DETERMINANTS OF INVESTMENT ACTIVITIES: A COMPARATIVE ANALYSIS OF THE BRICS AND SOME SELECTED SADC COUNTRIES

by

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DECLARATION

I declare that "**DETERMINANTS OF INVESTMENT ACTIVITIES: A COMPARATIVE ANALYSIS OF THE BRICS AND SOME SELECTED SADC COUNTRIES**" is my own work, and all sources used and quoted are indicated and acknowledged by complete references, also this work has not been presented to other institutions before for any other degree.

…….. …….

Full names **Date**

DEDICATION

This dissertation is dedicated to Annah Mochinye Letsoalo and Harrison Theophilus Masedi, my loving mother and late father, for their unwavering support since I began University. Thank you for your love and patience for me, and for believing in me. God bless you. May your soul rest in complete peace to my late grandmother and dad.

ACKNOWLEDGEMENTS

The following bible verses have guided me throughout my life, and I would not be where I am today if it weren't for them;

“With God, all things are possible” Mark 10:27

“All things are possible if you believe” Mark 9:2

“As soon as I pray, you answer me, you encourage me by giving me strength” Psalm 138:3

First and foremost, I want to thank the Almighty God and my Ancestors for this opportunity, blessings and safety that they have bestowed upon me. I never cease to be surprised by the confidence I have in God. Thank you for your courage and strength to write this report to the Man above. Hope actually gives us confidence. Thanks sincerely to my supervisor, Prof. Thobeka Ncanywa, I thank you for the quality of your valuable guidance and commitment on this journey. I thank you for the competent supervision. Thank you very much, and may God continue to bless you. My family, particularly my mother Annah Mochinye Letsoalo and late father Harrison Theophilus Masedi, my two lovely sisters Kholofelo and Maggie Letsoalo, and last but not least, my nephews (Thabang and Tumelo Letsoalo) and nieces (Refilwe and Joyce Letsoalo), for their unwavering support. All thanks to the University of Limpopo for allowing me to pursue and conduct my Masters in Economics study. Finally, I'd like to express my gratitude to my friends for their motivation and support.

ABSTRACT

Investment as one of the main macroeconomic variables can ensure development of infrastructure and economic growth through increasing productivity and attracting investors. This study examined key determinants of investment activities by means of a comparative analysis between the SADC and BRICS groups during the period 2004-2019. The key variables were the real exchange rate, real interest rate and trade openness.

The analysis began by reporting unit roots tests, which paved way for employing Panel Autoregressive Distributive Lag (PARDL) methodology in the existence of different orders of integration. To estimate the long run relationship between the variables, we made use of the panel Johansen cointegration test, Pedroni test, Kao test and the Johansen Fisher cointegration test. Through the PARDL, the exchange rate and trade openness were found to be positive and statistically significant determinants of investment in SADC although statistically insignificant in the BRICS group. In addition, interest rates yielded insignificant results in the SADC region while, on the contrary, yielded a negative and statistically significant relationship in the BRICS group. The Granger causality test indicated a bi-directional causality in the exchange rate-investment and trade openness-investment nexus for the SADC group while there was no causality in the BRICS group.

It can be concluded that trade openness and exchange rate are key determinants of investment in the SADC region while interest rates are key in the BRICS group. It is therefore recommended that in order to attract investors and boost investment activities the SADC group need to focus more on exchange rate stability and trade openness while the BRICS group need to pay more attention to the flexibility of interest rates. This is beneficial on trading patterns, more for South Africa as it can be found in both groups.

KEY CONCEPTS: Investments, real exchange rate, trade openness, SADC, BRICS, Panel-ARDL

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GDP:	Gross Domestic Product
SEZ:	Special Economic Zone
SADC:	Southern African Development Community
BRICS:	Brazil, Russia, India, China & South Africa
OECD:	Organisation for Economic Co-operation and Development
FDI:	Foreign Direct Investment
IMF:	International Monetary Fund
USD:	United States of America Dollar
SARB:	South African Reserve Bank
ADF:	Augmented Dickey Fuller
PP:	Phillips Perron
IPS:	Im, Perasan & Shin
ARDL:	Autoregressive Distributive Lag
VAR:	Vector Autoregressive
AIC:	Akaike Information Criterion
FPE:	Final Prediction Error
SC:	Schwarz information Criterion
HQ:	Hannan-Quinn information criterion
VAT:	Value Added Tax
WTO:	World Trade Organisation
COMESA:	Common Market for Eastern and Southern Africa

SACU: Southern Africa Customs Union

CMA: Common Monetary Area

EU: European Union

CMA: Common Monetary Area

CHAPTER 1
ORIENTATION TO THE STUDY

1.1 Introduction and background

It has been debated nationally and internationally that investment activities can be beneficial to boost the countries' economy by accelerating growth and creating employment (Gilal, Ajmar & Farooq, 2019; Sibanda, Gonese & Mukarumbwa, 2018; Ncanywa & Makhenyane, 2016). When investing money or other resources in anticipation of future benefit, this act is referred to as investment. Investment activities involve investments in fixed income such as bonds, fixed deposits, preferential shares and business ownership of property (Acosta & Loza, 2005). Fixed investment calculated by gross fixed capital formation was adopted in this study (StatsSA, 2019).

According to StatsSA (2017), fixed investments can be seen from three main viewpoints, first during the global financial crisis of 2008/9, where it was gradually expanding. Second, despite being slower as a percentage of gross domestic product (GDP) growth, it remained above its long-term average of 18.3 per cent in South Africa from 1990-2016. Lastly, during the global financial crisis, the capital investment system by form of organisation, represented a marked shift in both economic activity and asset size. Hishongwa (2015) further claimed that, in terms of aggregate investments, growth reached 9.2 per cent per annum during the pre-crisis period from 2000 to 2008 but decelerated to a mere 0.6 per cent per annum following financial crisis.

South Africa is a trade partner with the countries of the Southern African Development Community (SADC) and BRICS (Brazil, Russia, India, China, and South Africa) among others. When comparing South Africa with its trading partners such as China, its fixed investment has been expanding steadily between 6.5 and 10% annually over the past few years (OECD, 2019).

The SADC is one of the richest regions in Africa and thus makes South Africa's participation the largest economy on the continent proving the basis for successful cooperation. The SADC's origins go back to the 1960's and 1970's because of the political, diplomatic and military conflict between the leaders of the major colonial countries and national independence movements to end apartheid. It is composed of 16 countries in Southern Africa with headquarters in Gaborone, Botswana. The

immediate predecessor of today's SADC's political and security cooperation leg grouping which remained a loose alliance of African countries aimed to terminate apartheid and white minority rule in South Africa and Rhodesia from the 1960s to the early 1990s (SADC, 2012). Such states depend on investment to help realise their long-term economic aims in order to grow the SADC economies. For this reason, SADC has developed policies and procedures that promote investments such as foreign direct investment that contributes directly to the project that creates employment in the area and that develops the infrastructure and industry required for economic growth.

The World Bank (2014) reports that the global economic crisis that began in 2008 significantly influenced SADC's investment in the region as they dropped by nearly 50% between 2009 and 2010. The market size, infrastructure efficiency, availability of natural resources and political stability of the member states are not equal in all. Consequently, some member states have more firmly held expenditure rates than others. Angola and South Africa have traditionally higher rates of investment, as indicated by the World Bank (2014), and in 2010 the Democratic Republic of Congo increased its net foreign direct investment influx to almost US$ 3 billion. Likewise, Seychelles significantly improved its revenue investment as a percentage of gross domestic product, reaching 40%. Identical associate countries that are lower average in terms of these main assessment measures stay still in a position to make stable investments in extractive trades as future foreign demand for mineral deposits outweighs any risks involved.

Investing in emerging markets is risky because it can either go reasonably well or go terribly wrong. BRICS countries are five major emerging national economies and they have bilateral relations which is conducted mainly based on non-interference, equality and mutual benefits. According to the World Bank (2019), all these five countries account for about 40% and an extra 25% of their GDP. Considering the important contribution that these countries make to the global economy, they can produce positive returns for investors. BRICS importance for foreign trade flows has increased dramatically over the last decade. The financial and pharmaceutical industries in these countries have usually been the highest beneficiaries of foreign investment, as they supplement the well-developed capacity of these sectors. Since 2015, investment inflows in the BRICS economies reduced by 6 percent that translate to US$ 256 billion

and has seen the group accounting for 9 per cent of the world's total foreign investment. In terms of foreign direct investment, China has been on top as compared to other BRICS counterparts with the country recording an aggregate of US$ 1724 million of the FDI inflows in the past 25 years followed by Brazil with US$ 785 million. Russia and India on the other hand have also seen an upsurge of inflows ranging US$ 452 and US$ 370 in aggregate flows respectively. Lastly, South Africa has been lagging behind as it recorded a mere US$ 77 million in the last 25 years (World Bank, 2017).

Fixed investment ratio to nominal GDP dropped for South Africa from a recent high of 23.5% in 2008 to 19.6% in 2016. A fall in the ratio occurred from about mid-2008 following the unwinding of boom conditions in global commodity prices. South Africa has experienced technical recession during two consecutive quarters in 2018 with real GDP recording a decline of 0.7% (StatsSA, 2018). It was the first recession in South Africa following the global financial crisis of 2008/9. In 2018, the top three main negative contributors to GDP growth were agriculture, transport and trade (StatsSA, 2018). The persistently low level of consumer and business trust in the domestic economy has also resulted in several main domestic private sector expansion projects being postponed, thereby reducing fixed investment by 0.5% in 2018 (StatsSA, 2018).

South Africa has a high potential for investment attractiveness as opposed to other African countries. While its output is relatively poor for attracting direct investment as a result of advances due to infrastructure projects, the country still leads in terms of FDI inflows and this can be attributed to the Special Economic Zone (SEZ) programs (StatsSA, 2018). According to the World Investment Report (2019), the Musina/Makhado SEZ offers a strategic role in which investment can be drawn along the key North-South road in SADC. It further indicates that that top investors in this region were Beijing Automotive Industry, BMW, Nissan and mainstream renewable energy.

1.2 Statement of the problem

Developing countries have underlying challenges of slow economic growth and high rates of unemployment among other ills such as high poverty level, inequality and inflation. It has been established that while investment activities can positively influence growth, it can simultaneously provide employment opportunities to the citizens (Ncanywa & Makhenyane, 2016). Increasing public and private sector investment in the economy is the centre of job creation and development which means that further economic growth needs to be demanded to improve investment in the country (National Treasury, 2014). Open economies have active investment activities and their global markets have affected investment activities in the country (Maepa, 2015).

It is worth pointing out that both the SADC and BRICS regions were less successful in attracting investment activity. According to Arvanitis (2006) there are various reasons that attribute to the dismissal of investment activities such as small size of domestic economies, property rights, political instability, corporate taxes, exchange rate stabilities, low interest rates, to name a few. Hence, it was imperative to have a study that provides a comparative analysis of what can stimulate investment activities in the SADC and BRICS countries, more particularly because South Africa is part of both groups.

1.3 Research aim and objectives

1.3.1 Aim of the study

The aim of the study is to conduct a comparative analysis of BRICS countries and some selected SADC countries during the period from 2004 to 2019, on the determinants of fixed investment activities measured by real exchange rates, real interest rates and trade openness.

1.3.2 Objectives of the study

The objectives of the study are as follows:

- To establish a short and long-term association between fixed investment and its determinants.
- To provide a comparative analysis of the determinants of fixed investment between the BRICS and SADC groups.

- To determine whether there is a causal relationship between investment and its determinants.

1.4 Research questions

- Does fixed investment have a short-term and a long-term relationship with its determinants?
- What is the causal relationship between fixed investment and its determinants?
- What are the comparisons between BRICS and SADC in terms of fixed investment and its determinants?

1.5 Definition of concepts

The focus in this study is on investment (gross fixed capital formation), exchange rate, real interest rate and trade openness. The definitions in respect of these variables of interest are discussed below:

- **Fixed investment measured by gross fixed capital formation**

It involves expenditure on fixed assets of the economy that have been added, plus remaining variations in inventories. Fixed assets take into account the acquisition of property (purchase of plants and equipment, creation of road infrastructures, railways and the like, including schools, workplaces, secluded houses and industrial profit-making structures). Inventory is the stock and work in progress of merchandises detained by corporations to encounter temporary or unexpected instabilities in creation or trades (World Bank, 2019). In the context of the study, gross fixed capital formation refers to investments made by both private and public sectors in SADC and BRICS.

- **Real effective exchange rate**

It is a partisan regular proportion of adjustment at which one nation exchanges currency for a basket of multiple foreign currencies. This is often referred to as a measure of the international competitiveness of a country as regards the foreign exchange market (Korkmaz, 2013). In the context of the study, exchange rate refers to the currency of South African Rand and currencies of its other trading partners in the world (BRICS and SADC).

- **Real interest rate**

Mohr & Fourie (2008) define interest rates as the prices of loanable funds, prices paid out to invested funds, lent out or even borrowed for various reasons for a certain period of time. It is conveyed as a portion of the funds invested where a contractor expects to earn an income.

- **Trade openness**

Trade openness is explained by the World Bank (2019) as the frequent measure used to assess the importance of domestic transactions for international transactions. It is further explained by Huchet-Bourdon (2011) as a quantity of commercial procedures that either restrict or encourage trade amongst nations. This means countries are granted admittance to also import or export as they choose. In the context of the study, trade openness refers to the sum of the country's exports and imports as a share of that country's GDP in %.

1.6 Ethical considerations

The study employed secondary data, which is an incorporation of quantitative statistical analysis obtained from reliable sources. The study was executed considering the plagiarism policy of the University in order to maintain and uphold academic standards. Furthermore, the study is conducted in accordance with the University of Limpopo rules and regulations. The information presented is handled with honesty and integrity and all sources utilised have been referenced.

1.7 Significance of the study

This study adds value and contributes to the growing literature on the determinants of investment as there are limited studies on the determinants of investment activities particularly for BRICS and the SADC regions. In order to ensure relevance of the study, it is supported by analysed data that is collected on the determinants of investments on the countries concerned. Furthermore, the study is relevant in South Africa as it has uncompetitive exchange rate and trade openness that disables it to seize investment opportunities (Ncanywa et al, 2016).

It is worth pointing out, and this is a problem among member states, that both the SADC and BRICS regions were very weak in attracting investment activity. In SADC, Malawi recorded a lowest investment rate of 14.9% of GDP till 2019. Consequently,

Namibia and Lesotho had an investment rate of 24% and 34.7% respectively. Mauritius has been consistent in its investments, however it fell since 2009 reaching an all-time low of 19% of GDP in 2014. Madagascar fell from the rate of 18.8% in 2010 to 14.9% of GDP in 2011. On the other hand South Africa account for less than the targeted 25% investment rate while Angola is leading in the whole region as its main investment go to the core oil field. The BRICS economies has India recording 36.5% of GDP in the period 2009-2010. Chinese investment fell from 20% of GDP in 2008 to 16% in 2016. Russia had a high average investment rate of 10.9% from 1999-2004 whereas during its strong period of 2006-2009 16.9% was recorded. Investments in fixed assets of Brazil accounted for 15.5% of GDP in 2019 slightly up from 15.2% in 2018.

According to Arvanitis (2006) there are various reasons that attribute to the dismissal of investment activities such as small size of domestic economies, property rights, political instability, corporate taxes, exchange rate stabilities, low interest rates, to name a few. Considering that substantial investment in these economies should be made in order to obtain real benefits through trade liberalisation in different countries (Adams, 2009). Hence, it was imperative to have a study that provides a comparative analysis of what can stimulate investment activities in the SADC and BRICS countries, more particularly that South Africa is part of both groups.

1.8 Structure of the dissertation

The dissertation is arranged as follows:

- Chapter 1 provided the orientation of the study.
- Chapter 2 reviews the trends in investment, trade openness, real exchange rate and real interest rates in the SADC and BRICS regions. It further examines the overview of the individual countries of these regions for the previous years and reforms that have been executed to enable a competitive investment environment.
- Chapter 3 reviews the theoretical framework and empirical literature review. The theoretical framework discusses the theories of financial development and growth while the empirical literature reviews findings of other authors in SADC, BRICS and the rest of the world.

- Chapter 4 presents the methodology of the study which is the panel Johansen cointegration and Panel Autoregressive Distributed Lag (PARDL).
- Chapter 5 discusses the research findings from the econometrics tests performed in the study.
- Chapter 6 presents the conclusion and policy recommendation of the study.

CHAPTER 2

TRENDS OF INVESTMENT ACTIVITIES IN SADC AND BRICS

2.1 Introduction

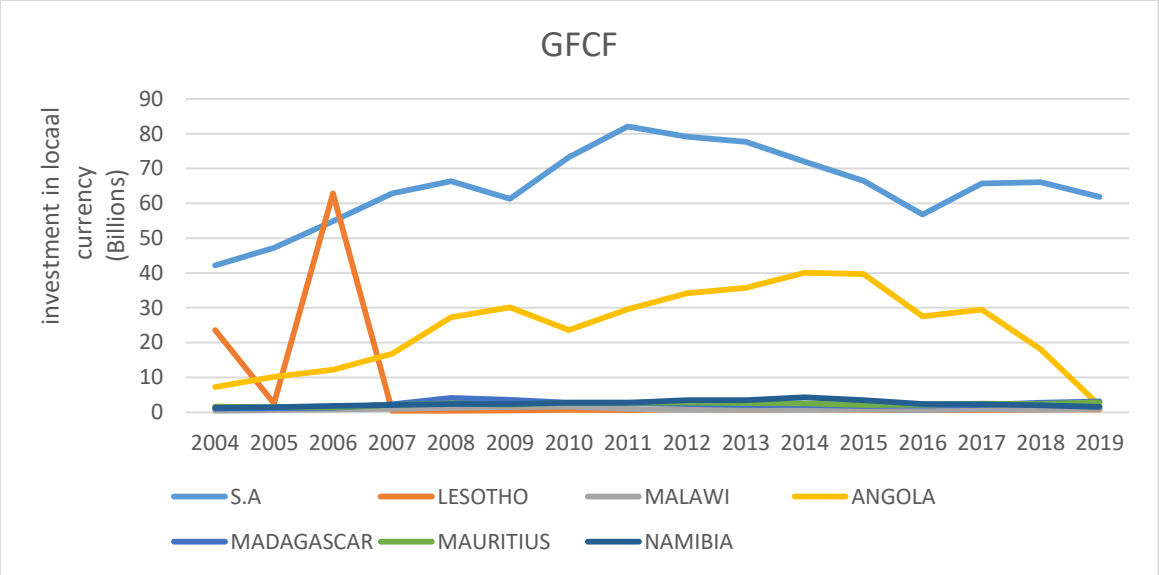
This chapter aims to explore the outcomes on the behaviour of the determinants of investment in the regions together with the trends thereof. Furthermore, it will report on how South Africa has been performing in both regions as it is the main trading partner. This is mainly because, despite it being the main trading partner, the South African economy continues to be in shambles led by low economic growth and low investment.

2.2 The analysis of investment trends in SADC

Investment will assist initiatives and programs intended to advance the mandate for regional integration and economic growth of the SADC. Both through direct investment and bond trading, investment promotes companies' profitable potential and allows them to succeed globally.

Investment has historically been poor due to political and security problems in the SADC region. However, in recent years such problems have been slowed down and thus attracted substantial investment by SADC policies to promote closer cooperation among member states. In most member states in the SADC region, direct investment continued to grow between 2004 and 2019. Though investment has declined dramatically in the midst of the global economic downturn in 2008, the fiscal incentives generated under the SADC advice still obtain funding for the region. Member states in particular Angola and South Africa, attract substantial investment from international countries with significant mineral industries. Further foreign direct investment is required to capitalise on the other markets and member states whose profitable capacity is not developed as the international economic environment is recovering.

Figure 2.1: Investment trends in SADC



Source: Author's compilation from World Bank Data 2004-2019

- South Africa

Investment activities in developed countries have a crucial role to play. South Africa under the apartheid regime has experienced slow investment and economic growth (Maphutha, 2018). There have been several changes in investment in the country and since 1994 there have been significant increases. More needs to be done to promote the investment climate in the country, as investment spending is below the 25% target (Bruggenman, 2009).

