gamma_5 \Delta GDP_{t-j} + \Sigma\gamma_6 \Delta RExR_{t-j} + \Sigma\gamma_7 \Delta FiscBal_{t-j} + \theta_0 Ratings_{t-1} + \theta_1 Infl_{t-1} + \theta_2 EDebt_{t-1} + \theta_3 EBal_{t-1} + \theta_4 GDP_{t-1} + \theta_5 RExR_{t-1} + \theta_6 FiscBal_{t-1} + \varepsilon_t \quad \ldots\ldots 2$$

The ARDL model has been used for decades to model the relationship between economic variables in single equation time series. It is useful when there is cointegration of non-stationary variables, as the model has a reparameterization in Error Correction form (Engle and Granger, 1987; Hassler and Wolters, 2006). The bounds test is further used to draw conclusive inference whether variables are integrated of zero I (0) or one I (1). The model which is a standard least squares regression, include lags of both the dependent variable and explanatory variables as regressors (Greene, 2008).

The methodology follows that of Mora (2006), but excludes economic development, which in the previous study, a variable indicator of 1 and 0 was used as a classification of whether a country is industrialized or not. Also the researcher is of the view that the level of economic development and income is already captured by GDP. The study introduces the real exchange rate factor due to the volatility of the South African Rand over the past decade, which has an

impact on SA's ability to service its long term foreign exchange debt and its continuance in accessing low cost capital on the international markets.

3.4.3 ARDL cointegration (Bounds Test)

Cointegration is a good way of establishing the existence of steady state equilibrium between variables (Pesaran et al., 2001). If the variables fail to cointegrate, there are problems of spurious regressions and meaningless results may be obtained. ARDL cointegration technique has become one of the best ways of determining the existence of a long run relationship between time series variables that are non-stationary, as well as finding the series' parametric equation to the Error Correction Model (ECM). The equation to the ECM gives the short run and long run relationship of the underlying variables (Pesaran and Shin, 1999).

The long run relationship of variables is estimated through the F-statistic. The long run relationship is said to be existent when the F-statistic is greater than the critical values. This method has an advantage of identifying the cointegrating vectors should a multiple of them exist.

$$\Delta Ratings_t = \beta_0 + \sum_{i=0}^{p} \beta_1 \Delta Ratings_{t-i} + \sum_{i=0}^{q} \gamma_2 \Delta Infl_{t-j} + \sum_{i=0}^{q} \gamma_3 \Delta EDebt_{t-j} + \sum_{i=0}^{q} \gamma_4 \Delta EBal_{t-j} + \sum_{i=0}^{q} \gamma_5 \Delta GDP_{t-j} + \sum_{i=0}^{q} \gamma_6 \Delta RExR_{t-j} + \sum_{i=0}^{q} \gamma_7 \Delta FiscBal_{t-j} + \alpha ECT_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where ECT_{t-1} is the error correction term.

The long-run relationship between the concerned variables can be conducted based on the Wald test (F-statistic) by imposing restrictions on the estimated long-run coefficients of one period lagged level of the variables equal to zero. Then, the computed *F*-statistic is compared with the critical value tabulated in Pesaran *et al*. (2001). The lower bound values assume that the explanatory variables are integrated of order zero, or *I*(0), while the upper bound values assume that they are integrated of order one, or *I*(1). Therefore, if computed *F*-statistic falls below the lower bound value, *I*(0), the null hypothesis of no cointegration cannot be rejected. Conversely, if the computed *F*-statistic exceeds the upper bound value, *I*(1) it is concluded that ratings and its determinants are cointegrated and approach a long-run equilibrium. However, if the test statistic lies between these two bounds, the result is inconclusive.

3.4.4 Granger causality

Though the cointegration analysis may prove existence of a relationship between variables in a time series, it ignores actual causation and direction of influence (Mora-Jensen, 2013). The Granger (1969) approach to an equation as to whether X causes Y is to see how much of the current values of Y can be explained by past values of Y, and then to determine whether adding lagged values of X can improve the explanation. Y is said to be Granger-caused by X if X helps in the prediction of Y, or equivalently if the coefficients on the lagged X's are statistically significant.

According to Gujarati and Porter (2009), if event A occurs before event B, then it is possible that A is causing B, but B cannot be causing A, thus events in the past can cause events to happen today.

The causality test will examine whether sovereign credit ratings "causes" some of the macroeconomic variables like real exchange rates, inflation and external debt and or vice versa.

H_0: The y_i do not Granger causes x_i.

H_1: The x_i does not Granger cause y_i , where;

y_i are the sovereign credit ratings

x_i various macroeconomic variables

The Granger causality test involves the following set of regressors:

$$x_t = \sum \alpha_i x_{t-1} + \sum \beta_j y_{t-j} + \mu_{1t}$$

$$y_t = \sum \lambda_i x_{t-1} + \sum \delta_j y_{t-j} + \mu_{2t}$$

where μ_1 and μ_2 are uncorrelated (Gujarati and Porter, 2009).

CHAPTER FOUR
DISCUSSIONS OF RESEARCH FINDINGS

4.1 Introduction

The chapter details the results of the findings. Prior to running any regression model, the Unit Root Test for stationarity of the variables was conducted. Also tests for cointegration and variable causality were run to avoid invalidating the hypothesis tests about the regression parameters. The default history variable was dropped in the tests as for the period under study; the variable has consistently been zero.

4.2 Descriptive statistics

Table 4 presents the summary statistics of the variables. In terms of variability measured by the standard deviation, ratings have the lowest variability, whilst external debt recorded the highest during the period under study. The skewness and kurtosis coefficients ranging from -0.58 to 0.82 and -1.5 to 0.92 suggest a close to normal distribution amongst the variables. It also shows that the distributions are mostly positive. GDP, as an exception is negatively skewed, which shows its impact of deteriorating ratings on economic growth.

