

The impact of sovereign credit ratings on foreign exchange rate returns in Africa

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ABSTRACT

This study investigates the impact of sovereign credit ratings on foreign exchange rate returns for a sample of 27 African countries over the period 2003–2018 to examine the response of the exchange rates around the time of sovereign rating announcements. The data consist of long-term foreign currency sovereign ratings, outlooks, watch lists and daily exchange rates. The study applies a combination of an event study methodology using both univariate and multivariate analyses and the Granger causality tests in a panel framework as well as impulse response tests. The results suggest that, in Africa, exchange rates do not react significantly to changes in sovereign credit rating announcements. No significant evidence of contagion was found. It is thus implied that foreign exchange rates do not react significantly to new information from credit rating agencies which shows a disjoint between macro-economic fundamental performance and financial markets. African countries are encouraged to focus on stabilising their currencies, as well as attending to macro-economic fundamentals that will result in improved credit ratings.

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LIST OF ACRONYMS

ACI	African Currencies Index
ADF	Augmented Dickey-Fuller
AU	African Union
CFTA	Continental Free Trade Area
CRA	Credit Rating Agency
FDI	Foreign Direct Investment
FXR	Foreign Exchange Rate
GDP	Gross Domestic Product
IR	Impulse Response
PP	Phillips-Perron
SARB	South African Reserve Bank
SCR	Sovereign Credit Rating

CHAPTER ONE

INTRODUCTION

1.1. Research background

Financial and economic integration has increased internationally and sovereign credit ratings (SCR) have become one of the most important elements in directing the global capital flows (Haspolat, 2015). Capital flows are an important source of external funding that developing countries rely on for financing savings gaps and to fast track economic development and growth. Additionally, capital flows have proven to be an important source of investment for developing economies since the emergence of financial globalisation which is evidenced by the steady growth of flows from developed economies to emerging markets (Eraslan, 2017). In addition, policies enacted after the 2008 global financial crisis led to an increase in capital flows from developed countries to emerging markets. In times of high international liquidity, developing economies attract high levels of capital flows. Similarly, as evidenced by the Asian currency crisis of 1997, during periods of financial distress or increased political or economic risk, capital flight is experienced as capital flows move away from emerging markets given their volatile nature (Gaillard, 2012). As postulated by Kodongo and Ojah (2013), foreign exchange rates drive private investment and this is the classical economist theory.

In the same fashion, Eraslan (2017) postulates that emerging markets are more sensitive and vulnerable to capital flows due to the linkages between capital flows and financial indicators such as exchange rate, interest rate and inflation. This vulnerability is further exacerbated by the fact that most emerging markets, especially those in Africa, adopted a raft of stabilisation and liberalisation economic policies such as the liberalisation of foreign exchange markets and the relaxation of restrictions on exports and imports championed by the International Monetary Fund (IMF). Figure 1 below shows the foreign exchange rate regimes of the African countries under study as at 2004 as well as the name of their currencies.

Table 1: Exchange rate regimes in Africa in 2004

(Source: IMF Annual report in exchange arrangements and exchange restrictions)

Exchange rate regime	Currency	Exchange rate volatility* 2002–2005 to the USD
Independent floating		
DRC	Congolese Franc	6.8
Malawi	Kwacha	5.6
South Africa	Rand	6.7
Uganda	Ugandan Shilling	4.5
Managed floating		
Angola	Kwanza	6.3
Egypt	Egyptian Pound	6.2
Ghana	Cedi	2.7
Kenya	Kenyan Shilling	4.2
Mauritius	Mauritian Rupee	4.6
Mozambique	Metical	6.3
Nigeria	Naira	4.0
Rwanda	Rwanda Franc	3.8
Zambia	Kwacha	8.0
Pegged		
Botswana	Pula	6.7
Cape Verde	Cape Verde Escudo	5.3
Lesotho	Loti	6.7
Morocco	Dirham	4.8
Seychelles	Seychelles Rupee	2.3
Tunisia	Tunisian Dinar	5.1
Namibia	Namibian Dollar	6.7
Benin	CFA Franc	5.3
Burkina Faso	CFA Franc	5.3
Ivory Coast	CFA Franc	5.3
Senegal	CFA Franc	5.3
Cameroon	CFA Franc	5.3
Gabon	CFA Franc	5.3
Congo	CFA Franc	5.3

*Calculated as annualised standard deviation of monthly percentage change

An exchange rate regime is a function of a country's monetary policy that seeks to establish the exchange rate of its own currency against currencies of other countries, with independent and managed floating regimes classified under flexible regimes and the different kinds of pegs, such as crawling peg, currency basket peg, fixed exchange rate, band and crawling band, classified under fixed exchange rate regimes (Gudmundsson, 2006). When the country makes no attempt

to fix its exchange rate and the exchange rate is allowed to fluctuate in response to foreign exchange mechanisms, such an exchange rate is termed a floating exchange rate regime whereas a fixed exchange rate regime is one in which the country pegs its currency's exchange rate to another currency or a basket of currencies with significant government intervention (Senadza & Diaba, 2017).

On the other hand, the liberalisation of foreign exchange markets meant that developing nations dropped currency pegs and adopted flexible or free floating exchange rate regimes. This move was meant to bring about an increase in growth, price stability and trade performance but sadly this has not been the case (Ndikumana, 2003). Kodongo and Ojah (2013) note that exchange rates are reactive to cross-border trade and investment activities and that capital flows are affected by changes in the value of a country's currency because perceptions about the risks of foreign investments influence foreign exchange rate behaviour. This relationship between capital flows and exchange rates makes it vital to study factors that affect exchange rates.

Exchange rates are classified into the nominal exchange rate (NER) and the real exchange rate (RER). While NER refers to the monetary concept that measures the relative price of currencies between two countries, RER is a real concept that measures the relative price of goods between two countries (Edwards, 1987). Alsakka and ap Gwilym (2012) posit that, in emerging markets, the importance of exchange rate behaviour for economic stability is highlighted by the currency crises that attract interest in exchange rate dynamics. Correspondingly, foreign exchange rates play a pivotal role in a country's international trade and consequently influence the balance of payment of that country (Monica & Santhiyavali, 2017).

In addition, exchange rate movements are of great interest to governments, cross border traders and investors, as well as multinational corporations operating in the region. According to Senadza and Diaba (2017), the advent of floating exchange rate regimes in Africa brought with it exchange rate volatility which is generally perceived to have negative effects on international trade and that exchange rate volatility has a short-run negative impact on exports in sub-Saharan Africa. Equally important, Twin (2019) posits that exchange rates are among the most-watched, analysed and manipulated economic indicators by governments because they are one of the determinants of a country's economic health and play a significant role in the level of trade in a country.

Consequently, when the local currency is stronger, it is beneficial for importers, but when the currency depreciates, it harms exports and foreign asset values (Hsing, 2016). In agreement, Fang Lai and Miller (2009) found that exchange rate risks, negative or positive, in a period of depreciation or appreciation affect exports for all countries studied. Furthermore, Eraslan (2017) argues that, in emerging markets, the nexus between financial indicators and capital flows makes emerging markets more sensitive and vulnerable to capital movements with the size of capital flows being the primary determinant of short-run exchange rate movements.

Extensive research has been done on the nexus between capital flows and financial indicators such as inflation, interest rates and exchange rates. Eraslan (2017) postulates that exchange rates are sensitive and respond quickly to news. Published financial statements, announcements from banks, news on rescue or bailout packages as well as announcements from credit rating agencies have an effect on exchange rate movements. There is little that can be found in literature about the impact of sovereign credit ratings announcements on exchange rates, especially in Africa.

The credit rating agencies originated in the United States of America (USA) in 1841 when the first mercantile credit rating agency was established after the 1837 financial crisis with ratings being applied to securities especially the railroad bonds in the early 1900s (Packer & Cantor, 1994). The earliest sovereign credit rating (SCR) was in the 1940s when Moody's Investor Service (Moody's) issued the first US long term domestic and foreign currency rating (Cantor & Packer, (1996). The interest in sovereign credit ratings peaked in the 1980s with the growth of the bond market due to the relaxation of financial regulations and the global expansion of capital markets.

Sovereign credit ratings reflect the assessments of a sovereign country's capacity and willingness to repay its debts (Jaramillo, 2010). In its first 1918 *Manual and Investment Letters*, Moody's defined its sovereign ratings as the relative creditworthiness of government. This measure has two components: the *ability* and the *willingness* (or the "good faith") to repay the debt (Gaillard, 2012). According to Jaramillo and Tejada (2011), developing nations seek the investment-grade rating to reduce costs of borrowing for the country and corporates as well as to expand the pool of potential investors.

Cantor and Packer (1996) proffer eight variables they claim to make up more than 90% of sovereign ratings assigned by both Standard & Poor's and Moody's. These variables are: GDP growth, fiscal balance, debt-to-export ratio, inflation, current account balance, an indicator variable of an advanced economy and an indicator of variable default since 1970. An unfavourable change in these variables leads to a credit downgrading. These credit ratings are an indication of the economic, financial and political situation of an economy and signal essential information regarding a country's development to governments and international financial markets (Afonso, 2003). In concurrence with Afonso (2003) on the importance of sovereign credit ratings, Reinhart (2008) states that ratings play a pivotal role in determining the terms and the extent to which nations have access to international capital markets. Boot, Todd and Anjolein (2006) posit that credit ratings act as a coordinating mechanism in situations where multiple equilibria can obtain and, as such, play a meaningful economic role. Between 2003 and 2018, more African countries received credit ratings than the period before 2003. During this period, all African countries that received sovereign credit ratings were downgraded with only seven exceptions (Botswana, Seychelles, Mauritius, Morocco, Rwanda, Tunisia and Burkina Faso). This brought about an increased interest in sovereign credit ratings and their increased significance (Kräussl, 2005a). Therefore, there is a need to investigate the impact of sovereign credit ratings on the exchange rates of countries comprising the African Union (AU). The results of this investigation will have important implications at policy level given the January 2012 proposed Continental Free Trade Area (CFTA) by the African Union that would pave the way for the establishment of the Continental Customs Union and the African Customs Union (Mevel & Karingi, 2012). The results will also inform policymakers on how sovereign credit rating announcements affect exchange rate volatility. Understanding exchange rate volatility in Africa is vital because it hinders trade, productivity, and investment in the long run (Chou, 2000); Bleaney & Greenaway, (2001), Aghion *et al.*, (2010).

Countries use sovereign debt to deal with budgetary constraints. Therefore, sovereign debt plays a vital role in the economic growth and development of both emerging and developed nations. The ability of a sovereign government to borrow from international credit markets depends on its perceived ability to repay and on the incentives it will have to do this (Gelos *et al.*, 2011). According to Cantor and Packer (1996), investors prefer rated securities over unrated ones of similar credit risk. Investors are therefore interested in knowing the sovereign risk and related default probability and this where credit rating agencies play a role. Duygun, Oztuk and Shaban (2016) contend that credit rating agencies play a critical role in determining countries'

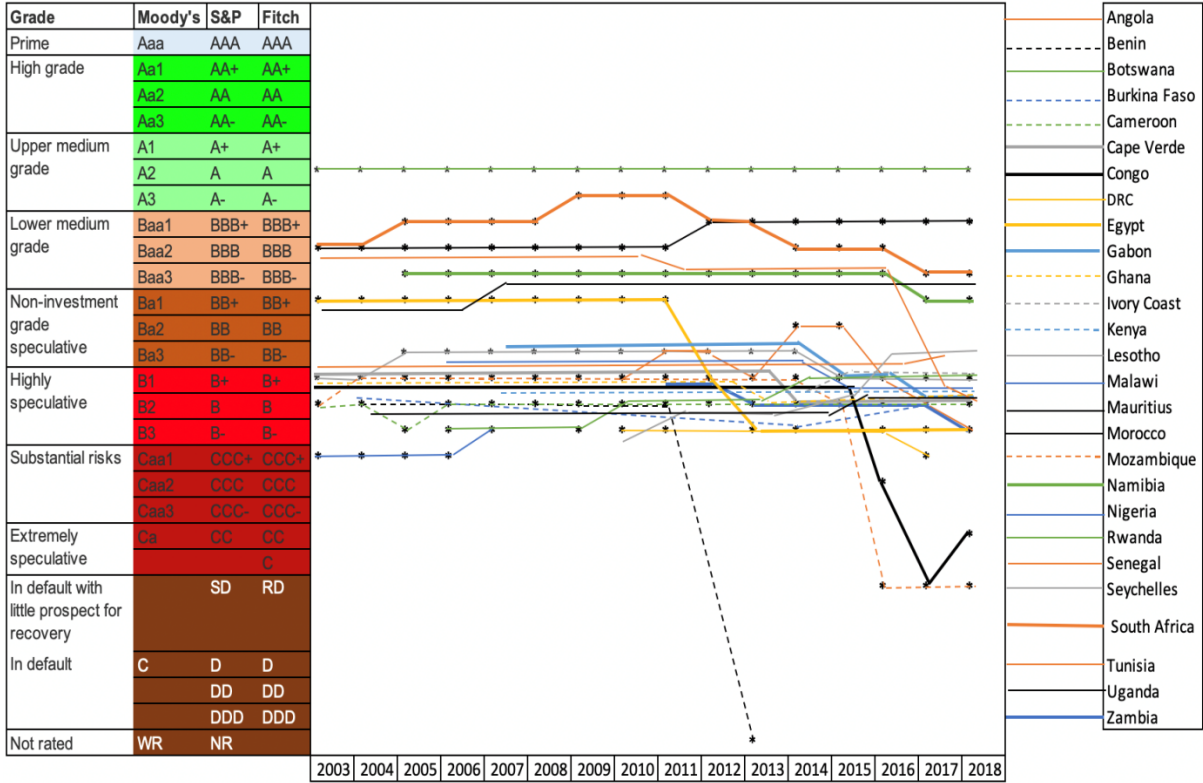
access to capital and the cost thereof because international investors' decisions are based on comparative assets in the same class and ratings puts a particular country in a class based on its willingness and capacity to pay. Additionally, Kräussl (2003) argues that rating changes affect the size and volatility of capital flows to emerging markets.

The three most influential credit rating agencies that are dominant in assessing the solvency of countries are Moody's Investors Service (Moody's), Standard & Poor's (S&P) and Fitch Ratings (Fitch). Credit ratings provided by these agencies influence how sovereign countries access international markets (Reinhart, 2002). Credit rating agencies' outputs are used to guide investment choices of government agencies and key institutional investors in the capital markets (pension funds, investment banks and other financial institutions) (Tennant & Tracey, 2016). Credit rating agencies use different methodologies to come up with sovereign credit ratings. They have standardised symbols and explanations to depict the credit rating scores.

Figure 2 below shows the credit ratings and explanations from the three credit rating agencies, as well as the visual depiction of 27¹ sampled African countries' assigned sovereign credit rating during the period under study. As can be seen, only six out of 27 sampled countries are classified as investment grade with Angola topping the list with an A rating while 78% of countries in Africa that received credit ratings fall in the non-investment grades of speculative and highly speculative. During the years of 2013 to 2018, as depicted in Figure 1 above, all African countries that received sovereign credit ratings were downgraded with only seven exceptions (Botswana, Seychelles, Mauritius, Morocco, Rwanda, Tunisia and Burkina Faso).

¹Angola, Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Republic of Congo (Congo), Democratic Republic of the Congo (DRC), Egypt, Gabon, Ghana, Côte d'Ivoire (Ivory Coast), Kenya, Lesotho, Malawi, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Tunisia, Uganda and Zambia

Figure 1: Sovereign credit ratings of African countries
 (Sources: Moody's, S&P, Fitch, countryeconomy.com, tradingeconomics.com)



1.2. An overview of sovereign credit announcements in Africa

For purposes of this study, only the 27 African countries that received sovereign credit ratings in the period under study have been chosen. These countries are as follows: Angola, Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Congo, DRC, Egypt, Gabon, Ghana, Ivory Coast, Kenya, Lesotho, Malawi, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Tunisia, Uganda and Zambia. Even though African countries started receiving sovereign credit ratings in the 1990s, it was only in 2003 that 10 out of the 27 countries received sovereign credit ratings.

Credit rating agencies play a pivotal role in financial markets, but Eraslan (2017) argues that doubts about the significance of credit rating agencies still linger since credit rating agencies have been accused of lagging behind markets instead of leading them. Since rating agencies are perceived to be highly influential, their sovereign debt announcements have a bearing on the financial systems of nations. The recent spate of downgrades of developing countries' sovereign debt has brought ratings into the spotlight again (Mugobo & Mutize, 2016). The exchange rate fluctuations of African currencies against the US dollar was noted by Singh and Saiia (2013) to be a significant cause of concern for the African countries as it negatively affects

their trade, especially for exports and intra-Africa trade. According to Langner (2016), as shown in Figure 3a below, Fitch, Moody's and S&P took 1,971 negative rating actions on emerging-market sovereign and government-related entities in 2016.² Figure 3b below focuses on African countries and shows the distribution of sovereign credit ratings given to African countries by the three leading credit rating agencies from 1994 to 2018. The graph shows that, during the period under study (2013–2018), most African economies received sovereign credit ratings with 15 countries in 2003 and 30 countries from 2015 through to 2018. Over two-thirds of the rated African countries were placed in and below non-investment grade, indicating that obligations are considered as speculative grade indicating high credit risk. During the period under study, only five of the rated African countries were rated A and BB (the upper and lower medium grades). Figure 3c below shows Africa's sovereign credit rating upgrade and downgrade trends from 1994 to 2018. During the period under study (2003–2018), the number of downgrades increased exponentially as more African countries began receiving credit ratings.

Figures 1 and 2 thus support the narrative that unsolicited ratings for African countries are biased downward which agrees with results from empirical studies conducted by Poon (2003) as well as the narrative that credit rating agencies are biased against developing countries as reported by The Economist (2017). Poon used time series analysis with cross-sectional data from 15 countries during the period from 1998 to 2000 and found that unsolicited ratings are lower than solicited ratings.

Even though sovereign credit ratings have become a significant part of macroprudential regulation and industry guidelines and play a pivotal role for emerging markets' access to capital (Christopher et al., 2012), credit rating agencies have been under criticism since the Asian crisis, the European debt crisis and the global financial crisis of 2008 (Gaillard, 2012). Credit rating agencies have been accused of not being able to foretell economic crises and for exacerbating existing financial crises by giving sudden downgrades and negative outlooks of the affected countries. Sy, Cantor, Carvajal et al (2009) argue that credit ratings contributed to the 2008/9 global financial crisis. The authors further found that downgrades led to systemic market losses and illiquidity due to the financial markets' increased reliance on ratings despite the systemic risk inherent to ratings. The authors further argue for macro-prudential regulation

²The data includes both rating and outlook downgrades for both sovereigns and government-related entities in developing countries.

of credit rating agencies in order to reduce conflict of interest, increasing transparency and encouraging competition. Having investigated the damaging bias of sovereign credit ratings, Vernazza and Nielsen (2015) found that the subjective component of sovereign credit ratings does not predict defaults and that it biased default predictions in the wrong direction lending credence to criticisms from emerging economies. The authors argue that credit rating agencies should be stripped of their regulatory power and be assigned to an international body. The credit rating agencies must be forced to significantly increase transparency by publishing a breakdown of their objective and subjective components of the ratings they issue as well as minutes of rating committees and the voting records. This call for increased transparency in how credit ratings are arrived at builds on the call by Marwan (2008) who argues that the lack of competition in the rating industry leads to the distrust of the ratings and the process by nations receiving negative ratings. The author argues for the creation of new rating agencies and making sure the new regulations channel business to these new agencies which requires policy action at both national and international levels.

Haspolat (2015) found that rating announcements do not reflect the real economic and social position of the rated countries. Credit rating agencies have been accused of being biased against Africa countries and a number of African countries have started to protest against these ratings or reject them outright. According to Mutize (2019), in 2015, Zambia encouraged investors to ignore unsolicited downgrades from credit rating agencies; Namibia rejected a downgrade from Moody's in 2017; Nigeria strongly disagreed with a downgrade it was given; and Tanzania criticised Moody's for its decision to assign the country a low credit rating with a negative outlook. From 2016, India has made its criticism of the three credit rating agencies known and this was amplified in 2017 when India's chief economic advisor, Arvind Subramanian, alleged that credit rating agencies were biased towards countries such as China and against other nations and criticised the rating firms methodology as a compromised analysis (Karnik, 2017).

Writing for the German international broadcaster, DeutscheWelle (DW), Pelz (2019) notes that African countries were beginning to retaliate against the 'subjective' ratings. Pelz (2019) quoted the Namibian Finance Minister, Calle Schlettein, who said the rating given to Namibia was confusing and puzzling. This was after Namibia was downgraded by Moody's to Ba1 from Baa3. Associate Professor Sean Gossel, who teaches economics at the University of Cape Town, was also quoted by Deutsche Welle saying "That is part of the criticism, that it isn't a very robust analytical process; there is a high degree of subjectivity to it" and "Much of the

criticism is that the personnel making these ratings do not understand the African environment and do not understand the challenges that African countries in particular face” (Pelz, 2019).

On the other hand, studies that dispute the presence of bias against emerging markets such as that of Yalta and Yalta (2018) who found that sovereign credit ratings assigned by Moody’s, Fitch and Standard & Poor indicate home country bias while they did not find any evidence of any bias against countries in the middle and north of Africa.

These statements by public officials and official communications by the government in response to credit rating announcements play a significant role in the financial markets and affect economic activity as is indicated by Atkins and Basu (1995), Rodríguez and Schulstad (2004) and Kriwoluzky (2012).

In light of the debates and controversy around the role played by rating agencies,³ this research uses a sample of 27 African countries over the period of 15 years from 2003 to 2018 in order to (i) examine the variation of the selected Africa countries’ currency exchange rate in response to the sovereign rating announcements; and (ii) establish whether sovereign credit rating downgrades or upgrades affect the exchange rates by the same magnitude.

Figure 2a: Fitch, Moody’s and S&P rating actions on emerging markets and governments

³ As articulated by Ferri (2004), Frost (2007), Gaillard (2009) Sinclair (2010) De Haan and Amtenbrink(2011), Eijffinger (2012), Zheng (2012), Bayar (2014), Vernazza and Nielsen (2015) Tennant and Tracey (2016) and Duygun, Huseyin and Mohamed (2016).