The low investment rate in South Africa was described as the main cause for under-optimized rates of growth. When programs are complete, the pace of funding infrastructure continues to taper. It has taken decades and made it impossible for investment plans to be carried out further (Lings, 2017). Institutional entities, including state companies, the private sector and the general government, make a significant contribution to the South African investment spending. The formation of gross fixed capital increased from the year 2000 to 2007 but has since declined. In spite of the financial recession from 2008 to 2009 public companies contributed more than ever since 2006 and were stable by the year 2017, although fluctuation appeared to be attributed to the world's erratic development (IDC, 2016).The government continues to cater for economic infrastructure and sustainable large-scale social infrastructure projects despite reductions in investment expenditures (schools, clinics, hospitals,

etc.). With some R92.1 billion invested in 2006, education expenditure in South Africa continued to increase, recognizing that South Africa holds the highest levels of education investments in the world.

- Angola

From the figure 2.1 above it is noted that between 2004 and 2008, the country enjoyed an upward trend in investment. Angola has been a leading SADC investment destination with an abundance of natural resources. As a result, the bulk of the investment go to the core oil field of the country. The nation has been placed in a good fiscal position with immense oil wealth. While this favourable economic situation provides the Angolan government with an excellent opportunity to make decisions on spending, Angola's existing transport and logistics system remains a major challenge (Lings, 2017). The petroleum industry accounts for nearly 98% of global wages, according to the World Bank.

- Malawi

Malawi has one of the lowest rates of investment in SADC with an average rate of 14.9 per cent of GDP between the period 2004 and 2017. Considerably lower from neighbouring countries which includes Namibia at 24.5 per cent and Lesotho at 34.7 per cent (IMF, 2018). This is mainly due to low private investment levels. In the past, macroeconomic instability undermined both public and private investment, which reduced the certainty for investors and boosted interest rates (Borhan and Ahmad, 2018).

- Madagascar

As a consequence of the global economic downturn and the political crisis that led to the Island being isolated from the diplomatic scene, investment inflows in Madagascar decreased dramatically. Total investment fell from 18.8% of GDP in 2010 to 14.9% of GDP in 2011 as a result of reduced development assistance and the completion of the construction and installation phases of large-scale mining projects. The nation earned USD 227 million of inflows in 2019, down from USD 353 million in 2018, according to the UNCTAD World Investment Report 2020. In 2019, the stock of gross fixed capital formation rose to USD 7.7 billion. The government has introduced many measures to change the market environment, in particular, to draw investors. There are three reforms, namely, company creation, building licenses and trans-boundary trade. Notwithstanding, there have been insufficient sustainable and high-quality

investments in specific economic zones. No statute bans or restricts foreign investment, however certain hurdles make it difficult for investment. Madagascar has great potential for nature, but weak and expensive service efficiency, low credit access and financial instruments, and poor land title concept are barriers to investment (Bilan and Ihnatov, 2015). Political instability and corruption blocked all government spending and forced many businessmen to flee. While the regulation treats multinational corporations for dubious taxations, labour or other purposes, they are also subjected to criminal investigation.

- Namibia

The Gross Fixed Capital Formation (GFCF) (% GDP) contributed 34.1 per cent and 24.3 per cent in 2015 and 2016, respectively. GFCF is an important indicator of the potential future development of a country at a given point in time as a percentage of GDP. In 2015, GFCF decreased by 25.3 per cent, after posting significant growth in 8.6 per cent in 2015 as a result of declines in almost all industries, and the largest decline in real terms was from ND$ 16.0 billion in 2015 to ND$ 7.8 billion in 2016, indicating a 51.4 per cent decrease (Constant, 2010).

- Lesotho

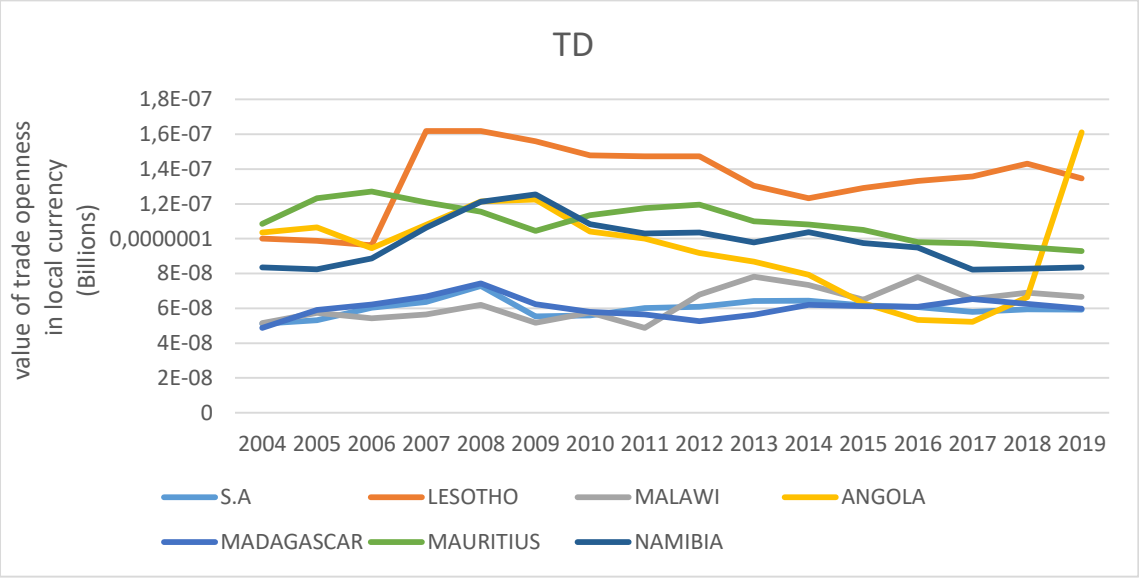
In 2018, Lesotho earned 9.044 million gross fixed capital formation. Lesotho's investment climate assessment is aimed at evaluating and supporting policies to improve the private sector in the Lesotho investment climate, in all its organizational aspects. High capital spending boosted short-term growth, especially in the construction sector. Many of the capital expenditure increase after 2005 was geared to recruiting new private sector investment; until now it is not clear whether such public investment was effective in attaining its objectives. While institutional deficiencies in project selection, management and execution could have contributed to the poor results, slow progress in additional reforms to improve the investment climate may have affected the productivity of public investment. The Government has, for example, spent a lot on maintaining and improving health care, but its use remains small due to a lack of additional factors—most important, physicians and medicines.

- Mauritius

As a percentage of GDP, Mauritius' GFCF has been consistent with trends in the global GFCF/GDP ratio. However, since the peak in 2009, the rate has been declining

and reached an all-time low of 19 per cent in 2014. In contrast to rapid-growth Asian economies, these investment rates are exceptionally poor. The ratio between GFCF and GDP illustrates how much added value has been invested and not consumed in total domestic output. This trend could severely reduce the competitiveness space. Over the years, FDI's participation in the GFCF has evolved to 22% by 2012. This peak was however accompanied by a major decrease in 2013, when FDI contributed 10 per cent in the GFCF.

Figure 2.2: Trade openness trends in SADC



Source: Authors compilation from World Bank Data 2004-2019

- Angola

The poor market climate in Angola often impedes industrial development, while an insufficient institutional structure hinders diversification of the economy. Angola is considered to have the lowest ranking in terms of the facilities for doing business in the SADC region. This ranking is attributed to a lack of contractual compliance, dysfunctional fiscal bureaucracy and concerns with the launch of a new company. Since the country is a SADC participant, regional trade should be growing, and it aims to become a significant provider to its landlocked neighbouring countries. This is of considerable significance for the country.

- Malawi

Taking account of the country's free exchange, Malawi imports from South Africa amount to 22 per cent of the country's GDP and fuel was the largest import in 2012

covering 13 per cent of all imports. The main imports representing 30 per cent of all SADC imports were Malawi imports of products worth $1.2 billion from SADC (42 per cent of the world) and petrol. Malawi exports to the SADC (19 per cent of the world) products worth US$0.2 billion and cereals are the main exports representing sixteen percent of all SADC exports (Ministry of trade and industry, 2012). Total imports in Malawi rose by 74 per cent in 2011 to an incredible $2.7 billion at end of 2012, while exports only increased by 31 per cent in 2011 to $1.3 million in USD (Ministry of trade and industry, 2011). The trade balance does not only seem to have weakened because input (which is inputs) is costly, but also because the nation imports are getting much more expensive at flexible exchange rates. A non-transparent and unpredictable market climate benefits firms with long-standing, policy-based networks in service of larger businesses. This is partially because of the lingering legacy of the strong state interference, which exacerbates obstacles to new companies' entrance into, and progress that can lead to export diversification and economic growth. Regulatory shortcomings benefit businesses with large networks that allow diverse risks to be mitigated. Greater initiatives would be required in order to simplify and make it easier to satisfy regulatory and licensing standards in particular. Regulatory mechanism in the industry must therefore facilitate a fair playing field and foster long-term investment.

- Madagascar

About 63 per cent of Madagascar's GDP is foreign trade, a country which collects large amounts of its income in the form of customs duty, importation duties and imported VAT. Madagascar is the world's 25th biggest exporting economy. The nation is also a member of the WTO, COMESA and SADC. Therefore, there are no big non-tariff obstacles. Moreover, most goods can be purchased without a certificate for imports. Vanilla (27.9%), raw nickel (13.4%), cobalt matt (7.2%), cloves and entire fruits (4.7%) and clothes were primarily exported throughout the United States at a tariff rate of 4.3 per cent. Its major imports include gasoline (15.2%), rice (6%), automobiles (4.2%), medical goods (2.3%) and palm oil (1.8%). Madagascar faces high shipping costs, much as other Island nations. The lack of well-developed infrastructure makes market activities costly and impedes competition of the private sector. The trade balance in the country has historically been negative and this tendency continues to drive space exports amid steady growth in exports. In 2018, the trade balance of Madagascar rose

once again to $458 million, up from $450 million in 2017 (World Bank, 2018). Rising imports of public investment capital goods have raised the trade deficit as vanilla prices have dropped. In 2018, exports of goods amounted to US dollars of about 3.05 billion (+7% as compared to 2017), while imports hit US dollars 4.03 billion (+10%). Service exports were USD 1.24 billion (+9%) and imports were USD 1.09 billion (+12 percent) relative to 2017 (World Trade Organisation, 2019).

- Namibia

Namibia also has close ties with its southern neighbour through strong trading links apart from monetary-policy links with South Africa. Almost 60% of its total goods were imported from South Africa by Namibia in 2016. At the same time, Namibia's dominant diamond export declined nearly 25% in 2016, in addition to a 19% decline in 2015. Diamonds accounted for only less than 30% of total exports, with second-class fish exports accounting for 16.5% of the country's total exports.

- Mauritius

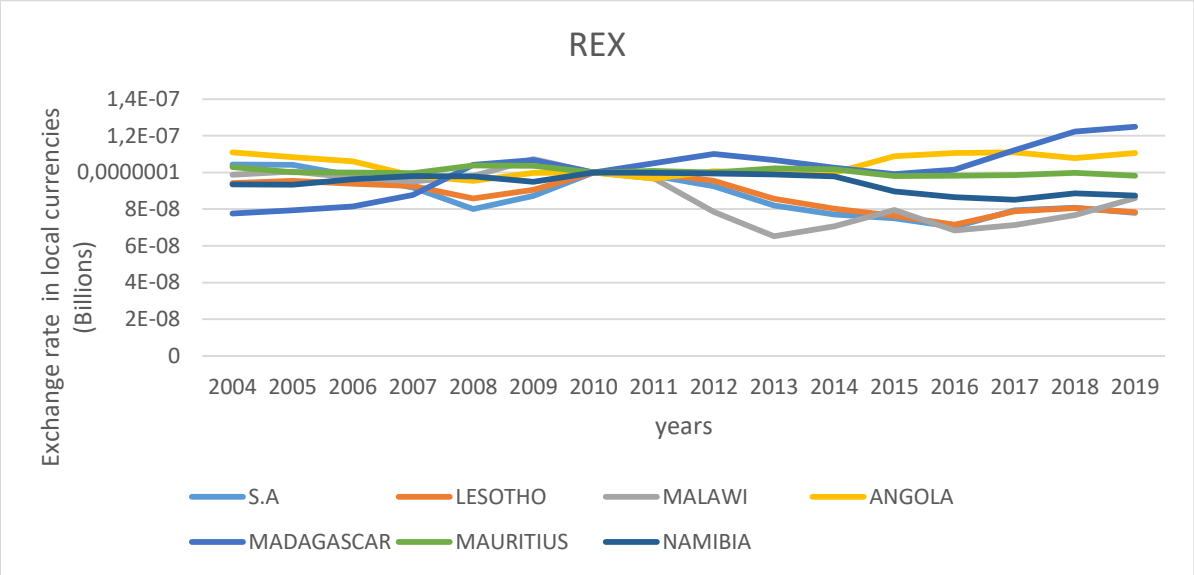
According to the International Finance Corporation Doing Business Report (2016), Mauritius is ranked 49th in the world. The Mauritian economy was driven by foreign trade. Trade openness remained high, and there was a rise in GDP per capita between 2004 and 2014. In 2006, trade opening stabilized at approximately 111% since 2011, after a GDP of 131.4% (114.5% in 2014). Mauritius' level of transparency seems to have faded and has even deteriorated in the last few years. Although that's normal with GDP rises above critical mass, Mauritius' marginal decline is starting to take into account its desire for export-led growth, increasing the issue of Mauritius' trade competitiveness.

- Lesotho

Lesotho is focused on its economic growth trajectory in South Africa. Since Lesotho is a member and its trade policies are aligned with those of the South African Customs Union (SACU). It also belongs to the Common Monetary Area (CMA), which affects and directs the monetary policy. The main trade partner for Lesotho is South Africa which provides almost 90% of all imported products. More than 50% of exports are for South Africa and the rest is for the United States (US) and the European Union (EU). In 2010, Lesotho ranked 137 out of 183 countries with regard to the ease of doing business, tumbling to 138 in 2011, according to the World Bank doing business

indicators. Between 2010 and 2011, Lesotho reported improvements in only two indicators, cross-border trade and closure of a business, while all other indicators decreased. On the starting measure, Lesotho decreased from the 140th place in 2010 to 134th place in 2011 in six places. Lesotho ranks 11th in relation to the 15 countries of the SADC. In terms of the global competitiveness index, Lesotho ranked 107th in 2009-2010 before falling to 128 in 2010-2011. Out of the 145 countries in 2011/2012, Lesotho stayed down to 135. Notably, Lesotho ranks 14 out of 15 SADC countries.

Figure 2.3: Real exchange rate trends in SADC



Source: Author's compilation from World Bank Data 2004-2019

- Namibia

The Namibian Dollar/South African Rand traded favourably between 2015 and 2016 with major currencies like the US dollar, the United Kingdom Pound and the Euro. The appreciation of the US dollar, the British pound and the euro by 5.7, 22.7 and 9.9 percent year-over-year, respectively, demonstrates that. The appreciation is due to basic effects and a moderate upsurge in the rate of commodities. In 2017, the Namibian dollar averaged the US Dollar, British Pound and Euro traded N$13.3, N$17.2 and N$15.1. Imports to Namibia (i.e. machinery, foodstuffs, etc.) are cheaper when appreciating the Namibia dollar, while Namibian exports are expensive (i.e. foodstuffs, mineral products, etc).

- Malawi

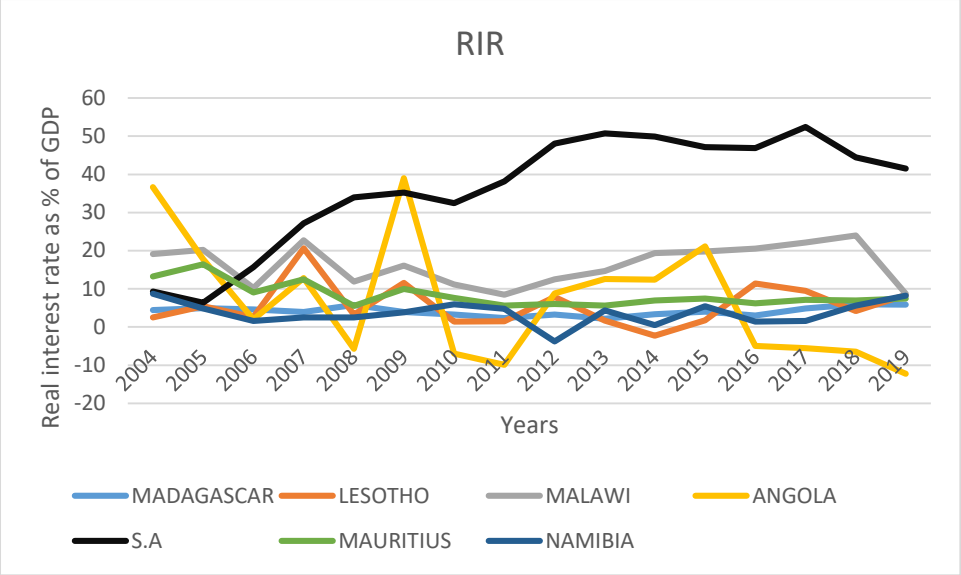
About 751 US dollars were exchanged in May 2019 by the Malawian Kwacha. This is a median depreciation over the same period in 2018 of roughly MK 731/US$. The Kwacha stood against the euro and the British Pound in contrast with other currencies.

- Lesotho

Lesotho is required to align monetary and monetary policies with those of the South African Reserve Bank by being a member of the common monetary area (CMA) (SARB). The loti is attached to the floating currency of South Africa that is also legal in Lesotho. The Lesotho Government has been able to maintain adequate levels of global reserves, normally an aggregate of 5-6 months of imports, to defend the loti/rand peg. The international reserves of the country have decreased to 4, 2 months since 2016, and in the next three years they are expected to fall further to below 3, 5 months. This decrease causes concern because loti and rand parity are in jeopardy in the medium term. Repo is used as its main monetary-policy instrument by the central bank of Lesotho (CBL), even though the rate is closely aligned with the Repo rate for South Africa in preventing volatile capital flows. However, the CBL introduced a banking rate in December 2015 that was intended to be a reference and an anchor to other domestic interest rates. The policy rate helps the Central Bank achieve its ultimate price stability objective. It supplements other monetary instruments, i.e. treasury loans and the reserve ratio required. However, the money supply, which is broadly defined, increased in 2017 and is expected to grow further in 2018, largely due to an expansion of private lending (Mehrara, 2013).

Figure 2.4: Real interest rates trends in SADC

In a number of emerging and developed countries, actual interest rates have been negative since the 2008/09 global financial crisis because nominal rates were near zero and inflation rates stayed positive and nearly constant, although at historic low levels (in most countries, at least on average).



Source: Author's compilation from World Bank Data 2004-2019

- South Africa

After the reserve bank declared its inflation targeting in 2002, a rise occurred as the rate was used as an inflationary instrument. Moreover, the rise was due to a monetary recession in those years which forced the SARB to lift the interest rate to balance the economy and the currency. For the first time in 2008, since inflation control was implemented in 2002, the interest rate was over 15%. The explanation is that in 2008, global financial crisis impacted many economies around the world and resulted in a decrease in spending in many countries in the developed world. The interest rate in South Africa has fluctuated between 7% and 10% from 2010 to 2015.

- Namibia

In 2016, the average repo rate in 2016 was 7.0% and in 2017, it fell to 6.75%. In order to promote domestic economic growth and keep the South African Rand one by one, the repo rate levels are considered appropriate. Likewise, in the third quarter 2017, the average primary lending rate of 10.75 in 2016 fell to 10.5%. Those developments stemming from the monetary policy declarations of the Bank of Namibia are a good boost to the much necessary economic growth.

- Lesotho

As of 2018, the value of the real interest rates in Lesotho stood at a value of 6.67% with a historic indication of the value reaching 22.97% in 1982 and a minimum value of -21.53% in 1980. From 1980 till 2019, the average value stood at 14.69% whereas in 2013 it stood at a minimum of 9.92%. Lesotho's current business environment has weakened, in part due to political difficulties in 2014 when the first coalition government of Lesotho collapsed, although elections in February 2015 were held early on and tensions continued to smoothly transition to a new coalition government. The Lesotho implementation of the national strategic development plan stalled and investment has slowed down in this environment. Some development partners have also diminished their financial support.