All kurtosis coefficients are less than 3, which is regarded as the acceptable level for standard normal distribution. All the time series distributions have sharp peaks with the exception of ratings and external balance, suggesting volatility in the data or the presence of outliers.

Table 4: Summary statistics

	ratings	edebt	gdp	exchange	infla	ebal	fisc
Mean	11.6796	9.1357	2.8696	7.6263	6.2652	-2.5130	-2.9826
S.E	0.2587	0.6739	0.3573	0.5727	0.4410	0.4358	0.4026
Median	11.67	8.68	3	7.263	5.9	-2.2	-3.9
Std. Dev	1.2408	3.2319	1.7137	2.7465	2.1150	2.0901	1.9308
Kurtosis	-1.3384	0.1377	0.6851	0.9251	0.5614	-1.2066	-0.7516
Skewness	-0.1402	0.6171	-0.5811	0.8276	0.0893	-0.1769	0.4818
Range	3.66	12.998	7.1	11.157	9.6	6.8	7.3
Minimum	9.67	4.235	-1.5	3.549	1.4	-5.9	-6.3
Maximum	13.33	17.233	5.6	14.706	11	0.9	1
Sum	268.63	210.121	66	175.405	144.1	-57.8	-68.6
Count	23	23	23	23	23	23	23

Source: Author's estimate from research data, 2017

4.3 The unit root test - Augmented Dickey-Fuller (ADF)

After running an ADF test on raw data, none of the variables were stationery at level. Five of the variable were integrated of order one I(1), and two of the variables integrated of order zero after logging, I(0) (See Appendix D). A major challenge in estimating long-run time series models using OLS is that variables must be stationary, that is, must be integrated of order zero, I(0). Should a conventional OLS regression model be applied on none I(0) time series variables, the regression will produce spurious results, which are meaningless or may lead to misleading conclusions (Brooks, 2004)

Table 5: ADF test results summary

Variable	Observations	Integration Order	ADF Test Statistic	Critical Value 1%	Critical Value 5%	Critical Value 10%
Ratings	23	0	-1,933456	-3.8304	-3,0294	-2,6552
External Debt Service	23	1	-4,276301	-3,8067	-3,0199	-2,6502
GDP Growth %	23	1	-4,679995	-3,8067	-3,0199	-2,6506
Real Exchange Rate to USD	23	0	-1.464266	-3,8304	-3,0294	-2,6552
Inflation rate %	23	1	-4,491474	-3,8067	-3,0199	-2,6502
External Balance % to GDP	23	1	-3,409363	-3,8067	-3,0199	-2,6502
Fiscal Balance % to GDP	23	1	-3,564929	-3,8067	-3,0199	-2,6502

Source: Author's estimate from research data, 2017

At critical value 1%, we reject the null hypotheses for four variables, (ratings, real exchange rate, external balance and fiscal balance) as the variables do not have unit roots. We fail to reject the null hypotheses for three variables (inflation, GDP and external debt) at all critical levels. However, at 5%, all variables have unit roots except for inflation and ratings.

4.4 Cointegration analysis (ARDL bounds results)

The F- statistic is used to test the hypothesis against the critical values at each leave. The value of the F-statistic obtained was 5.87. The critical values of the F-statistics for a different number of variables are available in Pesaran et al., (2001). Two sets of critical values, one assuming that all the variables in the ARDL model are I(0), range from 1.92 (at 10%), 2.17 (at 5%) to 2.73 (at 1%), marking the lower critical bound, which means that there is no cointegration amongst the variables. Assuming that all the variables are I(1), the critical values range from 2.89 (at 10%) to 3.9 (at 1%), marking the upper critical bound, meaning that there is cointegration among the variables. For the study, a level of 5% was chosen to test the hypothesis, and at that level the F-statistic (5.87) was greater than both the lower critical

bounds (2.17) and the upper critical bounds (3.21), suggesting the existence of a cointegration relationship (see Table 6).

Table 6: Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.874338	10%	1.92	2.89
k	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9

Source: Author's estimations from research data 2018

4.5 Long run regression results

Table 7 presents the long-run estimates. All the variables show a positive relationship with ratings, with the exception of exchange rate and external debt service which both reflect negative impact on ratings. Even though all variables are insignificant in the long run, GDP has the most impact, following by external balance with each unit of change in economic growth and external debt service resulting in 2.63 and -0.70 units of change in ratings.

Table 7: Long-run estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLA	0.293327	0.929110	0.315708	0.7603
GDP	2.630162	6.305652	0.417112	0.6876
FISC	1.110096	1.496033	0.742026	0.4793
EXCHANGE	-0.064539	0.460067	-0.140281	0.8919
EDEBT	-0.704455	1.676890	-0.420096	0.6855
EBAL	1.758754	3.058741	0.574993	0.5811
C	10.39860	15.22336	0.683069	0.5139

Source: Author's estimate from research data, 2017

The long run impact of the variables is in line with the findings of Afonso (2003) and MacFadden et al (2005), who suggested that in as much as economic growth and external debt service were the major drivers for sovereign credit rating for developing and emerging market countries, there are other qualitative factors like governance, policy consistency and institutional independence which have a bearing on credit ratings. The findings also support

the study by Gaillard (2009), who alluded to the opinions of the ratings' agencies on policy direction and perceived risk as being of great significance compared to quantitative economic factors.

In the long run economic and quantitative variables become insignificant in determining sovereign credit ratings as policy effectiveness, consistency and stability in the socio-political environment become major determinants of growth and economic performance (Haque et al, 1996). Also in the long term, the credit ratings agencies form opinion inferences from past performances of the economy, including the default history, which is not captured in the model.