(Source: Bloomberg; Langer, 2016)



Figure 2b: Africa’s sovereign credit rating distribution
(Sources: African Peer Review Mechanism; Mutize, 2018)

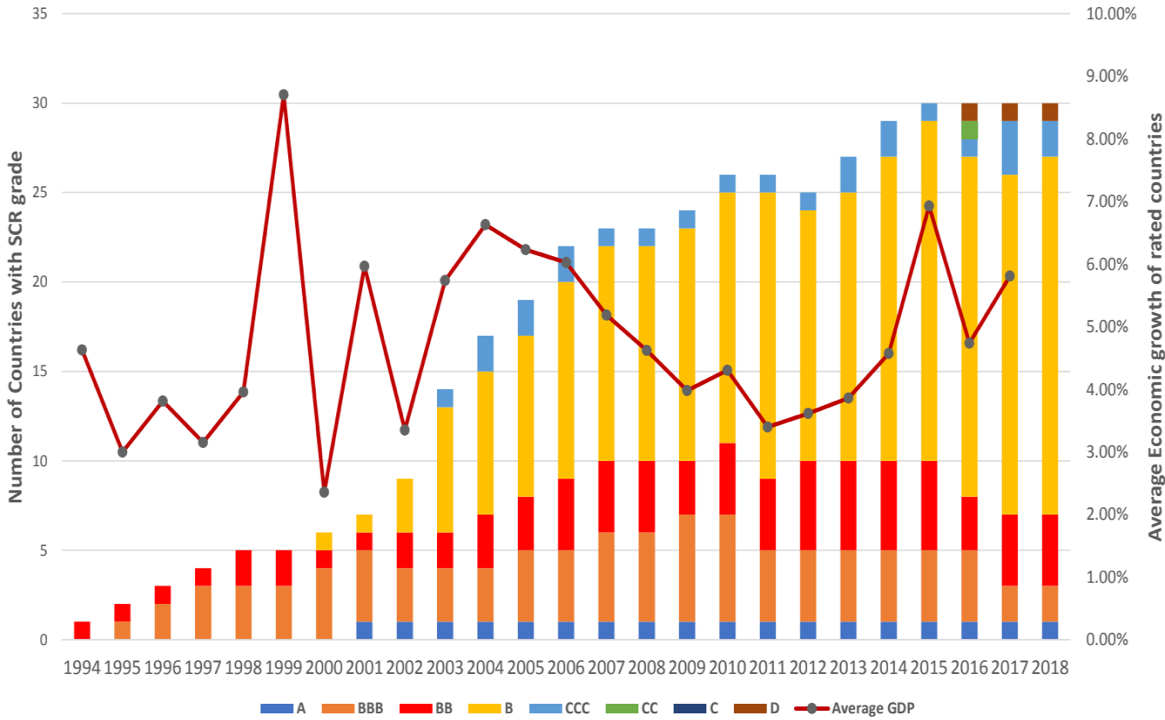
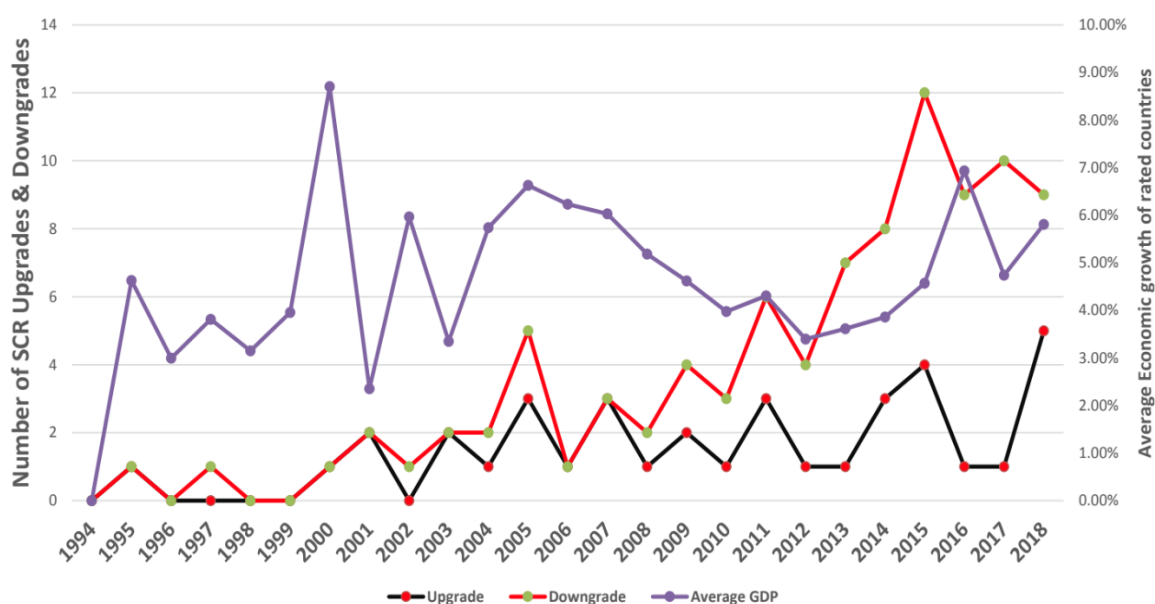


Figure 2c: Africa’s upgrades and downgrades trend
(Sources: African Peer Review Mechanism; Mutize, 2018)



1.3. Foreign Exchange Regimes of Selected Countries

1.3.1. The Common Monetary Area

South Africa, Eswatini, Lesotho and Namibia form the Common Monetary Area which is effectively a monetary union with the South African Rand being a legal tender in all these countries. Even though the other countries issue their own respective currencies, they are on par with the South African Rand. The South African Reserve Bank (SARB) has intervened in the foreign exchange market since the 1960s. The Bank has often maintained a large net open forward position whereby the Bank's forward US dollar liabilities exceed its forward dollar assets. The official objective of this policy is to absorb speculative pressures on the Rand, preventing sharp depreciations and mitigating the increases in the interest rate. The objective is not to defend a predetermined value of the Rand but to ease the (market-driven) adjustment of the exchange rate. The experiences of the 1990s suggest that the effectiveness of the SARB's intervention in the foreign exchange market in dampening pressures on the exchange rate was minimal and short-lived, at best. In contrast, the evidence tends to support the view that a high net open forward position leads to a higher risk premium on investment in South Africa, as the market calls into question the ability of the SARB to sustain a large uncovered forward book.

1.3.2. The CFA franc zone

The CFA franc zone is made up of two monetary unions, namely, the West African Economic and Monetary Union and the Central African Economic and Monetary Union. These two monetary unions maintain the same currency, the CFA franc. Fourteen countries in sub-Saharan Africa form part of the CFA franc zone by belonging to either the West African Economic and Monetary Union or the Central African Economic and Monetary Union. Of these 14 countries, only seven form part of this study and these are Benin, Burkina Faso, Cameroon, Congo, Gabon, Ivory Coast and Senegal. There are two regional central banks that operate independently and issue two separate CFA currencies: the franc de la Communauté Financière de l'Afrique and the franc de la Coopération Financière Africaine. Since the two currencies have the same parity to the FF, they are equivalent for all practical purposes and the zone is, in fact, a common currency area. Any decision to change the parity of the currencies requires the unanimous support of all members of the entire zone. The parity of the CFA to the FF was established in October 1948 at 0.5 CFA per FF. However, in 1968, the parity was adjusted following the introduction of a new FF equivalent to 100 of the old FF. The value of the CFA relative to the FF did not change, but its absolute value was raised to 50 CFA per FF. Following continued deterioration of economic conditions in the 1980s and early 1990s, the CFA, which had been overvalued for years, was finally devaluated by 50% in February 1994.

The CFA is fully convertible and there is free capital mobility between the two regions and France. Full convertibility of the CFA is guaranteed by the French Treasury, rather than the Central Bank of France. Therefore, the arrangement is of a budgetary rather than a monetary nature. This feature facilitated the shift of the parity from the FF to the Euro at the creation of the EMU, as it did not require the approval of other members of the EMU. This shift has left the operating structures of the CFA zone and the relationships between the group and France fundamentally unchanged. The current fixed rate is 100 CFAF per 0.8385 Euro.

Under the fixed exchange regime, zone member countries have been able to maintain inflation rates that are lower than other comparable sub-Saharan African countries. However, price stability was achieved at significant costs. The inability to adjust the exchange rate has resulted in higher sensitivity of economic growth to real shocks, especially terms-of-trade fluctuations. Most observers conclude that CFA zone countries should rather have flexibility to use exchange rate adjustments in the presence of external shocks.

1.3.3. Kenya

In 1989, Kenya began the process of liberalisation of the financial system. Interest rate ceilings were gradually removed, and interest rates were fully liberalised by 1991. In 1991, the liberalisation of current and capital accounts was initiated with the introduction of “foreign exchange bearer certificates of deposits”, which could be used in current and capital account transactions. These certificates were available for residents and non-residents; they were freely traded in the secondary market, and redeemed at the central bank at their face value. Since 1991, some companies were allowed to hold foreign currency-denominated bank accounts abroad and domestically. Banks were allowed to conduct transactions in foreign exchange directly. Forward foreign exchange contracts were allowed at market rates albeit with some restrictions on the amount and the term. In the fourth quarter of 1993, the exchange rate regime shifted from a currency composite peg to an independently floating regime. In 1994, the Kenyan shilling became fully convertible. In 1995, all remaining exchange controls were removed. Also removed were restrictions on purchases of shares and government securities by non-residents.

1.3.4. Egypt

The exchange rate regime in Egypt experienced significant shifts in the early 1990s. Starting in 1969, Egypt instituted a system of multiple exchange rates and maintained an “official” parallel market to attract workers’ remittances and encourage tourism. The exchange rate policies pursued in the 1970s and the 1980s resulted in a substantial appreciation of the Egyptian pound and undermined export competitiveness. As part of the reform program, the government established a free market for foreign exchange for current account transactions in 1991, and eased capital account restrictions further in 1992. The real exchange rate continued to appreciate after 1991, partly as a result of appreciation and partly as a result of the differential in inflation between Egypt and its trading partners (see Subramanian & Handy, 1997 and Mongardini, 1998). However, there is no evidence to suggest that the real appreciation reflected the productivity gains. The country did not experience any improvement in trade performance. In fact, non-oil exports declined at the end of the decade. The appreciation of the Egyptian pound may continue in the future if capital inflows continue.

1.3.5. Nigeria

Over the years, Nigeria applied a variety of foreign exchange arrangements, including fixed official exchange rates, market-determined exchange rates, dual systems of fixed official rates, and rates based on interbank exchange (IMF 1998). Before 1986 (the beginning of structural adjustment), the official rate was fixed without any link to the market rate or inflation, resulting

in a high premium. After 1986, the government pursued a de facto indexation of the official exchange rate by adjusting the official exchange rate in response to changes in the parallel market to prevent the premium from being too large. The evidence shows that the official and parallel exchange rates moved together after 1986 (Azam 1999). With the “abandonment” of the adjustment program in 1994, the Nigerian government reinstated – among other controls – foreign exchange controls with an artificially fixed exchange rate. However, by the end of 1994, it was clear that attempts to stabilise the Naira by administrative means had failed. In 1995, the government made a turnaround, resuming the economic liberalisation program. Since then, the government has pursued policies aimed at allowing the exchange rates to reflect market conditions while using monetary policy to contain pressures on foreign exchange markets. In January 1999, the government abolished the official exchange rate (fixed at 22 Naira per dollar since 1993), and the Central Bank of Nigeria (CBN) gradually shifted its intervention from a weekly allocation of foreign exchange through the Autonomous Foreign Exchange Market (AFEM) to exclusive reliance on continuous buying and selling in the Interbank Foreign Exchange Market (IFEM). This has eliminated the multiple exchange rates arising from the spread between the rates in the two markets.

1.3.6. Uganda

The Ugandan government has committed to moving toward liberal foreign exchange and trade regimes. In particular, the government committed to not resisting fluctuations in the exchange rate due to changes in economic fundamentals. It is committed to supporting liberalisation of the foreign exchange regime with appropriate fiscal and monetary policies. Recently the Ugandan shilling has been relatively stable compared to the 1980s and early 1990s and compared to neighbouring countries (Krichene, 1998).

1.3.7. Malawi

Until May 2000, Malawi had actively managed its foreign exchange markets, which resulted in a large depreciation of the kwacha as well as severe distortions of economic incentives (IMF, 2001). The country’s data indicate large depreciations of the kwacha, especially in 1994, in 1998 (by 40%), and in 2000 (by another 40%). Even in periods of relative stability of the exchange rate (between 1994 and 1998), high inflation rates led to substantial real depreciation of the currency. May 2000 marked a major policy shift, when the central bank stopped quoting an explicit exchange rate and substantially reduced its intervention for exchange rate determination purposes, making the exchange rate fully flexible. Since 1995, Malawi has moved towards the liberalisation of capital account transactions. For example, non-residents

are allowed to repatriate investment proceeds without restrictions (only registration for statistical purposes is required).

1.3.8. South Africa

From the days of apartheid, South Africa inherited and maintained a floating currency regime. According to Nowak and Ricci (2006), there are a number of factors that have contributed to non-impressive performance of the South Africa Rand against its major trading currencies and these factors include: policy directions from the South African Reserve Bank, activities of currency speculators, the politics in the country, the unrest and strikes on the labour front, the public sector debts and the increasingly erratic weather patterns affecting agricultural exports. The Rand has proved to perform well against these major trading currencies when the South African economy does well. However, the Rand has been under immense pressure following multiple signals by credit rating agencies that they would move to downgrade South Africa's sovereign credit rating.

1.4. Problem definition

With the globalisation of financial markets, credit ratings have taken on a more significant role in the international allocation and pricing of capital (Reinhart et al., 2002). Reinhart (2002) proffers that developed countries take international markets for granted, whereas developing countries' access to international capital markets is precarious and highly variable, and thus sovereign credit ratings are critical. In developing markets, capital flows are important for portfolio diversification, as well as an essential source of investment (Eraslan, 2017). With capital flows being susceptible to changes in financial indicators, such as exchange rates, inflation and interest rates (Kräussl, 2005b), it is vital to investigate the impact that sovereign credit ratings have on exchange rates given that Andersen *et al.* (2002) note that exchange rate structures are very responsive to such news. Alsakka and ap Gwilym (2012) posit that currency crises in emerging markets highlight the importance of exchange rate behaviour for economic stability and attract interest in exchange rate dynamics. Eraslan (2017) posits that emerging markets are more sensitive to capital flows due to the nexus between capital flows and financial indicators such as exchange rate, inflation and interest rate. Given the central role that credit rating agencies play in financial markets, it is therefore necessary to investigate how the sovereign credit rating announcement impacts exchange rates in Africa. Between 2003 and 2018, the number of sovereign credit ratings given to countries in Africa increased, which increased the interest in investigating the impact of these sovereign ratings in Africa. Despite this long-standing interest in the effects of sovereign credit rating announcements, the focus

has been on the impact of sovereign credit ratings on country risk and stock returns. Limited studies have investigated the impact of sovereign credit ratings on foreign exchange rates. Consequently, the purpose of this study is to investigate the empirical effects that sovereign credit rating announcements have on foreign exchange rates in Africa over a period from 2003 to 2018.

1.5. Research Objectives and Questions

1.5.1. Research Questions

This study investigates the impact of the information provided by credit rating agencies through the issuance of sovereign credit ratings on exchange rates in Africa. The quest is to see if the sovereign credit rating announcements contain new and material information that influences African exchange rate movements. Therefore, the primary research question that this study seeks to investigate is:

Do sovereign credit rating announcements have a significant impact on foreign exchange rate returns in Africa?

Griffin and Sanvincente (1982) posit that credit rating agencies announce a change in a sovereign credit rating of a country when it is felt that there is a material and fundamental shift in that country's macroeconomic environment. A positive credit rating therefore implies an improvement of the country's credit risk profile whereas a negative rating implies the worsening of the country's credit risk profile. Therefore, when a credit rating downgrade is announced, the market considers it negative information and an upgrade is considered as positive information (Mutize, 2017). According to Mateev (2012), a sovereign credit rating should lead to either a positive or negative exchange rate reaction. However, since literature on this specific study is limited, it is implied therefore that there is little empirical evidence of this impact on exchange rates. Goh and Ederington (1993) even argue that sovereign credit rating announcements might not have a significant effect on exchange rate movements.

In order to further examine the implications arising from the primary question, and the hypothesis that exchange rates react positively to sovereign credit rating upgrades and negatively to sovereign credit rating downgrades, the following sub-questions are explored:

- Do sovereign credit rating announcements influence excess exchange rate returns?
- Is there a significant relationship between sovereign credit rating announcements and exchange rate movements?

- Do sovereign credit rating downgrades or upgrades affect the exchange rates by the same magnitude?
- Does one country's sovereign credit rating change cause significant spillover effects on other African countries' exchange rates?

1.5.2. Objectives

The goal of this research is to employ an event study analysis to determine the extent to which sovereign credit rating announcements impact foreign exchange rates. The result of this endeavour will be valuable to the practitioners and professionals in academia and the industry to understand the impact of sovereign credit rating on foreign currency exchange rates.

1.6. Research Hypothesis

Babin and Zikmund (2015) define a hypothesis as an educated and predictive statement about the possible outcome of a scientific research study. The statement should be clear, specific and testable by scientific research.

Cavallo, Kisselev, Perri and Roubini (2005) argue that a good sovereign credit rating leads to an increase in capital flows to emerging markets and consequently results in potential exchange rate overshoots as compared to countries with low ratings who find it more costly to repay their international debt. Studies by Özatay, Özmen and Sahinbeyoglu (2009) show that negative credit rating announcements affect countries with low credit ratings more than countries with good ratings. Agreeing with Cavallo, Kisselev, Perri and Roubini (2004), Eraslan (2017) found that sovereign credit rating announcements affect some of the emerging markets' foreign exchange rate movements. However, none of these studies concentrated specifically on African countries. In order to close the knowledge gaps identified above, this study tests two hypotheses, that is, the null hypothesis (H_0) and alternative hypothesis (H_1) as follows:

H_0 : Sovereign credit ratings have no significant impact on foreign currency exchange rate returns in Africa

H_1 : Sovereign credit ratings have a significant impact on foreign currency exchange rate returns in Africa

1.7. Justification of the study

The study of how sovereign credit ratings impact financial markets is relatively new, with most studies focusing on how sovereign credit ratings affect bond yields and stock markets as target variables. Fewer studies have been conducted to show the impact of sovereign credit ratings on exchange rates. Surges in capital inflows have positive effects on the real economy and the relationship between exchange rates and capital flows has been established by Kodongo and Ojah (2013). It is therefore equally important to investigate factors that influence exchange rates. While research has been conducted on how financial indicators, such as exchange rate, interest rate and inflation, influence exchange rates and consequently capital flow, there is little research on how sovereign credit rating announcements impact exchange rates in Africa. This study aims to close that gap in the literature.

This study firstly adds to the theoretical understanding of the significance of sovereign credit rating and outlook news on the foreign exchange rates by looking at the performance of the African currencies' returns and volatility around the time of those pronouncements. Secondly, it is important to understand the behaviour of exchange rates in response to sovereign credit rating announcements since, according to Kodongo and Ojah (2013), classical economists believe that foreign exchange rate changes drive private investment flow. Therefore, this study provides valuable information for international investors and managers of international portfolios. Managers and investors are facing a wave of information relating to the risk of investing in foreign nations, often turning to sovereign credit ratings as a country risk indicator. Engle *et al.* (2012) and Gallo and Velucchi (2012) note that, when investors are faced with increased volatility in their country's stock markets, they naturally reduce their positions due to the increased risk. According to Twin (2019), exchange rates impact the real return of an investor's portfolio, albeit on a relatively smaller scale. Thirdly, a comprehensive understanding of the effects of rating changes on foreign exchange rates will improve the foreign exchange rate policy. If ratings affect foreign exchange rates, then they can exacerbate and prolong financial crises. Policies should, therefore, address this possibility, additionally factoring in potential contagion from other financial market downgrades and upgrades. According to Munro (2015), examining exchange rate reactions to sovereign credit ratings is vital in understanding cross-border financial linkages. Furthermore, an understanding of spillovers across emerging markets and within regions can be used, not only reactively but proactively too, possibly smoothing out financial crises or business cycle upswings and/or downswings.

1.8. Organisation of the Study

The study will consist of five chapters, and the synopsis of the chapters is as follows:

Chapter One details a general introduction and overview of the thesis. Objectives, hypothesis and main research questions will be outlined as well as highlighting the purpose and significance of the dissertation.

Chapter Two reviews the literature on the behaviour of exchange rates and the effects of sovereign credit ratings as well as how this investigation adds to the body of knowledge by addressing a gap in the existing literature.

Chapter Three details the methods and techniques employed in this study as well as the justification of such methods thereby acknowledging the methods' strengths and limitations.

Chapter Four discusses the findings by reporting the outcome of testing the null and the alternative hypotheses.

Chapter Five consists of a conclusion and recommendations linking outcomes in Chapter Four to the literature in order to show how the findings corroborate or disapprove previous research findings. A summary of the main findings will be included in this chapter as well as limitations of the study and how they may be addressed in future research. Lastly, the implications of the findings will be discussed.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This literature review considers the theoretical and empirical studies on sovereign credit ratings and their impact on exchange rates. The review is divided into six sub-sections that discuss the theoretical studies that explore the relationship between SCRs and exchange rates before moving on to detail the empirical studies that investigated the associations on a cross country basis. Thereafter, the studies that have considered the dynamics in developed countries, developing countries studies, and in Africa, are discussed. A summary concludes each subsection then culminates in a conclusion of the literature at the end of this chapter.

2.2. Theoretical framework: Sovereign credit ratings and exchange rates

This section reviews the theoretical studies that highlight and examine the behaviour of exchange rates. There are theories that seek to explain the behaviour of exchange rates. This study focuses on these theories and proposes how sovereign credit ratings come into the mix. To examine the impact of sovereign credit rating on exchange rates in Africa, this review of the literature first explores the theoretical areas that explain the nature and responsiveness of exchange rates. Exchange rates are one of the most important macroeconomic indicators because changes in the value of a country's currency affect trade and capital flows. Foreign exchange rates are dependent on the supply and demand of currencies connected with international trade and capital flows. They are susceptible to speculation, and government and central bank interventions (Staszczak, 2015). Classical economists believe that exchange rate changes drive international private investment flows.

2.2.1. Balance of payments approach

In theory, the balance of payments approach seeks to explain the relationship between international trade and capital flows, on the one hand, and foreign exchange rates. The balance of payments approach, which rests on the flow concept, postulates that financial markets are equilibrated only "in the margin" so that the exchange rate is determined to equilibrate the flow supply of (demand for) foreign exchange from a current account surplus (deficit) with the net desired additions (subtractions) of foreign assets by holders of financial assets (Krueger, 1969). Under the balance of payments approach, the amount that domestic residents spend on imports

determines the demand for foreign exchange. Conversely, the amount that foreign residents spend on domestic exports determines the supply of foreign exchange (Kodongo & Ojah, 2013). Therefore, in the short run, the country's balance of payments improves when there is a devaluation of that country's currency resulting in a reduction in the price of exports and domestic capital assets and an increase in the price of imports and foreign capital assets.