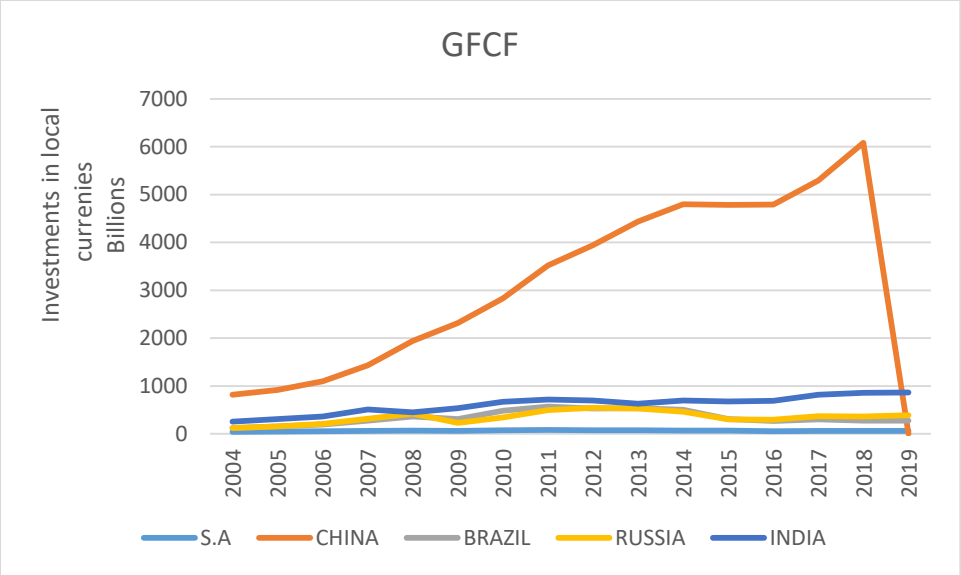
- Angola

The interest rate in Angola shows a growing trend over the years. But after the global financial crisis knocked out most countries in 2008 and 2009, Angola does not vary from the countries impacted by this global financial crisis as a developed world. It showed a substantial decrease and hit less than 5 percent in 2011.

2.3 The analysis of investment activities in BRICS

The five emerging markets of Brazil, Russia, India, China, and South Africa offer companies a wide range of opportunities to spread / integrate the region in their growing economies, increased revenues, and expanding population. Increased demand is critical to the growth of these economies. The advantages and disadvantages of these nations, however, are distinct.

Figure 2.5 Investment trends in BRICS



Source: author's compilation from World Bank 2004-2019

- South Africa

Figure 2.5 displays the quarterly estimates for South African investment activities. The only industry that led to investment activities during the financial crisis was public corporations; the private sector contracted from the third quarter of 2008. Investment hit undesirable mark in 2009, suggesting a low degree of consumer confidence and saw only negative growth in 2016. Public companies increased in 2014 as a result of the tough negative growth in 2013. Investment has been rising as shown, but at a sluggish pace. There was no positive flow after 2015 and 2016 reveals that there is only a slow rise in infrastructure investments. Private sector enterprises announced a sharp fall in real terms of around 2.6 per cent in 2016 after the year-on-year decline. The contribution of the private sector to investment spending is in stagnation, dipping by almost -5.8% in 2016, following a decrease of -4.3% in 2015. Lings (2017) suggests that capital formation rose by 1.2 per cent in the first three months of 2017, but there was a downturn stemming from the reshuffling of the cabinet and the downgrade of the credit rating.

In the South African economy, however slow, investment activities have played a range of roles (infrastructure improvement and replacement, educational needs), but they may hinder investment prospects for the immediate future. In order to increase investor interest and achieve the priority set, South Africa must achieve and maintain

its investment target of 25% for GDP (The Presidency, 2014). As investment decisions are affected by a diverse development of industry and the economy as a whole, investment activities are influenced by competitive environments in the region. More needs to be done to foster a robust investment environment in South Africa. The investment ratio continued to fluctuate more and fewer than the optimum 25% needed for investment activities by the government, businesses and individuals.

- Brazil

Brazil has reported USD 67,820bn in Dec 2020 for Gross Fixed Capital Formation. This is an increase over Sep 2020's previous figure of USD 56,930 billion. The figure of Gross Fixed Capital Training in Brazil is quarterly updated with an average of 59,199 USD bn between March 1995 and December 2020. In Sep 2011, the figure reached an all-time high of USD 144,940 billion, and in December 2002 a record low of USD 19,226 billion.

- Russia

The negative factor for Russia is a small demand for services from major investors like the government, the people and the private sector offered by building companies. Construction industry profitability has remained at a low level of 3.7 percent, but the average in Russia is 8.1 percent. Unless they prefer to fall prices in the industry, contractors do not have the option of changing the situation. Nevertheless, the number of operating construction companies increased by 207 percent during the period between 2000 and 2016.

- India

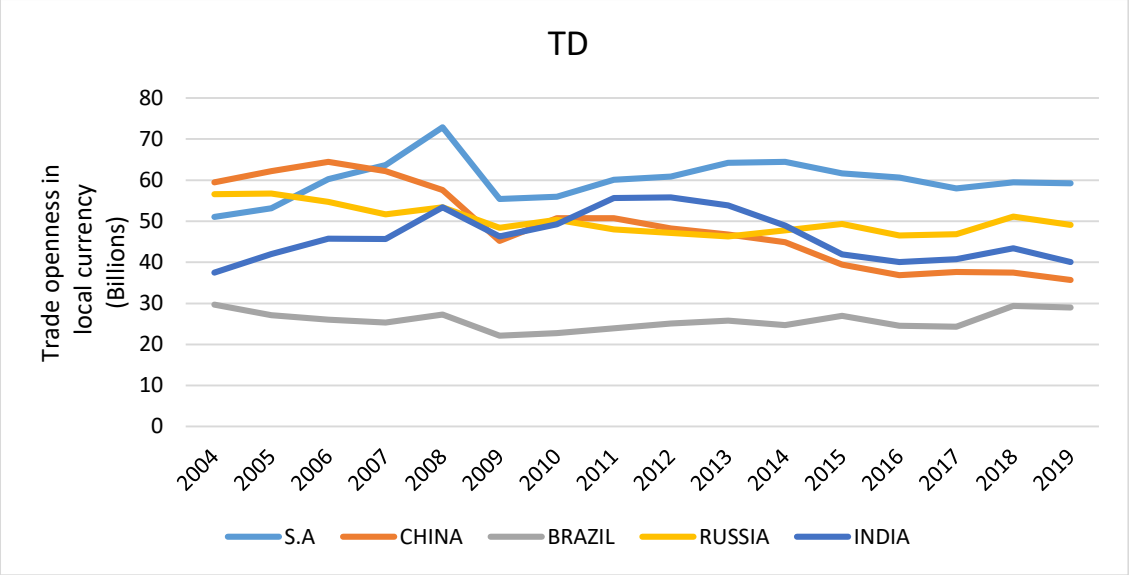
The importance of the formation of gross capital is that this part of GDP contributes to the growth of GDP itself. This is a must to achieve a high production rate, the formation of capital and changes in production techniques and the people's perspectives. In India, 36.5 per cent of GDP was the gross capital for the period 2009-10. In the public sector it was 9.2 percent and in the private sector it was 24.9 percent. The household sector investment was 11.7%. Company industry investment amounted to 13.2%.

- China

Equipment and construction trends in China have varied significantly. Equipment prices decreased annually between 2004 and 2016 by 1.1%, with building prices up by 2.7%. These major differences in price movements mean that a price index that uses the equipment and construction expenditure for base term shares gradually resembles an index based solely on the cost of expenses in construction. The extent of the price movement differences between the four capital formation sectors which are to reflect various shares of construction and equipment in each sector will therefore be underestimated. In addition, the value share in the overall fixed asset investment of different types of assets has remained stable over time. As a result, the fixed asset investment price index of the industries was calculated by assuming that the investments of the different types of assets were consistent by sector. There has been a shift from business investment to housing and infrastructure investments. This has been driven by a number of influences. The investment rate in the business sector is critically influenced by the economy's expected growth. A decrease in the expected economic growth rate will lead to the decrease of investment for the business sector until a level reaches that again makes capital inventory growth consistent with the lower forecast economic growth. In fact, from around 9.6 percent to about 6.7 percent, economic growth slowed from 2008 to 2016. With growth declining, companies reduced their anticipated capital requirement, and this led to a sharp drop in the amount of investment in business sector from an estimated 20% of GDP in 2008 to 16% in 2016.

Figure 2.6: Trade openness trends in BRICS

Over the course of the economic reform era, China has a relatively high investment to output ratio that surpassed almost any other economic, developed or developing nations. In fact, the high investment rate is a significant proximate driver of China’s high growth rate.



Source: Author's compilation from World Bank Data 2004-2019

- South Africa

The overall South African trade with its BRICS counterparts rose from USD 3.1 billion in 2001 to USD 28.9 billion in 2016 from the highest level of 39 billion dollars in 2013. Although the number of exports from South Africa to these trading partners has declined briefly since 2013, recent trade figures show an increase again, especially in connection with export of raw materials, produced goods and chemicals to China. Their global imports were 25.2% higher than the previous year in January 2017 and commodity prices recovered, which led to the rise in mining output.

- Brazil

Brazil constantly records trade surpluses mostly due to the strong export of mining and agriculture goods, from the beginning of 2000 to 2012 and between 2015 and 2017. South Africa posted the highest trade surpluses in 2018. In November 2020, trade surplus in Brazil increased to USD 3.73 billion, relative to the market estimate of USD 4.79 billion. Exports dropped by 1.2% to USD 17.53 billion from 2019 while imports plummeted quicker by 2.6% to USD 13.79 billion during the same period.

- China

With China opening up to the world and particularly after its WTO entry in 2001, benefit prospects generated additional investment demand by expanding exports. High export gains could be accomplished, partly by imbalances created by trade barriers and partly by Chinese currency undervalued. Exports may, however, surpass their role; domestic

added value is only about half the export value. As a result, in 2007 export added value accounted for about 18% of GDP. Potential investors ought to believe that their contributions will be properly compensated. Trust in the protection of their property and their business arrangement could be important. Such trust may be gained either through the formal legal framework or through informal alternatives.

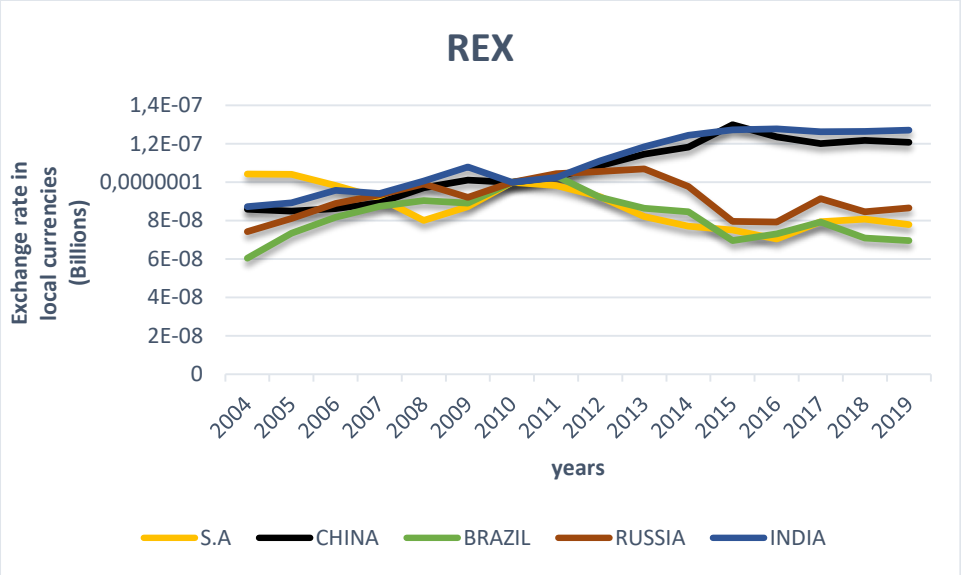
- India

India experienced a slow growth rate, particularly after 2008-2009 due to the global financial crisis. Investing by international institutional investors and non-resident Indians in terms of foreign direct investment has been limited due to a financial crisis. The trade output in India has been significantly impaired by the downturn in exports and rising imports, which have resulted in a growing current account deficit and low investment rates.

- Russia

Russia's external trade exposure can be measured by a trade open-ended indicator, usually expressed in terms of purchasing power parity, which refers to the ratio between total exports and imports in the GDP. The values of this ratio are generally influenced by several endogenous factors, especially the territory and economy dimension and the gap between each country's major or dynamic markets and the changes in its economic growth and trade shocks. Russia's broad regional differences are, moreover, structurally similar to landlocked regions, while others show greater commercial openness as a result of their considerable natural resource exportable. In addition, Russia's broad regional disparities are structurally similar to landlocked countries in some areas while others are more open to trade because of their significant natural exportable resources or their proximity to foreign markets. Overall, the trading turnover/GDP ratio of Russia remains lower than that of the OECD or transitional economies. Russia has increased openness in recent years, but at a slower pace than in other transition countries and China in particular. Russia still has a modest current share in world trade: in 2003 it ranked 17th among the world's leading exporting companies, representing 1.8% of global exports. Russia's exports were 45.14 million dollars in 2004, 8.4 per cent in 2004, 61.8 million dollars in total and 1.5 per cent in total exports by 2013.

Figure 2.7: Real exchange rate trends in BRICS



Source: Author's compilation from World Bank Data 2004-2019

- Russia

Russian economy was no immortal to the impact of the world financial crisis which had a negative impact on many economies. The mild rouble exchange rate depreciation strategy came to an end in March 2009, with the currency band hitting RUR 38-41 in a USD/EUR basket, compared to RUR 29-30 in a 2008 basket. The Russian Federation's monetary authority floated the band in early 2010, and it reached RUR 33.7-36.7 per basket in April 2010 due to world prices of Russian main export commodity items.

- China

The lower RMB exchange rates are thought to have stimulated China's growth but harmed the economies of its trading partners. Renminbi (RMB) has indeed since 1994 been appreciated by nearly 38% but still does not meet the expectations of trading partners. The slow pace of RMB appreciation was criticized by the international community. The exchange rate of the RMB appears to have played an important role in boosting the Chinese economy, and so trade partners are pressing Chinese governments more and more to appreciate the currency and make the exchange rates in China more flexible and tradable.

- India

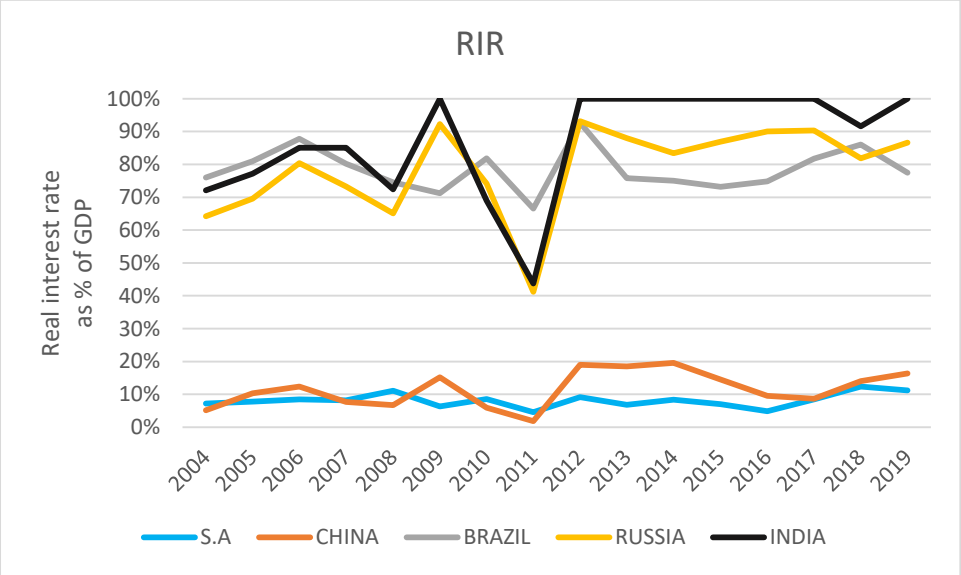
After deregulation, the exchange rate of rupee was mostly managed by the floating regime that from time to time intervened in the stabilization of the nominal Exchange Rate by the Reserve Bank of India (RBI). Clearly, despite an appreciation of around 1.4% in the real effective exchange rate of India over the 2000-2010 period, exports grew highly (with the exception of the post-crisis period of 2009 when there was a sharp depreciation). While exchange rate appreciation of Indian export expenditures rose rapidly after 2000, it does not necessarily imply a decline in exchange rate appreciation. Without exchange rate appreciation, the export growth rate could have risen.

- Brazil

When the global financial crisis of 2008 struck, Brazil's resilience was demonstrated. The country was affected by the rapid drop in commodity prices and the financial market strain. Brazil has been able to implement countercyclical measures for the first time in its history during the global financial crisis. Brazil had sufficient buffers to weather the storm by rising government expenditure and interest rate reduction rather than needing to impose stricter fiscal and monetary policies, which had previously been needed to maintain trust. After the completion of the real bond to the US dollar in 1998, Brazil had a managed floating exchange rate system. Due to the extremely loose western currency policies and high oil prices, exchange rate pressures have risen sharply in the last few years. The government worked hard to safeguard the attractiveness of native producers to reduce the appreciation of the reality and therefore make the real currency a profoundly accomplished one. It used not only exchange-rate interventions, it also imposed several capital controls, for instance portfolio fees, to limit capital inflows. It also imposed a number of capital controls. These restrictions have recently been removed because the government has become worried about the sharp depreciation after a curbing monetary stimulus by the US Federal Reserve has begun to anticipate the financial markets. The central bank has established stock in abundance of foreign reserves in the last decade. This stock was USD 367 billion in August 2013 and equals approximately import for 14 months and nearly all Brazil's external liability. The central bank nowadays arbitrates primarily with swaps in monetary markets.

Figure 2.8: Real interest rate trends in BRICS

After the early 1980s, real interest rates have decreased and in most developing countries during the global financial crisis have turned negative suggesting low investment rates in the economy. As the amount of investment remains poor, even economic growth remains low as investors struggle to attain decent investment returns.



Source: Author's compilation from World Bank Data 2004-2019

- China

China's real interest rate in 2019 was 2.73 per cent. While the real interest rate in China has fluctuated significantly in recent years, it has continued to decline from 2000 to 2019, ending at 2.73 per cent in 2019.

- Brazil

Real interest rates in Brazil were previously high but decreased for many years. In 2012, after the central bank's main policy rate of SELIC had been cut by 525 basis points within one year, the policy interest rate reached a historically low. The new tightening cycle started in April 2013 and the central bank seems determined to regain its credibility, which had been slightly weakened by its previous unparalleled policy easing. Also, in recent years, as complementary tools of monetary policy, the central bank has increasingly used macro-cautionary rules. In reality, that means the central bank is trying by raising or decreasing capital and reserves to influence credit growth.

In practice this led the Central Bank not to influence credit growth through monetary policy, which could make it harder to manage the currency rate, by raising or lower the criteria for bank capital and reserves.

- India

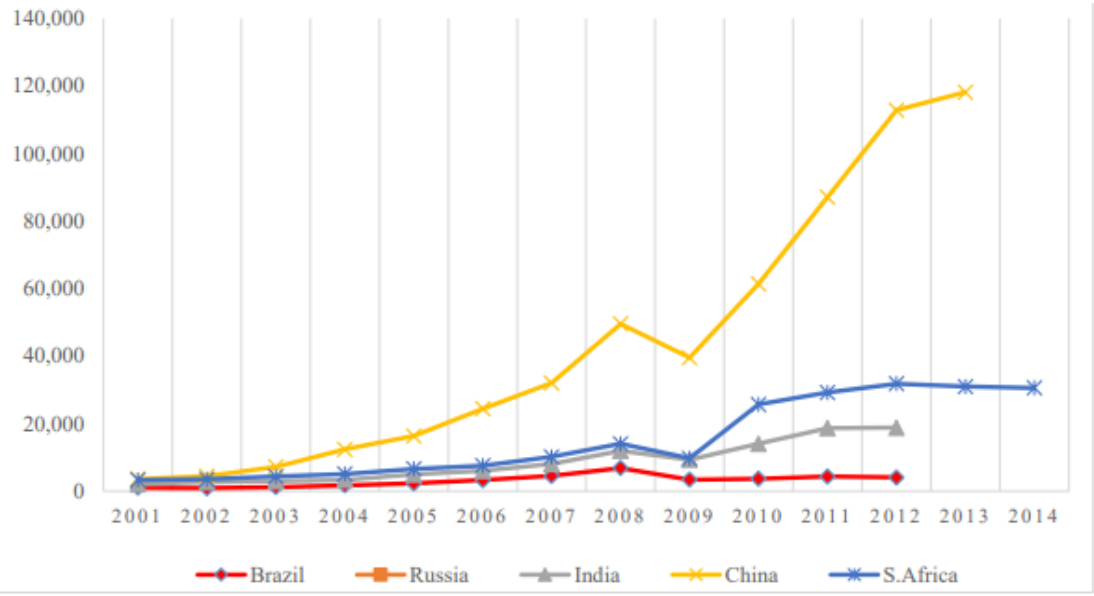
Negative real interest rates were found in about half of the observations between 2008 and 2011, and real rates were less than 1% in about 82 percent of the observations. According to reports, the financial crisis was the most repressive in terms of actual interest rate levels, and this coincided with the Great Recession.