4.6 Short run error correction model

Table 8 shows the results of the short run error correction terms. In the short run, inflation has a negative impact on sovereign credit ratings. Contrary to studies by Cantor and Parker (1996), GDP was noted to also have a negative relationship to ratings, although the effects are quite insignificant as compared with the rest of the variables. Variables like fiscal balance and external debt servicing have a significant and positive impact on ratings as noted by a larger t-statistic and very small p-values. Although external debt has a positive effect on ratings in the short run, the effects are also quite insignificant.

Table 8: Short run error correction terms

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLA)	-0.150726	0.021393	-7.045674	0.0001***
D(GDP)	-0.027774	0.029132	-0.953393	0.3683
D(FISC)	0.229160	0.043647	5.250354	0.0008***
D(EDEBT)	0.016464	0.012647	1.301809	0.2292
D(EBAL)	0.257590	0.038450	6.699349	0.0002***
CointEq(-1)*	-0.084320	0.008200	-10.28290	0.0000***

*Note: *** denotes significance at 1%. Source: Author's estimate from research data, 2017*

The negative cointEq is considered significant and has a higher t-statistic and a lower p-value. The cointEq has a negative coefficient of -0.084 and a p-value close to zero suggesting the presence of a negative long run relationship between the variables. The cointEq shows the rate at which the long run disequilibrium is corrected, with the general disequilibrium of variables corrected at a rate of almost 8%.

Table 9: ARDL Summary Statistics

R-squared	0.985517	Mean dependent var	11.77091
Adjusted R-squared	0.961983	S.D. dependent var	1.188192
S.E. of regression	0.231673	Akaike info criterion	0.174150
Sum squared resid	0.429380	Schwarz criterion	0.868450
Log likelihood	12.08435	Hannan-Quinn criter.	0.337706
F-statistic	41.87558	Durbin-Watson stat	3.543317
Prob (F-statistic)	0.000007		

The model had an R-squared of 0.986 indicating that the model was a good fit. However, one problem of relying on R-squared as a measure of goodness of fit is that as you add more regressors, though some will not be contributing to the explanatory power of the model, R-squared will keeps on increasing to the extreme case of even obtaining a one. Hence, the adjusted R-squared, which was 0.962, is better measure of goodness of fit for the model.

The DW statistic of 3.54 the output, which according to the rule of thumb of 2, shows that there was no evidence of a positive serial correlation in the residuals. The F-test is a joint test such that even if all the t-statistics are insignificant, the F-statistic can be highly significant. The p-value of 0.000007, below the F-statistic, denoted by Prob(F-statistic), which is the marginal significance level of the F-test is less than the significance level tested at 0.05, hence rejecting the null hypothesis that all slope coefficients are equal to zero. From the results above, the p-value is fundamentally zero; hence we reject the null hypothesis that all of the regression coefficients are zero.

4.7 Granger causality

The results of the granger causality analysis are presented in Table 10. From the results, the following causality relationships were observed.

Table 10: Granger test results

Null Hypothesis:	F-Statistic	Probability	Decision
EDEBT does not Granger Cause EBAL	3.19987	0.05901*	Reject the null hypothesis
EBAL does not Granger Cause EDEBT	0.11376	0.95048	Cannot reject the null hypothesis
EXCHANGE does not Granger Cause EBAL	0.67476	0.58273	Cannot reject the null hypothesis
EBAL does not Granger Cause EXCHANGE	1.18647	0.35312	Cannot reject the null hypothesis
FISC does not Granger Cause EBAL	0.10414	0.95618	Cannot reject the null hypothesis
EBAL does not Granger Cause FISC	0.80531	0.51305	Cannot reject the null hypothesis
GDP does not Granger Cause EBAL	1.02914	0.41186	Cannot reject the null hypothesis

EBAL does not Granger Cause GDP	1.11945	0.377	Cannot reject the null hypothesis
INFLA does not Granger Cause EBAL	0.85841	0.48702	Cannot reject the null hypothesis
EBAL does not Granger Cause INFLA	0.20737	0.88947	Cannot reject the null hypothesis
RATINGS does not Granger Cause EBAL	2.45573	0.1094	Cannot reject the null hypothesis
EBAL does not Granger Cause RATINGS	0.06184	0.97902	Cannot reject the null hypothesis
EXCHANGE does not Granger Cause EDEBT	1.1267	0.37434	Cannot reject the null hypothesis
EDEBT does not Granger Cause EXCHANGE	0.35226	0.78827	Cannot reject the null hypothesis
FISC does not Granger Cause EDEBT	1.35606	0.29958	Cannot reject the null hypothesis
EDEBT does not Granger Cause FISC	0.62842	0.60944	Cannot reject the null hypothesis
GDP does not Granger Cause EDEBT	0.78882	0.5214	Cannot reject the null hypothesis
EDEBT does not Granger Cause GDP	0.80339	0.51401	Cannot reject the null hypothesis
INFLA does not Granger Cause EDEBT	0.07062	0.97464	Cannot reject the null hypothesis
EDEBT does not Granger Cause INFLA	0.14874	0.92865	Cannot reject the null hypothesis
RATINGS does not Granger Cause EDEBT	6.65857	0.00581***	Reject the null hypothesis
EDEBT does not Granger Cause RATINGS	1.75846	0.20456	Cannot reject the null hypothesis
FISC does not Granger Cause EXCHANGE	1.37829	0.29323	Cannot reject the null hypothesis
EXCHANGE does not Granger Cause FISC	0.53397	0.66703	Cannot reject the null hypothesis
GDP does not Granger Cause EXCHANGE	1.2095	0.34529	Cannot reject the null hypothesis
EXCHANGE does not Granger Cause GDP	1.35595	0.29961	Cannot reject the null hypothesis
INFLA does not Granger Cause EXCHANGE	1.12673	0.37432	Cannot reject the null hypothesis
EXCHANGE does not Granger Cause INFLA	2.06807	0.15404	Cannot reject the null hypothesis
RATINGS does not Granger Cause EXCHANG	2.55927	0.10009	Cannot reject the null hypothesis
EXCHANGE does not Granger Cause RATINGS	1.39341	0.289	Cannot reject the null hypothesis
GDP does not Granger Cause FISC	0.32549	0.80696	Cannot reject the null hypothesis
FISC does not Granger Cause GDP	0.66566	0.58789	Cannot reject the null hypothesis
INFLA does not Granger Cause FISC	4.78434	0.0185**	Reject the null hypothesis
FISC does not Granger Cause INFLA	0.61201	0.61914	Cannot reject the null hypothesis
RATINGS does not Granger Cause FISC	1.15668	0.36353	Cannot reject the null hypothesis
FISC does not Granger Cause RATINGS	2.59346	0.09721	Cannot reject the null hypothesis
INFLA does not Granger Cause GDP	4.86378	0.01754**	Reject the null hypothesis
GDP does not Granger Cause INFLA	0.28358	0.83637	Cannot reject the null hypothesis
RATINGS does not Granger Cause GDP	1.93236	0.17424	Cannot reject the null hypothesis
GDP does not Granger Cause RATINGS	0.40639	0.75098	Cannot reject the null hypothesis
RATINGS does not Granger Cause INFLA	0.82277	0.50434	Cannot reject the null hypothesis
INFLA does not Granger Cause RATINGS	0.0682	0.97587	Cannot reject the null hypothesis