2.2.2. The portfolio balance model

On the other hand, there is the portfolio balance model that is espoused by monetary economists which contends that the exchange rate is one of the prices that equilibrate the international markets for various assets (Kodongo & Ojah, 2013). According to Frenkel, (1976) what should be considered is stock rather than flow when considering monies for the purpose of determining the exchange rate. The portfolio balance model adds that the critical equilibrium condition is the requirement that the demand for the stock of each national money must equal the stock of that money available to be held; flows of funds occur in order to correct existing monetary disequilibria or to prevent new disequilibria from emerging (Mussa, 1976). Accordingly, under the assumptions of the portfolio balance model, the argument that capital flows are expected to lead exchange rates, with a negative correlation if exchange rates are directly quoted, can be advanced.

2.2.3. The classical economist theory

Classical economists, on the other hand, believe that private investment flows are driven by foreign exchange rate changes. Ojah and Kodongo (2013), highlight the two reasons to believe that the devaluation of the domestic currency would affect the inflow of international private investments. Firstly, devaluation eliminates the impending threat of a change in the exchange rate when a currency is obviously overvalued. Secondly, devaluation, insofar as it improves the foreign exchange position, makes possible a more liberal trade and foreign exchange policy and encourages foreign investments because it makes amortisation and profit remittances relatively freer. These views point to a unidirectional causality in which foreign exchange rate changes drive the flow of cross-border trade and capital flows with a positive correlation. However, it is important to note that the direction of causality between exchange rates and capital flows has not been resolved in the literature. These theories attempt to explain exchange rate behaviour and similarly this study attempts to find out whether exchange rate behaviour is influenced by sovereign credit rating announcements in Africa.

2.3. The role of credit rating agencies

Credit rating agencies play a significant role in financial markets. Millon and Thakor (1985) posit that there are three ways in which credit rating agencies add value to financial markets, through the provisions of information, certification, and monitoring. Under the informational theory, they theorise that the information gathering causes information asymmetries and moral hazards. The authors contend that credit rating agencies help to reduce the cost of information, which, in turn, increases the number of potential borrowers and consequently promotes market liquidity. Agreeing with Millon and Thakor (1985), Cantor and Packer (1996) find that sovereign credit ratings announcements summarise and supplement information contained in macroeconomic indicators. Pukthuanthong-Le, Elayan, & Rose (2007) and Elkhoury (2008) support this narrative by advancing that credit rating agencies provide financial markets with new tradable information and therefore help to reduce informational asymmetry between lenders and borrowers about the creditworthiness of the latter who are corporates and sovereigns.

As depicted by their credit watch announcements, the monitoring role of credit rating agencies is also highlighted in the literature. Kiff, Nowak, Schumacher and Sylwia (2012) posit that a credit watch acts as an implicit contract between the borrower and the credit rating agencies where the former commits to undertake explicit actions to mitigate the potential deterioration of its credit standing and rating facilitated by the monitoring regime put in place by the credit rating agencies. Along with the information and monitoring theories, credit rating agencies also classify securities as either investment or non-investment grades, therefore fulfilling their certification services. Kiff *et al.* (2012) suggest that sovereign credit ratings applied to securities impacts demand and market liquidity and thus acts as a trigger in investment decision making and regulatory oversight.

Elkhoury (2008) advances that credit rating agencies provide financial markets with new tradable information and therefore help to reduce informational asymmetry. The presence of informational asymmetry may lead to rational or irrational behaviour which is used to explain the relationship between countries when economic fundamentals and contagion shocks fail to explain such relationship (Gavriilidis, Kallinterakis, and Ferreira 2013). Herding behaviour results when almost all individual investors have private information that is not publicly shared and want to utilise that information to make abnormal returns. Alternatively, when information is costly to obtain, it means that not all investors would have access to relevant information

required to be informed (Grossman and Stiglitz 1980). Thus, less-informed investors usually choose to follow the action of informed market leaders, which causes markets across borders to move together.

In summary, the existing literature suggests that credit rating agencies add value to markets. By extension, the importance and significance of sovereign credit ratings are vital for economies, especially emerging ones, to attract investments in the form of capital flows. According to Millon and Thakor (1985), credit rating agencies add value to financial markets through the provisions of information, certification, and monitoring. Credit rating agencies, through sovereign credit rating announcements, bring new tradable information to the market thereby reducing informational asymmetry between lenders and borrowers. Due to asymmetric information, investors are expected to behave rationally or irrationally, usually based on observing other investors. This phenomenon usually causes significant withdrawals as a result of herding when there is an economic run triggered by a few investors divesting. The next section thus considers empirical cross-country literature.

2.4. Empirical cross-country studies

This section discusses existing empirical cross-country studies that have been undertaken to investigate the impact of sovereign credit rating announcements. The study of how sovereign credit ratings impact financial markets is relatively new with most studies focusing on how sovereign credit ratings affect bond yields and stock markets while fewer studies have been conducted to show the impact of sovereign credit ratings on foreign exchange rates.

With regards to cross country studies of both developed and emerging countries, Cantor and Packer (1996) show the determinants of sovereign debt ratings using a multiple regression covering 49 countries using their sovereign credit rating of September 1995. Their results reveal that rating variations across countries cannot be explained by quantitative models only but by other determinants such as qualitative social and political factors. Additionally, they find that sovereign rating announcements cause significant cross-country spillover effects on financial markets. Hence, they conclude that macroeconomic variables, such as inflation, gross domestic product per capita and foreign debt level, explain sovereign debt rating changes.

Using data from advanced and emerging economies, Cantor and Manor (1996) investigate the determinants of sovereign credit ratings using an event study of 49 advanced and emerging countries as of September 1995. The results indicate that CRA opinions independently affect

market spreads with a single rating accounting for 92% of the variation in spreads, especially economies that are below the investment grade. Also, the impact of one CRA announcement is more significant if it confirms the announcement of another CRA or a previous announcement. Cantor and Manor thus conclude that, despite sovereign credit ratings having a significant predictable component, they provide new information to the market that is not readily available on the public domain.

Reinhart (2002) posits that currency crises are usually preceded by credit rating downgrades and that instability increases default risks. Using the signals approach, covering the period from 1970 to 1999, Reinhart (2002) finds that a currency crisis leads to an increased likelihood of a sovereign credit rating collapse which, in turn, leads to a loss of access to international credit by the affected country. He argues that, since much of the emerging markets debt is denominated in US dollars, emerging markets' currency devaluations have a significant impact on the countries' balance sheets and thus credit ratings are more reactive than predictive in emerging markets.

Kaminsky and Schmuckler (2002) use panel regressions and perform event studies to investigate the spillover effects using data from 16 emerging markets over the period from 1990 to 2000. The results show that changes in sovereign credit ratings directly affect financial markets of countries rated and trigger contagious fluctuations in neighbouring countries. Kaminsky and Schmuckler (2002) thus conclude that rating and outlook changes significantly affect bond and stock markets, with ratings having a more significant impact than outlooks. The results also support Cantor and Packer's (1996) finding that sovereign credit rating changes in one emerging market trigger spillover changes in bond yield spreads and stock returns in other developing markets.

Pukthuanthong-Le *et al.* (2007) use event studies to examine equity and debt market responses to sovereign credit ratings announcements in 34 countries, covering the period 1990–2000. They find that equity return responses to a downgrade are more pronounced in the cases of high inflation and low fiscal debt, and on bond returns. Also, the response of the markets to a downgrade is more pronounced when the economy is ailing. Therefore, the authors conclude that downgrading has a significant impact on equity and bond returns and that the sovereign credit rating announcements are asymmetric. This conclusion agrees with Kräussl (2003), who also found that a downgrade was more significant than an upgrade in terms of US dollar bond yield spreads.

More recently, Alsakka and ap Gwilym (2012) investigate the impact of sovereign credit rating announcements on exchange rates using an event study on developed and emerging markets over a period spanning from 1994 to 2010. They find evidence that both positive and negative credit news has a significant impact on the own-country exchange rate and other countries' exchange rates, which agrees with Kaminsky and Schmuckler (2002). The authors find that the response to sovereign credit rating announcement is asymmetric but contributes significantly to exchange rate contagion in Europe and Central Asia. Alsakka and ap Gwilym further find that negative rating results in stronger market reactions than positive ratings and that the impact of sovereign credit rating signals differs in emerging markets versus developed markets. They thus conclude that downgrades and positive outlooks are only significant in emerging markets whereas, in developed markets, only upgrades and negative outlooks are significant.

Treepongkaruna and Wu (2012) use a multiple regression analysis of intraday market data and sovereign credit ratings data of nine countries in the Asia-Pacific region over a period from 1997 to 2001 to examine the impact of sovereign credit ratings on both stock and currency markets. The results find that currency markets are less responsive to rating news than stock markets. They thus conclude that sovereign credit rating announcements have a significant impact on financial market stability because market participants consider them essential.

Concurring with previous studies by Pukthuanthong-Le *et al.* (2007), Brooks, Faff, Treepongkaruna and Wu (2015) examine the effects of sovereign credit re-ratings on equity markets returns of 36 countries during the period 1996–2013 using event study methodology and find that stock market returns are more responsive to sovereign re-ratings during financial crises. However, the impact is different across different financial crises. The authors conclude that there are asymmetric effects during financial crises.

Mutize and Gossel (2018) use Granger causality and impulse response tests to investigate the effects of sovereign credit rating spillovers on neighbouring countries' financial markets among a sample of 19 African countries over the period from 1994 to 2014. The results show that there are marginal regional sovereign credit rating spillover impacts that persisted for more extended periods in the sovereign credit rating of other countries in the same region. Mutize and Gossel (2018) thus conclude that regional bilateral linkages between countries serve as channels of capital and sovereign credit rating information flows.

Thus, in summary, the available literature suggests that sovereign credit rating announcements impact financial markets, causing significant cross-country spillover effects on financial markets. Furthermore, existing literature suggests that currency crises are usually preceded by credit rating downgrades and that instability increases default risks. In the African context, studies further show that regional bilateral linkages between countries serve as channels of capital and sovereign credit rating information flows.

2.5. Empirical studies of developed countries

This section discusses the existing empirical studies that have been undertaken to investigate the impact of sovereign credit rating announcements in developed countries. Yang and Zhang (2011) study the impact of sovereign credit rating announcements on foreign exchange rates in the Eurozone using the EGARCH model over the period spanning from January 2009 to March 2011. They find that rating news significantly affects the volatility of the USD/EUR and that markets reacted to announcements of large economies and ignored the rating announcements of small economies. They thus conclude that, since credit ratings assess the default risk of outstanding loans, currency depreciation leads to a more substantial burden for the country to repay, which causes higher default risks.

There are very few studies that have investigated the impact of sovereign credit ratings on exchange rates and there are no theories that focus specifically on the impact of sovereign credit rating announcements of exchange rates. According to Kodongo and Ojah (2013), a devaluation of the domestic currency eliminates the threat of a change in the exchange rate when a currency is overvalued, and devaluation provides conducive conditions for a more liberal trade and foreign exchange policy and encourages investments. Kodongo and Ojah (2013) point out that this approach suggests a unidirectional causality where cross-border trade and capital flows are driven by foreign exchange rate changes with many African countries enacting policies that ensured the change in exchange rate regimes by adopting varying degrees of the flexible exchange rate regimes. Kodongo and Ojah (2013) postulate that, when exchange rates are not fixed, they respond to cross-border trade and investment activities as well as being responsive to new information that is introduced to the market. However, the response to new information will depend on the levels of informational asymmetry prevailing in the market. Consequently, changes in exchange rates influence perceptions about the risks of foreign investments therefore trade and capital flows are expected to be impacted by changes in the currency value of any given country.

Fatnassi *et al.* (2014) use regression analysis to investigate the reactions of returns of four European stock markets to changes in sovereign credit ratings during the period 2000–2012. Fatnassi *et al.* (2014) find that sovereign credit rating upgrades and downgrades affect both own country and other countries' returns and that the impacts of downgrades on markets are more pronounced and significant during periods of debt crises. This agrees with Kaminsky and Schmukler (2002), who find that sovereign credit ratings have a pronounced impact on both domestic and foreign markets during crises. Fatnassi *et al.* (2002) also find that negative announcements are more significant in terms of their impact as compared to positive news. They thus conclude that sovereign credit rating signals have an impact on stock market returns and contribute to contagion, which accords with Chiang, Jeon and Li (2007), and Alsakka and ap Gwilym (2012).

Kang and Min (2016) investigate the effect of sovereign credit ratings in East Asian countries using panel vector autoregression over the period spanning from 2000 to 2013. The findings provide evidence that sovereign credit rating upgrades and positive outlooks have stronger effects than downgrades and negative outlooks, and there are spillover effects where the economic variables of one country are affected by outlooks of another, thereby supporting Cantor and Packer (1996) and Kaminsky and Schmuckler (2002). Kang and Min thus conclude that, despite the criticisms of the credit rating agencies, ratings and outlooks provide new information to capital markets. However, King and Min (2016) argue that the evidence of the contagion effect shows that ratings and outlooks do not provide enough information regarding the creditworthiness of countries.

Baum, Karpava, Schaefer and Stephan (2016) use an event study combined with GARCH models to examine the impact of sovereign credit rating announcements on the value of the Euro and the yields of French, Italian, German and Spanish sovereign bonds during the Eurozone debt crisis period of 2011–2012 among 17 countries in Europe. They find that the CRA downgrade negatively impacted the value of the Euro and increased its volatility while increasing the yields of the other four currencies. The authors conclude that sovereign credit rating announcements influenced crisis-time reallocation of capital in Europe with investors taking their money out of troubled states and investing in more stable nations.

Hu (2017) uses regression analysis to study the impact of sovereign credit rating changes on domestic banks' stock returns using data from 150 listed banks in 17 countries in Europe over a period of 2004–2013. The results agree with previous studies on the impact of sovereign credit

rating announcements that positive sovereign credit rating announcements do not have a significant impact, while negative announcements lead to adverse reactions in the prices of bank stocks. The author concludes that positive sovereign credit ratings do not cause significant bank stock responses, while negative announcements lead to negative share valuations of domestic bank stock.

More recently, Masood, Bashir and Sahi (2017) use regression analysis to investigate the impact of sovereign credit ratings on financial markets using data from Greece and Ireland from March 2008 to December 2015. They find that, during the European debt crisis of 2009, sovereign credit ratings were negatively correlated with bond yields in both Greece and Ireland and confirm that negative rating announcements bring about high bond spreads and low bond spreads in cases of positive rating announcements. They thus conclude that sovereign credit ratings have a significant influence on financial markets during crisis periods agreeing with earlier studies by Treepongkaruna and Wu (2012).

Thus, in summary, for most African countries, the liberalisation of foreign exchange markets meant dropping currency pegs for exchange rates to be flexible or free floating, which was intended to bring about an increase in growth, price stability and trade performance but sadly this has not been the case. Studies devoted to developed countries find that sovereign credit rating announcements have a disproportionate impact on financial markets with a more significant effect on large economies than small economies. Also, it has been shown that upgrades and positive outlooks have a more significant impact compared to downgrades and negative outlooks. Furthermore, it is found that sovereign credit rating signals have an impact on stock market returns and contribute to contagion, particularly during crisis periods.

2.6. Empirical studies of developing countries

This section discusses existing empirical studies that have been undertaken to investigate the impact of sovereign credit rating announcements in developing countries. Empirical studies by Reisen and von Maltzan (1998) find a significant announcement effect when emerging market sovereign bonds are put on a review with a negative outlook. On the other hand, the authors find that positive announcements are less significant in terms of their impact on sovereign bond yield spreads. Reisen and von Maltzan use a combination of Granger causality tests, together with an event study methodology to investigate the impact of sovereign credit rating announcements on sovereign bond yield spreads and overall financial markets of 26 countries over the period 1987–1996. The authors conclude that sovereign credit ratings have the

potential to diminish the flow of excessive private capital into the emerging markets by using negative rating announcements.

Kaminsky and Schmukler (2002) investigate the impact of sovereign credit ratings on country risk and stock returns using data from 16 emerging countries over a period 1990–2000 by employing panel regression and event studies. They find that sovereign credit rating changes significantly affect bond and stock markets, with outlooks being less critical than ratings. The authors conclude that rating changes lead to spillover effects and that sovereign credit ratings have a pronounced impact on both domestic and foreign financial markets during crises. Kaminsky and Schmukler also conclude that the impact of sovereign credit rating changes is more pronounced in non-transparent economies than in transparent ones.

In contrast to the results from the previous studies of the impact of sovereign credit ratings on financial markets, Kräussl (2003) studies the role of credit rating agencies during a financial crisis to examine whether they add to the dynamics of emerging market crises. Kräussl (2003) achieves this by investigating how the US dollar bond yield spreads react to an unexpected change in sovereign credit rating from 20 countries over the period 1992 to 2000 using a vector autoregressive method. Empirical results from the investigation suggest that, during the Asian crisis of 1997–1998, the sharp sovereign credit rating downgrade of South Korea had an insignificant effect on its short-term liquidity position. The author concludes that a rapid downgrade does not necessarily intensify a financial crisis in emerging markets.

Chiang, Jeon and Li (2007) investigate the dynamic correlation of financial contagion in nine Asian markets over the period of 1990–2003 by using a dynamic conditional correlation model. They find that, during the Asian crisis, news about rating changes in domestic and foreign financial markets increased in contagion and herding. They thus conclude that credit rating agencies and investors play a significant role in shaping the structure of dynamic correlations in the Asian markets.

Kräussl (2005a) uses event studies to investigate whether sovereign credit ratings have an impact on financial stability in 28 emerging economies over the period 1997–2000. The results show that rating changes negatively affect exchange rates and that adverse events have a stronger effect than positive events. Additionally, Kräussl (2003) also finds that sovereign credit ratings have a lesser impact on financial markets in emerging economies as compared to

developed economies. Hence, these results imply that credit rating agencies have a significant influence on the magnitude and volatility of capital flows to emerging markets.

Kim and Wu (2008) use a panel data estimation framework to investigate the impact of sovereign credit ratings on domestic financial sector development and international capital flows into emerging countries using data from 51 emerging countries over the period 1995–2003. They find that long term sovereign credit ratings are essential to encourage capital flows and financial intermediary. On the other hand, the long-term domestic currency ratings discourage international capital flows but stimulate local market growth. Short-term ratings are found to retard and stunt the growth and development of financial development and capitals flows. The authors thus conclude that long-term ratings are most important for the development of financial sectors within emerging markets.

Jaramillo and Tejada (2011) make use of a fixed effects panel regression to study the nexus between sovereign credit ratings and spreads in emerging markets by using data from 35 countries over the period 1997–2010. They find that an upgrade within the investment grade class reduces spreads by 5–10% but has no impact on the classes below investment-grade. Jaramillo and Tejada (2011) conclude that an investment-grade status significantly reduces financing costs and improves expectations and liquidity in the market by encouraging increased inflows from an extensive and diversified investor base.

Christopher, Kim and Wu (2012) use a bivariate GARCH model and a three-stage correlation estimation to examine whether sovereign credit ratings influence regional stock and bond market interdependencies in emerging markets using data from 19 countries over a period from 1994 to 2007. They find that downward ratings and revisions of outlooks lead to an increase in diversification potential in regional stock portfolios. In contrast, downgrades lead to reduced opportunities for diversification in regional bond portfolios. The authors also find that the negative ratings impact is more pronounced in countries with higher foreign currency debt ratings. They thus conclude that sovereign credit rating announcements cause heterogeneous responses to stock and bond market co-movements within a region and find evidence of positive rating spillover effects. Sovereign credit rating upgrades lead to positive benefits to countries in the region, agreeing with earlier findings on contagion effects of sovereign credit ratings by Kaminsky and Schmukler (2002).

Using Granger causality tests, Treepongkaruna and Wu (2012) investigate the impact of sovereign credit ratings announcements on stock and currency market volatilities and cross-asset correlations during the periods of financial crisis using data from nine countries over the period 1997–2001. Similar to Christopher, Kim and Wu (2012), Treepongkaruna and Wu (2012) find that sovereign credit rating announcements cause heterogeneous reactions to currency and stock markets with stock markets being more impacted by the announcements than the currency markets. They conclude that market participants take heed of sovereign credit rating announcements which has a significant impact on the stability of financial markets but that the impact differs in magnitude across asset markets and during periods of financial crises.

Event studies conducted by Alsakka and ap Gwilym (2012) to investigate the impact of sovereign credit rating signals on foreign exchange spot markets in 112 countries over the period 1994–2010. The authors find that sovereign credit rating announcements affect both domestic exchange rates and other countries' exchange rates in agreement with earlier studies by Kaminsky and Schmukler (2002) and Christopher, Kim and Wu (2012). However, in contrast to Kräussl (2005a), Alsakka and ap Gwilym (2012) find that the market responses to sovereign credit rating events are more pronounced in emerging markets as compared to developed countries. The impact of sovereign credit rating changes is found to be more pronounced in non-transparent economies than in transparent ones.

Caporale *et al.* (2017) use a VAR-GARCH model to examine the nexus between macro-news and exchange rates in the Brazil, Russia, India, China and South Africa (BRICS) grouping over the period from 2000 to 2013. They find that the results differ across countries, but there is evidence of significant spillover effects whose strength appeared to increase during the crisis. Caporale *et al.* (2017) thus conclude that the empirical evidence confirms that news plays a vital role in developed economies and BRICs countries.

Kang and Min (2016) use panel vector autoregression to study the impact of sovereign credit ratings on the economies of seven East Asian countries. They find evidence to suggest that rating upgrades and positive outlooks have stronger impacts than rating downgrades and negative outlooks, and that the impact of positive outlooks and ratings are higher after the financial crisis. The authors conclude that outlooks and ratings provide new tradable information into the capital market, and they will continue to play a more critical role in an ever-riskier world.

Eraslan (2017) studies the impacts of sovereign credit rating announcements on exchange rates of 11 emerging market economies using a multivariate DCC-GARCH approach over a period 2002 to 2015. The results find that, although sovereign credit rating announcements affect exchange rates, they have a more significant impact in countries that have a high amount of foreign debt, large account deficit and are ranked in the speculative-grade rating. Eraslan (2017) thus concludes that investors may rebalance their portfolios just before sovereign credit rating announcements which may lead to exchange rate volatilities in emerging economies.

Thus, in summary, the literature in this section shows that sovereign credit rating announcements have the potential to diminish the flow of excessive private capital into the emerging markets therefore significantly reducing financing costs. Also, an investment-grade status improves expectations and liquidity in the market by encouraging greater inflows from a wide and diversified investor base. In addition, the impact of sovereign credit rating announcements on exchange rates in the emerging markets is shown to be more pronounced in countries with a high amount of foreign debt. Sovereign credit rating announcements could potentially impact the stability of financial markets, particularly during periods of financial crises when there are significant spillovers and contagion effects in the developing economies as a result of financial linkages.