- Russia

The real Russian Federation interest rate in 2019 was 4.79%. While the actual interest rate of the Russian Federation has been fluctuating significantly in recent years, it was growing to 4.79% by 2000 – 2019 in 2019.

2.4 BRICS total investment and trade with SADC (US$ millions)

Figure 2.9: BRICS total investment with SADC



Source: UNCTAD Database (2015)

As stated in this chapter, the SADC region is the largest trading partner in Africa for BRICS. BRICS region has enjoyed positive commercial growth in Africa on average and, moreover, in SADC, despite the global economic downturn.

- China

As illustrated above by the trend line, China is the leading or most successful BRICS trade nation in SADC. For the past fourteen years, bilateral trade between China and Africa has increased exponentially. It was worth 10.6 billion dollars in 2000 and reached 201.1 billion dollars in 2014. China has evolved and is distinctly diverse in trade with SADC, except for South Africa, than other BRICS members. While Chinese exports to the region are relatively well distributed with only one single product at low concentration, the region's imports are highly concentrated at 82% of the top 5 imports and 96% in the top 20. In reality, in Africa, SADC is China's largest block partner. In 2013, approximately US$ 89 million of the total imports from Africa came from Africa. Instead, SADC accounted for just 32% of exports from the state to Africa.

- South Africa

South Africa, second only to China, is also an important player in the trade in the SADC region. Gumede (2014) stressed that South Africa's prominence as the second largest trading partner is a remarkable achievement, especially considering the state's smallest economy, by far, in all the BRICS countries. South Africa also plays a major role in this study since both SADC and BRICS members are members of the country. South Africa has also been a part of BRICS with an increasing interest in Africa's development goals, which diverge from African states' normal position as policy participants and recipients. The state's membership of the BRICS, the G20, and other multilateral organisations – including those on the African continent – is a sign of Africa's increasingly important position in the world community and of the global South's cooperation for sustainable growth by means of better values for its development – not the neoliberal rule. The importance of the bloc is due to the supremacy of the continent's economy in South Africa and Angola. South Africa (31%), a member of the BRICS and one of Africa's largest economies and Angola were among China's main trading partners (17 percent).

- Brazil

Since 2000 Brazil has gradually increased its commitment to the African continent too. Increasingly integrative Brazil's foreign policy – an attempt to be recognized as a global force – has brought about an intensification of collaborative participation in trade,

investment and growth (Kirton, 2015). Between 2000 and 2012, trading between Brazil and Africa increased to US$ 27.6 billion from US$ 4.2 billion, with natural resources dominated by crude oil in particular. Arkhangelskaya and Shubin (2013) say that the motive for this is mainly because the state refineries are more suited to African "high grade" oil, which will change when the government constructs refineries more suitable for its "medium grade" oil. In the SADC area trade has increased exponentially since 2001, in particular in minerals (because of Angola) and farm products. This rise was seen in at least one quarter of trade growth last year, with Angola and South Africa among the top export destinations in Brazil. In 2012, the SADC accounted for some 15.6% of total Brazil's trade; Angola, with trading of about US$ 1.2 billion, was the fourth largest recipient of Brazilian exports and the fourth biggest trading partners.

- India

Indeed, India has expanded its activity on the continent of Africa in recent years, from 6.4% to 10.1% between 2001 and 2013, from 597% and by 2014 11% of exports and 9% of imports are made up of the continent. The trade between India and Africa is also highly concentrated with the five most important imports (85 percent) and the 20 most important (96 percent) from the country. These quantities are primarily attributed to mineral products (74% of the total), emphasizing the massive role played in the continent by oil and related key commodities in trade. The SADC block trade plays an important part in the engagement, including China, South Africa and Brazil. SADC is India's second largest commercial partner. In 2012, South Africa and Angola accounted for 19.41% and 11.14% of their top trading partners.

- Russia

Prior to 2001, Russia was somewhat haphazard in its relationship with Africa. In the beginning, the state (including Angola, Mozambique and Zimbabwe) as an aspect of its cold war policy was a key partner in many African state struggles for liberation against colonial domination. In contrast to its BRICS allies, Russia's trade engagement in the SADC fades. In 2012, for instance, Africa accounted for just two percent of the overall trade in Russia. Russia's investment and cooperation with Africa has been very lazy, although slightly better than in commercial terms, relative to the other BRICS countries. The cooperation of Russia lies in the fields of oil, infrastructure, telecommunications, fisheries, education, health, tourism and military assistance.

2.5 Conclusion

This chapter has shown that exchange rate, interest rates and trade openness as determinants of investment have been underperforming in all the regions. The trends of all the variables in these regions are fluctuating and can seemingly be concluded that all these variables have effect on each other. Furthermore, it is noted from the trends and supported by different authors such as Maphutha (2019) and Lamhmiri (2017) that the movement of interest rates in these regions have an effect on investors. According to International Monetary Fund (2018), the exchange rate is also considered to be an important factor in determining growth and the amount of investment that will enter the economy. Finally, trade liberalization in these regions has a huge influence on the nation's trade growth and development; as a result, the country can export and import goods and services with other economies.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

This chapter reviews the research into the different determinants of SADC and BRICS investment. These determinants are essential in order to attract investments while maintaining economic growth in the SADC and BRICS regions. The chapter begins with an analysis of the theoretical context and examines the different literatures on investment determinants.

3.2 Theoretical literature

It has been debated by different authors that investment plays a very crucial role for the long-term competitiveness of the economies worldwide. Romer (1996), Dornbusch & Fischer (1990) have stressed out that multinationals and governments of different nations should find the same method to investment to ensure affluence accumulation in the long run. Different investment theories are used globally to describe the conduct of companies and governments. At least some investment theories can be distinguished, such as the Keynes model, growth model, accelerator theory, neoclassical theory, and Q theory. Some of the models discussed in the study, according to Samuel (1996), are beneficial when bearing in mind various options (such as cash flows and capital stocks) in influencing investment choices. All five hypotheses presume that the decision maker acts in an optimum manner (investor). In the following pages, the patterns are briefly discussed, and each theory has its own specific understanding of the investment series.

3.2.1 Keynes model of investment

The Keynes theory (1936) stressed that the key factors deciding and stimulating business investment are efficient demand and financial conditions when tax cuts are implemented. As Ali et al (2012) pointed out, it is argued that since Adam Smith and Karl Marx's time, investment has been assumed to be equally the instrument of the economy as well as the main root of trade and industry environments. Keynes concluded that new and increased investment would boost overall economic demand (Tobin, 1965). Once remaining corporations create new investments or new native investor come into the market, an increase in domestic investment occurs (Meyer &

Sanuisi, 2019). There are three determinants of business investment as expense, return and expectations according to the classical theory. Keynes further argues that investment decision-making is made by comparing the marginal benefit or return on capital with the real rate. The theory equate marginal rate of investment with interest rate (Ralarala & Ncanywa, 2020). The decision to invest is determined by the conducive environment where the decision to invest is to be made and ensure long run survival of the investment.

In terms of theory, gross fixed capital formation (investment) has been recognised as an integral component of commercial development and job facilitation (Becker et al, 2012). Linking investment with trade, the old and modern theories of trade and development explain why countries trade. Neoclassical theories of trade include competitive advantage and theories of Hecksher-Ohlin Samuelson to try to justify the basis for trade. There is no clear linkage among trade and the trade of economic growth in economic development simulations. Meyer and Sanusi (2019) stressed that an episode of trade liberalisation had growth effects in initial growth models, such as the Harrod-Domar in which capital is the exclusive productive dynamic.

3.2.2 Harrod-Domar growth model

This theory relates the rate of growth in an economy to its capital stock. Due to this theory, increasing the level of investment in terms of fixed capital is the essential measure required to achieve a continuous economic development. The theory presumed investment would be an important factor for achieving and maintaining economic growth. Expanded investment is achieved through incentives for savings. In this context, the target growth rate of Harrod-Domar model is centred on the country's savings, capital/output ratio and depreciation of capital (Goodman, 2014). The model believes that in order for a country to realise growth, their economies must be able to save and invest a fraction of their GDP in capital formation. The role of investment as a core component of development in developing economies is further emphasized. Mathematically, the model displays that growth is linked to savings and to the capital production ratio indirectly. The following simple economic growth model can be constructed, if we express domestic income as Y, growth as G, the capital production ratio as K, the save as S and investment as I, average saving ratio as s and incremental capital output as k ;

S=sY (3.1)

Savings (S) proportion of (s) of national income (Y)

I=Δk (3.2)

Net investment (I) defined a change in capital stock (K)

G=ΔY (3.3)

ΔY is a change in national income, divided by national income amounts, represents the development. However, since k's total inventory is directly linked in the k capital/production ratio to the total national revenues or y output, it follows:

$K\frac{k}{y}$ (3.4)

or

$K = \frac{\Delta K}{\Delta Y}$

Or finally

ΔK=KΔY

Finally, because S should be equal to the total national saving, equality should be laid down as:

S=I (3.5)

But the equations 3.1 above S=sY and (2) and (3):

I=ΔK=$k\Delta$Y

The identity of saving the equivalent investment demonstrated by Equation (6) therefore follows that it can be written as:

S=sY=kΔY=Δk=I (3.6)

sY=$k\Delta$Y (3.7)

ΔY=G=sYK (3.8)

Equation 3.8 which in the theory of economic development, is a condensed version of the popular Harrod-Domar equation, means that the rate of GDP growth (ΔY/Y) is jointly determined by the national saving ratio s, and the national capital/output ratio, k. More precisely, it notes that the growth rate of national income would positively contribute to the saving ratio with the absence of government (i.e., the more a given GDP can be saved and spent by an economy, the greater the GDP growth). An opposite or negative relationship to the capital or production ratio of the economy (i.e. the higher the risk k is the lower the GDP growth rate would be).

The rationale behind equation 3.8 is that they can save and spend a certain share of their GDP so that economies can expand. This is because the more countries save and spend, the more they are likely to expand and the degree of growth depends on how efficient the investment is. That is to say in order to realise this growth countries should be open to trade with one another profitably hence the study incorporated trade openness as one of the determinants for investment activity.

3.2.3 Neo-classical model

As it implies benefit or utility maximisation, the neo-classical model is also well established as the user-cost model. The hypothesis is that businesses optimise returns under the Cobb-Douglass processing technology (Maphutha, 2018). In order to yield an optimum capital stock, Eklund (2013) further notes that profits are maximised in each cycle. Assuming that it is possible to write the output feature as a traditional Cobb-Douglass function as:

$$Y(t)=f(K(t),L(t))=AK^{\alpha}L^{1-\alpha} \quad (3.9)$$

From equation 3.9 above, Y (t) is the output of the firm, capital is denoted by K and lastly L represent labour in all period. This follows Fisher's (1930) investment discovery that is an efficient change path to optimal inventory. Jorgenson's (1963) formalised the theories of Fisher's neoclassical investment theory (Maphutha, 2018). Eklund (2013) argued that the paradigm of neoclassical theory suffers from a variety of limiting assumptions such as the fixed capital, unitary elasticity of capital and labour replacement, the exogenous price of production, the reversible expenditure and the malleable capital stock. Again, the model assumes that there is a perfect stock market, which ensures that the company will borrow or lend at a certain interest rate. These

assumptions continued to limit the adaptation of the neoclassical paradigm to developed countries (Twine et al, 2015).

3.2.4 Heckscher-Ohlin theory

The theory of Heckscher-Ohlin is based on how countries can gain comparative advantage when trading with other nations by utilising the scarce resources in the home country to gain trade advantage. The theory is grounded on a country's factor of production such as labour, capital and land which will then lead to availability of capitals for investment in plants and equipment. This theory was based on factor proportions and calculated the cost of the resource as a function of supply and demand. Factors that were in high supply compared to production are claimed to be cheaper and factors that were in high demand relative to supply will be more costly. The hypothesis also claimed that countries would manufacture and export product that required capital or factors of high supply and thus cheaper development factors.

3.2.5 Tobin's Q-theory

The Tobin's Q theory was aimed at applying the neoclassical model as it applies investing operations to the company's business value as calculated by the value of an extra unit of capital. In other words, the q-model is a revamped variant of the neoclassical model. To define the optimum level of capital stocks, the formula uses the shadow price of capital services, defined as the cost of capital and this means a high degree of perfection in the capital markets. For example, as companies optimise profits from current expenses, the capital stock can adjust accordingly until no profits are made. Capital gains in investment inflows and declines are calculated by depreciation (Ngifenwa, 2009; Tobin, 1969).

While this theory specifically ties funding to the goals of the companies, there has been some scepticism of the model on a variety of grounds. For example, there is a great deal of simplification of assumptions, such as reasonable expectations and competitive markets, and the probability of producing separate investment actions from the specifications of the alternative goal and the output mechanism of the business (Twine et al., 2015). Investment increases as the marginal q reaches one and reduce as it is below one (Ferderer, 1993). Investment hypothesis explained differ as they vary in the investment results used. This implies that it relies on the state of

investment. It can be expected that both can apply to the analysis as it is all about the growth of investment taking into account investment decisions and production.

3.3 Empirical literature

This section provides empirical evidence on the determinants of investment activities found in literature. Throughout the collection of empirical studies, the study has observed that rarely research has been undertaken on determinants of investment activities in the countries of SADC and BRICS. Furthermore, it has been observed that not all the determinants mentioned are in a single study. This section will therefore find what kind of relationship the determinants of investment in other studies that have been conducted before this one has.

3.3.1 Short and long run relationships between investment and its determinants

Ralarala & Ncanywa (2020) used panel auto regressive distributive lag for some selected Sub Saharan African countries and they found a negative and significant relationship between lending rates and investment in the long run. Because of this negative relation, they recommend that in a sluggish economy, interest rates must not be raised to a point where investment will be discouraged. They further found that exchange rate is positively related to investment in the long run. This means a stable exchange rate has the potential of driving economic growth through increased investment. The findings follows that of Osemene & Arotiba, (2018) who found a negative relationship in the long run between exchange rate and investment in Nigeria.

Moyo & Khobai (2018) investigated the nexus between trade openness and economic growth for 11 SADC countries using the ARDL bounds test and the Pooled Mean Group (PMG). It was found that trade openness has a negative impact on economic growth in the long run.

The most debated topic in the empirical studies is the relation between corporate tax, investment & free trade (Mphutha, 2018). The country's tax policy would ultimately decide the form of funding corporations. Thus, the funds can be expanded by either new equity, retained earnings, or debt for further investment. Ojima and Fabian (2015) are of the opinion that high tax rates would decrease corporate income and thus the

likelihood of reinvestment afterwards. Financial capital movement allows for easy selection of allocation of assets. The high taxes can be a competitive issue for small open economies that are mainly beneficiaries of investment (Saeed, 2016). Further investigations by Buettner and Ruf (2007), Buettner and Wamser (2006) indicate the degree and place of global investment is affected by corporate taxation. Keuschnigg (2008) provides a classic of competitive monopoly industry by means of large & rigorous investments and shows how minimal shifts of these investments respond to changes in the average and marginal tax levels.

In a multivariate context involving capital stock, labour, and openness to trade as regressors, Keho (2017) analysed the effect of trade openness on economic growth for the Ivory Coast over the period 1965–2014. Autoregressive Distributed Lag Bounds were used for cointegration tests and for the causality testing of Toda and Yamamoto Granger. The findings indicate that free trade has positive short-term and long-term impact on economic development. In addition, the connection between trade openness and capital formation in fostering economic growth is positive and solid. Kim (2011) shows that openness to trade has a positive impact, but a negative effect in developing countries, on economic development and real revenue.

A further study by Ncanywa, Mongale and Mphela (2016) in South Africa found that technical progress in investment activities can be promoted over the rough guide of new knowledge and the reduction of deficiency levels. The research used the model for Johansen cointegration, and vector error correction and it was established that the time series data had a long and short-term relationship. It sets out a constructive relationship between economic growth, interest rates, inflation and investment. Taxation and expenditure have been found to be linked negatively.

In Zahonogo's (2016) study, 42 sub-Saharan African countries explored the link between open trade and economic growth. This study contains annual data from 1980 to 2012. An inverted U-curve reaction reveals empirical data of the Pooled Mean Group estimates approach, which demonstrates that the relationship between trade openness and economic growth in Sub-Saharan nations is not fragile. The results of this study show that economic growth and commercial openness are not linked to a linear relation in Sub-Saharan Africa.

Khurshid (2015) used Johansen cointegration to test for long run relation between interest rate and investment in China and it was found that there is a positive relation in the long run while in the short run it indicated negative nexus between the variables. The study suggested ways in which interest rate policy can help improve investment in China that will promote economic growth. The proposition is that since interest rate operate as the influence on investment, a rise in interest rate will increase the cost of investing and thus leading to lower income investors to withdraw their investments.

Mbulawa (2015) conducted another study in the SADC countries to explore economic growth determinants. For the period 1996-2010, the study used GMM techniques. Trade openness was found to have a favourable influence on economic growth only when institutional quality is strong.

Burange et.al. (2013) aimed at analysing the causal relation between BRICS member nations' economic growth and trade openness. The study utilised Johansen (1998) and Johansen and Julius' (1990) co-integration methodology. The findings demonstrated that the variables had a long-term association whereas the Granger causal approaches showed distinct outcomes for each country. The data reveal that the open trade Granger is the driving force of economic growth, starting with Brazil. A hypothesis of growth-led exports was established in South Africa while the hypothesis of export-oriented growth was realized in China. A bi-directional causality of growth and trade openness has been discovered in Russia and India.

In India, Pami & Reetika (2013) carried an auto regressive distributive lag study which found a negative and significant relationship between exchange rate volatility and portfolio investment. It was established that exchange rate increases the risk of an investor and reduced the return.

Naa-Idar et al. (2012) conducted a study using an annual data from 1960-2010 survey of private investment in Ghana. In the analysis, co-integration and error correction techniques were employed. It has been found to have a positive effect on investment in Ghana: inflation, GDP, trade openness and exchange rates.

In order to study correlations between trade openness and economic growth in seven SADC nations spanning 1980 – 2008, Dava (2012) adopted a technique of difference in differences. The results of the fixed effect revealed that the average growth rate

change of 4.1 percentage points to real GDP from before and after trade liberalization. Overall, it has been found that trade openness in the SADC countries has a favourable and considerable effect on economic growth.

Gray (2011) used time series and panel data analysis to conduct a research on the core contributing factors of external direct investment. In South Africa, market dimension, exchange rate, infrastructure and GDP are statistically important to FDI. Training and labour efficiency are statistically important when performing the panel data analysis as selected variables. The study concluded that policymakers and policy changes affecting the determinants highlighted by the analysis need to improve South Africa's FDI.

For the period 1980-2000 in Zimbabwe, Masunda (2011) probed the upshot of real exchange rate on sectorial production growth. Generalised least square was used in the study and the results showed that disastrous sectorial output is as a result of real exchange rate misalignment. It was also found the depreciation of the real exchange rate had an undesirable impact on the output of the sector. In China, a similar study by Chen (2012) investigated the convergence of growth rates and the role of real exchange rate in economic growth for the period 1992-2008. Using generalised moments test, the study results showed that actual increase of exchange rate has a progressive effect on economic development in the 28 provinces.