*Note:***, ** and * denotes rejection of the null hypotheses at 1%, 5% and 10% respectively.*

It could be concluded that changes in most of the variables do not have an effect on the changes amongst each other, thus do not "granger cause' each other, therefore cannot reject the null hypothesis as indicated on Table 10 above. However, changes in external debt and

GDP led to changes in external balance, and changes in fiscal balance and exchange rate had an impact on changes in ratings. Therefore it can be concluded that servicing of the external debt forms a major component of the current account surplus relative to GDP. Also changes in ratings affect changes in external debt servicing and exchange rate, hence changes in the two variables is said to be “granger caused” by changes in sovereign credit ratings.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter sums the research by summarising the study, bringing forth the conclusions and recommendations which may be useful in making sure emerging and developing countries achieve quality investment grade ratings. The chapter is concluded by discussions on other avenues for future and further study surrounding the subject of sovereign credit ratings.

5.2 Summary of the study

Certain regulatory requirements necessitating sovereigns and their sub-sovereigns to have achieved certain credit ratings shows the importance and need for every emerging country to have, not just an assigned sovereign credit rating, but a good one in order to easily access funding on the international capital markets. According to Cantor (2006), credit ratings, which until this day, are still dominated by the three international ratings agencies namely Moody's, S&P and Fitch, have become a *de-facto* requirement in the international borrowing community.

Several studies have revealed that a relationship does exist between macroeconomic factors and sovereign ratings, which in turn have a subsequent impact on the cost of borrowing, (Hooper et al, 2008 and Moora, 2006). However, despite such overwhelming evidence on the impact of sovereign credit ratings, most emerging and developing countries still remain unrated. The few that have been assigned these ratings still fall short of quality investment grades, (Standard and Poor's, 2015). South Africa was assigned its first sovereign ratings in 1994 by all three leading ratings agencies, and its ratings have tumbled year on year in the past decade.

It is upon such background that the study seeks to investigate the determinants of sovereign credit ratings in emerging markets using South Africa as a case study. For the purposes of the study, the ratings assigned by Moody's, S&P and Fitch are used, together with other six macroeconomic variables, to test the hypotheses that;

1. Long term economic prospects (economic growth and development) do not have a marginal effect on sovereign credit ratings assigned by the credit rating agencies.
2. Stability and flexibility of fiscal and monetary policies have no statistically significant effect on sovereign credit ratings assigned by the credit rating agencies.
3. Long term external debt and sovereign credit history do not have a marginal effect on sovereign credit ratings assigned by the credit rating agencies.

5.3 Conclusions

In the long run, the empirical evidence from the research supports and is in line with the findings of Cantor and Parker (1996), that economic development and growth, inflation, external debt are the major quantitative drivers and determinants of sovereign credit ratings. It also goes on to re-affirm findings by Bissoondoyal-Bheenick et al (2006), which observed the high impact of economic growth and external debt in the quality of ratings assigned to a particular country.

The study also supports Mellios et al (2006) on their conclusions that government revenue, real exchange rate stability and the inflation rate are factors which drive sovereign credit ratings. The statistically non-significance of the variables in the long run also support the findings by Gaillard (2009), who argued that in as much as quantitative macroeconomic factors significantly determine sovereign credit ratings in the short run; certain qualitative factors have a bearing on the ratings in the long term, and such evidence based on the long run empirical results is overwhelming.

The empirical evidence further reveals, with respect to the hypotheses tested under the study, that long term economic prospects on growth and development, have a marginal effect on sovereign credit ratings. Also, that stability and flexibility of both the fiscal and monetary policies is key to the determination of credit ratings for countries. The empirical evidence also suggests that long term external debt has a great impact on the present sovereign credit risk architecture.

In conclusion, the study tested six macroeconomic variables and their impact on sovereign credit ratings; and the empirical evidence suggests that these variables, namely GDP, inflation, real exchange rate, external balance, external debt and fiscal balance, in the short run determine about 96 percent of the sovereign credit ratings outcome assigned to emerging

and developing countries by the three leading credit ratings agencies. However, in the long run, these quantitative macroeconomic factors, on their own, have no significant impact on ratings.