2.7. Empirical studies of Africa

This section discusses the recent empirical studies that have been undertaken to investigate the impact of sovereign credit rating announcements on markets in Africa. Many African countries have liberalised their foreign exchange markets and moved away from soft pegs towards independently floating or managed floating exchange rate regimes (see Figure 1 above). However, these transitions have been asymmetric. While countries have moved out of the middle of the exchange regime spectrum, there has been virtually no movement out of or into the category of hard-peg regimes. Out of 27 African countries in this study, 52% were classified as having soft peg regimes in 2003. In 2008, only 18% of the countries were in this category.

Exchange rate regime transitions in Africa have mostly consisted of a movement of countries out of the soft pegs category (especially “conventional fixed pegs”) into independent floats. The transition matrix in Figure 1 indicates that over 52% of the countries (14 out of 27 countries) that were in the soft peg category in 2003 had adopted an independent floating regime by 2008. In contrast, no shifts – with a single exception of Namibia which shifted from a hard

peg to a soft peg – occurred among countries in both extremes of the exchange regime spectrum. The countries in the hard pegs category in 2003 were older members of the CFA zone – again except for Namibia. The existing evidence on African countries is inconclusive as to the relative advantages and disadvantages of alternative exchange rate regimes.

Ntswane (2014) investigates the impact of sovereign credit ratings on capital flows and financial markets in Africa over a period between 1994 and 2011 using an event study analysis. The author finds that the historic investment rate is an essential determinant of capital flows in emerging economies. Ntswane (2004) finds that there exists an incentive for a positive rating announcement for below investment grade ratings while there is no punishment for a negative announcement.

Mutize and Mugobo (2016) use event study methodology to examine the impact of sovereign credit rating downgrades on FDI in South Africa over the period 2004–2014. The results show that there is a significant relationship between sovereign credit rating downgrades and FDI. However, investors' decisions also consider other factors such as movements in global markets, political comments and announcement of the government's policy. Mutize and Mugobo (2016) thus conclude that it is important for emerging countries' governments to focus on those other factors, including those that contribute to a sovereign credit rating change. This conclusion is in agreement with Cantor and Packer (1996) who argue that, over and above quantitative models, qualitative social and political considerations are also important determinants.

Mutize and Gossel (2018a) investigate the effects of sovereign credit rating spillovers on neighbouring countries' financial markets of 19 African countries over the period 1994–2014 using Granger causality and impulse response analysis. The results show that there are regional sovereign rating spillover effects in capital markets trading long-term securities, which may be an outcome of increased financial integration. Consequently, Mutize and Gossel (2018a) posit that investors consider regional credit rating profiles rather than on an individual country basis. They therefore conclude that regional economies need to craft and implement developmental macroeconomic policies to avoid negative ratings that will have regional spillover effects. This supports the findings in earlier studies by Cantor and Packer (1996), Kaminsky and Schmukler (2002), Kang and Min (2016), and Caporale *et al.* (2017).

Mutize and Gossel (2018b) use a combination of GARCH models and event study techniques to examine the impact of sovereign credit rating announcements on bond and equity returns of 30 African countries over the period 1994–2014. They find that financial markets do not react significantly to sovereign credit rating announcements. However, since most African countries are rated below investment grade, they are thus considered too risky for short-term investments, and therefore only attract passive and long-term capital that is less sensitive to sovereign credit rating announcements. Mutize and Gossel (2018b) conclude that, instead of assisting, CRA may be contributing to the volatility in financial markets of developing countries. This conclusion agrees with earlier studies by Kräussl (2005a), who concludes that credit rating agencies have a substantial influence on the size and volatility of emerging markets' lending.

There are not many studies that focus on the impact of sovereign credit ratings on exchange rates of African economies. Eraslan (2017) investigates the impact of sovereign credit rating on the emerging markets exchange rate however South Africa is the only African country included in that investigation. This study therefore fills in that gap by using a sample of 27 African countries in the investigation of the impact of sovereign credit ratings on exchange rates.

Thus, in summary, there are conflicting results from various studies conducted on the African continent with regards to the impact of sovereign credit ratings on financial markets. Some studies find that sovereign credit rating announcements affect the exchange rate and spill over to other countries, particularly during crisis periods, as a result of regional bilateral linkages. However, other studies report that there is no significant financial market response to sovereign credit rating announcements. Instead, these studies find that historic investment rate is more important, which indicates that, while there is an incentive for a positive rating announcement for below investment grade ratings, there is no punishment for a negative announcement.

2.8. Conclusion

The results show that, while credit rating agencies add value to markets, sovereign credit rating announcements can cause significant cross-country spillover effects and that credit rating downgrades usually precede currency crises. Studies devoted to developed countries find that sovereign credit rating announcements have a disproportionate impact on financial markets with a more significant impact in large economies than small economies. With regards to emerging countries, sovereign credit rating announcements have the potential to diminish the flow of excessive private capital into the emerging markets because investment-grade status

significantly reduces financing costs and improves expectations and liquidity in the market by encouraging greater inflows from a wide and diversified investor base. In addition, the impact of sovereign credit rating announcements on exchange rates in the emerging markets is shown to be more pronounced in countries with a high amount of foreign debt, and thus could potentially impact the stability of financial markets, particularly during periods of financial crises when there are significant spillovers and contagion effects in the developing economies as a result of financial linkages.

In the African context, there are conflicting results from various studies conducted on the African continent with regards to the impact of sovereign credit ratings on financial markets. Some studies find that sovereign credit rating announcements affect the exchange rate and spill over to other countries, particularly during crisis periods, as a result of regional bilateral linkages. However, other studies report that there is no significant financial market response to sovereign credit rating announcements. These studies find that the historic investment rate is more important, which indicates that, while there is an incentive for a positive rating announcement for below investment grade ratings, there is no punishment for a negative announcement.

CHAPTER THREE

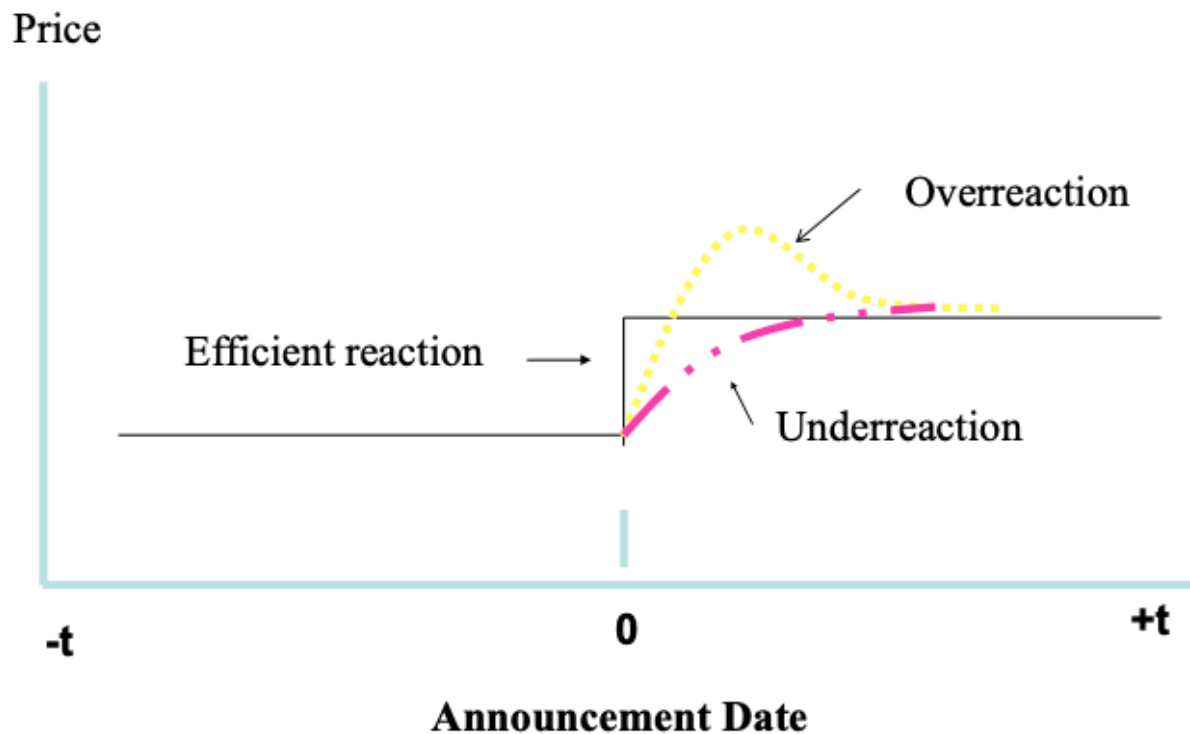
METHODOLOGY

3.1. Introduction

This study investigates the impact of sovereign credit ratings on exchange rate returns in 27 African economies using an event study approach covering the period from 2003 to 2018. Previous studies focusing on the impact of sovereign credit ratings on markets use mainly three econometric methodologies, namely, the generalised autoregressive conditionally heteroskedastic model (GARCH Model), regression analysis and event studies. Yang and Zhang (2011), Baum, Karpava, Schaefer and Andreas (2016), and Eraslan (2017) use GARCH models while Kaminsky and Schmukler (2002), Brooks, Faff and Treepongkaruna (2015), Vernazza and Nielsen (2015), Masood, Bashir and Al (2017), and Demoussis, Drakos and Giannopoulos (2017) use regression analysis to investigate the impact of sovereign credit ratings. Reisen and Von Maltzan (1998), Afonso, Furceri and Gomes (2011), Mateev (2012), Ntswane (2014), Mutize and Mugobo (2016), Mutize (2017), and Mutize and Gossel (2018b) use a combination of event studies and Granger causality tests. Of all econometric models used to study the impact of events on the price of stocks or on exchange rates, event studies dominate empirical research.

This study, therefore, employs the use of event study methodology and Granger causality tests as well as impulse response function. An event study is one of the most important methodological approaches for market based empirical research on finance and accounting (Bowman, 1983). Binder (1998) posits that event study methodology has become a standard method of measuring security price reactions to an announcement or event which makes it the most appropriate methodology to use in this study to investigate exchange rate reactions to sovereign credit rating announcements as depicted in Figure 3 below.

Figure 3: Prices around announcement date under efficient market hypothesis
(Source: Kothari & Warner, 2006)



Event study methodology has been used widely in finance, economics and accounting to evaluate the impact of a major corporate announcement on the price of stock (Siegel & Teoh, 1999). The underlying assumption is that the market processes new information about an event in an efficient and unbiased manner. Therefore, on event date, when new information is fed into the market, an overreaction or an under-reaction in terms of prices can be observed. These new events can be voluntary corporate announcements or announcements by regulatory bodies, competitors or credit rating agencies. These new events or announcements are presumed to bring new information to the market.

The event study method measures the impact of a specific event on the value of a security (MacKinlay, 1997) by measuring the abnormal returns. According to MacKinlay (1997), there are five steps to performing event studies:

- i. Identify the precise date of the event of interest.
- ii. Define the event window around the event.
- iii. Measure abnormal reactions during the event window.
- iv. Run a cross-sectional regression of the abnormal reactions on characteristics of interest

to determine the source of the reactions.

- v. Present the empirical results and arrive at conclusions.

3.2. Research Approach

To examine the response of exchange rates to the sovereign credit rating announcements (defined as an event in this study), this study employs an event study methodology using both univariate and multivariate analysis in accordance with previous studies by Kaminsky and Schmukler (1999), and Mutize and Gossel (2018b). The study examines whether exchange rates display abnormal returns over and above their expected return before and after a sovereign credit rating announcement.

In keeping with MacKinlay (1997), there is no standard or prescribed window period, and it is up to the researcher to choose an appropriate one. Therefore, this study defines a window to be 21 days in accordance with Mutize and Gossel (2018b). The 21 days are split into 10 days before the event, 10 days after the event and one day as the event day. Choosing a shorter window may compromise the results since most of the African countries' financial markets are small and illiquid; thus, the full impact of the sovereign credit rating announcement may not be captured (Ntswane, 2014).

3.3. Estimation Strategy

The primary research method for this study is to subject the daily exchange rates to the event study analysis around the time of different sovereign credit rating pronouncements. Firstly, the data of all the 27 countries which have received sovereign credit ratings from 2003 to 2018 is taken. Then the daily foreign exchange rate of each of the 27 countries is taken for the period of 15 years. From the above data, the actual return of each daily foreign exchange rate is calculated.

The empirical steps that will be used to conduct the analysis consist of the following:

- i. Compute exchange rate expected returns in accordance with models presented by Brown and Warner (1980).
- ii. Use the Mean Adjusted Return Model in accordance with Brown and Warner (1980) to compute the average return over the 50 days preceding the sovereign credit rating even window to act as a benchmark representing normal returns.

- iii. Compute the abnormal reaction. Bowman (1983) posits that this step generally entails the calculation of residuals from some model of the process generating security returns.
- iv. Organise and group the abnormal returns by summing average abnormal returns which must be summoned to the window period.
- v. Analyse the results by performing Granger Causality tests when possible.

3.4. Research design

3.4.1. Tests for stationarity

The first step taken was to determine whether variables in this study are stationary and uncorrelated. Oftentimes financial and economic time series, such as exchange rates, GDP and stock prices as well as other macro-economic indicators, exhibit nonstationary behaviour (Hlouskova et al., 2005). Any conventional regression methods used with data that exhibit trending behaviour would give spurious results (Ventosa-Santaulària, 2009) therefore arriving at misleading conclusions. According to Stevans (2012), any trends in the data must then be removed so that data are transformed from nonstationary to stationary form – I(0).

Following the methodology by Stevans (2012) for checking the order of integration of study variables, this study employs the Augmented Dickey-Fuller (ADF), and the Phillips-Perron (PP) tests to determine whether the data series contains any unit root or trending characteristics. The objective of the non-stationarity test is to investigate the null hypothesis (H_0) that the data series is non-stationary. If the resultant probability is greater than 0.05, then the null hypothesis cannot be rejected, meaning the data are non-stationary. Conversely, if the probability is less than 0.05, then the null hypothesis can be rejected as the data would be stationary.

3.4.2. Identify the events of interest

To investigate the impact of sovereign credit rating announcements on foreign exchange rate returns, this study makes use of an event study to examine the reaction of foreign exchange rates during the event window as detailed in Mutize and Gossel (2018). A sovereign credit rating announcement is defined as an event and the study examines whether there are resultant abnormal returns before and after the sovereign credit rating announcement as compared to the expected return. The event of interest is defined as one that results in a flow of information to the market and, in this study, these events are sovereign credit ratings. According to Bowman (1983), a broad interpretation should be placed on what constitutes an event that could occur

once in a calendar year or it could occur a number of times. Sovereign credit ratings, in this case, occur a number of times in a calendar year and these are announcements by the big three credit rating agencies regarding sovereign credit risk assessments of a subject country. The assessment comes in the form of a rating upgrade or downgrade and/or placing a country under active assessment through issuing an outlook or watch listing (Ntswane, 2014). All of these are considered events for this study.

3.4.3. Identify the event window

Concepts of event time and event window are introduced in event studies (Brown and Warner (1980), Bowman (1983) MacKinlay (1997), Ntswane (2014), Eraslan (2017), Mutize (2017)). According to Ntswane (2014), the event window is the period of impact brought on by the sovereign credit rating announcement whereas the event time refers to the date of the sovereign credit rating announcement. It is important to note that an event window will start before the event time and continue for a period after the event. This is because the market starts reacting to the event before it has happened due to the anticipation of the sovereign credit rating announcement. The impact of an event continues after the event as a reaction to the announcement. In order to create the event window, a process of standardisation is done where the date of announcement is considered “Day 0” (Bowman, 1983). The researcher uses statistical analysis to determine the number of days to include in the investigation before and after “Day 0” thus forming the event window period for each sovereign credit rating announcement. According to Brown and Warner (1980), Bowman (1983), MacKinlay (1997), Ntswane (2014), Eraslan (2017) and Mutize (2017), there is no standard window to be used in event studies, it is up to the researcher to choose an appropriate window however the researcher needs to filter out the noise as financial and capital markets react to more than just credit rating announcements. The longer the event window, the more the researcher has to account for contamination, which is why Kothari and Warner (2004) advocate for a shorter time period as it is more reliable. The authors advocate for an average of a 21-day window as they argue it is enough to capture the full effect of the sovereign credit rating announcement while limiting the chances of contamination associated with longer time periods.

Previous event studies utilised varying window periods with Brown and Warner (1980), Bowman (1983), MacKinlay (1997), Ntswane (2014), Eraslan (2017) and Mutize (2017) using from 21 days to over 190 days to define the event window. In keeping with Kothari and Warner (2004), this study uses a period of 21 days split between 10 days before the event, one day as the event day and 10 days after the event.

3.4.4. Normal and abnormal reactions to the event

Choosing a method of estimating the excess return is the third step in conducting an event study with three estimation options available, namely, unadjusted or mean adjusted returns, risk adjusted returns and risk controlled portfolio returns (Bowman, 1983). For the purposes of the study, the mean adjusted return model is used in accordance with MacKinlay (1997). The abnormal return is calculated as the difference between the observed return around the event of interest and the normal or expected return (Brown & Warner, 1985). The normal return is the return that would be expected if the event did not take place. Even though this study investigates the impact of sovereign credit rating announcements on exchange rates, it is vital to transform the daily exchange rates to returns in order to apply the event study methodology (Mutize (2017)).

This study will follow the steps detailed below. The daily foreign exchange rate returns are first transformed into returns by using the equation:

$$E(R_{it}) = \ln \left(\frac{E_{it}}{E_{i,t-1}} \right) \quad (1)$$

Where E_{it} is the foreign exchange rate for sovereign i at time t , $E_{i,t-1}$ is the foreign exchange rate for sovereign i at time $t-1$, and $E(R_{it})$ is the expected return on the foreign exchange rate for sovereign i at time t .

The Mean Adjusted Return Model then consists of the following:

$$E(R_{it}) = \frac{1}{t} \sum_{i=1}^t (R_{it}) \quad (2)$$

Where $E(R_{i,t})$ is the expected return on the foreign exchange rate for sovereign i at time t and R_{it} is the observed return on the foreign exchange rate for sovereign i at time t .

Internationally, there is a benchmark for exchange rates provided by Reuters called the WM/Reuters Benchmark rates. The WM/Reuters Benchmark rates are spot and forward foreign exchange rates that are used as a benchmark for valuations of portfolios and measurement of performance. However, as observed in Ntswane (2014), there is no benchmark market return index for the foreign exchange rate for African countries. There are four currency indices that come close to being a benchmark. The first one is the Emerging Markets Index (EMBASKET) which consists of Chinese Renminbi, Turkish Lira, Mexican Peso, and the South African Rand. The second one is the Rand Index (RAIN) which comprises the Japanese Yen, United Kingdom

Pound, Chinese Yuan, United States Dollar and the South African Rand. It is clear that these two indices are not very useful in this study as both indices have a significant weakness of having South Africa as the only African country included in the weighting. The third index, MSCI Emerging Markets Currency Index, also suffers from the same defect that, of the 25 countries weighted, only Morocco, Egypt and South Africa are included.

To solve this problem, a benchmark market return for Africa, henceforth called the African Currency Index, was constructed according to the methodology used in the Sagaci Research KFC Index (2020). The KFC Index estimates whether currencies of African countries are overvalued or undervalued against the USD by comparing the local currency price of a bucket of KFC chicken to its price in the USA (Sagaci Research, 2020). The Sagaci Research's KFC Index analyses the purchasing power in 20 African countries by using KFC pricing data in those African countries to calculate implied foreign exchange rates against the United States dollar providing a useful comparison with the actual foreign exchange rates of African countries under study as shown below in Figure 4.

Figure 4: The Sagaci Research KFC Index
(Source: Sagaci Research (2020))

Country	Ticker	Currency	Market rate	KFC-implied rate
Gabon	XAF	Central African CFA franc	588	630
Côte d'Ivoire	XOF	West African CFA franc	590	628
Senegal	XAF	Central African CFA franc	588	600
Kenya	KES	Kenyan Shilling	101	99.4
Tunisia	TND	Tunisian Dinar	2.8	2.7
Morocco	MAD	Moroccan Dirham	9.6	8.7
Sudan	SDG	Sudanese Pound	45.1	37.9
Angola	AOA	Angolan Kwanza	486	377
Nigeria	NGN	Nigeria Naira	363	280
Zimbabwe	ZWL\$	Zimbabwean Dollar	17.1	12.9
Mozambique	MZN	Mozambican Metical	62.3	44.1
Uganda	UGX	Ugandan Shilling	3,699	2,586
Botswana	IBWP	Botswanan Pula	10.7	7.3
Mauritius	MUR	Mauritian Rupee	36.6	24.6
Ghana	GHS	Ghanaian Cedi	5.7	3.7
Tanzania	TZS	Tanzanian Shilling	2,305	1,462
Lesotho	LSL	Lesothan Loti	14.4	7.0
South Africa	ZAR	South African Rand	14.4	7.0
Egypt	EGP	Egyptian Pound	15.9	7.6
Zambia	ZMW	Zambian Kwacha	14.4	5.7

The KFC Index is the most appropriate index given the footprint of KFC on the African continent. KFC is the largest international fast-food chain on the continent which makes the pricing of its products an ideal metric for comparing the purchasing power of different African currencies. The Africa Currency Index, which is tailor made according to the KFC Index, represents the normal market return index for the foreign exchange rate for African countries for the period under study. This was achieved by using equation 1 to come up with daily market returns and averaging the returns of 10 African countries covering all the subregions of Africa, namely, Angola (C₁), Botswana (C₂), Egypt, (C₃) Ivory Coast (C₄), Kenya (C₅), Mauritius (C₆), Morocco (C₇), Nigeria (C₈), South Africa (C₉) and Tunisia (C₁₀) for the same period under study. These countries were chosen on the basis that they form part of the weighting of the Sagaci Research KFC Index, that they represent the major economies of Africa with the most efficient markets, and they are the most trade competitive, according to Kodongo and Ojah (2013).

The daily Africa Return Index (ARI) is therefore computed as follows:

$$ARI_{it} = \frac{\sum_{n=1}^{10} E(R_{it})}{10} \quad (3)$$

Where $E(R_{i,t})$ is the expected return on the foreign exchange rate for sovereign i at time t and R_{it} is the observed return on the foreign exchange rate for sovereign i at time t .