3.3.2 Causal relationships between investment and its determinants

In Laidler (2015) research, the investment factors in Namibia were calculated using OLS in accordance with co-integration and ECM. The results revealed a positive long-term and short-term relationship between investment and GDP, which is negatively correlated with interest rates (loan rates) and long-term inflation.

From 1970 to 2012, Agu (2015) addressed private investment determinants in Nigeria. The paper examined how domestic and private investment can be increased and showed a correlated link of investment in disposable income and interest rates on bank deposits. The results also show that the slow rate of investment in Nigeria has been affected by the growth in some determinants such as lending rate, lower savings, political stability and infrastructure deficiency.

The determinants of the Nigerian economy from 1990-2013 were analysed by Duruechi and Ojiegbe (2015) in a multiple study of regressions using the common least square (OLS) method. Interest rate, inflation rate, exchange rate and public spending were listed. The determinants were found to not be having effect but effect on investment was by government spending. Thus, the study concludes that Nigeria remains at low levels and government attention should be paid to inflation rates, interest rates, exchange rates and government spending.

In Nigeria, Kanu and Ozurumba (2014) scrutinised the effect of capital formation and economic growth using the regression and VAR model. It has been found that the long-term positive ties with economic growth are between the variables like total exports, native investment and lagging economic values. In the short term between the variables, no important relationship were found. Previous research in Nigeria confirm the findings. For instance, Bakare (2011) as well as Ugochukwu & Chinyere (2013) argued for the positive and weighty link between production capital and growth in Nigeria. Similarly, another major positive effect of investment on economic growth was reported by Shuaib and Dania (2015) as well as by Adegboyga and Odusanga (2014).

Tadeu (2014) investigated the factors that influence private investment in developing countries, including Brazil. The findings indicate that high inflation rates, interest rates, exchange rates, and the international crisis all have a negative effect on private investment.

In the macroeconomic determinants of the private sector investments in Nigeria, Kolade (2014) developed its autoregressive distributed lag model (ARDL). The result indicates that private investment determinants used in this study GDP, real interest rate, real exchange rate, inflation rate and private sector credit were not able to contribute effectively or stimulate Nigeria's private investors.

Mohsen and Maysam (2013) discovered the causal connection concerning economic development and gross domestic investment in the North African nations and Middle East. From 1970 to 2010, their research employed root panel unit tests and system cointegration analysis. The study discovered a robust causality from economic growth to investment in those countries. Conversely, they have found that investment does not have any major short-and long-run effects on economic development. The notion

that investment is the driver of economic development are subsequently supported by the results in line with the arguments in the literature. Another argument is by Rajni (2013) on bi-directional causality amongst gross capital formation and the growth in exports. The results thereof support and bring evidence of uni-directional causality from capital accumulation and export shifts.

Adetiloye and Adeyemo (2012) investigated whether investment and the formation of capital are contributing to growth in Nigeria through the use of the central bank's secondary data. The empirical findings showed that Nigeria's investments did not result in capital build-up and did not help growth inflows. The results showed that there is growth in Nigeria, but it is negligible because the formation of capital does not increase.

Using the co-integration tactic and VAR Grander causality, Constant (2010) analysed long run effect of FDI and trade, trade openness towards economic growth and production. Long run link was further found between foreign direct investment, development, trade openness and growth. Constant also advices that Ivory Coast achieve a strong arrangement with national investment and institution-building policy can draw more FDI influxes for economic growth dynamics by taking into account opportunities provided by global markets.

A study conducted by Lemzoudi (2005) on three coastal countries (Benin, Ghana & Nigeria) and non-coastal nations in West-Africa reviewed the literature on studies that apply to African nations for the period 1980-2002. It was established that two of three coastlines had a positive relation amongst the variables. Findings indicate non-haven nations are less externally focused than coastal countries. As a result, these countries do not have a strong national economy to deal with distant completion. In terms of coping in the international economy, these countries were found to not have a strong national economy.

3.3.3 Comparison of investment and its determinants

Mourao (2018) examined the role and comparative weightage of economic, institutional and political factors in attracting BRICS investment in the attraction of FDI. For ten years, the study used panel data ranging 2000-2009. The analysis takes account of market size, free trade, natural resources, inflation rates, political stability,

efficiency of government, regulatory and corruption regulation, speech and transparency, the rule of law as possible structural and political determinants of FDI. Findings showed that the economic factors in the BRICS economy are more important than the structural and political. The results indicate that real GDP market size is a major determination of FDI that suggests a market-based motivation of most BRICS investment. Empirical data analysis also shows that the statistically important are transparency, availability of natural resources, the rule of law and speech, and responsibility. The market size coefficients and trade openness are positive and thus have a positive impact on overall internal FDI. The availability of natural resources has a negative impact on total domestic FDI, this particular result indicates that the FDI in BRICS economies is not driven by resource-seeking (Huchet-Bourdon, 2018).

The stochastic model of frontier was used for the period 2003 and 2010 in a study by Borhan and Ahmad (2018) in 48 African and Chinese economies. The results were that the political and institutional features of each African country attract Chinese investors. They also suggested that greater political stability and regulatory quality will optimize the efficiency of this allocation, with the efficiency of government being another requirement for this efficiency.

In trying to research movements and developments in BRICS markets from 1990-2015, developed markets (Bose & Kohli, 2018) have still seen the lion's share in FDI, claiming the world's highest FDI inflow ratings. But, highly effective emerging and cross-border markets can still entice FDI influxes if that have ideal market features for investors. The global FDI flows are also volatile and reflect both global corporate managers and countries looking to foster investments with challenges and opportunities. Thus, policymakers must remove obstacles to FDI inflows and rise their absorbing capacity to achieve best possible optimistic outcomes.

For 20 countries (11 developed and 9 developing) over the period 2004–2013, Saini and Signhania (2018) used the static and dynamic modelling panel data analysis to examine the FDI factors. The findings show diverse results across countries. FDI seeks political determinants (GDP growth, open trade and the Index of Liberties) in the developed countries and FDI has shown positive associations of economic determinants in developing countries (gross fixed capital formulation, trade openness, and efficiency variables).

By usage of levels of human resources, investment in infrastructure and openness to trade, Kotrajaras (2015) analysed the impact of FDI on the economic growth of 15 East Asian countries. The data sets were based on the cointegration review of the panels from 1990 to 2009. The findings have shown that FDI does not boost economic growth inherently. Only in countries with adequate economic conditions did FDI have a positive impact on economic development.

For a sample of 115 developing countries, Sakyi, Villaverde, and Maza (2015) show positive bilateral causal links between trade and economic development. Were (2015) finds that the effect of trade on economic growth is positive and substantial in developed and developing countries, but its impact does not matter for less-developed countries, mainly African. Hye, Wizarat and Lau (2016) in a study of China show that opening up trade has a positive connection with long-term and short-term development.

Lin and Suen (2012) show that trade encourages economic development, but has a negative effect, in countries that have opposite characteristics, in high-income, low-inflation, and not farming economies. Huang and Chang (2014) find that trade growth depends on how much the stock market develops for a panel of 46 countries. Trade only increases economic growth if the nation exceeds a stock market development threshold.

The effects of FDI on economic growth in China and India were studied by Agrawal and Khan (2011). The study was conducted between 1993 and 2009. GDP, human capital, the labour force, the FDI and the Gross Capital Formation have all been the variables in their growth model. After running the regression method for OLS (Ordinary Least Square), they found that a 1% rise in FDI would increase China's GDP by 0.07% and India's GDP by 0.02%. They also discovered that FDI affects China's growth more than India's. This study also gave possible explanations for China's great FDI display and India's lesson for better use of FDI from China.

For the period 1980-2003, Thompson (2011) explored the links between commercial openness, infrastructure, FDI and economic growth through the forty-two Sub-Saharan Africa (SSA) including SADC countries panel. His findings were that FDI is focused on trade transparency and per capita GDP while there is little increase in FDI inflows due to the relationship between trade accessibility and infrastructure. In

addition, Thompson (2011) highlights FDI's positive and significant growth impact and suggests that policymakers should make further efforts to increase trade openness and infrastructural development to improve FDI influx levels in order to support sustainable growth.

In order to identify factors that decide FDI influxes to developed countries, Mottaleb and Kalirajan (2011) used panel data of 68 low revenues and lower middle incomes developing countries. The study found, as developed countries, that developing countries were not seen as FDI-friendly destinations. Moreover, the main beneficiaries of FDI were found to be a few developing countries, including China, India, Nigeria and Sudan, with the remainder facing disputes. Based on a comparative debate on the reasons why certain countries succeed in attracting FDI, the investigation showed that countries with greater GDPs, higher GDP rates and an enhanced foreign trade share are better suited to attract FDIs.

Blomstrom, Lipsey and Zejan (2004) also discovered that FDI had a positive waves on progress levels in higher income developed countries and not lower income nations in a cross-country study of 78 evolving nations. Ultimately, the trading system also plays a part in transmitting FDI's positive growth effects. In a fixed-effect model, Salisu and Sapsford (2006) endorsed that the growth effects of FDI were positive in export-promoting countries, but negatively in import-related countries for 46 developing countries. In a similar way Zhang (2001), the FDI found that the economic growth in Hong Kong, Indonesia, Singapore, Taiwan and Mexico is improved in 11 of the study countries, with unidirectional causal effects revealed to the six others in 5 countries that have no cointegration relation. It is also evident that offshore companies participate in countries to benefit from higher investment earnings or small total proportion of production. The market inadequacy hypothesis argues that because markets are imperfect, multi-nationals are able to localise their business or manufacturing operations in other countries to maximise economies of scale, rights benefits and policy inducements (Eiteman, Sinehill & Moffett, 2007).

3.4 Conclusion

The study provided important theories such as the Keynes, Harrod-Domar, Neo-classical, Hecksher-Ohlin and the Tobin's Q theories. The chapter began by paving the way for discussion with theoretical perspectives regarding determinants of SADC and BRICS investment activities. The empirical studies were discussed to highlight differing views by other researchers and academics on matters relating to the determinants of investment activities in addition to the theoretical perspectives. Naa-Idar et al (2012) found a positive relationship between trade openness and exchange rates on investments. These findings are in accordance with the Hecksher-Ohlin theory and further support the objectives of the study of causal relationship between the determinants. Further empirical evidence is found by Keho (2017) whom the findings conform to the Harrod-Domar model and the objectives of the study in determining the short and long run relationship between economic development, capital stock, and labour and trade openness.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the research methodology to be followed to examine the determinants of investment. The study applied quantitative method by following econometric techniques. Following econometric techniques, the study begins by deriving a chosen empirical model. This study assesses the determinants of investment activities in SADC and BRICS countries using the Autoregressive Distributive Lag. The variables employed are gross fixed capital formation, trade balance, real interest rates and real exchange rate.

4.2 Data

The study employed yearly secondary data obtained from the World Bank for the period 2004-2019 for SADC and BRICS regions. The selected SADC countries that are analysed in this study are South Africa, Lesotho, Mauritius, Malawi, Angola, Madagascar and Namibia. The countries were selected on the basis of data availability and that they are regarded as the well performing economies amongst SADC counterparts.

4.3 Model specifications

The study explores the determinants of investment activities in the SADC and BRICS regions for the period 2004-2019. The model is derived based on the Keynes theory which stressed that the key factors deciding and stimulating investments are efficient demand and stable financial conditions. The linear relationship for both regions is as follows:

$$LGFCF_{SADCit} = \alpha_0 + \beta_1 LTD_{SADCit} + \beta_2 LREX_{SADCit} + \beta_3 LRIR_{SADCit} + \varepsilon_{it} \quad (4.1)$$

$$LGFCF_{BRICSit} = \alpha_0 + \beta_1 LTD_{BRICSit} + \beta_2 LREX_{BRICSit} + \beta_3 LRIR_{BRICSit} + \varepsilon_{it} \quad (4.2)$$

Where

$LGFCF$= Gross fixed capital formation on current (local currency) LCU used as proxy for investment.

LTD= Trade % of GDP used as proxy for trade openness

$LREX$= Official exchange rate on current (local currency) LCU

$LRIR$= Real interest rate %

α Represent a constant or intercept parameter. Moreover, the term ε_t represent disturbance error term which serves to capture the effect of unaccounted variables that affect investment and symbols β_1,β_2 and β_3 in equations 2 and 3 are the coefficients of the estimated model. The two models as represented by equations 1 and 2 above denotes Gross fixed capital formation as $LGFCF_{.}$, trade openness as $LTD_{.}$, real exchange rate as $LREX_{.}$ and $LRER_{.}$ as real interest rate. All the variables in both the models are in linear form as logarithms are introduced sot that the coefficients could be standardized to enable for sensible estimation of the model.

4.4 Estimation techniques

Data estimation will be done following an econometric procedure consisting of firstly checking for panel unit root, secondly panel cointegration test and followed by Panel Autoregressive Distributive Lag, Granger causality, stability tests, impulse response and the variance of decomposition. The study adopted the method as it investigates the determinants of investment activities in SADC and BRICS using cross section series for the period 2004-2019.

4.4.1 Panel unit root test

In order to choose the right and suitable model for the data in the study, panel unit root tests was helpful before testing for cointegration. The testing of unit root can be done formally and informally so. The informal testing is done by means of visual inspection in this study followed by formal tests. Therefore, this study in particular has employed formal tests such as Im, Pesaran and Shin (2003) and the Fisher-type tests by means of Augmented Dickey-Fuller and Phillips-Perron (ADF and PP) unit roots. According to Brooks (2016) testing for stationarity of data is important as those tests allow to assess if there is heterogeneity of coefficients and ensure persistent parameters that move freely in all sections. According to recent literature, panel data analysis can observe long periods of time across a large number of cross section units such as nations, regions, businesses, or even households; hence, this study focused on

BRICS and selected SADC countries. The justification of applying unit root and cointegration tests in a panel analysis is to ensure the expansion of statistical power and to expand on their reduced power of their univariate counterparts (Bai, 2004).

In order to examine the existence of unit roots in the model, Im, Perasan and Shin (2000) suggested a test that pools information from the time series dimension together with those of cross sections. This process ensures that fewer time dimensions in the test have power. The use of this test in the study is motivated by the fact that it is superior and has power (Chou and Lee, 2003). To support and draw evidence of the claims about this test, many economic researchers such as Lee et al (1997), Sarantis & Steward (1999), Canzoneri et al (1999) and Chou Lee (2003) have utilised and applied this test to determine the long run relationship in their panel data analysis.

IPS it therefore begins by postulating a detached ADF regression for cross-section respectively per separate effects and no time trend:

$$\Delta(y_{it}) = \phi y_{it-1} + z'_{it}\gamma_i + \varepsilon_{it} \qquad (4.3)$$

Where i equals, 1; 2; …; *N*; t = 1; 2; …; N cross-section units or series that are observed over period's t = 1, 2 …

T and ε_{it} represent white noise disturbance error term.

According to Wagner and Hlouskova (2005), instead of pooling the results, IPS considers the mean of ADF statistics calculated for each cross-section unit and starts by defining a separate ADF regression. Fisher ADF and Fisher PP are both used to validate unit root results measured using the IPS process. All three approaches have the same null hypothesis, which states that a unit root exists. In the equation above, ϕ is panel-specific that are autoregressive coefficients. Im, Perasan and Shin shoulder ε_{it} as autonomously spread for all i and *t* and they permit ε_{it} to devise heterogeneous variances across panels. In the model, exogenous variables and any individual trends or fixed effect are signified by z'_{it}.If the absolute value of ϕ_{it} is less than one, y_{it} is understood to be stationary whereas when the absolute value of ϕ_{it} equals one, then y_{it} contains a constant unit root. There are two assumptions made about the ϕ_{it} before doing the testing. First assumption is about the persistence limitations which are collective across-sections so that that $\phi_{it} = \phi$ for all i. Lastly, ϕ_{it} can be allowed to

diverge easily across cross-sections. This form matches the assumptions and form that Im, Perasan and Shin (IPS), and Fisher-ADF and Fisher PP tests follows. The study chose IPS method of testing for the main unit root test based on the robustness of the method whereas Fisher testing was used to confirm the results.

4.4.2 Panel cointegration

Once the order of integration has been determined when running the panel unit root tests, the next step that follows was to assess if there exist the long run relationship between the variables. The study used general tests such as the Kao test, the Fisher (combined Johansen) test and Pedroni test (Pedroni, 1999, 2004; Kao, 1999). The Kao test is based on the two-step (residual-based) cointegration tests developed by Engle and Granger (1987). The cointegration test developed by Engle and Granger (1987) is based on a consideration of the residuals of a spurious regression performed with I (1) variables. When the variables are cointegrated, the residuals should be I (0), and when the residuals are not cointegrated, they will be I. (I). Pedroni (1999, 2004) and Kao (1999) encompass the Engle-Granger (1987) background to tests cointegration comprising panel data. Pedroni test was also used to determine cointegration of variables in the model. In order to correct for bias that may be introduced by potentially endogenous regressors, the Pedroni test offers seven panel cointegration test statistics.

The estimated cointegration regression in the study was the panel regression and was expressed as:

$$y_{it} = \sigma_i + \beta_i z'_{it} + \epsilon_{it} \quad (4.4)$$

Both y_{it} and z'_{it} are integrated of order one. For each ϵ_{it} stationary at each i cointegration is implied and it is required that $\beta_i = \beta$ for homogenous cointegration. Upon satisfying the condition and the cointegrating parameter is heterogeneous, and homogeneity is implied, the estimator is expressed as:

$$y_{it} = \sigma_i + \beta z'_{it} + [(\beta_i - \beta) z'_{it} + \epsilon_{it} \quad (4.5)$$

In this case the composite error term,ϵ_{it} even if stationary, it integrates of order one. The trace test and the Maximum Eigenvalue test are the two diverse probability ratio tests of the reduced rank of the matrix. The trace test was stated as:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_{r+1}) \quad (4.6)$$

To test the hypotheses, the Johansen maximum likelihood method employed Trace statistics and Maximum Eigenvalue statistics to test for cointegration between the variables.

And the maximum eigenvalue test was specified as:

$$\lambda_{max}(r, r+1) = -Tln(1 - \lambda_{r+1}) \quad (4.7)$$

Whereby,

T is the sample size, and λ is the *ith* largest canonical correlation.

r , represent the number of cointegrating relationships.

4.4.3 Panel Auto Regressive Distributive Lag

The Panel ARDL model proposes an intermediate coefficient that allows for the equality of long-term coefficients between the variables and the difference in short-term coefficients between groups (Perasan et al, 2001). The benefit of the ARDL panel is that it allows short-term dynamic coefficients to vary from variable to variable, but limits long-term coefficients to the same (Ahmed et al., 2013). Furthermore, Hamuda et al (2013) suggests that this model illustrates the adjustment between short and long-term dynamism. Therefore, for all nations the long-term relationship between investment and the fundamental determinants of investment activities is presumed to be the same, while short-term coefficients are assumed to be country-specific. The model is employed to determine the relationship between the determinants of investment activities in SADC and BRICS regions. Panel ARDL has been employed in other readings by researchers such as Sunde (2017); Dritsakis (2011) and Shittu et al (2012). This approach further implies that the terms of error are not serially associated and that the independent variables obey the same distribution independently.

Due to the ease with which data is available, panel data analysis in recent research uses models with long time spans (T) for analytic purposes. The asymptotic effects of huge numbers of dynamic (N) and large (T) transverse panels differ from the

asymptotic effect of the normal big number of dynamic transverse (N) and tiny (T) transverse panels. Arellano and Bond (1991) have submitted small time panel estimates that include fixed and random impact estimates or the Generalized Moment Method (GMM) (1991). These estimators combine several cross sections and allow the continuous term to fluctuate exclusively in cross sections. The major results gained from the large N, large T show that the assumption of slope coefficient homogeneity is typically inadequate (Pesaran and Smith, 1995; Pesaran, Shin, and Smith, 1997, 1999; Phillips and Moon, 2000; Im, Pesaran and Shin, 2003). The most recent work on dynamic heterogeneous panel valuation with big N and T presents numerous estimation strategies. Time series data for each cross section are pooled in the fixed effect estimate approach, and intercept terms are allowed to vary between cross sections. If the slope coefficients differ, the fixed effect may produce deceptive upshots. On the other hand, the model can be generated separately for each cross section and the arithmetic mean of the coefficients determined. This method is known as the Mean Group (MG) estimator, which was proposed by Pesaran and Smith (1995). The intercepts, slope coefficients, and error variances are all allowed to vary between cross sections in the MG approach.