5.4 Recommendations

Sovereign credit ratings provide the international debt and capital markets with information about sovereigns' investment grades which go beyond what is available on the public domain. That information is of great value to the markets in investment decisions and on pricing those investments. Therefore, it is imperative that individual countries get quality investment grade ratings to better manage the cost of capital for the central governments and all its sub-sovereign units.

The study recommends that sovereigns maintain clear consistent policies that dictate and drive positive macroeconomic fundamentals. As it can be noted from the findings of the study that external debt servicing and past ratings have a huge impact on future sovereign credit ratings, countries should always avoid defaulting on debt. It would make economic sense, from a debt management point to seek restructures before debt default or write-offs.

The fiscal and monetary authorities should always work hand in hand in providing policies and measures that in sync. An effective interplay of these two policies will contribute immensely to positive ratings. Also to the policy makers, clear efforts should be made in growing the economy and the country's aggregate income. Whilst managing all these other issues well, it is imperative for sovereigns to report and retain correct and reliable data which can be easily accessible to ratings agencies and investors. Reliable data will enable investors to make valuable investment decisions about sovereigns, even in the event of a downgrade or non-investment grade credit ratings.

As it can be noted from the research, quantitative factors alone do not guarantee good quality ratings, hence countries need to strengthen their democratic processes, institutions and the perception displayed to the rest of the world with regards to issues like respecting the rule of law, corruption and policy consistency.

5.5 Avenues for future research

In as much as the study attempted to capture all the determinants of sovereign credit ratings in emerging countries using South Africa as a case, there is still an opportunity to further explore this area of study. The study did not address the impact of ratings agencies' perceptions around political developments, corruption and the strength of legal institutions on assigned ratings considering that those factors are quite rampant in emerging and developing countries. The future research can make further contributions on the weight of those qualitative factors on sovereign credit ratings.

The study also ignored ratings outlook by only focusing on core ratings benchmarks, it would also be of great contribution to the research area to incorporate ratings outlook on the overall determinants of sovereign credit ratings.

Another avenue of further study will be to investigate the impact of sovereign credit ratings on some of the fundamental macroeconomic variables like exchange rates and capital flows. There is also overwhelming evidence that suggest that most developing countries still remain unrated to this day, an investigation on the impact and reasons as to why most developing countries and some emerging markets, despite the clear advantages of sovereign credit ratings, still remain unrated can be another immensely-contributing future study.

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APPENDICES

Appendix A: Long term issuer foreign currency credit ratings

Category	Definition
AAA	An obligor rated 'AAA' has extremely strong capacity to meet its financial commitments. 'AAA' is the highest issuer credit rating assigned by S&P Global Ratings.
AA	An obligor rated 'AA' has very strong capacity to meet its financial commitments. It differs from the highest-rated obligors only to a small degree.
A	An obligor rated 'A' has strong capacity to meet its financial commitments but is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
BBB	An obligor rated 'BBB' has adequate capacity to meet its financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
BB; B; CCC; and CC	Obligors rated 'BB', 'B', 'CCC', and 'CC' are regarded as having significant speculative characteristics. 'BB' indicates the least degree of speculation and 'CC' the highest. While such obligors will likely have some quality and protective characteristics, these may be outweighed by large uncertainties or major exposures to adverse conditions.
BB	An obligor rated 'BB' is less vulnerable in the near term than other lower-rated obligors. However, it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitments.
B	An obligor rated 'B' is more vulnerable than the obligors rated 'BB', but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.
CCC	An obligor rated 'CCC' is currently vulnerable, and is dependent upon favourable business, financial, and economic conditions to meet its financial commitments.
CC	An obligor rated 'CC' is currently highly vulnerable. The 'CC' rating is used when a default has not yet occurred, but S&P Global Ratings expects default to be a virtual certainty, regardless of the anticipated time to default.
R	An obligor rated 'R' is under regulatory supervision owing to its financial condition. During the pendency of the regulatory supervision the regulators may have the power to favour one class of obligations over others or pay some obligations and not others.
SD and D	An obligor rated 'SD' (selective default) or 'D' is in default on one or more of its financial obligations including rated and unrated financial obligations but excluding hybrid instruments classified as regulatory capital or in non-payment according to terms. An obligor is considered in default unless S&P Global Ratings believes that such payments will be made within five business days of the due date in the absence of a stated grace period, or within the earlier of the stated grace period or 30 calendar days. A 'D' rating is assigned when S&P Global Ratings believes that the default will be a general default and that the obligor will fail to pay all or substantially all of its obligations as they come due. An 'SD' rating is assigned when S&P Global Ratings believes that the obligor has selectively defaulted on a specific issue or class of obligations but it will continue to meet its payment obligations on other issues or classes of obligations in a timely manner. An obligor's rating is lowered to 'D' or 'SD' if it is conducting a distressed exchange offer.
NR	An issuer designated 'NR' is not rated.

*The ratings from 'AA' to 'CCC' may be modified by the addition of a plus (+) or minus (-) sign to show relative standing within the major rating categories.