In order to calculate the foreign exchange rate abnormal return, the expected return of each foreign exchange rate daily basis is calculated. This expected return has been calculated using event study methodology which requires the computation of three types of returns, i.e., the expected return, the actual return and the abnormal return. After calculating the expected return, the expected return is subtracted from the actual return and from this the abnormal return for each exchange rate or the entire 21 days (-10 days to +10 days) is obtained. Similarly, the abnormal return for each daily exchange rate for a 21-day period is calculated. The abnormal return, therefore, is computed by calculating the difference between the observed foreign exchange rate return before and after the sovereign credit rating event and the estimated expected return spread as follows:

$$AR_{it} = R - E(R_{it}) \quad (4)$$

Where AR_{it} is the abnormal return on the foreign exchange rate for sovereign i at time t , R_{it} is

the observed return on the foreign exchange rate for sovereign i at time t , and $E(R_{it})$ is the expected return on the foreign exchange rate for sovereign i at time t .

In accordance with MacKinlay (1997), in order to draw inference for the sovereign credit rating event, abnormal returns must be aggregated. In order to eliminate the effect of any foreign exchange rates on abnormal return, the abnormal returns are averaged over countries on day basis, i.e., abnormal returns of individual countries are averaged for each day surrounding the selected days and, from this, the averaged abnormal returns for all different periods, i.e., AAR_t is calculated.

The simple average returns are therefore computed as follows:

$$AAR_t = \frac{1}{n} \sum_{i=1}^n (AR_{it}) \quad (5)$$

Where AAR_t is the average abnormal return for sovereign i in period t and n is the number of securities in the sample.

After calculating the average abnormal return, the cumulative average abnormal returns using CAAR formulae from all previous event days till the current event day are calculated. According to Ntswane (2014), in order to compute cumulative abnormal return, average abnormal returns must be summoned to the window period as follows:

$$CAAR_t = \frac{1}{t} + \sum_{t=-15}^{t=+15} (AAR_t) \quad (6)$$

Where $CAAR_t$ is the cumulative average abnormal return in period t and t is the window period. Furthermore, this study employs t -tests to test the statistical significance of sovereign credit rating announcements on foreign exchange rates. Daily foreign exchange rate returns are tested to see if they significantly differ from the expected returns during the same window in accordance with recent studies by Cooke and Bailey (2015). The results will be significant if they are large on either side of the t -statistic of 0. The closer the t -statistic is to 0, the more insignificant the impact. The following equation is used:

$$t_{\infty} = \frac{AR_{it}}{std(AR_{it})} \quad (7)$$

Where t_{α} is the student t -test at significance level α and $std(AR_{it})$ is the standard error of abnormal returns of country i at time t . According to Efron (1969), a t -test is a statistical test that is used to compare the means of two groups, in this case, sovereign credit ratings and exchange

rate returns. Oftentimes, a t-test is a statistical test used to determine whether a process or treatment actually has an effect on the population of interest, or whether two groups are different from one another. Consequently, in this study, the t-test is used to check whether sovereign credit ratings have an effect on exchange rate returns in Africa.

3.4.5. Causality

As regional economies have grown to share relatively close fundamentals through trade and financial linkages, a change in a single country's SCR profile usually has ripple effects that spread to other countries in the same region. Thus, countries are becoming more prone to common SCR shocks that arise from channels of potential interconnections. The magnitude of the spillovers transmitted across country borders depends on how vulnerable a financial system is (Enowbi et al., 2017). A country's economy is more vulnerable to spillover impacts if it has weak macroeconomic fundamentals and a weak financial system. The magnitude of spillover exposures is further increased by the number and size of linkages with the real economy and financial system of other economies (Kalotychou et al., 2014). According to Chen, Chen, Yang et al. (2016), the following key financial and economic linkages that act as transmission channels through which spillovers might be transmitted from one financial market to another:

First, real channels that involve linkages between major trading partners that largely depend on each other for export markets. Second, financial channels that provide linkages through trade credit, foreign direct investments and other capital flows among countries that have a high degree of financial market integration. Third, common creditor and interconnected lenders channel can be through international banks which creates shocks that spill over to the real and financial channels' borrowing countries to weaken their capital position (Ismailescu and Kazemi, 2010). Fourth, business interactions under a market-based financial system where spillovers are transmitted through asset price changes, measured risks and market-to-market capital of high leveraged institutions. Finally, the hedging channel creates spillover through portfolio rebalancing across financial markets as investors respond to market shocks by re-examining and adjusting their portfolios to macroeconomic risks (Kaminsky and Reinhart 2000).

Thus, in order to determine whether an announcement in one country's SCR has spillover effects in other credit-rated countries, this study applies causality tests to answer this sub-question: (1) Does one country's sovereign credit rating change cause significant spillover effects on other African countries' exchange rates?

This study, therefore, employs impulse response tests together with Granger causality tests in a panel framework to further explore the nexus between sovereign credit ratings and exchange rates in accordance with Afonso, Furceri and Gomes (2011) as follows:

$$R_{it} = \left(\frac{1}{3}\right) \left[(S_{it} + M_{it} + F_{it}) + 0.5(posS + posM + posF) - 0.5(negS + negM + negF) \right] \quad (8)$$

Where S , M and F take the values between 1 and 22 as given in Table 2 below, and pos is short for positive, neg is short for negative.

Causality tests can then be computed by estimating separate regressions of the changes of exchange rate returns and ratings as follows:

$$\Delta R_{it} = \sum_{i=1}^k \gamma_0^i \Delta R_{it-i} + \sum_{i=1}^k \gamma_1^i \Delta Q_{it-i} + \sum_{i=1}^k \gamma_2^i \Delta Z_{it-i} + \varepsilon_{it} \quad (9)$$

$$\Delta Q_{it} = \sum_{i=1}^k \lambda_0^i \Delta R_{it-i} + \sum_{i=1}^k \lambda_1^i \Delta Q_{it-i} + \sum_{i=1}^k \lambda_2^i \Delta Z_{it-i} + \omega_{it} \quad (10)$$

$$\Delta Z_{it} = \sum_{i=1}^k \delta_0^i \Delta R_{it-i} + \sum_{i=1}^k \delta_1^i \Delta Q_{it-i} + \sum_{i=1}^k \delta_2^i \Delta Z_{it-i} + \mu_{it} \quad (11)$$

Where Q is foreign exchange rate returns and Z is a vector of independent variables influencing sovereign credit ratings and foreign exchange rates. The F-statistic is therefore applied to test the significance of the Granger causality to determine whether the model satisfies best fit requirements. Having examined the causal relationships among the factors, the analysis next uses impulse responses to assess the effect of sovereign credit rating shocks on exchange rate returns. The impulse response analysis quantifies the reaction of every single variable in the model on an exogenous shock to the model (Koop et al., 1996) and the reaction is measured for every variable at certain times after credit rating announcements. It is hypothesised that, if there is a reaction by one variable to an impulse in another variable, then the latter causes the former. In accordance with Khalid and Kawai (2003), in order to estimate the degree and timing of sovereign credit rating changes, the impulse response function ψ_t at time t is specified as follows:

$$\psi_t = \frac{\delta R_t}{\delta \varepsilon_t} \quad (12)$$

Where R_t is the exchange rate return, and ε_t is the impulse from sovereign credit rating series as unit impulses. Koop, Pesaran and Potter (1996) note that the Granger causality test does not determine the relative strength of causality effects beyond the selected time span. Therefore, causality tests are unable to indicate the response of the endogenous variable to an impulse with another exogenous variable when shocking the residuals (Rajasekar et al., 2014). Thus, the

impulse response function traces the effect of a one-unit shock to one of the variables on current and future values of all the endogenous variables in a system over various time horizons (Rahman & Shahbaz, 2013). Through impulse responses, the positive and negative relationships in relation to future periods can be specifically identified.

3.5. Research Data

The empirical analysis makes use of data that consist of a dependent variable, one explanatory variable of interest and six control factors.

3.6. Timespan

The primary aim of this study is to investigate the transitory impact of sovereign credit ratings on foreign exchange rate returns in Africa over a 15-year period from 1 January 2003 to 31 December 2018. This time frame was chosen because it is the period in which more African countries began receiving sovereign credit ratings and several credit rating changes took place. The study makes use of long-term foreign currency sovereign credit rating data issued by the three major credit rating agencies on 27 African countries. Prior to 2003, only South Africa and Mauritius received their first ratings in 1994 and 1996 respectively, followed by Botswana in 2001 and Lesotho in 2002.

3.7. Dependent Factor

The dependent factor comprises the daily exchange rates between each of the sampled African currencies against the US dollar (hereinafter called data set 1). The African currencies' historical daily exchange rate figures are obtained from Bloomberg. The research uses the US dollar (USD) because the bulk of Africa's trade is in US dollars (Maradiaga & Hall, 2012). The data consist of 27 African countries that received sovereign credit ratings from the three major credit rating agencies in the period under study.

3.8. Long-Term Sovereign credit rating data

The explanatory factor of interest is the long-term sovereign credit rating changes and outlooks of the African countries covering the same period and assigned by the three major credit rating agencies. Credit rating data are sourced from the countryeconomy.com website, which provides all credit ratings announced by S&P, Moody's and Fitch. The obtained ratings are averaged across the three credit rating agencies. In order to confirm the data credibility, the credit rating data from countryeconomy.com is compared to the sovereign credit ratings published by tradingeconomics.com. Not all African countries received consistent ratings from all three

major rating agencies therefore, where no data are available, the ratings were assumed to stay the same as the previous rating given.

Table 2. Rating summary statistics of the 27 countries under study from 2003 to 2018
(Sources: Moody's, S&P, Fitch, countryeconomy.com)

Country	Rating Upgrade	Rating Downgrade	Outlook Upgrade	Outlook Downgrade
Angola	4	8	3	8
Benin	1	-	-	2
Botswana	-	1	1	4
Burkina Faso	1	1	2	-
Cameroon	2	2	-	1
Cape Verde	-	2	1	4
Congo	5	13	-	7
DRC	0	1	-	2
Egypt	5	17	5	19
Gabon	-	5	1	5
Ghana	3	6	3	8
Ivory Coast	1	-	2	-
Kenya	1	2	1	4
Lesotho	1	1	1	4
Malawi	2	-	5	1
Mauritius	-	1	-	1
Morocco	2	-	3	3
Mozambique	3	15	2	9
Namibia	-	2	1	3
Nigeria	1	6	1	6
Rwanda	3	1	5	1
Senegal	-	1	2	2
Seychelles	3	-	2	-
South Africa	6	10	4	14
Tunisia	2	13	-	14
Uganda	1	2	2	2
Zambia	-	7	1	7

In order to investigate the impact of sovereign credit rating and outlook announcements, the empirical analysis uses the approach of Gaillard (2009), an approach earlier used by Cantor and Packer (1996) with reference to Williams *et al.* (2013) and Alsakka *et al.* (2014), whereby the credit ratings employed by sovereign credit rating agencies are transformed from ordinal rating scales into cardinal values according to a 22-point numerical scale as shown in Table 3 below.

Table 3: Linear transformation of credit ratings: The letter ratings are converted into numbers for the purpose of estimation

(Sources: Compiled by the author based on data from Moody's, S&P, Fitch)

Fitch		Moody's		S&P's	
Ratings	Numerical Trasnformation	Ratings	Numerical Trasnformation	Ratings	Numerical Trasnformation
AAA	23	Aaa	20	AAA	22
AA+	22	Aa1	19	AA+	21
AA	21	Aa2	18	AA	20
AA-	20	Aa3	17	AA-	19
A+	19	A1	16	A+	18
A	18	A2	15	A	17
A-	17	A3	14	A-	16
BBB+	16	Baa1	13	BBB+	15
BBB	15	Baa2	12	BBB	14
BBB-	14	Baa3	11	BBB-	13
BB+	13	Ba1	10	BB+	12
BB	12	Ba2	9	BB	11
BB-	11	Ba3	8	BB-	10
B+	10	B1	7	B+	9
B	9	B2	6	B	8
B-	8	B3	5	B-	7
CCC+	7	Caa1	4	CCC+	6
CCC	6	Caa2	3	CCC	5
CCC-	5	Caa3	2	CCC-	4
CC	4	Ca	1	CC	3
C	3	C	0	C	2
DDD	2			SD	1
DD	1			D	0
D	0				

Other sovereign credit rating events, such as changes in outlooks and watchlists, are taken into account by adding 0.5 for a positive change in outlook and -0.5 for a negative outlook. Similarly, 0.25 is added for a positive credit watch and -0.25 added for a negative credit watch in accordance with the methodology in Mutize and Gossel (2018).

3.9. Limitations of the Study

This empirical study is not without limitations. As some of the studies focusing on the impact of sovereign credit ratings on financial and capital markets in Africa, this study faces data limitations as well as methodological challenges and assumptions detailed below.

3.9.1. Data limitations

- Not all countries in Africa received credit ratings from the three major credit rating agencies during the period under study. The study is limited to those countries in Africa that received credit ratings from 2003 to 2018. Even those countries that received sovereign credit ratings, some received them from just one CRA. Some countries did not receive periodic sovereign credit ratings.
- In order to calculate abnormal returns around the time of sovereign credit rating announcements, there needs to be a benchmark for normal returns. However, there is no market return index for the African countries' foreign exchange rates.

3.9.2. Data assumptions

- As a result of the above-mentioned limitations, this study assumes the last given sovereign credit rating to be the sovereign credit rating in the period where none was given.
- To overcome the lack of a benchmark for normal foreign exchange returns, an Africa Index is constructed. To solve this problem, a benchmark market return for Africa was constructed to represent the normal market return index for the foreign exchange rate for African countries for the period under study.

3.9.3. Methodological limitations

- Mutize (2017) observes that a lack of transparency, limited information, inadequate regulatory frameworks and low institutional quality characterise Africa's financial markets. This could potentially distort the nexus between sovereign credit rating announcements and Africa's foreign exchange rates. Similarly, this study takes into consideration the same methodological limitations.
- Event studies have the limitation of assuming that only one event occurs in the event window which poses a difficulty when more than one event occurs in the same period giving rise to biased results (Yang & Zhang, 2011). The choice of estimation window affects the results of event study methodologies. Therefore, different researchers could get different results using the same data if their estimation windows were different. In

addition, event study methodologies do not detect dynamic responses in correlations to new information and do not eliminate heteroskedasticity caused by volatility increases during a crisis (Eraslan, 2017)

3.9.4. Methodological assumptions

- The methodology assumes that all unobservable factors correlate with the included variable and that the unobservable factors are time-invariant, implying that the factors mimic the individual specific constant term, and the variance of each of the unobservable factors is constant.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1. Introduction

The main aim of this study is to investigate the impact of sovereign credit rating announcements on foreign exchange rate returns in Africa. The primary research question that this study sets out to investigate is:

Do sovereign credit rating announcements have a significant impact on foreign exchange rate returns in Africa?

In order to further examine the implications arising from the primary question, the following sub-questions are also explored:

- Do sovereign credit rating downgrades or upgrades affect the exchange rate returns by the same magnitude?
- Does one country's sovereign credit rating change cause significant spillover effects on other African countries' exchange rates?

In order to answer these questions, this chapter details the research findings of the empirical investigation of the impact of sovereign credit rating announcements on foreign exchange rate returns in 27 African countries over the period from 2003 to 2018 using an event study methodology and Granger causality tests. Even though the first sub-question asks whether sovereign credit rating downgrades or upgrades affect the exchange rates by the same magnitude, the data set will not be sub-divided into upgrades and downgrades and outlooks because all SCR changes are classified as events in terms of the event study methodology (Yang & Zhang, 2011).

4.2. Unit Root Test Results

Prior to running the empirical analysis, it is crucial to ascertain the stationarity conditions of the data to avoid spurious regression (Ventosa-Santaulària, 2009). The results of running panel unit root tests are presented in Table 4 below and show that the daily exchange rates and sovereign credit rating announcements are first-difference stationary, $I(1)$.

Table 4: Panel unit root test results

(Source: Compiled by the author)

I(0) Test	SCR		FXR	
	Statistic	Prob.	Statistic	Prob.
<u>Null: Unit root (assumes common unit root process)</u>				
Levin, Lin & Chu t*	-1.057	0.145***	4.37	1.000***
<u>Null: Unit root (assumes common unit root process)</u>				
Im, Pesaran and Shin W-stat	-5.6345	0.000***	1.961	0.975***
ADF -Fisher Chi-square	161.138	0.000***	71.666	0.054***
PP - Fisher Chi-square	171.178	0.000***	264.896	0.000***
<u>I(1) test</u>				
<u>Null: Unit root (assumes common unit root process)</u>				
Levin, Lin & Chu t*	-210.474	0.000***	-208.955	0.000***
<u>Null: Unit root (assumes common unit root process)</u>				
Im, Pesaran and Shin W-stat	-179.708	0.000***	-209.508	0.000***
ADF -Fisher Chi-square	372.410	0.000***	3411.870	0.000***
PP - Fisher Chi-square	423.676	0.000***	497.358	0.000***

*** indicates significance at the 1% level. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

4.3. Event Study Results

After determining the stationarity of the data, the discussion of the results proceeds to the event study used to determine the nexus between sovereign credit rating event announcements and foreign exchange rates in Africa. Table 5 below presents a summary of the sovereign credit rating events employed to test the significance of abnormal returns in the chosen event windows. As can be seen, African countries received a total of 117 downgrades compared to just 47 upgrades, which accords with Mutize and Gossel's (2018) contention that once an African sovereign is downgraded, it is difficult to recover and get an sovereign credit rating upgrade.

Furthermore, contrary to the findings by Alsakka and ap Gwilym (2012) that positive and negative credit news has a significant impact on both home country and other countries' exchange rates, the results in Table 5 suggest that exchange rates in Africa do not react to an sovereign credit rating downgrade or upgrade announcement as evidenced by the insignificant

average abnormal returns *t*-tests of 25⁴ countries. The two exceptions however are Egypt and Nigeria. Egypt's *t*-test result of 2.68 is significant at 1% level, and Nigeria's *t*-test result of 1.83 is significant at 10% level. At face value, the abnormal average *t*-test results for Egypt and Nigeria would seem to indicate that sovereign credit rating announcements have a significant impact on the foreign exchange rates of these two countries and thus further analysis was conducted on these two countries.

⁴ The *t*-test results for the following countries: Angola, Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Congo, DRC, Gabon, Ivory Coast, Kenya, Lesotho, Malawi, Mauritius, Morocco, Mozambique, Namibia, Rwanda, Senegal, Seychelles, South Africa, Tunisia, Uganda and Zambia.

Table 5: Summary of sovereign credit rating events and Abnormal Returns (AR) t-test
(Source: Compiled by the author)

Country	Currency	No. of Upgrades	No. of Downgrades	No. of Outlooks	No. of Watchlist	Average Abnormal Returns- t-test
Angola	AOA	4	8	11	4	0.10
Benin	XOF	1	-	3	-	-0.07
Botswana	BWP	-	1	11	-	-0.06
Burkina Faso	XOF	1	1	6	1	-0.04
Cameroon	XAF	2	2	10	1	-0.03
Cape Verde	CVE	-	2	15	1	0.07
Congo	XAF	5	13	17	3	0.03
DRC	CDF	-	1	7	-	-0.13
Egypt	EGP	5	17	38	5	2.68**
Gabon	XAF	-	5	14	1	-0.05
Ghana	GHS	3	6	24	-	0.09
Ivory Coast	XOF	1	-	4	-	0.02
Kenya	KES	1	2	14	1	-0.04
Lesotho	LSL	1	1	9	-	0.10
Malawi	MWK	2	-	13	1	-0.06
Mauritius	MUR	-	1	3	2	-0.08
Morocco	MAD	2	-	15	-	0.12
Mozambique	MZN	3	15	20	4	-0.02
Namibia	NAD	-	2	8	-	-0.04
Nigeria	NGN	1	6	20	3	1.83*
Rwanda	RWF	3	1	12	-	-0.11
Senegal	XOF	-	1	8	-	-0.06
Seychelles	SCR	3	-	5	-	-0.11
South Africa	ZAR	6	10	34	5	0.11
Tunisia	TND	2	13	21	3	-0.11
Uganda	UGX	1	2	11	-	-0.06
Zambia	ZMW	-	7	19	-	0.06
		47	117	372	35	

* represents significance at 1% level (>2.575)

** represents significance at 5% level (>1.960)

*** represents significance at 10% level (>1.645)

The results presented in Tables 6(a) and 6(b) below show that Nigeria and Egypt achieved abnormal returns in the event window from 1 November 2016 to 21 November 2016. The abnormal returns achieved by Egypt can be attributed to the 48% devaluation associated with the flotation of the Egyptian currency to meet the International Monetary Fund requirement in order to secure a USD 12 billion loan over three years (Reuters,(2016). Similarly, Nigeria devalued its currency by 30% when its central bank removed the currency peg (Reuters, 2016). Thus, these results suggest that an African currency devaluation is associated with positive abnormal returns, which accords with Momodu and Akani (2016) who suggest that, in the short run, a devaluation leads to increased output and an improved balance of payments.