Pesaran et al. (1997, 1999) popularize an innovative methodology known as Pooled Mean Group (PMG) to estimate nonstationary dynamic panels because, as the time period of study increases, dynamic panels' nonstationarity becomes an increasingly critical concern. The PMG estimator is based on a combination of coefficient amalgamation and averaging (Pesaran et al., 1997, 1999). This estimator allows short run parameters, intercept terms, and error variance to differ between groups (as in MG estimator). It does, however, constrain the long run coefficients to be comparable. Starting with a primary guess of the long run coefficient, the short run coefficients and the swiftness of the corrective term can be calculated.

The general form of the PMG model's empirical specification can be described as follows.

$$\Delta y_{it} = \sum_{j=1}^{p} \lambda_{i,j}\, y_{ij-j} + \sum_{j=0}^{q} \delta_{ij}\, X_{i,t-j} + \mu_t + \epsilon_{it} \qquad (4.8)$$

Where no of cross sections i=1, 2…..N and time t=1, 2,3….T. X_{it} is a vector of K × 1 regressors, $\lambda_{i,j}$ is a scalar, μ_t is a group specific effect. The disturbance term is an I

(0) process if the variables are I (1) and co-integrated. Co-integrated variables are notable for their ability to respond to any deviation from long-run equilibrium. This feature infers that the system variables are influenced by the equilibrium deviation in their dynamic error correction. The above equation is re-paraphrased into error correction equation as:

$$\Delta Y_{it} = \phi_i y_{it-j} - \theta_i X_{i,t-j} \sum_{j=1}^{p-1} \lambda_{i,j} \Delta y_{ij-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta X_{i,t-j} + \mu_t + \epsilon_{it} \quad (4.9)$$

The error correction parameter ϕ_i indicates speed of adjustment. If $\phi_i = 0$, then there is no evidence of that variables have long run association. It is expected that $\phi_i$is negative and statistically significant under prior supposition that variables indicate a convergence to long run equilibrium in case of any disturbance.

4.4.4 Diagnostic and stability tests

The diagnostic test for the stability of the model is using the normality test assessing with probability value, Jarque-Bera, Kurtosis and Skewness. Lastly, the stability of the models is tested using the VAR stability test of inverse roots of AR characteristic polynomial (Wycliffe and Muriu, 2014) .The normality test will be carried out by an exhausting Jarque-Bera. In the normality test, the Jarque-Bera and the related p-value are important things to be tested along with kurtosis. If the p-value is greater than 0.05 per cent, this means that the residuals of the model are usually distributed and this is a positive indicator. The normality of the model will further be assessed by visual inspection whereby for it to be evenly distributed the shape of it has to be bell shaped. However, the issue may occur if it found that the residuals are serially correlated as shown by the serial correlation test (Magableh & Ajlouni, 2016). A further and last test for this study will include the VAR stability test of inverse roots of AR characteristic polynomial for the models of SADC and BRICS. This test will determine if the model is stable by use of a circle which has dots and they must not lie outside as this will indicate the instability of the model.

4.4.5 Panel Granger-causality test

Generally, correlation between two variables does not give any indication about what is the cause and what is the effect. That is, the Granger causality test is a mathematical hypothesis test to assess if one-time sequence is useful in predicting another (Granger, 1969). Causality may be checked by testing the potential to forecast future

time series values using past time series values. The time series X is said to be Granger cause Y if it can be seen, usually by a series of t-tests on the lagged values of X (and the lagged values of Y also included), that such X values have statistically relevant details on the potential values of Y. if the null hypothesis states that x does not induce Granger Y, and vice versa, the 5 percent likelihood denies the null hypothesis and the alternate hypothesis must be weighed. This study's null hypothesis is indicated as gross fixed capital formation does not granger cause the trade openness, real effective exchange rate and real interest rate and vice versa. The Granger-causality model will be as follows:

$$LGFCF_{it} = \alpha_{it} \sum_{i=1}^{n} \alpha_j LGFCF_{t-1} + \sum_{i=1}^{n} \beta_j LTP_{t-1} + \sum_{t=1}^{n} \eta_j LRIR_{t-1} + \sum_{I=1}^{n} \theta_j LREX_{t-1} + \varepsilon_{it} \quad (4.10)$$

There are four types of causality that can be distinguished depending on the significance of the estimated coefficients of the parameters:

- One-way (uni-directional) causality, this means X causes Y but also Y Causes X at the same time. It is found if the estimated coefficients of the lagged X are statistically significant and the coefficients of the lagged Y are not statistically different from zero.
- On the other hand, one-way causality from Y to X exists if the set of the lagged X coefficients are not statistically different from zero and the set of lagged Y coefficients are statistically different from zero.
- Bilateral also known as two-way or feedback causality is confirmed if the sets of X and Y coefficients are statistically different from zero.
- Finally, the variables are independent if the sets of X and Y coefficients are not statistically significant.

Before the error correction models came into practice, the standard Granger tests were used to provide inferences on causality. However, Granger (1988) argues that the standard Granger tests are not likely to give valid causal inferences in the presence of cointegrated variables. The alternative causality test is then based on the error correction models that incorporates information from the cointegrated properties.

4.4.6 Generalised Impulse Response Function

The impulse response function and the forecast error variance decomposition track the evolution of economic shock through the study of vector auto regression as it focuses on their estimation (Swanson & Granger, 1997). Thus by generating variance decomposition and impulse response functions, the complex relationship between the variables is studied. Although the validity of causality tests is true within the sample period, as postulated by Soytas & Sari (2003), the variance decomposition is used to determine the validity of causality within the sample period. The decomposition of the variance helps the out-of-sample causality of the variables within the VAR method to be investigated. The decomposition of thee variance calculates the proportion of the expected variable error that is explained by another variable. In fact, the relative effect that one variable has on another variable is indicated (Alam & Ahmed, 2010).

4.4.7 Variance Decomposition

With regard to the developments of each variance within the scheme, the variance of the forecast error of a measure can be split into four, i.e. the variance of the forecast error in gross fixed capital formation can be related to innovations owing to their own innovations, as well as to trade openness, real exchange rate and real interest rate. That being the case, it is possible to consider the variance decomposition as out of study causality checks. A shock to a VAR system is the impulse response function. When a shock is placed to the error term, impulse responses describe the susceptibility of the variables in the VAR. As a result, a unit shock is added to each vector and its effect on the VAR system is tested. Ivanov & Kilian (2005) suggested that the impulse response research plays a key role in contemporary empiric macroeconomics focused on vector auto regressions (VARs). In addition, several scholars have researched the impulse responses in the structural or semi-structural VAR model on the basis of defining hypothesis regarding the economy's short-run and long-run responses to individual structural shocks. The impulse response function makes it possible to map the temporal responses of variables in other variables to their own shocks (Alam & Ahmed, 2010).

4.5 The priori expectations

According to Bilan & Ihnatov (2015), the expected results of the study will depend on the methodology applied. According to Maphutha (2019), the determinants of investment in the regions of SADC and BRICS are sensitive to the choice of modelling because of the instability of some variables such as real exchange rate and real interest rates in these economies.

4.6 Conclusion

This chapter indicated the methodology that this study has applied. The study firstly started by specifying the models that it will use. These included the use of testing for presence of unit root using tests of Im, Perasan and Shin and Fisher Augmented Dickey Fuller confirmed by Fisher Phillips-Perron. The result of the unit test determines whether or not the Johansen cointegration test should be followed. Unit root testing often paves the way for the right approach to be adopted, which as mentioned in this part, is the panel Autoregressive Distributed Lag. This chapter further discussed the Granger causality test and the models applied for diagnostic testing, stability test, variance decomposition and lastly the impulse response function.

CHAPTER 5

INTERPRETATION OF FINDINGS

5.1 Introduction

This chapter presents, analyse and interpret results from the empirical regression estimations that aims to conduct a comparative analysis of the SADC and BRICS countries on the determinants of investment activities. The determinants are measured by real effective exchange rates, trade openness and real interest rates in the period 2004 to 2019. This study employed IM, Perasan and Shin (IPS) (2003), Fisher Augmented Dickey Fuller (ADF) and Fisher Phillips Perron (PP) for unit root testing. Following the order of integration from unit root testing, it goes further to test for cointegration using Pedroni, Johansen, Kao and panel combined Fisher Johansen co-integration tests prior to panel ARDL. The study further employed Granger causality, variance decomposition and impulse response function as well as the diagnostic tests. All these tests are conducted using statistical package E-views.

5.2 Empirical tests results

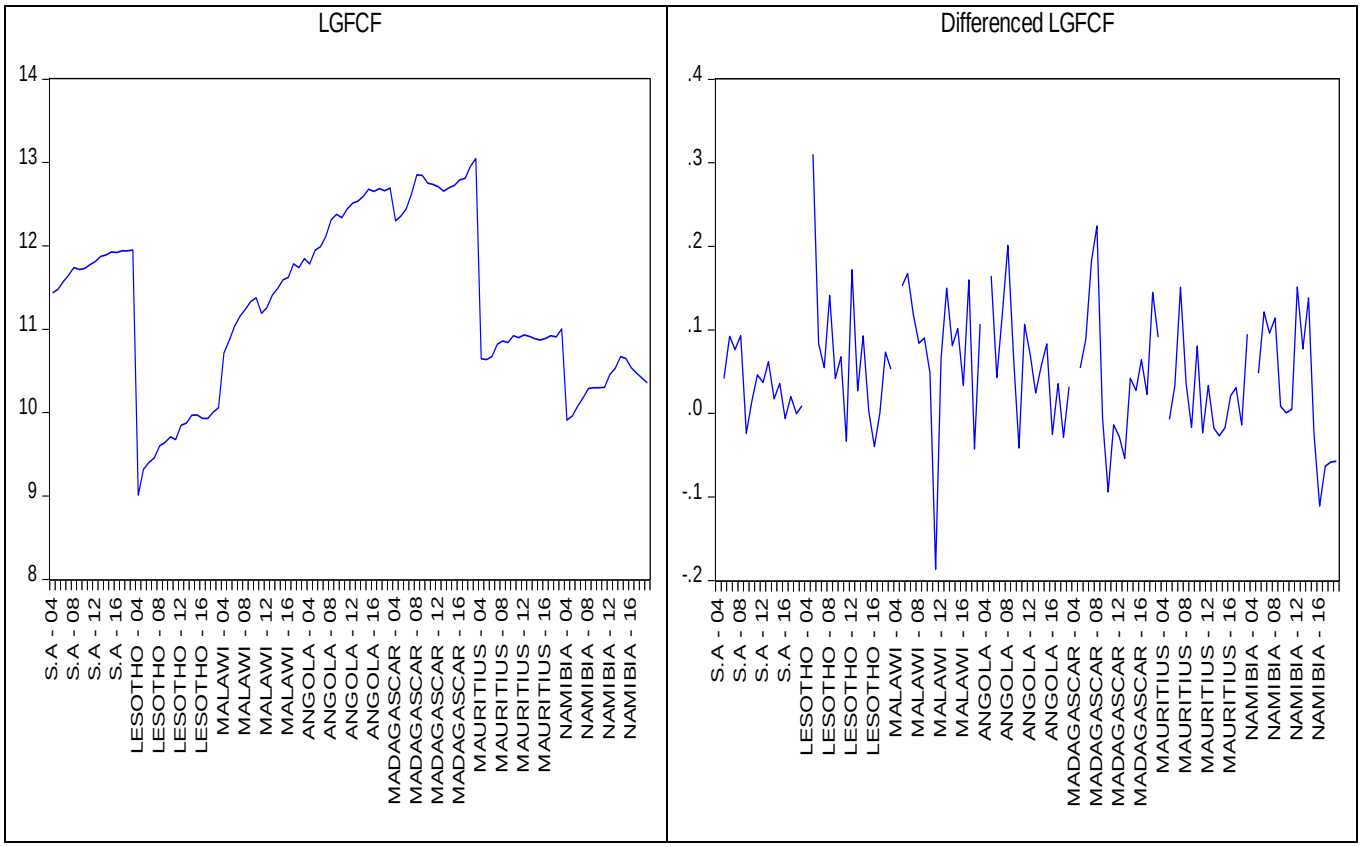
5.2.1 Unit root tests results

Firstly, in this section, the results of unit root are tested informally followed by formal testing using the three selected tests IPS, Fisher ADF and Fisher PP. However, the informal test present only the visual presentation while the formal test was used to confirm the findings of informal test.

5.2.1.1 Informal testing of unit roots for both SADC and BRICS

In testing for informal unit root, the data for both SADC and BRICS have been separated as one of the aim of the study is to have a comparative analysis between these two economic regions. The variables are tested at level form and first difference.

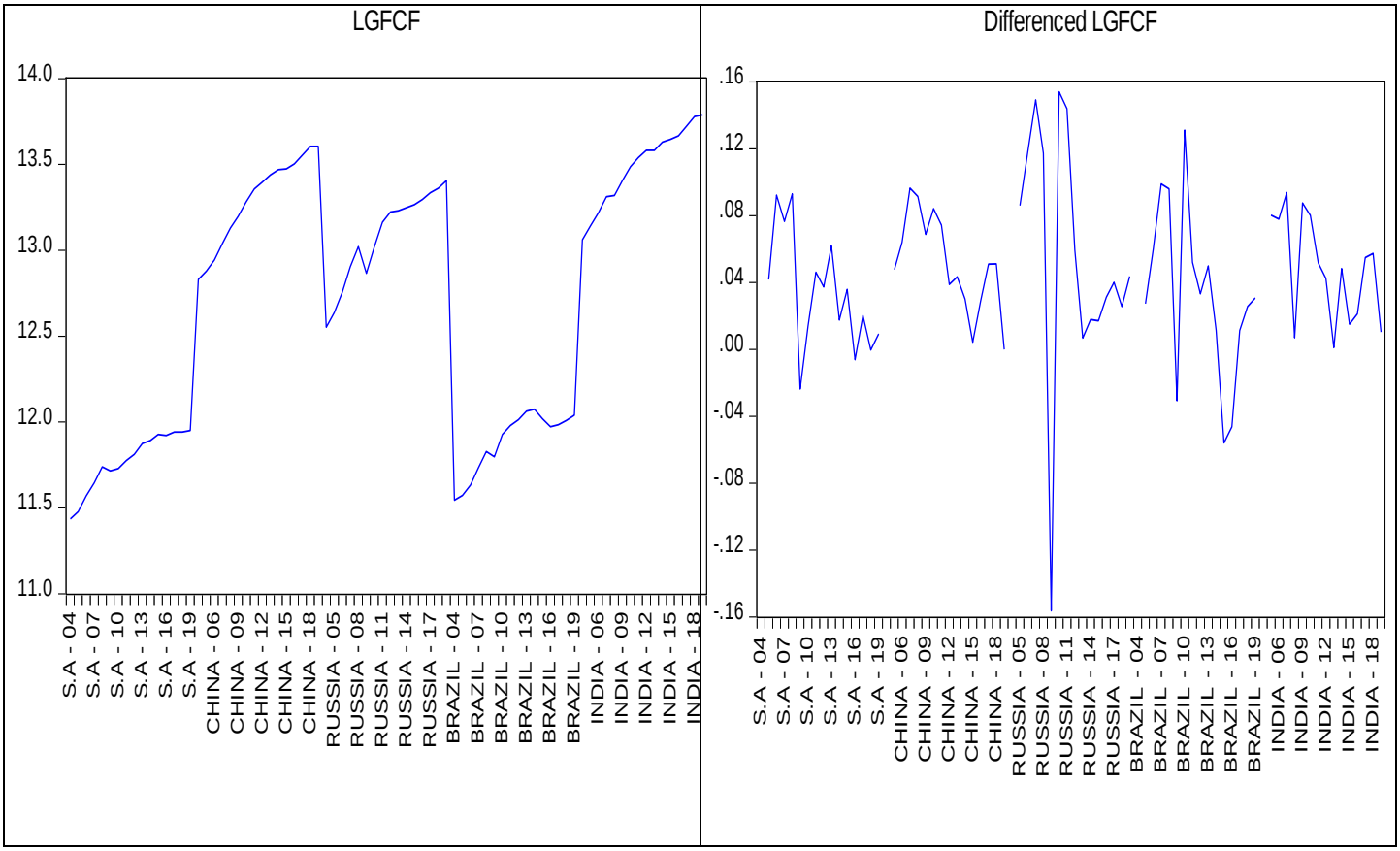
Figure 5.1: SADC Gross fixed capital formation (LGFCF) (Investment), 2004-2019



Source: Author compilation from World Bank data 2004-2019

Notes: LGFCF-gross fixed capital formation; SA-South Africa

Figure 5.2: BRICS Gross fixed capital formation (LGFCF) (Investment), 2004-2019

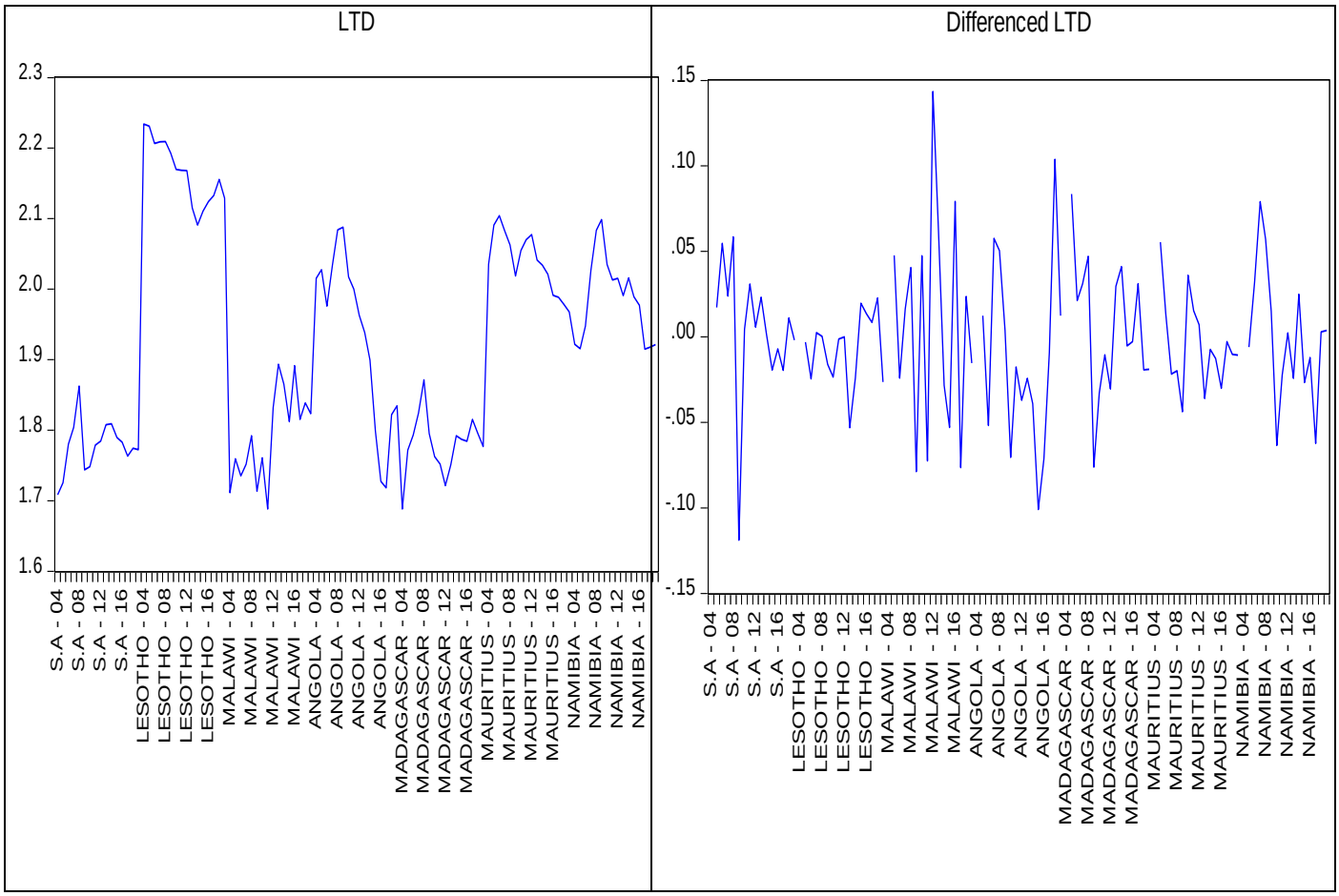


Source: Author compilation from World Bank data 2004-2019

Notes: LGFCF-gross fixed capital formation; SA-South Africa

The informal inspection of gross fixed capital formation representing investment is at both level and first difference prior to the test using formal testing on figures 5.1 and 5.2 respectively. The inspection shows that investment has explosive trend at level form showing non stationary of investment. When such a trend is experienced, a variable need to be differenced at 1st difference to obtain the stationary. It is evident with 1st differenced investment that it becomes stationary and the trend is that investment is wavering around the mean of 0. This is confirmed by formal testing in section 5.2.1.2 table 5.1 where IPS, Fisher ADF and Fisher PP tests show the stationary when investment obtains significant probability value.