Source: S&P Global Ratings

Appendix B: Mapping of Rating Grades

South Africa's long term foreign currency sovereign credit ratings from 1994 to 2016

Year	Fitch (Symbol)	Fitch (Numeric)	Moody's (Symbol)	Moody's (Numeric)	S&P (Symbol)	S&P (Numeric)	Average Ratings (S&P, Fitch & Moody's)
1994	BB	9	Baa3	11	BB	9	9.67
1995	BB	9	Baa3	11	BB	9	9.67
1996	BB+	10	Baa3	11	BB+	10	10.33
1997	BB+	10	Baa3	11	BB+	10	10.33
1998	BB+	10	Baa3	11	BB+	10	10.33
1999	BB+	10	Baa3	11	BB+	10	10.33
2000	BB+	10	Baa3	11	BB+	10	10.33
2001	BBB-	11	Baa2	12	BBB-	11	11.33
2002	BBB-	11	Baa2	12	BBB-	11	11.33
2003	BBB-	11	Baa2	12	BBB-	11	11.33
2004	BBB	12	Baa2	12	BBB	12	12.00
2005	BBB	12	Baa1	13	BBB	12	12.33
2006	BBB+	13	Baa1	13	BBB+	13	13.00
2007	BBB+	13	Baa1	13	BBB+	13	13.00
2008	BBB+	13	Baa1	13	BBB+	13	13.00
2009	BBB+	13	A3	14	BBB+	13	13.33
2010	BBB+	13	A3	14	BBB+	13	13.33
2011	BBB+	13	A3	14	BBB+	13	13.33
2012	BBB+	13	Baa1	13	BBB+	13	13.00
2013	BBB	12	Baa1	13	BBB	12	12.33
2014	BBB	12	Baa2	12	BBB	12	12.00
2015	BBB	12	Baa2	12	BBB-	11	11.67
2016	BBB-	11	Baa2	12	BBB-	11	11.33

Source: S&P Global Ratings; Moody's Investor Services; Fitch Ratings

Appendix C: Economic variables data from 1994 to 2016

Year	Average Ratings	External Debt Service % to Exports	GDP Growth %	Real Exchange Rate to USD	Inflation rate %	External Balance % to GDP	Fiscal Balance % to GDP	Default History
1994	9.67	9.368	3.2	3.549	8.8	0.0	-4.30	0
1995	9.67	9.541	3.1	3.626	8.8	-1.6	-4.20	0
1996	10.33	11.584	4.3	4.297	7.4	-1.1	-4.10	0
1997	10.33	17.233	2.6	4.607	8.6	-1.5	-4.50	0
1998	10.33	12.172	0.5	5.528	7.0	-1.7	-3.50	0
1999	10.33	12.114	2.4	6.113	5.1	-0.5	-2.40	0
2000	10.33	9.868	4.2	6.943	5.4	-0.1	-1.90	0
2001	11.33	11.360	2.7	8.615	5.6	0.3	-1.00	0
2002	11.33	13.068	3.7	10.502	9.1	0.9	-0.70	0
2003	11.33	8.357	2.9	7.546	5.9	-0.8	-2.30	0
2004	12.00	6.337	4.6	6.440	1.4	-2.8	-2.00	0
2005	12.33	6.417	5.3	6.364	3.4	-3.1	-0.50	0
2006	13.00	8.680	5.6	6.768	4.6	-4.5	0.20	0
2007	13.00	4.235	5.4	7.052	7.2	-5.4	1.00	0
2008	13.00	6.937	3.2	8.273	11.0	-5.5	-1.00	0
2009	13.33	5.952	-1.5	8.419	7.1	-2.7	-6.30	0
2010	13.33	5.648	3.0	7.320	4.3	-1.5	-4.70	0
2011	13.33	4.761	3.3	7.263	5.0	-2.2	-4.70	0
2012	13.00	7.862	2.2	8.207	5.6	-5.1	-5.00	0
2013	12.33	10.640	2.2	9.651	5.8	-5.9	-4.40	0
2014	12.00	6.654	1.5	10.848	6.1	-5.3	-4.30	0
2015	11.67	7.673	1.3	12.768	4.6	-4.4	-4.10	0
2016	11.33	13.660	0.3	14.706	6.3	-3.3	-3.90	0