Table 6(a): Nigeria's sovereign credit rating significance test results in June 2016
(Source: Compiled by the author)

Nigeria						
SCR event	Fitch	B+	stable	Jun 23 2016		
Date	Exchange Rate	Return	Africa Index	Expected Return	Abnormal Return	T-statistic
16-6-13	199.050	0.000	-0.002	0.000	0.000	0.077
16-6-14	199.050	0.000	0.004	0.000	0.000	-0.226
16-6-15	198.500	-0.003	-0.001	0.000	-0.003	-5.615 *
16-6-16	198.500	0.000	0.002	0.000	0.000	-0.131
16-6-17	199.000	0.003	-0.005	0.000	0.003	5.417 *
16-6-18	199.000	0.000	0.000	0.000	0.000	-0.002
16-6-19	199.000	0.000	0.000	0.000	0.000	-0.002
16-6-20	282.500	0.350	0.032	0.001	0.350	713.513 *
16-6-21	284.500	0.007	0.000	0.000	0.007	14.384 *
16-6-22	282.500	-0.007	-0.003	0.000	-0.007	-14.252 *
16-6-23	281.250	-0.004	-0.003	0.000	-0.004	-8.882 *
16-6-24	281.750	0.002	0.013	0.000	0.001	2.968 *
16-6-25	281.750	0.000	0.000	0.000	0.000	-0.002
16-6-26	281.750	0.000	0.000	0.000	0.000	-0.002
16-6-27	282.250	0.002	0.007	0.000	0.002	3.228 *
16-6-28	282.250	0.000	-0.005	0.000	0.000	0.251
16-6-29	282.750	0.002	-0.004	0.000	0.002	3.842 *
16-6-30	280.500	-0.008	0.000	0.000	-0.008	-16.311 *
16-7-1	282.130	0.006	-0.003	0.000	0.006	12.002 *
16-7-2	282.130	0.000	0.000	0.000	0.000	-0.002
16-7-3	282.130	0.000	0.000	0.000	0.000	-0.002

* represents significance at 1% level (>2.575)

** represents significance at 5% level (>1.960)

*** represents significance at 10% level (>1.645)

Table 6(b): Egypt's sovereign credit rating significance test results in November 2016
(Source: Compiled by the author)

Egypt						
SCR event	S&P	B-	stable	Nov 11 2016		
Date	Exchange Rate	Return	Africa Index	Expected Return	Abnormal Return	T-statistic
16-11-1	8.879	-0.001	0.000	0.000	-0.001	-1.401
16-11-2	8.877	0.000	-0.002	0.000	0.000	-0.466
16-11-3	13.891	0.448	0.045	0.001	0.446	1172.000 *
16-11-4	15.377	0.102	0.010	0.000	0.101	265.969 *
16-11-5	15.377	0.000	0.000	0.000	0.000	-0.054
16-11-6	15.377	0.000	0.000	0.000	0.000	-0.054
16-11-7	16.533	0.072	0.006	0.000	0.072	189.720 *
16-11-8	17.377	0.050	0.004	0.000	0.050	130.281 *
16-11-9	17.424	0.003	0.005	0.000	0.003	6.676 *
16-11-10	16.505	-0.054	0.002	0.000	-0.054	-142.497 *
16-11-11	16.543	0.002	0.002	0.000	0.002	5.759 *
16-11-12	16.543	0.000	0.000	0.000	0.000	-0.054
16-11-13	16.543	0.000	0.000	0.000	0.000	-0.054
16-11-14	15.575	-0.060	-0.002	0.000	-0.060	-158.089 *
16-11-15	15.381	-0.013	-0.002	0.000	-0.013	-32.882 *
16-11-16	15.643	0.017	0.004	0.000	0.017	43.995 *
16-11-17	15.935	0.018	0.004	0.000	0.018	48.184 *
16-11-18	15.946	0.001	0.003	0.000	0.001	1.561
16-11-19	15.946	0.000	0.000	0.000	0.000	-0.054
16-11-20	15.946	0.000	0.000	0.000	0.000	-0.054
16-11-21	17.571	0.097	0.006	0.000	0.097	254.221 *

* represents significance at 1% level (>2.575)

** represents significance at 5% level (>1.960)

*** represents significance at 10% level (>1.645)

Table 7a shows the results of the AR *t*-tests of the significant returns based on upgrades and downgrades. In order to conduct the tests, the 27 African countries were grouped according to their sovereign credit rating class as assigned by the three credit rating agencies. The average abnormal returns *t*-test results show that the sovereign credit rating class assigned to African countries does not significantly affect foreign exchange rate movements, which is contrary to the assertion by Eraslan (2017) that sovereign credit rating announcements are more likely to

impact foreign exchange rate co-movements of countries in the speculative grade.

The results thus show that there is no significant nexus between sovereign credit rating announcements and foreign exchange rates in Africa, which may be attributed to two possible reasons. First, Africa's financial sector development is still nascent (Otchere, Senbet and Simbanegavi, 2017) and thus it may take longer for the flow of information and the associated impact of sovereign credit rating announcements to filter through the continent's financial systems. Second, there is a disjoint between Africa's foreign exchange markets and macroeconomic fundamentals (Mutize and Mugobo, 2016) as a result of weak monetary policies (Sahn et al., 1996), expansionary policies (Masson & Pattillo, 2002) and weak currencies (Okafor, 2015).

Table 7a: Sovereign credit rating significance test results
(Source: Compiled by the author)

Sovereign credit rating upgrades			Sovereign credit rating downgrades		
Sovereign credit rating change S&P/Fitch (Moody's)	No. of upgrades	Average abnormal returns t-test	Sovereign credit rating change S&P/Fitch (Moody's)	No. of downgrades	Average abnormal returns t-test
A- (A3) to A (A2)	-	-	A (A2) to A- (A3)	1	-0.06
BBB+ (Baa1) to A- (A3)	2	0.02	A- (A3) to BBB+ (Baa1)	1	0.11
BBB (Baa2) to BBB+ (Baa1)	1	0.11	BBB+ (Baa1) to BBB (Baa2)	1	-0.08
BBB- (Baa3) to BBB (Baa2)	2	0.00	BBB (Baa2) to BBB- (Baa3)	2	0.00
BB+ (Ba1) to BBB- (Baa3)	1	0.12	BBB- (Baa3) to BB+ (Ba1)	4	0.45
BB (Ba2) to BB+ (Ba1)	2	0.00	BB+ (Ba1) to BB (Ba2)	3	0.89
BB- (Ba3) to BB (Ba2)	1	0.10	BB (Ba2) to BB- (Ba3)	2	1.28
B+ (B1) to BB- (Ba3)	6	0.32	BB- (Ba3) to B+ (B1)	7	0.66
B (B2) to B+ (B1)	7	-0.05	B+ (B1) to B (B2)	13	0.34
B- (B3) to B (B2)	5	0.48	B (B2) to B- (B3)	9	0.31
CCC+ (Caa1) to B- (B3)	4	0.70	B- (B3) to CCC+ (Caa1)	5	0.53
CCC (Caa2) to CCC+ (Caa1)	1	2.68	CCC+ (Caa1) to CCC (Caa2)	3	0.90

* represents significance at 1% level (>2.575)

** represents significance at 5% level (>1.960)

*** represents significance at 10% level (>1.645)

Table 7b: Summary of rating upgrades, downgrades and significant coefficients
(Source: Compiled by the author)

Summary of rating upgrades, downgrades and significant coefficients			
Country	Currency	Action	Coefficient
		Up/Up/Down/Up/Down/Down/Down/Down/Down/Down	
Angola	AOA	/Down/Down/Down/Down/Down/Down/Down/Down	+ve/-ve/-ve/+ve/-ve/-ve/-ve/-ve/-ve/-ve
Benin	XOF	Up	-ve
Botswana	BWP	Down	-ve
Burkina Faso	XOF	Down/Up	-ve/-ve
Cameroon	XAF	Down/Up/Up/Down	-ve/+ve/-ve/-ve
Cape Verde	CVE	Down/Down	-ve/-ve
		Up/Up/Down/Up/Up/Down/Up/Down/Down/Down	+ve/-ve/-ve/+ve/-ve/-ve/-ve/-ve/-ve/-ve
Congo	XAF	/Down/Down/Down/Down/Down/Down/Down/Down	/-ve/-ve/-ve/-ve/-ve/-ve/-ve/-ve
DRC	CDF	Down	-ve
		Up/Down/Up/Down/Up/Up/Down/Up/Down/Down/Down/Down	+ve/-ve/-ve/+ve/-ve/-ve/-ve/-ve/-ve/-ve
Egypt	EGP	/Down/down/Down/Down/Down/Down/Down/Down/Down/Down	/-ve/-ve/+ve/-ve/-ve/-ve/-ve/-ve/-ve/-ve
Gabon	XAF	Down/Down/Down/Down/Down	-ve/-ve/-ve/-ve/-ve
Ghana	GHS	Up/Down/Down/Up/Down/Up/Down/Down/Down	+ve/-ve/-ve/+ve/-ve/-ve/-ve/-ve/-ve/-ve
Ivory Coast	XOF	Down	-ve
Kenya	KES	Down/Up/Down	
Lesotho	LSL	Down	-ve
Malawi	MWK	Up/Up	+ve/+ve
Mauritius	MUR	Down	-ve
Morocco	MAD	Up/Up	+ve/+ve
		Up/Up/Up/ Up/Down/Down/Down/Down/Down/Down	
Mozambique	MZN	/Down/Down/Down/Down/Down/Down/Down/Down	+ve/-ve/-ve/+ve/-ve/-ve/-ve/-ve/-ve/-ve
Namibia	NAD	Down/Down	-ve/-ve
Nigeria	NGN	Down/Up/Down/Down/Down/Down/Down	-ve/-ve/-ve/-ve/-ve/-ve/-ve
Rwanda	RWF	Up/Down/Up/Up	+ve/-ve/+ve/+ve
Senegal	XOF	Down	-ve
Seychelles	SCR	Up/Up/Up	+ve/+ve/+ve
South Africa	ZAR	6	
		Down/Up/Down/Down/Down/Down/Down/Down	
Tunisia	TND	/Down/Down/Down/Down/Down/Up/Up/Down	+ve/-ve/-ve/+ve/-ve/-ve/-ve/-ve/-ve/-ve
Uganda	UGX	Up/Down/Down	-ve/+ve/-ve
Zambia	ZMW	Down/Down/Down/Down/Down/Down/Down	+ve/-ve/-ve/+ve/-ve/-ve/-ve/-ve/-ve/-ve

As can be seen in Table 7b above, the coefficient, in most instances, mimics the direction of the sovereign credit action. With most countries, when a sovereign credit rating action is an upgrade, then the coefficient is positive. On the other hand, when the sovereign credit rating action is a downgrade, the coefficient is negative.

4.4. Estimation of sovereign credit rating announcements' impact on foreign exchange rate

Table 8 below shows the Cumulative Average Abnormal Return for foreign exchange rates from -10 days to +10 days.

Table 8: Estimation of sovereign credit rating announcements' impact on foreign exchange rate returns

(Source: Compiled by the author)

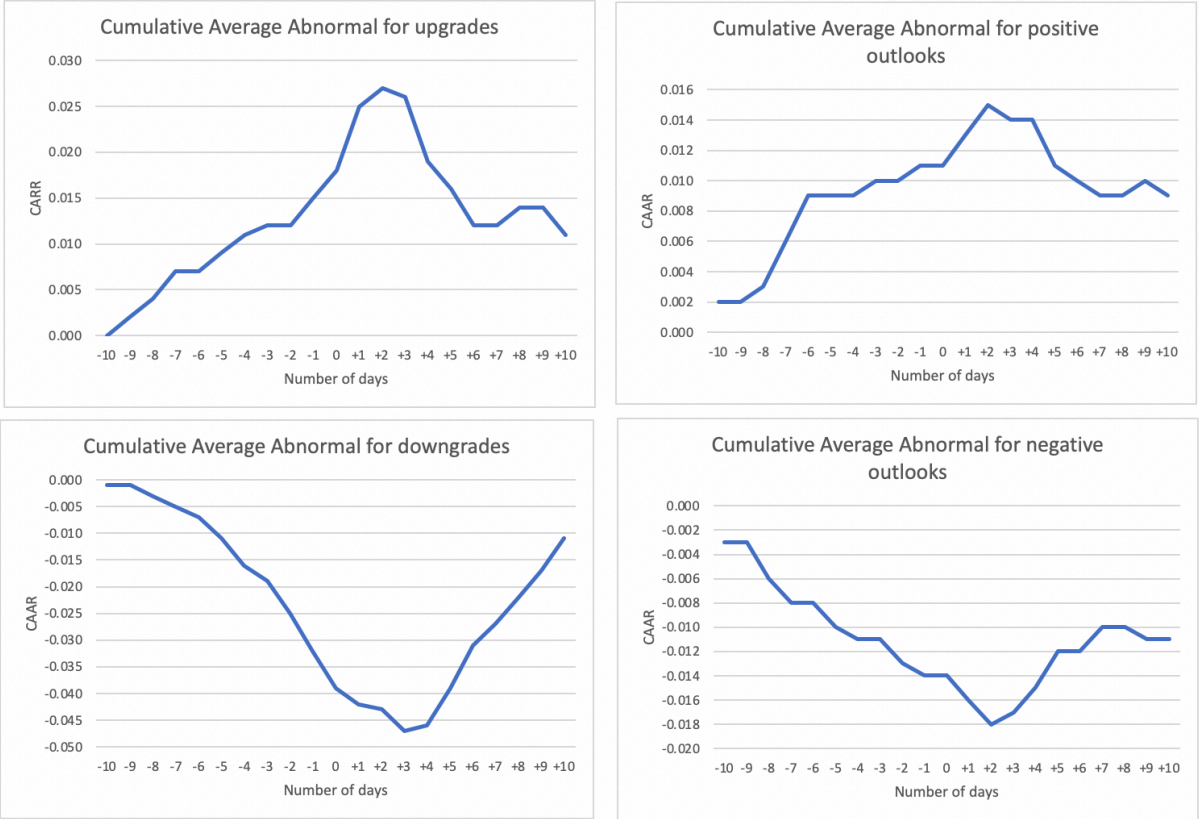
Window	Upgrade	Downgrade	Negative	Positive
	CAAR	CAAR	CAAR	CAAR
Day	All countries	All countries	All countries	All countries
-10	0.000	-0.001	-0.003	0.002
-9	0.002	-0.001	-0.003	0.002
-8	0.004	-0.003	-0.006	0.003
-7	0.007	-0.005	-0.008	0.006
-6	0.007	-0.007	-0.008	0.009
-5	0.009	-0.011	-0.010	0.009
-4	0.011	-0.016	-0.011	0.009
-3	0.012	-0.019	-0.011	0.010
-2	0.012	-0.025	-0.013	0.010
-1	0.015	-0.032	-0.014	0.011
0	0.018	-0.039	-0.014	0.011
+1	0.025	-0.042	-0.016	0.013
+2	0.027	-0.043	-0.018	0.015
+3	0.026	-0.047	-0.017	0.014
+4	0.019	-0.046	-0.015	0.014
+5	0.016	-0.039	-0.012	0.011
+6	0.012	-0.031	-0.012	0.010
+7	0.012	-0.027	-0.010	0.009
+8	0.014	-0.022	-0.010	0.009
+9	0.014	-0.017	-0.011	0.010
+10	0.011	-0.011	-0.011	0.009

* represents significance at 1% level (>2.575)

** represents significance at 5% level (>1.960)

*** represents significance at 10% level (>1.645)

Figure 5: Cumulative Average Abnormal Returns graphs
 (Source: Made by the researcher)



As shown in Table 8 above, the reaction of exchange rate returns to sovereign credit ratings is insignificant. There is a positive reaction to the upgrade announcement on rated sovereigns. Even though the impact is not significant, the positive reactions persist throughout the entire window period from day -10 to day +10. Similarly, there is a negative reaction to a downgrade. Even though it is insignificant, it however persists through the entire event window. It is noteworthy that, for both upgrades and downgrades, there are respective positive and negative reactions that start from day -10 and p-values keep increasing until day +3 when they begin to decline. Additionally, the reaction to either a rating upgrade or downgrade is felt more after the announcement and takes longer to subside, as compared to the reaction before the sovereign credit rating announcement. As highlighted in Table 8 above, even though the impact is insignificant, sovereign credit rating downgrades or upgrades do not affect the exchange rate returns by the same magnitude. As depicted by the cumulative average abnormal return graphs in Figure 5 above, the reaction of exchange rate returns in the window encompassing a positive outlook mimics the reaction of exchange rates in the window encompassing an SCR upgrade announcement. Similarly, the reaction of exchange rate returns in the window encompassing a

negative outlook mimics the reaction of exchange rates in the window encompassing an SCR downgrade rating announcement.

4.5. Granger Causality Results

The aim of this study was to provide evidence of the impact of sovereign credit rating announcements of exchange rates. With Granger causality tests, there are two main approaches. One approach would be to use the ECM model via MLE to conduct the tests on noncausality in accordance with Johansen (1997) or to choose to apply alternative methods such as in Toda and Yamamoto (1995). This study uses this alternative approach by Toda and Yamamoto (1995) mainly due to its simplicity when compared to Johansen’s LR test. Therefore, the null hypothesis becomes that sovereign credit rating announcements do not Granger cause exchange rate volatility in each of the African countries under study. Table 9 below presents the p-values from the Granger causality tests performed between sovereign credit ratings (SCR) and the exchange rates (FXR) at 2, 4, 6 and 8 lags.

Table 9: Pairwise Granger Causality test results
(Source: Compiled by the author)

	Lags: 2		Lags: 4		Lags: 6		Lags: 8	
	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
SCR ->FXR	0.080	0.924	0.275	0.895	0.686	0.661	0.511	0.811
FXR ->SCR	0.213	0.808	0.581	0.676	0.429	0.860	0.356	0.944

Across all lags, the results show that there is no significant evidence that sovereign credit rating announcements Granger cause exchange rate volatility in African countries. The null hypothesis is accepted.

4.6. Impulse responses

Table 10a: Impulse response tests results for North Africa region

(Source: Compiled by the author)

North Africa Region																		
Period	Response of Egypt FER to:			Response of Egypt SCR to:			Response of Morocco FER to:			Response of Morocco SCR to:			Response of Tunisia FER to:			Response of Tunisia SCR to:		
	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.028	0.014	0.015	-0.031	0.020	0.043	0.028	0.037	0.026	0.012	0.006	-0.029	0.002	0.037	0.020	0.034	0.012	0.028
2	-0.035	0.013	0.012	0.007	0.017	0.014	0.034	0.030	0.020	0.014	0.040	0.026	0.044	0.042	0.030	0.004	0.023	0.009
3	0.020	0.005	0.019	0.038	0.027	0.001	0.009	0.038	0.001	0.003	0.006	0.013	0.016	0.036	0.012	0.023	0.043	0.037
4	0.039	0.013	0.028	0.036	0.027	-0.029	0.039	0.010	0.015	0.026	0.008	0.020	0.024	0.042	0.002	0.022	0.043	0.011
5	0.038	0.015	0.012	0.025	0.003	0.003	0.015	0.017	0.044	0.011	0.004	0.005	0.033	0.021	0.037	0.015	0.015	0.005
6	0.023	0.023	0.002	-0.022	0.034	0.025	0.002	-0.026	0.039	0.024	0.021	0.030	0.021	0.017	0.039	0.044	0.032	0.000
7	0.006	0.018	0.034	0.003	0.032	0.016	0.015	0.014	0.025	0.008	0.027	0.034	0.002	0.009	0.025	0.026	0.014	0.038
8	0.014	0.023	0.021	0.001	0.025	0.026	0.003	0.017	0.011	0.011	0.011	0.009	0.032	0.039	0.022	0.028	0.009	0.031
9	0.012	0.021	0.025	0.031	0.006	0.043	0.001	0.009	0.006	0.020	0.041	0.022	0.038	0.004	0.033	0.032	0.013	0.038
10	0.007	0.010	0.025	0.027	0.009	0.036	0.017	0.001	0.033	0.013	0.042	0.034	0.024	0.043	0.008	0.038	-0.034	0.033

Table 10b: Impulse response tests results for East Africa region

(Source: Compiled by the author)

East Africa Region																		
Period	Response of Kenya FER to:			Response of Kenya SCR to:			Response of Rwanda FER to:			Response of Rwanda SCR to:			Response of Uganda FER to:			Response of Uganda SCR to:		
	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.042	0.024	0.024	0.026	-0.043	-0.036	0.026	-0.034	0.024	0.004	0.006	0.044	0.036	0.044	0.005	0.001	0.030	0.003
2	0.041	0.043	0.004	0.044	0.021	0.003	0.006	0.039	0.011	0.026	0.014	0.044	0.025	0.037	0.015	0.019	0.033	0.042
3	0.010	0.024	0.021	0.037	0.033	0.033	0.003	0.025	0.034	0.034	0.032	0.028	0.014	0.008	0.014	0.024	0.035	0.022
4	0.019	0.003	0.033	0.014	0.043	0.037	0.037	0.013	0.020	0.038	0.012	0.020	0.014	0.026	0.013	0.000	0.020	0.025
5	0.017	0.002	-0.042	0.037	0.018	0.039	0.018	0.001	0.043	0.027	0.020	0.004	0.021	0.042	0.018	0.003	0.030	0.008
6	0.001	0.032	0.023	0.007	0.003	0.037	0.001	0.028	0.003	0.041	0.043	0.020	0.016	0.007	0.018	0.034	0.009	0.019
7	0.016	0.037	0.001	0.014	0.030	0.023	0.016	0.043	0.019	0.019	0.008	0.039	0.035	0.033	0.029	0.038	0.020	0.038
8	0.029	0.007	0.021	0.024	0.019	0.033	0.012	0.030	0.010	0.043	0.024	0.036	0.019	0.014	0.043	0.005	0.015	0.027
9	0.009	0.023	0.033	0.020	0.034	0.007	0.030	-0.013	0.033	0.035	0.043	0.030	0.021	0.013	0.042	0.014	0.023	0.005
10	0.014	0.013	0.038	0.028	0.038	0.003	0.039	0.017	0.033	-0.042	0.040	0.025	0.036	0.015	0.023	0.025	0.015	0.021

The results of the exchange rate return impulse responses to Cholesky's one standard deviation sovereign rating shock for countries in the regions of North Africa and East Africa are presented in Tables 10a and 10b above with the rest presented in Appendix B. The results indicate that, when a sovereign rating is shocked by one standard deviation, the regional stock and bond markets generally respond by less than 1% and this effect fades away within four days of a sovereign rating change. Thus, the regional sovereign rating spillover impact is very small and its effects are quickly absorbed into stock and bond market prices. The cross-country impulse responses from a sovereign rating shock in one country to the sovereign ratings in other countries in the region are also marginal but persist for more than 10 periods. These effects could be attributed to regional financial and economic integration (Braun and Raddatz 2007) associated with capital account liberalisation (Eichengreen, Gullapalli, and Panizza 2011), financial deregulation and financial innovation (Causevic 2003) as well as with monetary unions (Bayar, Kiliç, and Savrul 2013) such as the CFA franc in West and Central Africa, the dinar in North Africa and the Rand3 indexed currencies in Southern and Eastern Africa. Thus, the sovereign rating shock originating from any of the countries in the same region is transmitted to all other countries' credit ratings. As suggested by Claeys and Vašíček (2012), the bilateral linkages between these countries open the channels of capital and cross-country information flows that determine sovereign rating spillovers and contagion. Hence, the results show that Drago and Gallo's (2016) findings of a spillover effect on financial markets of other countries following credit rating announcements, transmitted through the international bank flows between regional member countries, also affect countries in Africa.

CHAPTER FIVE

RESEARCH CONCLUSION AND RECOMMENDATIONS

5.1. Research Conclusion

The major source of external funding for developing markets is made up of foreign direct investment and portfolio flows. Emerging markets, of which Africa is included, are more sensitive to capital flows due to the potential relationship between these capital flows and financial indicators such as exchange rate, inflation and interest rate. This study examined the effects of sovereign credit ratings on foreign exchange rate returns for a sample of 27 African countries over the period 2003–2018 to examine the response of exchange rate co-movements around the time of sovereign rating announcements. There are a number of studies in literature that focused on investigating the impact of sovereign credit ratings on the bond and stock markets. In contrast, there are few that investigated the nexus between sovereign credit ratings and exchange rates. Therefore, this study makes a contribution to closing that gap in literature by investigating the impact of sovereign credit rating announcements on exchange rate returns in Africa. Following other studies, this study employed an event study methodology and Granger causality tests as well as impulse response tests in a panel framework to explore the nexus between sovereign credit ratings and exchange rates. The results of all methods utilised find that African foreign exchange rates are not significantly affected by sovereign credit rating announcements and there is no evidence of contagion found.