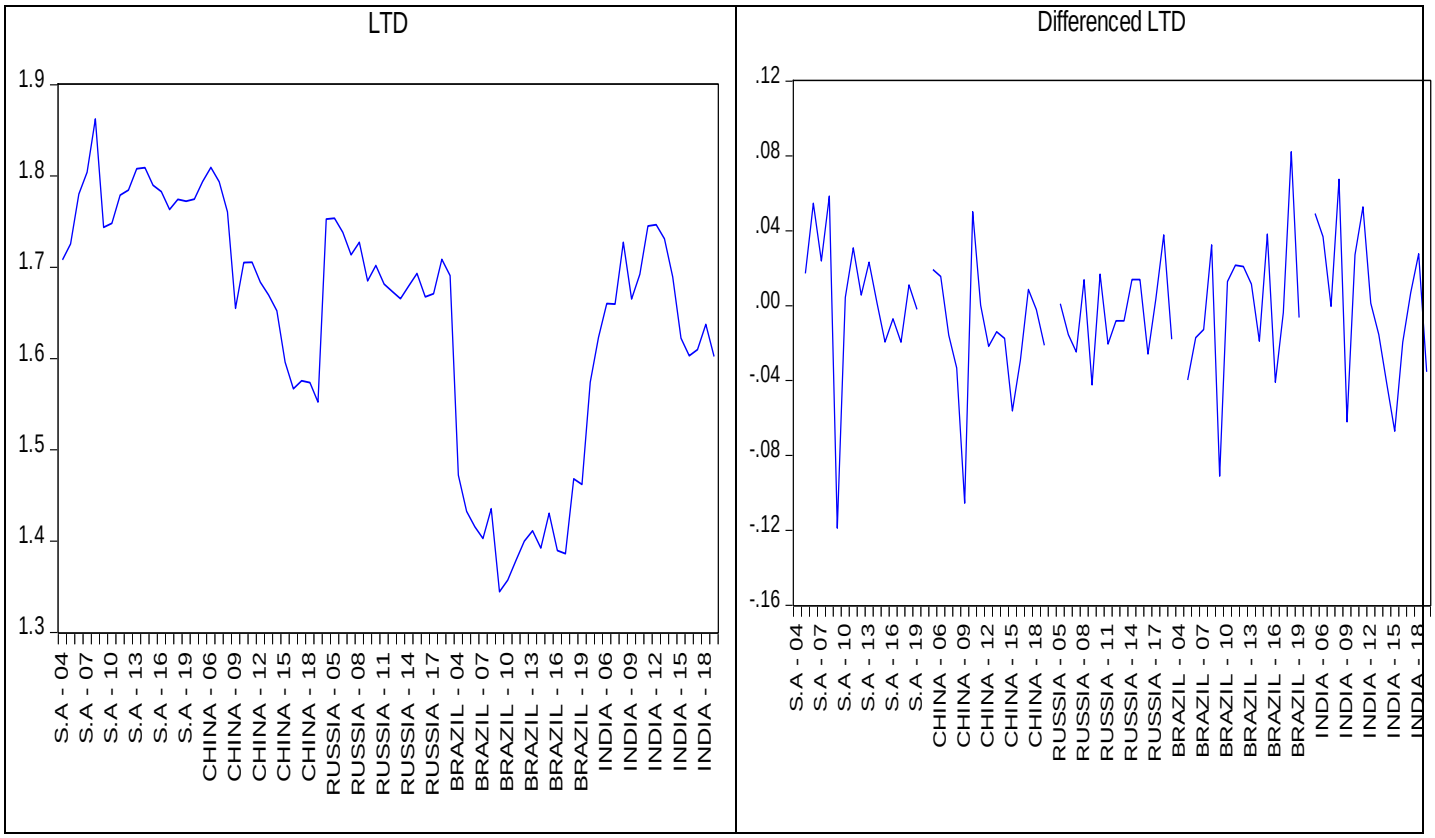
Figure 5.3: SADC trade openness (LTD), 2004-2019



Source: Author compilation from World Bank data 2004-2019

Notes: LTD-Trade openness; SA- South Africa

Figure 5.4: BRICS trade openness (LTD), 2004-2019

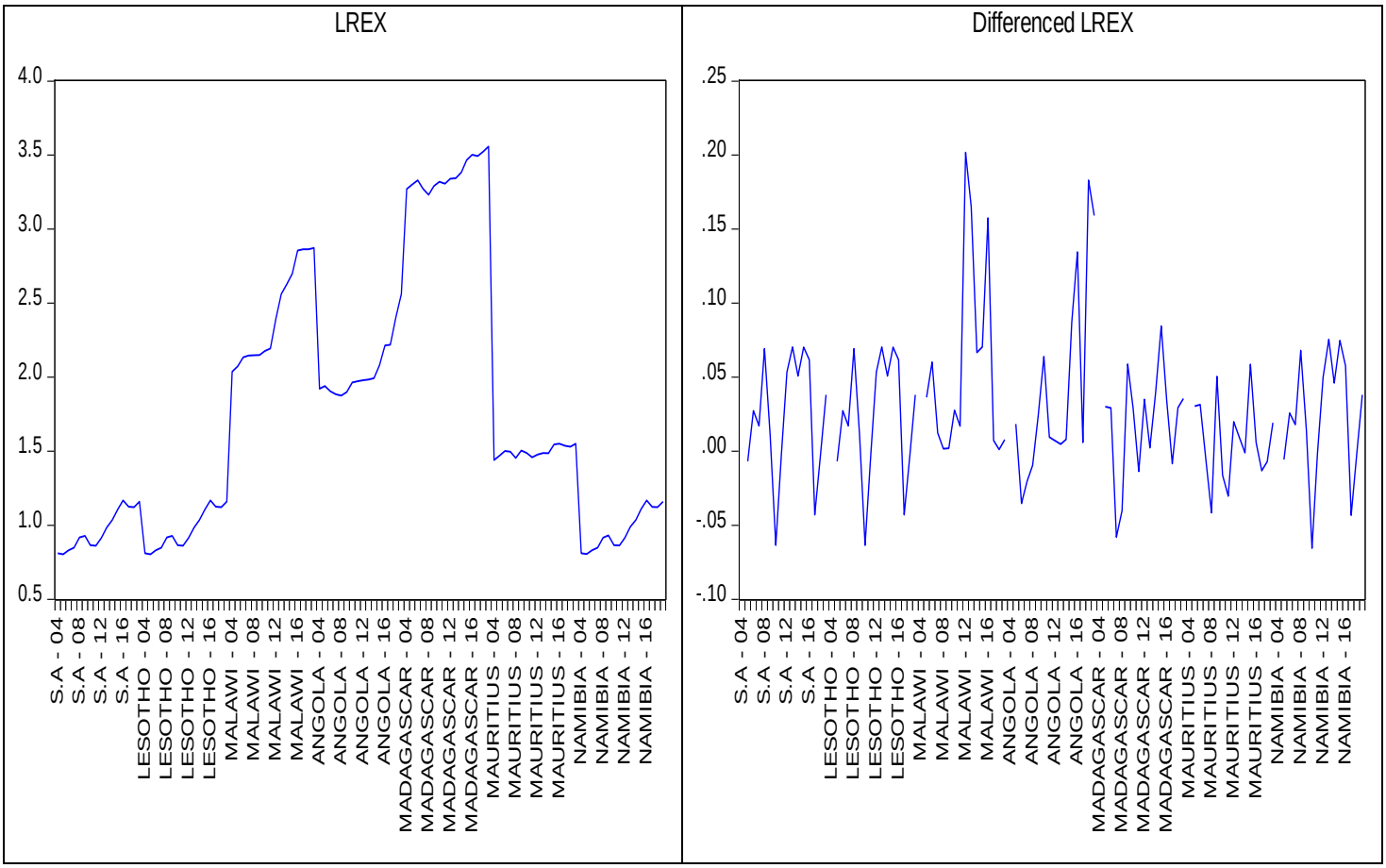


Source: Author compilation from World Bank data 2004-2019

Notes: LTD-Trade openness; SA- South Africa

The log of trade openness variable in figures 5.3 and 5.4 is in both level and 1st difference. The level form demonstrates non stationary of trade openness because of the trend it takes over the period. When trade openness is differenced, trade openness wavers around the mean and thus becomes stationary. Formal tests, IPS, Fisher PP, and Fisher ADF confirms the informal findings with integration of trade openness at 1st order.

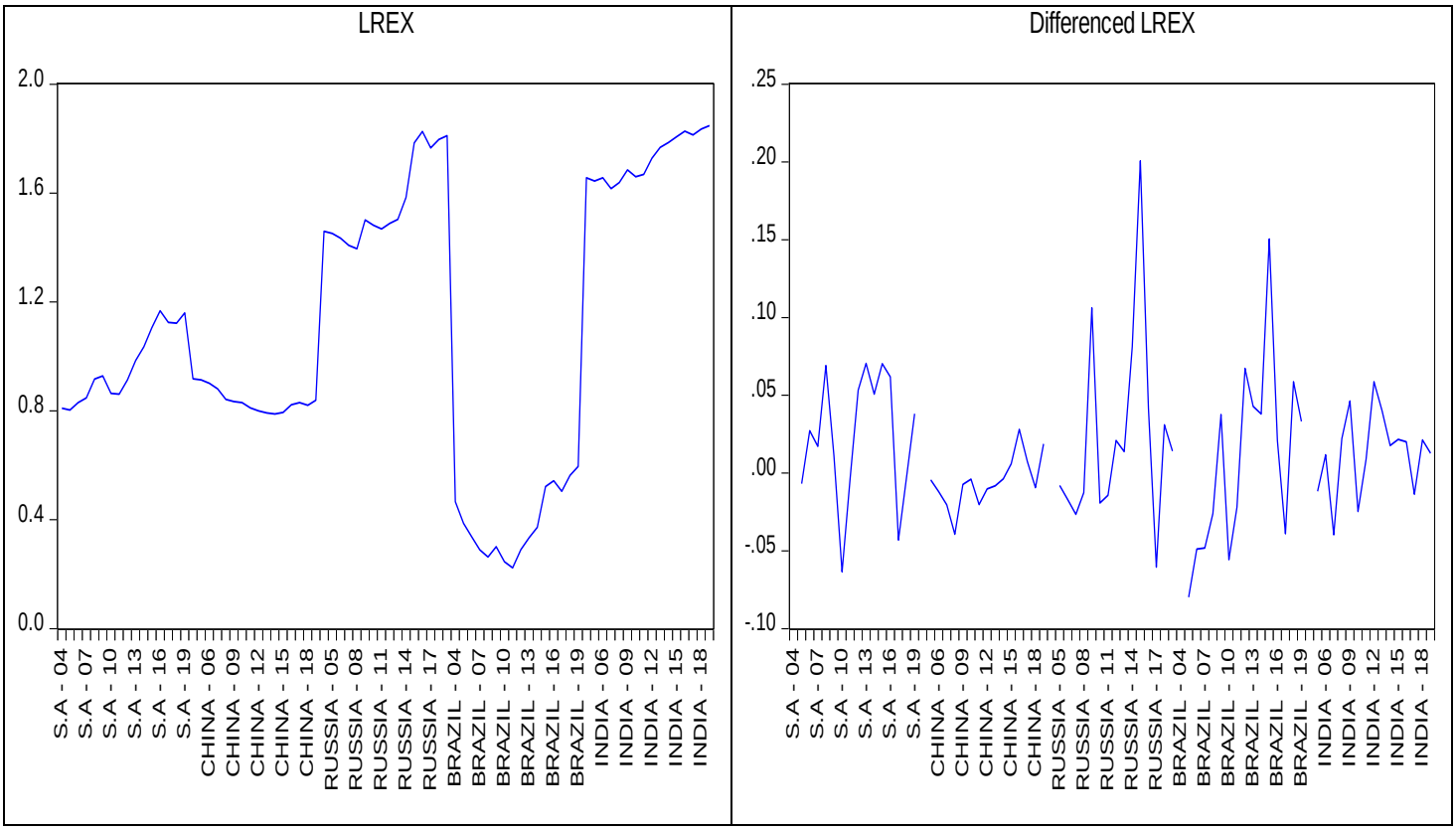
Figure 5.5: SADC Real exchange rate (LREX), 2004-2019



Source: Author compilation from World Bank data 2004-2019

Notes: LREX-Real exchange rate; SA-South Africa

Figure 5.6: BRICS Real exchange rate (LREX), 2004-2019

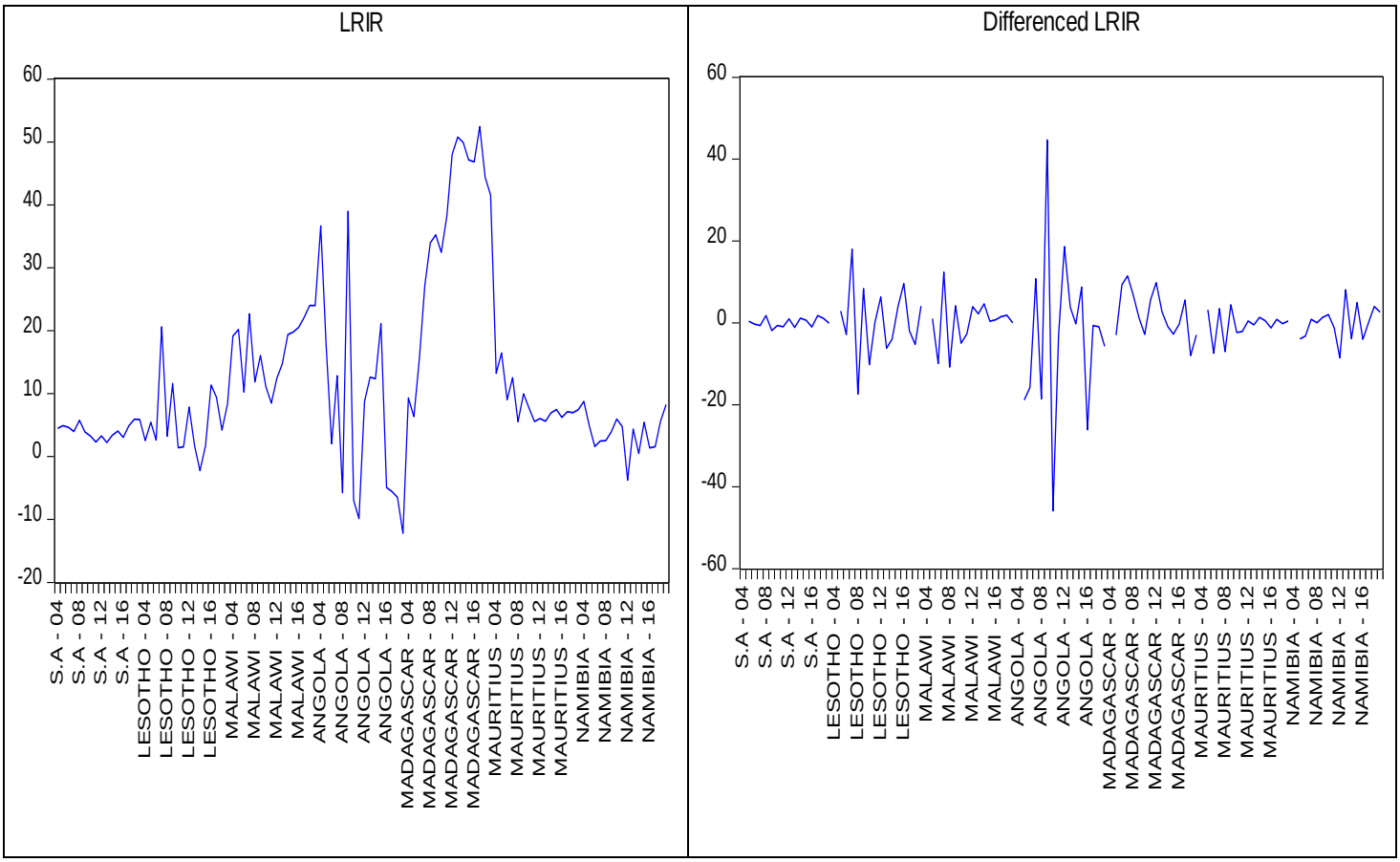


Source: Author compilation from World Bank data 2004-2019

Notes: LREX-Real exchange rate; SA-South Africa

Figure 5.5 and 5.6 shows the stationary and non-stationary of the logged real interest rate variable. The similar analysis as those found in figures 5.1, 5.2, 5.3 and 5.4 are applicable in this case also. This is shown when real exchange rate at level is non stationary due to its explosive trend. In order for it to be associated with other econometric models it has to be stationary. Therefore, when real exchange rate is differenced at 1st difference, it becomes stationary and as a result now it is associated with other econometric models. The findings of informal testing are also confirmed in the formal test as real exchange rate becomes stationary at 1st difference when ran by IPS, Fisher ADF and Fisher PP.

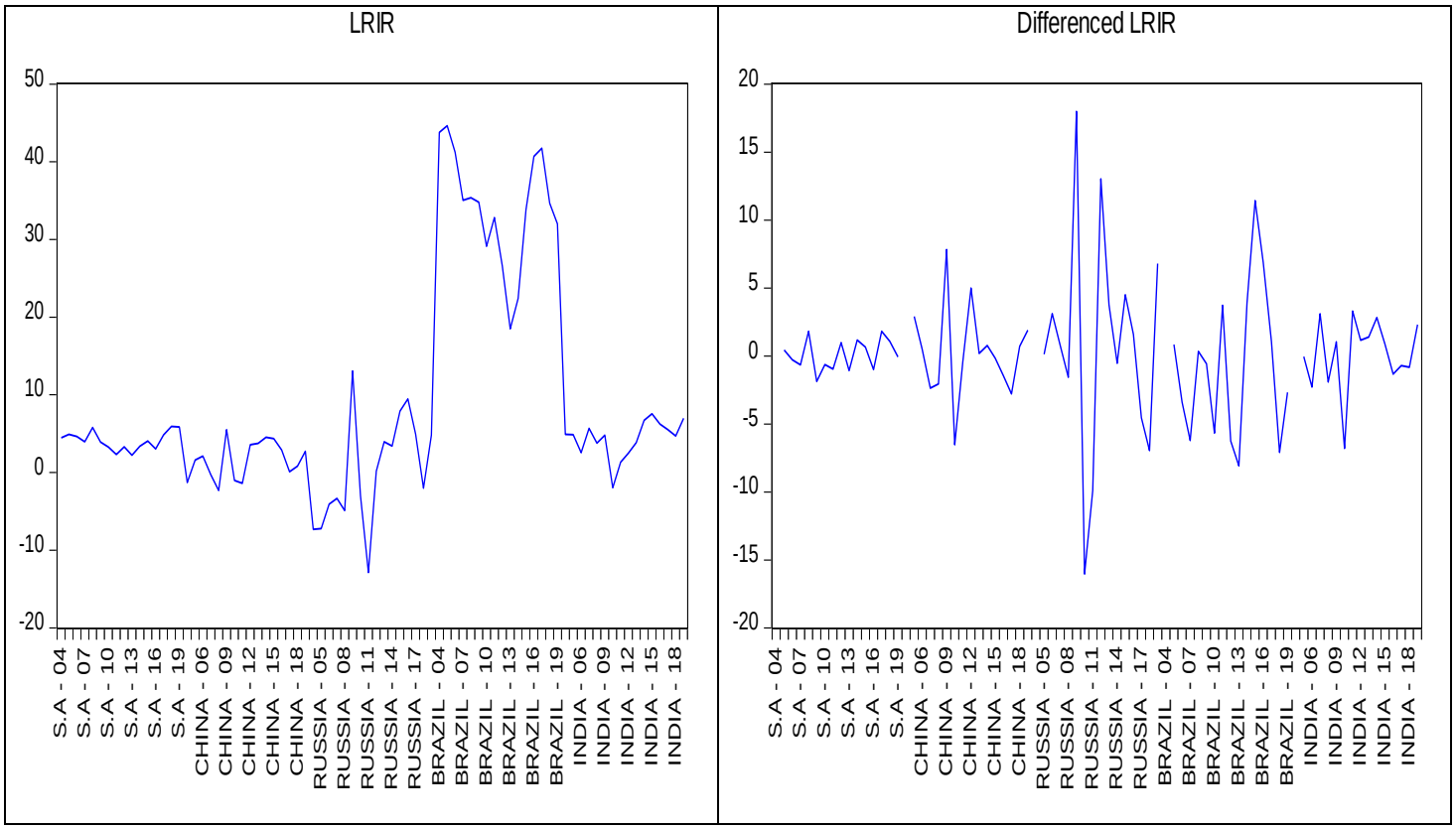
Figure 5.7 SADC Real interest rate (LRIR), 2004-2019



Source: Author compilation from World Bank data 2004-2019

Notes: LRIR-Real interest rate; SA-South Africa

Figure 5.8 BRICS Real interest rate (LRIR), 2004-2019



Source: Author compilation from World Bank data 2004-2019

Notes: LRIR-Real interest rate; SA-South Africa

As shown by previous figures above, at level form all the variables are non-stationary thus they become stationary after 1st difference. The same applies to figures 5.7 and 5.8 as they show that real interest rate is non stationary at level. Therefore, once it is differenced at 1st difference it becomes stationary and thus real interest rate waver around the mean of zero. Although real interest rate on SADC is stationary at level, these findings are not clear on informal testing hence the formal test was performed to confirm this by using IPS, Fisher ADF and Fisher PP which found it to be stationary at level. However, BRICS data showed non-stationary of real interest rate.