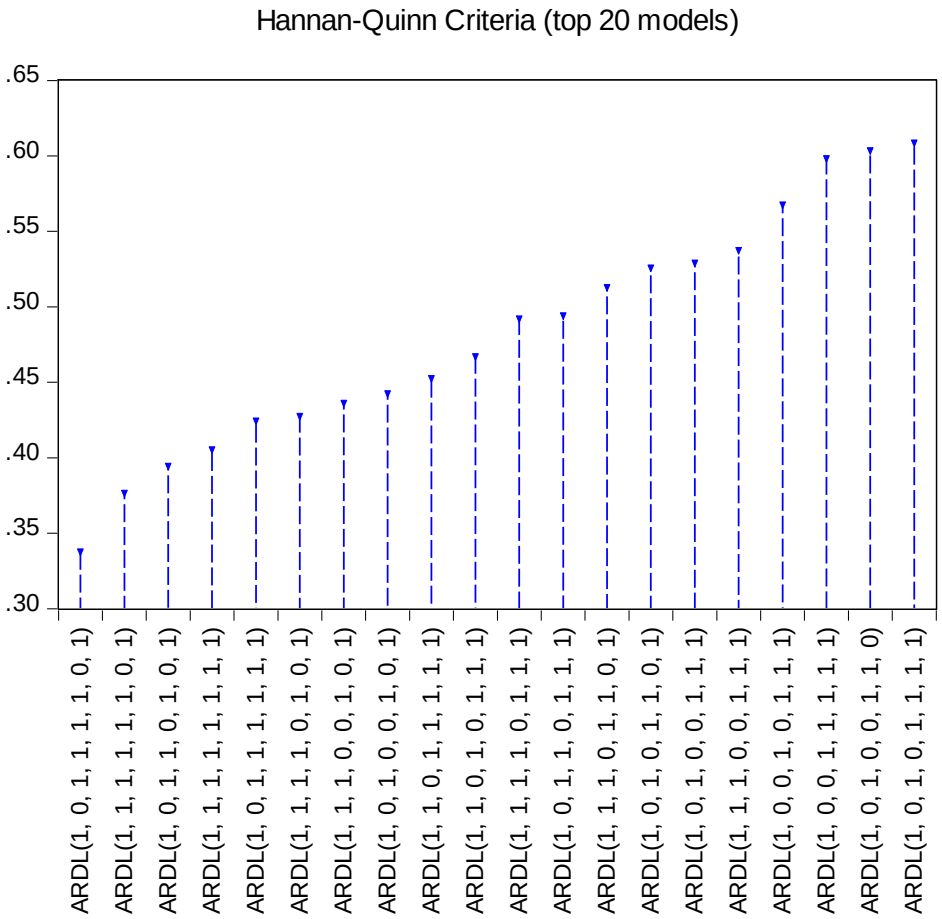
Appendix D: ARDL Model Results

Dependent Variable: RATINGS
Method: ARDL
Date: 11/28/17 Time: 10:06
Sample (adjusted): 1995 2016
Included observations: 22 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Hannan-Quinn criterion (HQ)
Dynamic regressors (1 lag, automatic): EXCHANGE EDEBT EBAL FISC GDP INFLA
Fixed regressors: C
Number of models evalulated: 128
Selected Model: ARDL(1, 0, 1, 1, 1, 1, 0, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RATINGS(-1)	0.915680	0.175223	5.225808	0.0008
EXCHANGE	-0.005442	0.038445	-0.141552	0.8909
EDEBT	0.016464	0.030210	0.544974	0.6006
EDEBT(-1)	-0.075864	0.031842	-2.382478	0.0444
EBAL	0.257590	0.086150	2.990009	0.0173
EBAL(-1)	-0.109292	0.066524	-1.642894	0.1390
FISC	0.229160	0.109339	2.095855	0.0694
FISC(-1)	-0.135556	0.115292	-1.175764	0.2735
GDP	-0.027774	0.078728	-0.352784	0.7334
GDP(-1)	0.249550	0.091724	2.720656	0.0262
INFLA	-0.150726	0.042838	-3.518477	0.0079
INFLA(-1)	0.175460	0.073672	2.381642	0.0444
C	0.876813	1.970096	0.445061	0.6681

R-squared	0.985517	Mean dependent var	11.77091
Adjusted R-squared	0.961983	S.D. dependent var	1.188192
S.E. of regression	0.231673	Akaike info criterion	0.174150
Sum squared resid	0.429380	Schwarz criterion	0.868450
Log likelihood	12.08435	Hannan-Quinn criter.	0.337706
F-statistic	41.87558	Durbin-Watson stat	3.543317
Prob(F-statistic)	0.000007		

*Note: p-values and any subsequent tests do not account for model selection.



ARDL Long Run Form and Bounds Test

ARDL Long Run Form and Bounds Test
Dependent Variable: D(RATINGS)
Selected Model: ARDL(1, 0, 1, 1, 1, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 11/28/17 Time: 10:13
Sample: 1994 2016
Included observations: 22

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.876813	1.970096	0.445061	0.6681
RATINGS(-1)*	-0.084320	0.175223	-0.481218	0.6432
EXCHANGE**	-0.005442	0.038445	-0.141552	0.8909
EDEBT(-1)	-0.059400	0.045062	-1.318186	0.2239
EBAL(-1)	0.148299	0.091045	1.628851	0.1420
FISC(-1)	0.093604	0.121548	0.770096	0.4634
GDP(-1)	0.221776	0.130861	1.694749	0.1286
INFLA(-1)	0.024733	0.057212	0.432314	0.6769
D(EDEBT)	0.016464	0.030210	0.544974	0.6006
D(EBAL)	0.257590	0.086150	2.990009	0.0173
D(FISC)	0.229160	0.109339	2.095855	0.0694
D(GDP)	-0.027774	0.078728	-0.352784	0.7334
D(INFLA)	-0.150726	0.042838	-3.518477	0.0079

* p-value incompatible with t-Bounds distribution.

** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCHANGE	-0.064539	0.460067	-0.140281	0.8919
EDEBT	-0.704455	1.676890	-0.420096	0.6855
EBAL	1.758754	3.058741	0.574993	0.5811
FISC	1.110096	1.496033	0.742026	0.4793
GDP	2.630162	6.305652	0.417112	0.6876
INFLA	0.293327	0.929110	0.315708	0.7603
C	10.39860	15.22336	0.683069	0.5139

EC = RATINGS - (-0.0645*EXCHANGE -0.7045*EDEBT + 1.7588*EBAL +
1.1101*FISC + 2.6302*GDP + 0.2933*INFLA + 10.3986)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.874338	10%	1.92	2.89
k	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9
			Finite Sample:	
Actual Sample Size	22		n=35	
		10%	2.196	3.37
		5%	2.597	3.907
		1%	3.599	5.23
			Finite Sample: n=30	
		10%	2.277	3.498
		5%	2.73	4.163
		1%	3.864	5.694

ARDL Short Run Form and Error Correction Model

ARDL Error Correction Regression
Dependent Variable: D(RATINGS)
Selected Model: ARDL(1, 1, 0, 1, 1, 0, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 01/26/18 Time: 20:07
Sample: 1994 2016
Included observations: 22

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLA)	-0.150726	0.021393	-7.045674	0.0001
D(GDP)	-0.027774	0.029132	-0.953393	0.3683
D(FISC)	0.229160	0.043647	5.250354	0.0008
D(EDEBT)	0.016464	0.012647	1.301809	0.2292
D(EBAL)	0.257590	0.038450	6.699349	0.0002
CointEq(-1)*	-0.084320	0.008200	-10.28290	0.0000

R-squared	0.870557	Mean dependent var	0.075455
Adjusted R-squared	0.830106	S.D. dependent var	0.397441
S.E. of regression	0.163818	Akaike info criterion	-0.553123
Sum squared resid	0.429380	Schwarz criterion	-0.255566
Log likelihood	12.08435	Hannan-Quinn criter.	-0.483027
Durbin-Watson stat	3.543317		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.874338	10%	1.92	2.89
k	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9