5.1.1. Do sovereign credit rating announcements have a significant impact on foreign exchange rate returns in Africa?

Sovereign credit ratings do bring new information to financial markets as suggested by empirical evidence in literature. One characteristic of emerging economies is that of informational asymmetry, and a number of studies suggest that sovereign credit rating announcements fill this deficiency. However, according to results of this study, the abnormal returns *t*-test results of the 27 countries in Africa are insignificant and this suggests that sovereign credit rating announcements do not significantly impact exchange rate returns in Africa. This is in contrast to Brooks et al. (2004) who showed that sovereign credit rating downgrades, specifically those by Fitch and S&P, resulted in the negative aggregate stock market and foreign exchange rates.

5.1.2. Do sovereign credit rating downgrades or upgrades affect the exchange rates by the same magnitude?

While exchange rates in Africa do not react significantly to a sovereign credit rating downgrade or upgrade announcement, the results of this study show that, when a sovereign credit rating downgrade is announced, abnormal returns t-tests are greater than those when a sovereign credit rating upgrade is announced. The results imply that in Africa punishment for a downgrade is more than a reward for an upgrade.

5.1.3. Does one country's sovereign credit rating change cause significant spillover effects on other African countries' exchange rates?

While sovereign credit rating events are found to have a marginal impact on the own country's exchange rates, there is no significant evidence of contagion. The results of the impulse response tests find no significant evidence of sovereign rating spillover effects in foreign exchange rate returns. Impulse response analysis further shows that the cross-country sovereign rating spillover impacts are insignificant. This may be because the currency impacts are too marginal to spill over to other countries and are a result of the significant structural deficiencies in African trade and cross border financial linkages. This finding is in line with Ndikumana (2003) who characterises Africa as having a weak macro-economic environment, underdeveloped financial systems, high country risks and exchange rate misalignments.

In summary, sovereign credit rating events have no significant impact on exchange rates in Africa within the borders of the countries that received the ratings and no contagion on neighbouring countries. This is in contrast to findings of spillovers by Eraslan (2017) when investigating the impact of sovereign rating announcements on emerging market exchange rate correlations. However, it could be argued that the investigation by Eraslan (2017) included non-African countries in the data set.

This study found no significant nexus between sovereign credit rating announcements and foreign exchange rates in Africa that may be attributed to two possible reasons. First, Africa's financial sector development is still nascent (Otchere, Senbet and Simbanegavi, 2017) and thus sovereign credit rating announcements may take longer for the flow of information and the associated impact to filter through the continent's financial systems. The finding lends support to the efficient market paradigm which is based on the random walk theory. The random walk theory suggests that future price changes represent random departures from previous prices

(Gupta et al., 2014). The logic of the random walk idea is that, if the flow of information is unimpeded and information is immediately reflected in stock prices, then tomorrow's price change will reflect only tomorrow's news and will be independent of the price changes today. Under this efficient market paradigm, sovereign credit rating announcements should therefore only have a potential impact on exchange rates on the day they are announced, not days leading up to the announcement and certainly not days after the announcement

Second, there is a disjoint between Africa's foreign exchange markets and macroeconomic fundamentals (Mutize and Mugobo, 2016) as a result of weak monetary policies (Sahn et al., 1996), expansionary policies (Masson & Pattillo, 2002) and weak currencies (Okafor, 2015). The disjoint between Africa's foreign exchange markets and macroeconomic fundamentals identified by Mutize and Mugobo (2016) lends credit to another possible reason why there is no significant impact on exchange rates by sovereign credit rating events. This is the hypothesis that sovereign credit ratings lag behind. With this hypothesis, any impact from the sovereign credit rating announcements will only be visible after a considerable amount of time has passed and this would not be beyond the 21-day event window used in this event study. This is why one of the recommendations for further study is to potentially enlarge the event window in order to explore the long-term dynamics.

5.2. Policy Implications

This study investigated the impact of sovereign credit rating announcements on foreign exchange rate returns in Africa. The following research question formed the basis of the investigation:

Do sovereign credit rating announcements have a significant impact on foreign exchange rate returns in Africa?

In order to further examine the implications arising from the primary question, the following sub-questions are also explored:

- Do sovereign credit rating downgrades or upgrades affect the exchange rates by the same magnitude?
- Does one country's sovereign credit rating change cause significant spillover effects on other African countries' exchange rates?

The results of this study have the following policy implications:

- The findings of the study showed that exchange rate returns react to sovereign credit ratings, but the impact is insignificant. However, despite this weak response of foreign exchange rates to sovereign credit rating announcements, governments in Africa should still continue to consider sovereign credit rating announcements as they provide new information to the financial markets.
- The lack of evidence of contagion between African countries proved that African countries have disjointed markets and there are none to few trade linkages amongst the African countries studied. Therefore, African governments should work towards regional integration to strengthen and deepen cross-border trade and financial linkages. This will encourage and enhance cross-border trade between neighbouring countries. Regional integration would provide the much-needed trade linkages given the proposed Continental Free Trade Area (CFTA) by the African Union that would pave the way for the establishment of the Continental Customs Union and the African Customs Union.
- Furthermore, the findings have shown evidence supporting the narrative that there is a disjoint between Africa's foreign exchange markets and macroeconomic fundamentals (Mugobo & Mutize, 2016). African countries should address macroeconomic deficiencies stipulated by credit rating agencies when they announce credit ratings and focus on improving other factors that contribute to sovereign credit rating upgrades such as good governance and improving macroeconomic fundamentals. These reforms will ensure that Africa is attractive for capital flows and encourage domestic investment.
- Even though many countries have leaned towards liberalising their exchange rate regimes, which has not brought forth the expected systemic gains in income growth, trade performance and price stability (Ndikumana, 2003), it is advisable for African economies to maintain selective discretionary control over capital movements and exchange rate markets in order to hedge against adverse shocks to the economy and to maintain macroeconomic and financial stability. Furthermore, reforms meant to improve the credibility of Africa's macroeconomic policy are needed.

5.3. Recommendations for Further Study

This study examined the effects of sovereign credit ratings on foreign exchange rate returns in Africa using a sample of 27 African countries over the period 2003–2018. However, the following are recommendations for future research:

- The analysis could further investigate the regional development effects by focusing on the different regional economic communities in Africa such as countries in Southern

African Development Community (SADC), Common Market for Eastern and Southern Africa (COMESA), Economic Community of West African States (ECOWAS), East African Community (EAC), Arab Maghreb Union (AMU), Economic Community of Central African States (ECCAS), Intergovernmental Authority on Development (IGAD) and the Community of Sahel-Saharan States (CEN-SAD).

- The window period could be expanded to explore the long-term dynamics.

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APPENDIX A: Credit rating grading applied by the three credit rating agencies in this study

Interpretation	Moody's	S&P	Fitch
Investment grade ratings			
Prime	Aaa	AAA	AAA
	Aa1	AA+	AA+
High grade	Aa2	AA	AA
	Aa3	AA-	AA-
Upper medium grade	A1	A+	A+
	A2	A	A
	A3	A-	A-
Lower medium grade	Baa1	BBB+	BBB+
	Baa2	BBB	BBB
	Baa3	BBB-	BBB-
Speculative grade ratings			
Speculative	Ba1	BB+	BB+
	Ba2	BB	BB
	Ba3	BB-	BB-
Highly speculative	B1	B+	B+
	B2	B	B
	B3	B-	B-
Substantial risks	Caa1	CCC+	CCC+
	Caa2	CCC	CCC
	Caa3	CCC-	CCC-
Extremely speculative	Ca	CC	CC
		C	
In default with little chance for recovery		SD	RD
In default	C	D	D
			DD
			DDD
Not rated	WR	NR	

APPENDIX B: Impulse responses

North Africa Region

Period	Response of Egypt FER to:			Response of Egypt SCR to:			Response of Morocco FER to:			Response of Morocco SCR to:			Response of Tunisia FER to:			Response of Tunisia SCR to:		
	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR	Egypt SCR	Morocco SCR	Tunisia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.028	0.014	0.015	-0.031	0.020	0.043	0.028	0.037	0.026	0.012	0.006	-0.029	0.002	0.037	0.020	0.034	0.012	0.028
2	-0.035	0.013	0.012	0.007	0.017	0.014	0.034	0.030	0.020	0.014	0.040	0.026	0.044	0.042	0.030	0.004	0.023	0.009
3	0.020	0.005	0.019	0.038	0.027	0.001	0.009	0.038	0.001	0.003	0.006	0.013	0.016	0.036	0.012	0.023	0.043	0.037
4	0.039	0.013	0.028	0.036	0.027	-0.029	0.039	0.010	0.015	0.026	0.008	0.020	0.024	0.042	0.002	0.022	0.043	0.011
5	0.038	0.015	0.012	0.025	0.003	0.003	0.015	0.017	0.044	0.011	0.004	0.005	0.033	0.021	0.037	0.015	0.015	0.005
6	0.023	0.023	0.002	-0.022	0.034	0.025	0.002	-0.026	0.039	0.024	0.021	0.030	0.021	0.017	0.039	0.044	0.032	0.000
7	0.006	0.018	0.034	0.003	0.032	0.016	0.015	0.014	0.025	0.008	0.027	0.034	0.002	0.009	0.025	0.026	0.014	0.038
8	0.014	0.023	0.021	0.001	0.025	0.026	0.003	0.017	0.011	0.011	0.011	0.009	0.032	0.039	0.022	0.028	0.009	0.031
9	0.012	0.021	0.025	0.031	0.006	0.043	0.001	0.009	0.006	0.020	0.041	0.022	0.038	0.004	0.033	0.032	0.013	0.038
10	0.007	0.010	0.025	0.027	0.009	0.036	0.017	0.001	0.033	0.013	0.042	0.034	0.024	0.043	0.008	0.038	-0.034	0.033

East Africa Region

Period	Response of Kenya FER to:			Response of Kenya SCR to:			Response of Rwanda FER to:			Response of Rwanda SCR to:			Response of Uganda FER to:			Response of Uganda SCR to:		
	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR	Kenya SCR	Rwanda SCR	Uganda SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.042	0.024	0.024	0.026	-0.043	-0.036	0.026	-0.034	0.024	0.004	0.006	0.044	0.036	0.044	0.005	0.001	0.030	0.003
2	0.041	0.043	0.004	0.044	0.021	0.003	0.006	0.039	0.011	0.026	0.014	0.044	0.025	0.037	0.015	0.019	0.033	0.042
3	0.010	0.024	0.021	0.037	0.033	0.033	0.003	0.025	0.034	0.034	0.032	0.028	0.014	0.008	0.014	0.024	0.035	0.022
4	0.019	0.003	0.033	0.014	0.043	0.037	0.037	0.013	0.020	0.038	0.012	0.020	0.014	0.026	0.013	0.000	0.020	0.025
5	0.017	0.002	-0.042	0.037	0.018	0.039	0.018	0.001	0.043	0.027	0.020	0.004	0.021	0.042	0.018	0.003	0.030	0.008
6	0.001	0.032	0.023	0.007	0.003	0.037	0.001	0.028	0.003	0.041	0.043	0.020	0.016	0.007	0.018	0.034	0.009	0.019
7	0.016	0.037	0.001	0.014	0.030	0.023	0.016	0.043	0.019	0.019	0.008	0.039	0.035	0.033	0.029	0.038	0.020	0.038
8	0.029	0.007	0.021	0.024	0.019	0.033	0.012	0.030	0.010	0.043	0.024	0.036	0.019	0.014	0.043	0.005	0.015	0.027
9	0.009	0.023	0.033	0.020	0.034	0.007	0.030	-0.013	0.033	0.035	0.043	0.030	0.021	0.013	0.042	0.014	0.023	0.005
10	0.014	0.013	0.038	0.028	0.038	0.003	0.039	0.017	0.033	-0.042	0.040	0.025	0.036	0.015	0.023	0.025	0.015	0.021

Central Africa Region

Period	Response of Angola FER to:					Response of Angola SCR to:					Response of Cameroon FER to:				
	Angola SCR	Cameroon SCR	Congo SCR	DRC SCR	Gabon SCR	Angola SCR	Cameroon SCR	Congo SCR	DRC SCR	Gabon SCR	Angola SCR	Cameroon SCR	Congo SCR	DRC SCR	Gabon SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.043	-0.038	0.007	0.027	0.027	0.020	0.007	0.041	0.004	-0.025	0.015	0.012	0.033	0.038	0.025
2	0.040	0.034	0.021	0.001	0.029	-0.037	0.008	0.007	0.013	0.014	0.009	0.044	0.003	0.013	0.009
3	0.036	0.002	0.024	0.003	0.030	0.032	0.017	0.044	0.013	0.000	0.012	0.042	0.014	0.027	0.010
4	-0.021	0.009	0.015	0.026	0.019	0.024	0.024	0.036	0.008	0.030	0.035	0.040	0.032	0.035	0.032
5	0.043	0.024	0.012	0.016	0.032	0.024	0.039	0.026	0.013	0.001	0.041	0.007	0.003	-0.010	-0.018
6	0.032	0.012	0.023	0.037	0.005	0.003	0.043	0.026	0.020	0.012	0.026	0.013	0.020	0.008	0.013
7	0.010	-0.035	0.021	0.029	0.040	0.022	0.017	0.033	0.028	0.009	0.023	0.005	0.005	0.028	0.023
8	0.020	0.032	0.033	0.010	0.039	0.014	0.042	0.021	0.040	0.005	0.015	0.036	0.038	0.031	0.044
9	0.012	0.031	0.021	0.015	0.021	0.015	0.028	0.019	0.031	0.007	0.018	0.013	0.040	0.026	-0.022
10	0.021	0.038	0.002	-0.003	0.007	0.004	0.016	0.039	0.001	0.017	0.031	0.034	0.036	0.010	0.000

Continued

Period	Response of Cameroon SCR to:					Response of Congo FER to:					Response of Congo SCR to:				
	Angola SCR	Cameroon SCR	Congo SCR	Gabon SCR	DRC SCR	Angola SCR	Cameroon SCR	Congo SCR	DRC SCR	Gabon SCR	Angola SCR	Cameroon SCR	Congo SCR	DRC SCR	Gabon SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.015	0.031	0.007	0.003	0.029	0.043	0.041	0.033	0.040	0.039	0.041	0.037	0.017	0.006	0.006
2	0.033	0.023	0.024	0.008	0.023	0.020	0.002	0.026	0.016	0.042	0.023	0.041	0.015	0.044	0.021
3	0.044	0.034	0.029	0.034	0.031	0.010	0.019	0.020	0.003	0.020	0.012	0.016	0.002	0.021	0.010
4	0.014	0.002	0.039	0.019	0.031	0.001	0.013	0.036	0.010	0.017	0.018	0.007	0.035	0.019	0.036
5	0.000	0.022	0.034	0.011	0.038	0.037	0.033	0.005	0.007	0.041	0.031	0.028	0.043	0.018	0.006
6	0.007	0.006	0.022	0.005	0.027	0.002	0.035	0.033	0.007	0.002	0.002	0.023	0.027	0.036	0.022
7	0.029	0.034	0.010	0.037	0.024	0.005	0.027	0.044	0.028	0.022	0.020	0.021	0.026	0.012	0.021
8	0.036	0.025	0.016	0.020	0.008	0.020	0.041	0.008	0.033	0.026	0.038	0.002	0.033	0.013	0.037
9	0.020	0.016	0.012	0.020	0.029	0.029	0.022	0.006	0.039	0.038	0.039	0.001	0.021	0.027	0.032
10	0.044	0.014	0.027	0.034	0.027	0.044	0.033	0.000	0.009	0.015	0.022	0.022	0.029	0.013	0.010

Continued

Period	Response of DRC FER to:					Response of DRC SCR to:					Response of Gabon FER to:					Response of Gabon SCR to:				
	Angola SCR	Cameroon SCR	Congo SCR	DRC SCR	Gabon SCR	Angola SCR	Cameroon SCR	Congo SCR	Gabon SCR	DRC SCR	Angola SCR	Cameroon SCR	Congo SCR	DRC SCR	Gabon SCR	Angola SCR	Cameroon SCR	Congo SCR	DRC SCR	Gabon SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.013	0.035	0.018	0.011	0.017	0.033	0.005	0.043	0.044	0.016	0.013	0.037	0.032	0.039	0.009	0.022	0.039	0.004	0.038	0.026
2	0.013	0.020	0.027	0.008	0.008	0.036	0.005	0.011	0.024	0.036	0.007	0.038	0.040	0.002	0.029	0.006	0.042	0.008	0.004	0.015
3	0.039	0.025	0.044	0.005	0.014	0.016	0.034	0.039	0.011	0.040	0.018	0.043	0.005	0.005	0.039	0.004	0.011	0.032	0.044	0.013
4	0.022	0.011	0.031	0.027	0.042	0.039	0.042	0.035	0.003	0.001	0.029	0.044	0.036	0.015	0.040	0.024	0.001	0.014	0.002	0.013
5	0.021	0.029	0.035	0.042	0.003	0.036	0.038	0.031	0.017	0.035	0.021	0.009	0.029	0.017	0.029	0.028	0.044	0.040	0.009	0.014
6	0.008	0.009	0.019	0.027	0.005	0.030	0.024	0.029	0.006	0.039	0.015	0.006	0.041	0.003	0.023	0.000	0.031	0.034	0.006	0.033
7	0.005	0.026	0.008	0.008	0.035	0.008	0.039	0.021	0.003	0.024	0.042	0.008	0.036	0.034	0.010	0.024	0.005	0.037	0.032	0.030
8	0.038	0.034	0.011	0.002	0.023	0.024	0.037	0.028	0.009	0.037	0.032	0.023	0.023	0.001	0.019	0.017	0.021	0.019	0.040	0.026
9	0.024	0.008	0.019	0.013	0.002	0.031	0.008	0.031	0.040	0.032	0.038	0.023	0.042	0.008	0.002	0.005	0.016	0.004	0.033	0.028
10	0.006	0.030	0.041	0.001	0.002	0.035	0.017	0.021	0.021	0.022	0.000	0.041	0.023	0.012	0.013	0.041	0.032	0.038	0.032	0.024

West Africa Region

Period	Response of Benin FER to:							Response of Benin SCR to:							Response of Burkina Faso FER to:						
	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.018	0.032	0.026	0.029	0.012	0.032	0.016	0.009	0.018	0.037	0.012	0.034	0.003	0.042	0.026	0.001	0.009	0.010	0.021	0.008	0.035
2	0.006	0.021	0.037	0.036	0.008	0.024	0.041	0.013	0.038	0.001	0.003	0.031	0.007	0.014	0.001	0.023	0.024	0.001	0.034	0.042	0.033
3	0.005	0.037	0.007	0.002	0.035	0.017	0.014	0.024	0.009	0.035	0.023	0.022	0.024	0.004	0.028	0.019	0.029	0.011	0.003	0.007	0.033
4	0.007	0.003	0.027	0.003	0.044	0.044	0.008	0.006	0.001	0.031	0.015	0.040	0.015	0.024	0.034	0.008	0.019	0.006	0.042	0.016	0.016
5	0.027	0.042	0.044	0.015	0.027	0.008	0.015	0.021	0.034	0.001	0.018	0.038	0.036	0.043	0.011	0.036	0.036	0.027	0.038	0.016	0.033
6	0.003	0.024	0.026	0.043	0.031	0.036	0.031	0.020	0.000	0.026	0.013	0.039	0.012	0.002	0.026	0.022	0.037	0.011	0.029	0.019	0.016
7	0.015	0.011	0.037	0.044	0.037	0.025	0.034	0.013	0.038	0.042	0.022	0.029	0.037	0.015	0.022	0.016	0.005	0.006	0.009	0.037	0.027
8	0.011	0.027	0.040	0.001	0.017	0.000	0.031	0.043	0.015	0.012	0.008	0.034	0.043	0.017	0.003	0.015	0.039	0.020	0.044	0.006	0.040
9	0.008	0.032	0.005	0.005	0.040	0.003	0.020	0.029	0.031	0.035	0.002	0.014	0.004	0.006	0.001	0.035	0.031	0.043	0.023	0.021	0.016
10	0.008	0.022	0.017	0.013	0.011	0.041	0.006	0.022	0.008	0.017	0.020	0.035	0.041	0.020	0.015	0.005	0.009	0.019	0.020	0.018	0.002

Continued

Period	Response of Burkina Faso SCR to:							Response of Cape Verde FER to:							Response of Cape Verde SCR to:						
	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.010	0.021	0.010	0.034	0.007	0.036	0.041	0.038	0.012	0.030	0.034	0.003	-0.032	0.012	0.021	0.034	0.012	0.036	0.038	0.023	0.027
2	-0.029	0.032	0.011	0.037	0.022	0.031	0.039	0.038	0.013	0.007	0.019	0.038	0.026	0.018	0.011	0.017	0.029	0.019	0.013	0.029	0.024
3	0.013	0.021	0.001	0.033	0.035	0.028	0.030	0.004	0.023	0.031	0.009	0.039	0.012	0.031	0.002	0.039	0.023	0.043	0.028	0.020	0.019
4	0.032	0.004	0.021	0.031	0.006	0.013	0.008	0.004	0.042	0.000	0.034	0.043	0.020	0.005	0.010	0.012	0.020	0.013	0.015	0.003	0.020
5	-0.026	0.025	0.018	0.020	0.018	0.009	0.009	0.037	0.005	0.026	0.001	0.006	0.029	0.033	0.015	0.032	0.041	0.013	0.004	0.035	0.003
6	0.035	0.004	0.040	0.015	0.031	0.005	0.017	-0.025	0.041	0.020	0.043	0.043	0.041	0.026	0.029	0.003	0.038	0.020	0.042	0.018	0.029
7	0.024	0.000	0.002	0.032	0.022	0.009	0.044	0.025	0.017	0.020	0.007	0.030	0.031	0.000	0.035	0.013	0.004	0.032	0.014	0.021	0.035
8	0.009	0.013	0.011	0.000	0.038	0.030	0.017	0.008	0.033	0.042	0.028	0.032	0.001	0.006	0.043	0.004	0.017	0.042	0.028	0.040	0.014
9	0.039	0.020	0.001	0.042	0.016	0.030	0.018	0.025	0.026	0.009	0.004	0.039	0.025	0.027	0.028	0.034	0.020	0.031	0.004	0.042	0.041
10	0.031	0.013	0.019	0.015	0.009	0.035	0.003	0.024	0.006	0.029	0.027	0.039	0.027	0.030	0.039	0.039	0.003	0.034	0.027	0.004	-0.012