Appendix E
Unit Root Analysis: Augmented Dickey-Fuller Test Results

Ratings

ADF Test Statistic	-1.933456	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RATINGS)
Method: Least Squares
Date: 11/16/17 Time: 23:30
Sample(adjusted): 1997 2016
Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RATINGS(-1)	-0.136307	0.070499	-1.933456	0.0691
D(RATINGS(-1))	0.215930	0.214679	1.005827	0.3278
C	0.148196	0.075526	1.962174	0.0654

R-squared	0.221121	Mean dependent var	0.003276
Adjusted R-squared	0.134578	S.D. dependent var	0.015349
S.E. of regression	0.014279	Akaike info criterion	-5.528447
Sum squared resid	0.003670	Schwarz criterion	-5.379229
Log likelihood	61.04869	F-statistic	2.555063
Durbin-Watson stat	1.858702	Prob(F-statistic)	0.105495

External Debt

ADF Test Statistic	-4.276301	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EDEBT,2)
Method: Least Squares
Date: 11/16/17 Time: 23:34
Sample(adjusted): 1997 2016
Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EDEBT(-1))	-1.748046	0.408775	-4.276301	0.0005
D(EDEBT(-1),2)	0.377223	0.254228	1.483799	0.1562
C	0.017976	0.698954	0.025718	0.9798

R-squared	0.632860	Mean dependent var	0.197200
Adjusted R-squared	0.589667	S.D. dependent var	4.868548
S.E. of regression	3.118656	Akaike info criterion	5.250162
Sum squared resid	165.3423	Schwarz criterion	5.399522
Log likelihood	-49.50162	F-statistic	14.65195
Durbin-Watson stat	1.876506	Prob(F-statistic)	0.000200

Growth, GDP

ADF Test Statistic	-4.679995	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 11/16/17 Time: 23:37
Sample(adjusted): 1997 2016
Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.617283	0.345574	-4.679995	0.0002
D(GDP(-1),2)	0.362076	0.224150	1.615330	0.1246
C	-0.253745	0.418255	-0.606675	0.5521

R-squared	0.650841	Mean dependent var	-0.110000
Adjusted R-squared	0.609764	S.D. dependent var	2.986443
S.E. of regression	1.865598	Akaike info criterion	4.222521
Sum squared resid	59.16776	Schwarz criterion	4.371881
Log likelihood	-39.22521	F-statistic	15.84422
Durbin-Watson stat	2.020129	Prob(F-statistic)	0.000131

Exchange rate

ADF Test Statistic	-1.464266	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCHANGE)
Method: Least Squares
Date: 11/16/17 Time: 23:48
Sample(adjusted): 1997 2016
Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCHANGE(-1)	-0.138875	0.094843	-1.464266	0.1604
D(EXCHANGE(-1))	0.386971	0.214623	1.803027	0.0882
C	0.137486	0.081251	1.692109	0.1079

R-squared	0.204409	Mean dependent var	0.028956
Adjusted R-squared	0.116010	S.D. dependent var	0.059269
S.E. of regression	0.055725	Akaike info criterion	-2.805221
Sum squared resid	0.055894	Schwarz criterion	-2.656003
Log likelihood	32.45482	F-statistic	2.312350
Durbin-Watson stat	1.777973	Prob(F-statistic)	0.127705

Inflation

ADF Test Statistic	-4.491474	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLA,2)
Method: Least Squares
Date: 11/16/17 Time: 23:49
Sample(adjusted): 1997 2016
Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLA(-1))	-1.400974	0.311918	-4.491474	0.0003
D(INFLA(-1),2)	0.419916	0.224705	1.868742	0.0790
C	-0.107711	0.512066	-0.210346	0.8359

R-squared	0.578826	Mean dependent var	0.155000
Adjusted R-squared	0.529276	S.D. dependent var	3.318445
S.E. of regression	2.276762	Akaike info criterion	4.620867
Sum squared resid	88.12197	Schwarz criterion	4.770226
Log likelihood	-43.20867	F-statistic	11.68170
Durbin-Watson stat	2.060262	Prob(F-statistic)	0.000643

External balance

ADF Test Statistic	-3.409363	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EBAL,2)
Method: Least Squares
Date: 11/16/17 Time: 23:50
Sample(adjusted): 1997 2016
Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EBAL(-1))	-0.869344	0.254987	-3.409363	0.0033
D(EBAL(-1),2)	0.391203	0.217611	1.797715	0.0900
C	-0.140609	0.269238	-0.522246	0.6082

R-squared	0.406944	Mean dependent var	0.030000
Adjusted R-squared	0.337172	S.D. dependent var	1.446629
S.E. of regression	1.177762	Akaike info criterion	3.302591
Sum squared resid	23.58111	Schwarz criterion	3.451950
Log likelihood	-30.02591	F-statistic	5.832534
Durbin-Watson stat	1.982833	Prob(F-statistic)	0.011785

Fiscal balance

ADF Test Statistic	-3.564929	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FISC,2)
Method: Least Squares
Date: 11/16/17 Time: 23:52
Sample(adjusted): 1997 2016
Included observations: 20 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FISC(-1))	-1.141335	0.320156	-3.564929	0.0024
D(FISC(-1),2)	0.237773	0.235730	1.008664	0.3273
C	0.009518	0.351281	0.027095	0.9787

R-squared	0.491268	Mean dependent var	0.005000
Adjusted R-squared	0.431418	S.D. dependent var	2.083387
S.E. of regression	1.570965	Akaike info criterion	3.878739
Sum squared resid	41.95485	Schwarz criterion	4.028099
Log likelihood	-35.78739	F-statistic	8.208218
Durbin-Watson stat	2.002083	Prob(F-statistic)	0.003200