Continued

Period	Response of Ghana FER to:							Response of Ghana SCR to:							Response of Ivory Coast FER to:						
	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.044	-0.009	0.033	0.024	0.039	0.030	0.017	0.041	0.040	0.005	0.006	0.038	0.040	0.009	0.017	0.006	0.044	0.011	0.039	0.021	0.001
2	0.042	0.036	0.043	0.027	0.025	0.007	0.037	0.016	0.007	0.015	0.022	0.033	0.008	0.008	0.013	0.005	-0.042	0.030	0.035	0.011	-0.021
3	0.017	0.014	0.033	0.011	0.027	0.013	0.023	0.015	0.030	0.028	0.032	0.039	0.018	0.030	0.014	0.019	0.025	0.027	0.013	0.040	0.013
4	0.003	0.009	0.006	0.011	0.030	0.005	0.004	0.016	0.005	0.038	0.029	0.044	0.037	0.032	0.042	0.002	0.007	0.013	0.029	0.004	0.025
5	0.006	0.029	0.024	0.043	0.004	0.012	0.012	0.043	0.035	0.039	0.009	0.024	0.035	0.041	0.003	0.028	0.027	0.004	0.042	0.037	0.038
6	0.023	0.009	0.005	0.001	-0.040	0.035	0.033	0.022	0.008	0.005	0.002	0.022	0.007	0.032	0.039	0.014	0.037	0.033	0.005	0.025	0.004
7	0.022	0.025	0.039	0.044	0.034	0.015	0.017	0.009	0.004	0.012	0.019	0.021	0.024	0.040	0.020	0.004	0.003	0.036	0.031	0.028	0.029
8	0.017	0.014	0.029	0.010	0.017	0.015	0.041	0.036	0.038	0.037	0.040	0.019	0.015	0.034	0.030	0.008	0.023	0.008	0.013	0.040	0.038
9	0.038	0.003	0.011	0.021	0.036	0.020	0.028	0.029	0.012	0.003	0.035	0.006	0.012	0.026	0.031	0.018	0.038	0.011	0.001	0.041	0.014
10	0.025	0.000	0.003	0.016	0.035	0.020	0.024	0.010	0.010	0.027	0.030	0.026	0.037	0.018	0.017	0.036	0.008	0.002	0.016	0.005	-0.020

Continued

Period	Response of Ivory Coast SCR to:							Response of Nigeria FER to:							Response of Nigeria SCR to:						
	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.028	0.001	-0.036	0.025	0.042	0.002	0.024	-0.016	0.023	0.024	0.013	0.033	0.024	0.036	0.040	0.014	0.025	0.020	0.025	0.027	0.040
2	0.033	0.003	0.030	0.002	0.012	0.040	0.009	0.020	0.034	0.028	0.003	0.030	0.014	0.001	0.043	0.007	0.026	0.028	0.011	0.043	0.016
3	0.019	0.024	0.010	0.010	0.014	0.036	0.031	0.031	0.018	0.013	0.006	0.015	0.023	0.022	0.006	0.009	0.043	0.040	0.024	0.035	0.004
4	0.011	0.042	0.038	0.043	0.006	0.016	0.002	0.019	0.036	0.024	0.039	0.037	0.033	0.027	0.018	0.006	0.021	0.026	0.039	0.017	0.015
5	0.043	0.009	0.042	0.017	0.021	0.024	0.013	0.017	0.012	0.015	0.033	0.038	0.016	0.036	0.038	0.025	0.017	0.039	0.031	0.042	0.044
6	0.012	0.033	0.039	0.029	0.023	0.033	0.029	0.039	0.021	0.021	0.017	0.042	0.008	0.034	0.022	0.042	0.019	-0.012	0.010	0.037	0.024
7	0.022	0.023	0.002	0.013	0.005	0.017	0.022	0.027	0.030	0.036	0.024	0.009	0.020	0.027	0.025	0.009	0.028	0.021	0.034	0.017	0.018
8	0.020	0.029	0.020	0.026	0.032	0.032	0.040	0.044	0.005	0.028	0.032	-0.008	0.027	0.025	0.014	0.007	0.021	0.019	0.038	0.014	0.011
9	0.034	0.033	0.040	0.037	0.040	0.030	0.024	0.030	0.025	0.035	0.027	0.034	0.002	0.042	0.029	0.036	0.003	0.011	0.024	0.033	0.014
10	-0.025	0.014	0.012	0.003	0.013	0.004	0.040	0.043	0.000	0.007	0.042	0.014	0.024	0.030	0.008	0.004	0.013	0.021	0.015	0.020	0.022

Continued

Period	Response of Senegal FER to:							Response of Senegal SCR to:						
	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal	Benin SCR	Burkina Faso SCR	Cape Verde SCR	Ghana	Ivory Coast	Nigeria	Senegal
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.013	-0.030	0.020	0.023	0.022	0.032	0.044	0.008	0.023	0.022	0.004	0.044	0.028	0.011
2	0.033	0.005	0.034	0.023	0.022	0.031	0.001	0.023	0.035	0.014	0.044	0.005	0.032	0.029
3	0.013	0.011	0.039	0.014	0.016	0.035	0.042	0.042	0.037	0.011	0.035	0.028	0.044	0.005
4	0.028	0.038	0.039	0.030	0.043	0.037	0.020	0.035	0.020	0.007	0.004	0.024	0.026	0.022
5	0.005	0.014	0.019	0.010	0.038	0.004	0.005	0.037	0.001	0.013	0.013	0.031	-0.006	0.013
6	0.002	0.034	0.035	0.040	0.027	0.036	0.041	0.033	0.028	0.005	0.018	0.026	0.039	0.016
7	0.008	0.009	0.026	0.016	0.010	0.028	0.013	0.008	0.001	0.018	0.002	0.002	0.019	0.036
8	0.000	0.006	0.031	0.002	0.015	0.018	0.039	0.007	0.023	0.029	0.037	0.009	0.043	0.000
9	0.029	0.006	0.020	0.014	0.020	0.031	0.019	0.022	0.016	0.043	0.005	0.007	0.018	0.025
10	0.014	0.016	0.030	0.012	-0.004	0.026	0.027	0.019	0.015	0.043	0.021	0.016	0.036	0.022

Southern Africa Region

Period	Response of Botswana FER to:									Response of Botswana SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.005	0.038	0.043	0.032	0.036	0.036	0.013	0.030	0.024	0.040	0.010	0.009	0.007	0.003	0.015	0.008	0.010	0.031
2	0.030	0.005	0.010	0.001	0.020	0.029	0.018	0.029	0.041	0.002	0.044	0.023	0.003	0.010	0.043	0.031	0.014	0.022
3	0.013	0.034	0.042	0.020	0.027	0.021	0.031	0.024	0.017	0.014	0.024	0.006	0.012	0.017	0.044	0.038	0.044	0.013
4	0.038	0.005	0.040	0.024	0.009	0.037	0.023	0.019	0.007	0.042	0.009	0.036	0.037	0.043	0.042	0.029	0.018	0.000
5	0.021	0.008	0.011	0.010	0.031	0.030	0.020	0.039	0.035	0.006	0.023	0.037	0.019	0.005	0.028	0.002	0.032	0.005
6	0.038	0.041	0.033	0.012	0.002	0.017	0.009	-0.016	0.011	0.008	-0.033	0.031	0.040	0.014	0.022	0.032	0.008	0.000
7	0.005	0.004	0.041	0.008	0.038	0.003	0.034	0.014	0.042	0.016	0.003	0.017	0.022	0.019	0.039	0.001	0.004	0.011
8	0.032	0.008	0.015	0.009	0.016	0.021	0.011	0.009	0.019	0.017	0.006	0.038	0.029	0.007	0.028	0.019	0.015	0.031
9	-0.019	0.032	0.025	0.039	0.043	0.033	0.038	0.040	0.038	0.024	0.022	0.032	0.034	0.021	0.037	0.008	0.027	0.019
10	0.036	0.039	0.013	0.010	0.007	0.032	0.001	0.019	0.019	0.042	0.033	0.037	0.012	0.037	0.020	0.026	0.013	-0.017

Continued

Period	Response of Lesotho FER to:									Response of Lesotho SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.003	0.019	0.044	0.024	0.017	0.027	0.028	0.005	0.017	0.031	0.008	0.009	0.015	0.043	0.012	0.035	0.043	0.007
2	0.005	0.032	0.031	0.028	0.005	0.040	0.024	0.014	0.040	0.027	0.020	0.006	0.032	0.038	0.026	0.006	0.001	0.042
3	0.016	0.034	0.042	0.001	0.010	0.003	0.018	0.030	0.018	0.015	0.041	0.023	0.015	0.009	0.007	0.036	0.005	0.009
4	0.010	0.004	0.010	0.003	0.033	0.009	0.021	0.005	0.032	0.037	0.017	0.029	0.022	0.004	0.033	0.013	0.014	0.042
5	0.043	0.037	0.022	0.037	0.011	0.003	0.015	0.034	0.020	0.040	0.015	0.010	0.019	0.036	0.029	0.014	0.031	0.041
6	0.017	0.029	0.035	0.006	0.002	0.022	0.019	0.040	0.022	0.007	0.032	0.035	0.027	0.000	0.011	0.008	0.044	0.001
7	0.018	0.008	0.028	0.038	0.040	0.030	0.000	0.013	0.026	0.016	0.041	0.030	0.030	0.034	0.012	0.024	0.005	0.015
8	0.039	0.033	0.014	0.007	0.030	0.042	0.043	0.009	0.013	0.043	0.041	0.010	0.004	0.030	0.028	0.032	0.025	0.010
9	0.027	0.000	0.023	0.037	0.035	0.013	0.001	0.026	0.010	0.001	0.034	0.006	0.014	0.031	0.032	0.025	0.029	0.035
10	0.025	0.038	0.017	0.032	0.001	0.004	0.030	0.018	0.030	0.003	0.031	0.024	0.033	0.022	0.043	0.038	0.002	0.025

Continued

Period	Response of Malawi FER to:									Response of Malawi SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.019	0.019	0.000	0.019	0.011	0.043	0.035	0.002	0.013	0.019	0.030	0.034	0.029	0.015	0.016	0.016	0.014	0.044
2	0.038	0.020	0.035	0.037	0.044	0.026	-0.010	0.037	0.030	0.039	0.041	0.038	0.016	0.007	0.005	0.038	0.012	0.009
3	0.001	0.036	0.033	0.007	0.042	0.005	0.025	0.013	0.008	0.016	0.030	0.015	0.040	0.039	0.020	0.021	0.038	0.024
4	-0.040	0.021	0.017	0.005	0.009	0.036	0.034	0.007	0.043	0.007	0.002	0.033	0.000	0.015	0.040	0.028	0.021	0.019
5	0.005	0.014	0.011	0.028	0.040	0.029	0.030	0.043	0.033	0.012	0.026	0.010	0.028	0.018	0.035	0.016	0.003	-0.027
6	0.009	0.039	0.025	-0.007	0.009	0.041	0.025	0.017	0.043	0.032	0.018	0.042	0.039	0.002	0.019	0.008	0.013	0.031
7	0.038	0.016	0.016	0.044	0.031	0.030	0.002	0.043	0.025	0.033	0.029	0.042	0.007	0.022	0.025	0.031	0.041	0.026
8	0.032	0.006	0.015	0.007	0.008	0.030	0.043	0.042	0.016	0.006	0.036	0.038	0.009	0.038	0.032	0.029	0.001	0.006
9	0.036	-0.023	0.028	0.008	0.015	0.001	0.022	0.008	0.019	0.032	0.004	0.022	0.000	0.007	0.022	0.040	0.027	0.014
10	0.010	0.039	0.021	0.042	0.036	0.015	0.034	0.038	0.038	0.001	0.031	0.018	0.020	0.043	0.022	0.009	0.025	0.014

Continued

Period	Response of Mauritius to:									Response of Mauritius SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.009	0.013	0.005	0.015	0.010	0.015	0.025	0.026	0.033	0.004	0.034	0.014	0.014	0.027	0.040	0.011	0.000	-0.024
2	0.017	0.035	0.022	0.002	0.020	0.038	0.020	0.011	0.022	0.012	0.028	0.023	0.016	0.038	0.007	0.032	0.007	0.042
3	0.025	0.012	0.026	0.020	-0.025	0.004	0.028	0.011	0.003	0.044	0.028	0.010	0.010	0.012	0.002	0.043	0.021	0.019
4	0.038	0.029	0.032	0.030	0.017	0.011	0.006	0.034	0.002	0.011	0.017	0.041	0.004	0.004	0.029	0.039	0.028	0.036
5	0.022	0.038	0.000	0.039	0.027	0.044	0.017	0.041	0.006	0.019	0.040	0.018	0.006	0.001	0.001	0.039	0.035	0.036
6	0.044	0.020	0.006	0.025	0.030	0.041	0.016	0.030	0.020	0.028	0.025	0.036	0.033	0.004	0.037	0.026	0.001	0.041
7	0.013	0.012	0.023	0.035	0.032	0.022	0.015	0.002	0.043	0.018	0.033	0.013	0.027	0.008	0.013	0.033	0.023	0.018
8	0.010	0.023	0.004	0.004	0.038	0.017	0.004	0.036	0.026	0.036	0.038	0.009	0.005	0.038	0.016	0.021	0.039	0.035
9	0.035	0.017	0.005	0.012	0.011	0.024	0.028	0.043	0.038	0.042	0.017	0.035	0.001	0.035	0.029	0.037	0.018	0.021
10	0.003	0.027	0.003	0.042	0.008	0.034	0.032	0.010	0.002	-0.005	0.015	0.001	0.019	0.008	0.034	0.043	0.003	0.022

Continued

Period	Response of Mozambique FER to:									Response of Mozambique SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.007	0.018	-0.006	0.035	0.036	0.033	-0.021	0.016	0.010	0.009	0.034	0.013	0.017	0.040	0.006	0.002	0.037	-0.025
2	0.031	0.044	0.032	0.022	0.031	0.036	0.038	0.030	0.044	0.033	0.026	0.038	0.030	0.034	0.036	0.027	0.006	0.014
3	0.024	0.018	0.031	0.018	0.043	0.010	0.005	0.010	0.043	0.005	0.016	0.013	0.028	-0.004	0.030	0.036	0.020	0.032
4	0.019	0.013	0.020	0.028	0.006	0.033	0.042	0.035	0.024	0.026	0.005	0.021	0.006	0.018	0.042	0.021	0.011	0.021
5	0.002	0.040	0.029	0.036	0.016	0.014	0.041	0.044	0.009	0.041	0.005	0.010	0.036	0.004	0.019	0.034	0.009	0.024
6	0.039	0.017	0.028	0.040	0.029	0.028	0.001	0.018	0.005	0.015	0.025	0.007	0.019	0.033	0.009	0.015	0.029	0.043
7	0.035	0.010	0.016	0.025	0.032	0.028	0.017	0.018	0.033	0.006	0.015	0.024	0.039	0.004	0.012	0.036	0.001	0.031
8	0.005	0.020	0.040	0.029	0.001	0.001	0.020	0.014	0.012	0.039	0.035	0.019	0.022	0.035	0.043	0.036	0.037	0.032
9	0.016	0.042	0.042	0.038	0.027	0.024	-0.025	0.014	0.026	0.022	0.033	0.035	0.015	0.021	0.033	0.035	0.038	0.029
10	0.044	0.039	0.023	0.030	0.017	0.016	0.042	0.015	0.044	0.040	0.039	0.003	0.009	0.035	0.034	0.035	0.019	0.002

Continued

Period	Response of Namibia FER to:									Response of Namibia SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.028	0.033	0.002	0.031	0.005	0.003	0.035	0.038	0.002	0.016	0.029	0.044	0.028	0.043	0.026	0.039	0.018	0.032
2	0.038	0.037	0.024	0.001	0.007	0.004	0.018	0.043	0.005	0.036	0.001	0.043	0.020	0.000	0.009	0.017	0.020	0.043
3	0.042	0.019	0.036	0.021	0.012	0.021	0.019	0.008	0.013	0.011	0.037	0.006	0.032	0.001	0.018	0.011	0.016	0.027
4	0.004	0.030	0.019	0.025	0.028	0.014	0.031	0.039	0.039	0.011	0.007	0.016	0.022	0.044	0.013	0.020	0.005	0.029
5	0.019	0.018	0.004	0.014	0.019	0.029	0.024	0.042	0.027	0.043	0.019	0.017	0.022	0.008	0.024	0.040	0.002	0.042
6	0.016	0.001	0.043	0.022	0.005	0.005	0.014	0.003	0.034	0.034	0.043	0.032	0.001	0.018	0.030	0.036	0.007	0.014
7	0.018	0.039	0.036	0.002	0.023	0.043	0.017	0.029	0.011	0.004	0.035	0.002	0.002	0.001	0.037	0.017	0.019	0.025
8	0.007	0.024	0.021	0.042	0.025	0.021	0.003	0.023	0.009	0.007	0.002	0.002	0.029	0.021	0.011	0.022	0.015	0.016
9	0.034	0.022	0.007	0.018	0.038	0.025	0.006	0.024	0.017	0.002	0.003	0.036	0.003	0.015	0.036	0.043	0.018	0.017
10	0.020	0.020	0.030	0.007	0.025	0.020	0.011	0.013	0.018	0.008	0.010	0.031	0.033	0.022	0.013	0.043	0.023	0.033

Continued

Period	Response of Seychelles FER to:									Response of Seychelles SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.028	0.023	0.024	0.042	0.011	0.005	0.020	0.041	0.044	0.025	0.021	0.012	0.043	0.014	0.006	0.036	0.028	0.031
2	0.015	0.030	0.029	0.032	0.018	0.012	0.030	0.042	0.006	0.036	0.001	0.034	0.003	0.027	0.033	0.019	0.025	0.026
3	0.016	0.011	0.028	0.011	0.035	0.032	0.010	0.006	0.010	0.007	0.032	0.035	0.006	0.040	0.007	0.014	0.001	0.013
4	0.022	0.013	0.011	0.035	0.037	0.002	0.034	0.041	0.032	0.005	0.035	0.013	0.018	0.026	0.034	0.012	0.028	0.001
5	0.008	0.011	0.027	0.014	0.025	0.029	0.040	0.018	0.029	0.014	0.037	0.006	0.010	0.002	0.024	0.022	0.002	0.017
6	0.015	0.041	0.039	0.011	0.023	0.031	0.019	0.038	0.044	0.018	0.041	0.005	0.036	0.007	0.044	0.015	0.033	0.010
7	0.004	0.015	0.039	0.003	0.000	0.007	0.006	0.021	0.034	0.004	0.017	0.024	0.009	0.030	0.037	0.042	0.003	0.008
8	0.002	0.005	0.001	0.001	0.024	0.039	0.023	0.031	0.033	0.019	0.030	0.013	0.023	0.009	0.018	0.043	0.029	0.036
9	0.004	0.033	0.006	0.016	0.001	0.026	0.037	0.006	0.032	0.016	0.038	0.015	0.026	0.037	0.015	0.030	0.022	0.017
10	0.032	0.006	0.027	0.034	0.021	0.029	0.009	0.023	0.037	0.002	0.033	0.038	0.033	0.033	0.008	0.017	0.021	0.034

Continued

Period	Response of South Africa FER to:									Response of South Africa SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.030	0.014	0.004	0.013	0.038	0.020	0.016	0.004	0.032	0.032	-0.008	0.006	0.029	0.012	0.000	0.023	0.003	0.036
2	0.040	0.004	0.020	0.030	0.034	0.031	0.004	0.018	0.007	0.031	0.005	0.040	0.033	0.044	0.029	0.022	0.018	0.026
3	-0.035	0.021	0.009	0.016	0.044	0.038	0.013	0.013	0.021	0.009	0.025	0.044	0.001	0.030	0.018	0.039	0.011	0.012
4	0.020	0.035	0.029	0.026	0.017	0.004	0.010	0.019	0.001	0.011	0.001	0.035	0.023	0.014	0.030	0.042	0.001	0.044
5	0.014	0.035	0.027	0.044	0.036	0.020	-0.023	0.014	0.003	0.039	0.016	0.033	0.027	0.017	0.018	0.018	0.009	0.011
6	0.034	0.039	0.033	0.036	0.028	0.017	0.002	0.020	0.017	0.000	0.036	0.003	0.005	0.015	0.001	-0.013	0.039	0.043
7	0.003	0.001	0.038	0.009	0.002	0.004	0.027	0.026	0.013	0.027	0.032	0.022	0.000	0.004	0.017	0.019	0.001	0.016
8	0.042	0.035	0.024	0.008	0.004	0.002	0.022	0.029	0.013	0.043	0.025	0.041	0.016	0.016	0.039	0.041	0.036	0.021
9	0.008	0.014	0.004	0.025	0.026	0.012	0.008	0.035	0.020	0.008	0.024	0.011	0.026	0.040	0.042	0.009	0.015	0.006
10	0.038	0.008	0.009	0.030	0.018	0.029	0.021	0.034	0.013	0.000	0.031	0.044	0.017	0.043	0.023	0.011	0.033	0.005

Continued

Period	Response of Zambia FER to:									Response of Zambia SCR to:								
	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR	Botswana SCR	Lesotho SCR	Malawi SCR	Mauritius SCR	Mozambique SCR	Namibia SCR	Seychelles SCR	South Africa SCR	Zambia SCR
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	0.035	-0.017	0.028	0.036	0.005	0.006	0.006	0.008	0.025	0.020	0.006	0.013	0.006	0.020	0.026	0.007	0.014	0.006
2	0.009	0.033	0.023	0.044	0.035	0.025	0.036	0.022	0.033	0.018	0.020	0.015	0.004	0.017	0.035	0.026	0.007	0.042
3	0.005	-0.029	0.005	0.024	0.037	0.044	0.019	0.038	0.027	0.030	0.022	0.010	0.012	0.026	0.036	0.006	0.003	-0.008
4	0.018	0.020	0.019	0.022	0.025	0.027	0.006	0.032	0.001	0.030	0.006	0.012	0.001	0.010	0.043	0.029	0.032	0.028
5	0.026	0.019	0.019	0.038	0.015	0.039	0.020	0.014	0.018	0.044	0.000	0.033	0.009	0.004	0.013	0.025	0.009	0.026
6	0.010	0.042	-0.007	0.007	0.016	0.009	0.020	0.027	0.005	0.001	-0.030	0.034	0.024	0.028	0.026	0.014	0.039	0.027
7	0.035	0.013	0.009	0.033	0.017	0.019	0.027	0.002	0.026	0.003	0.002	0.028	0.019	0.040	0.022	0.011	0.011	0.039
8	0.038	0.003	0.013	0.013	0.015	0.038	0.008	0.019	0.024	0.019	0.035	0.014	0.016	0.012	0.015	0.032	0.019	0.008
9	0.020	0.029	0.034	0.000	0.036	0.011	0.042	0.033	0.032	0.014	0.001	0.001	0.044	0.027	0.032	0.032	0.024	0.038
10	-0.017	0.041	0.031	0.036	0.014	0.040	0.023	0.010	0.010	0.004	0.016	0.018	0.016	0.044	0.028	0.038	0.009	0.027