5.2.1.2 Formal testing of unit roots

This section reports on findings on the existence of unit roots to check for order of integration of the variables as extracted from the E-views. The tests are conducted using the IM, Perasan and Shin (2003), Fisher ADF (1979) and the Fisher PP (1988) which will be used to confirm the findings of Fisher ADF.

Table 5.1: Summary of unit roots test results (SADC and BRICS)

Var.	Order of Int.	IM, Perasan and Shin		Fisher Augmented Dickey Fuller			Fisher Phillips-Perron		
		Indiv. intercept	Indiv. trend	Indiv. intercept	Indiv. trend	none	Indiv. intercept	Indiv. trend	None
SADC model									
LGFCF	Level	-	0.6795	0.0614	0.7064	1.0000	0.0000	0.6402	1.0000
	1st diff	-	0.0475	-	0.0522	0.0006	-	0.0000	0.0000
LTD	Level	0.1331	0.1612	0.1457	0.2284	0.6502	0.0695	0.1388	0.7581
	1st diff	0.0007	0.0807	0.0019	0.1209	0.0000	0.0000	0.0000	0.0000
LREX	Level	0.9997	0.6802	0.9995	0.5164	1.0000	0.9995	0.9155	1.0000
	1st diff	0.0004	0.0041	0.0004	0.0051	0.0000	0.0000	0.0001	0.0000
LRIR	Level	0.0000	0.2866	0.0001	0.0055	0.2412	0.0002	0.0533	0.0748
BRICS model									
LGFCF	Level	0.0062	0.7840	0.0120	0.8652	1.0000	0.0000	0.9540	1.0000
	1st diff	-	0.0257	-	0.0324	0.0112	-	0.0000	0.0017
LTD	Level	0.1203	0.3954	0.0970	0.2553	0.4090	0.0312	0.0561	0.0979
LREX	Level	0.9213	0.5897	0.9068	0.5818	0.9944	0.9669	0.1656	0.9648
	1st diff	0.0108	0.0147	0.0161	0.0200	0.0003	0.0018	0.0008	0.0000
LRIR	Level	0.0943	0.3144	0.1251	0.2260	0.1037	0.0265	0.0794	0.0163
	1st diff	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Author's compilation World Bank data 2004-2019

Notes: Var-variables in the study, Order of int-order of integration, Indiv. Intercept-individual intercept, Indiv. Trend-individual trend and intercept, LGFCF- gross fixed capital formation, LTD-trade openness, LREX-real exchange rate, LRIR-real interest rate.

Table 5.1 confirms the earlier findings in informal tests on all the variables in figures 5.1 to 5.8. The results for SADC show that gross fixed capital formation, trade openness and real exchange rate are significant at 1%, 5% and 10% and are stationary at 1st difference. The conclusion on variables that are stationary after being differenced is that they integrate at order I (1). The null hypothesis of the unit root indicate its presence and the study reject it for these variables. It was found that real interest rate in the SADC model becomes stationary at level meaning it integrates at order I (0).

For the BRICS unit root, investment and real exchange rate becomes stationary at 1st difference and thus the null hypothesis is rejected as the probability values are less than 5%. Trade openness and real interest rate becomes stationary at level of significance. The conclusion on BRICS outcomes is that investment and real exchange rate integrate at order I (1) while trade openness and real interest rate integrate at order I (0). All the rejection of null hypothesis on all the variables are confirmed by IPS, Fisher ADF and Fisher PP.

The decision for these three model specifications of unit root test was to ensure robustness of the stationarity in terms of order of integration as one test will be confirmed by another. The reason for selection of the tests is mainly because of Fisher and IPS tests are comparable. This is because both tests are a combination of different independent tests and verify the same hypothesis (Maphutha, 2018). In literature, Fisher ADF & PP are represented by the studies of Sugimoto et al (2015), Adegboyega and Odusany (2014) and Nyarota (2015) who found investment and trade openness to be stationary at order I(1) which is in consistent with the results of the study. Contrary to the results found in this study, Kapingura (2018) discovered in their study that trade openness and interest rate integrated at order I(0) and I(1) respectively. The tests included results on stationarity at individual intercept, individual intercept and trend and at none. In terms of comparison, SADC is found to have three variables that integrate at order I(1) whereas one is at order I(0) then in BRICS two of the variables

integrate at order I(1) and order I(0). The order of integration yielded different orders of integration at level and 1st differencing. Now that the order of integration has been determined, table 5.2 presents a VAR lag order criteria to determine the lag length.

5.2.2: VAR Lag Order Criteria

Table 5.2 display results of lag length selection using the vector autoregressive (VAR) lag order criteria. The VAR is the order of inferences in the models since they depend on the correct lag order specifications. When the lag of the model has been correctly specified, cointegration will therefore be demonstrated (Wilma, 2017, Nicholson, 2017 and Kilian, 2013).

Table: 5.2 VAR Lag Order Criteria results

Lag	LogL	LR	FPE	AIC	SC	HQ
SADC						
0	-234.6525	NA	0.0058	6.1988	6.3205	6.2475
1	254.0579	913.9520	2.69e-08	-6.0794	-5.4706*	-5.8359
2	278.3742	42.9482	2.18e-08*	-6.2954*	-5.1996	-5.8571*
3	288.8040	17.3378	2.54e-08	-6.1508	-4.5679	-5.5176
4	298.1387	14.5476	3.07e-08	-5.9776	-3.9078	-5.1497
5	316.7704	27.1006*	2.94e-08	-6.0459	-3.4891	-5.0233
BRICS						
0	-117.7006	NA	0.0000	4.4255	4.5715	4.4819
1	234.9914	641.2582*	4.74e-09*	-7.8179*	-7.0879*	-7.5356

2	247.7558	2.3514	5.38e-09	-7.7002	-6.3863	-7.1921
3	259.3196	17.6610	6.48e-09	-7.5388	-5.6411	-6.8049
4	276.5063	23.7488	6.51e-09	-7.5820	-5.1002	-6.6223
5	292.2454	19.4592	7.11e-09	-7.5726	-4.5068	-6.3870

Source: Author's compilation from World Bank

Notes: * indicates lag order selected by the criterion, LR- sequential modified LR test statistic (each test at 5% level), FPE-Final prediction error, AIC- Akaike information criterion, SC-Schwarz information criterion and HQ-Hannan-Quinn information criterion.

The study follows the lag order selection of Schwarz information criterion as indicated by table 5.2 above. The decision to follow this order amongst other reasons is because for both SADC and BRICS models in lag 1 it is selected as indicated by the asterisks in the table above. Main reason for this lag selection is because of the best results it produced as Johansen co-integration test will be piloted using this lag. For SADC it shows only lag 1 on Schwarz information criteria while on BRICS shows on sequential modified LR test statistic, final prediction, akaike information criteria and schwarz information criterion. Although other criterion such as final prediction error and Akaike information criterion indicates lag 1 on BRICS, the study followed the Schwarz information criterion recommendation. Schwarz information criterion is said to be efficient in measuring the parameter model in terms of predicting data (Neath & Cavanaugh, 2012). Therefore, when comparing the results produced by the Schwarz information criterion, the study found that the results for both regions are comparable and best produce.

5.5.3 Panel cointegration tests results

After the lag length has been determined, the study follows the panel of Johansen, Kao test and Johansen Fisher cointegration to investigate for the long run relationship concerning investment plus its determinants.

5.5.3.1 Panel Johansen Trace and Maximum Eigenvalue test

Panel Johansen trace and maximum eigenvalue test present panel individual co-integration tests for the presence of long run relationship amongst the variables in the SADC and BRICS simulations which consist of trace test and the maximum eigenvalue. Table 5.3 and 5.4 presents the panel Johansen cointegration tests.

Table 5.3: Panel Johansen cointegration Trace test results

SADC	**Hypothesized No. of CE(s)**	**Eigenvalue**	**Trace Statistic**	**0.05 Critical value**	**Prob.****
	None*	0.3479	52.4505	47.8561	0.0174
	At most 1	0.0727	10.5412	29.7971	0.9712
	At most 2	0.0279	3.14027	15.4947	0.9602
	At most 3	0.0038	0.36871	3.34147	0.5437
BRICS					
	None	0.3574	40.1444	47.8561	0.2174
	At most 1	0.1107	9.1908	29.7971	0.9898
	At most 2	0.0134	0.9771	15.4947	1.0000
	At most 3	0.0004	0.0304	3.84147	0.8616

Source: Author's compilation from World Bank

According to the trace test in table 5.2, it indicates at least one cointegrating equation at the probability of 0.05 for SADC data. In the case of SADC, the null hypothesis is rejected because the trace statistic of 52.45 is superior to the p-value of 0.05 critical value of 47.87. For BRICS it indicates no cointegration as the t-statistic of 40.14 is lower than the critical value of 0.05 of 47.87. This means the study accept the null hypothesis of no co-integration using the trace statistics for BRICS of 0.05 critical value. In comparison with the SADC, it is found in trace test there is no cointegration.

However, the maximum eigenvalue was utilised to reject the null hypothesis of no cointegration in BRICS.

Table 5.4: Panel Johansen cointegration Maximum Eigenvalue test result

SADC	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical value	Prob.**
	None*	0.3479	41.9092	27.5843	0.0004
	At most 1	0.0727	7.4009	21.1316	0.9364
	At most 2	0.0279	2.7716	14.2646	0.9608
	At most 3	0.0038	0.3687	3.8415	0.5437
BRICS					
	None*	0.3574	30.9535	27.5843	0.0177
	At most 1	0.1107	8.2138	21.1316	0.8901
	At most 2	0.0134	0.9467	14.2646	0.9999
	At most 3	0.0004	0.0303	3.8415	0.8616

Source: Author's compilation from World Bank data

Maximum Eigenvalue test indicates one cointegrating equation on both SADC and BRICS. This is shown by trace statistic which is more than the critical value of 5%. The trace statistic for SADC is 41.91 and critical value of 27.58 while trace statistic for BRICS is 30.95 and critical value is 27.58. The maximum eigenvalue test indicates cointegration for all SADC and BRICS as opposed to when it was compared in the trace test. All the regions are cointegrating indicating long run relationship with trade openness, real exchange rate and real interest rate on investment.

5.5.3.2 Pedroni cointegration test

Table 5.5 tests for the Pedroni cointegration for this study which comprises of seven statistics with each having its own probability value. The null hypothesis is that there

is no cointegration and each statistic can either reject or accept the null hypothesis depending on the probability value.

Table 5.5: Pedroni cointegration tests results

SADC	
Statistics	**Probability**
Panel v-statistic	0.0350
Panel rho-statistic	0.0505
Panel PP-statistic	0.0785
Panel ADF-statistic	0.0619
Group rho-statistic	0.9960
Group PP-statistic	0.0494
Group ADF-statistic	0.0099
BRICS	
Panel v-statistic	0.0000
Panel rho-statistic	0.8989
Panel PP-statistic	0.0186
Panel ADF-statistic	0.0300
Group rho-statistic	0.0712
Group PP-statistic	0.0079
Group ADF-statistic	0.7503

Source: Author's compilation from World Bank data

The results aimed at the SADC region indicates that six obtainable of seven statistics rejects the null hypothesis of no cointegration (see table 5.5). This means in the SADC region there is a long run relationship between the variables on investment activities.

When assessing for BRICS region it is found by the study that there are five cointegrating statistics and thus the null hypothesis is rejected. The results also confirms the presence of long run relationship between the variables. In comparison between the regions, it is found that SADC has more cointegrating statistics than the BRICS region. The fact that there is long run relationship between the determinants of investment in these regions is line with the works of Bilan & Ihnatov (2015) in SADC as well as those of Lamhmiri (2017) & Jadhhar (2012) in BRICS on determinants of investment.

5.5.3.3. Kao panel cointegration test

Table 5.6 tests for the availability of cointegration in the models for SADC and BRICS respectively using the Kao panel cointegration test. The null hypothesis of the Kao test is that there are no cointegration in the models and permits for unbalanced panel in the long term.

Table 5.6: Kao panel cointegration test results

	Variable	*t-statistic*	*Prob.*		*t-statistic*	*Prob.*
	ADF	-2.9973	0.0014		-3.6723	0.0001
SADC	Residual variance	0.0073	-	***BRICS***	0.0040	-
	HAC variance	0.0147	-		0.0108	-

Source: Author's compilation from World Bank

It is illustrated in table 5.6 that the Kao test followed the same null hypothesis as Panel Johansen cointegration trace and maximum eigenvalue test as well as the Pedroni cointegration test. The null hypothesis is that if the p-value is less than 0.05 there is no cointegration and the null hypothesis is not rejected. The p-values for SADC and BRICS regions shows that they are below the 0.05 and therefore the null hypothesis are rejected. The conclusion on the Kao test was that there was cointegration and the null hypothesis are rejected. It can therefore be concluded that in the model there is existence of long run relationship amongst the variables in both the SADC and BRICS. Studies conducted in Southern African Development Community by Mahembe & Odhiambo (2016) confirms the importance of the Kao test in determining cointegration

of the model as they found it to be significant and yielded a long run relationship between investment, economic growth and trade openness. In BRICS literature, Bhattacharya (2016) support the findings of cointegration in the Kao test.

5.5.3.4. Johansen Fisher panel cointegration test

The Johansen Fisher panel cointegration tests for the presence of the long run association amongst the variables in the models and in this study is used to complement the results by the Kao test. This test combines the trace test and maximum eigenvalue test and their p-values are used for determination of the existence of or no co-integration. It goes further to test for co-integration in the individual countries to assess if there exist long run relationship between investment and its determinants.

Table 5.7: Johansen Fisher panel cointegration test results

Hypothesised no of CE(s)	**Fisher Stat.* (from trace test)**	**Prob.**	**Fisher Stat.* (from max-Eigen test)**	**Prob.**
SADC				
None	166.6	0.0000	109.8	0.0000
At most 1	77.62	0.0000	46.24	0.0000
At most 2	47.91	0.0000	37.38	0.0000
At most 3	33.73	0.0023	33.73	0.0023
BRICS				
None	97.26	0.0000	66.85	0.0000
At most 1	43.00	0.0000	24.04	0.0075
At most 2	29.12	0.0012	24.67	0.0060
At most 3	21.38	0.0186	21.38	0.0186

Source: Author’s compilation from World Bank

Notes: Prob**-Probability value, S.A-South Africa, Fisher Stat**-Fisher Statistics.

Table 5.7 displays the outcomes for unlimited cointegration rank test using the trace and maximum eigenvalue for both SADC and BRICS. The results are therefore rejecting the null hypothesis of no cointegration as all the p-values are below the 0.01 for SADC and most of BRICS outcomes follow the same decision except only at most 3 where the rejection of null hypothesis is at less than critical value of 0.05. These findings confirms the Kao test which indicated the long run relationship between variables in all the regions in the study. This means for this study there is a long run relationship among investment, trade openness, real exchange rate and real interest rate. As a result, the existence of long run relationship between the variables allows for the estimation of determinants of investment in the SADC and BRICS economic regions. It is found in the study that both regions when compared to each other there is cointegration amongst their variables using both the trace statistic and maximum eigenvalue. Thus, according to the panel Johansen fisher cointegration there is a long run relationship between trade openness, real exchange rate and real interest rate on investment in SADC and BRICS. This long run relationship between the two regions means that when these variables are implemented and monitored correctly, they have the potential to drive high investments. This could further help the economies of these countries to improve in terms of development as there will be increased economic activities leading to economic growth (Djapou, 2017). In conjunction with each other, SADC and BRICS regions can form great alliance in terms of sharing investment opportunities and clear trade agreements, stable exchange rate and reliable interest rates in the long run to yield positive results.

5.5.3.5. Individual cross section test

This sections aims to determine if exposure to specific factors might correlate with the outcomes.

Table 5.8: Individual cross section for SADC

SADC				
Cross Section	**Trace Test Statistics**	**Prob.****	**Max-Eigen Test Statistics**	**Prob.****
Hypothesis of no cointegration				
S.A	85.5703	0.0000	46.3565	0.0001
LESOTHO	79.4660	0.0000	38.2014	0.0015
MALAWI	77.7032	0.0000	36.9563	0.0024
ANGOLA	59.2057	0.0030	33.5233	0.0077
MADAGASCAR	99.5262	0.0000	55.8454	0.0000
MAURITIUS	49.6524	0.0336	26.2921	0.0724
NAMIBIA	103.8176	0.0000	53.3133	0.0000
Hypothesis of most 1 cointegration relationship				
S.A	39.2138	0.0031	18.7159	0.1054
LESOTHO	41.2646	0.0016	20.6419	0.0584
MALAWI	40.7469	0.0019	30.0822	0.0021
ANGOLA	25.6824	0.0007	22.3208	0.0757
MADAGASCAR	43.6808	0.0007	22.3208	0.0339
MAURITIUS	23.3603	0.2288	16.5016	0.1969
NAMIBIA	50.5063	0.0001	24.9486	0.0138

Source: Author's compilation from World Bank data

Notes: Prob**-probability value, S.A-South Africa

The individual cross sections results for the SADC countries show the rejection of null hypothesis on all countries under the trace test and maximum eigenvalue using the hypothesis of no cointegration except for Mauritius with the acceptance of null hypothesis under the maximum eigenvalue. Under the hypothesis of most 1 cointegration relationship, South Africa, Lesotho, Malawi, Angola, Madagascar and Namibia rejects the null hypothesis of no cointegration whereas Mauritius accept the null hypothesis. The maximum eigenvalue accept the null of no cointegration for South Africa and Mauritius while rejecting the null hypothesis of no cointegration for Lesotho, Malawi, Angola, Madagascar and Namibia as their p-values are below the critical values of 0.05 and 0.10 percent. Therefore for these countries there is cointegration among the variables.

Table 5.9 Individual cross section for BRICS

BRICS				
Cross Section	**Trace Test Statistics**	**Prob.****	**Max-Eigen Test Statistics**	**Prob.****
Hypothesis of no cointegration				
S.A	85.5703	0.0000	46.3565	0.0001
CHINA	60.6758	0.0020	31.5539	0.0146
RUSSIA	63.2121	0.0010	26.4980	0.0683
BRAZIL	99.6189	0.0000	59.2063	0.0000
INDIA	50.9876	0.0247	26.3380	0.0715
Hypothesis of most 1 cointegration relationship				
S.A	39.2138	0.0031	18.7159	0.1054
CHINA	29.1219	0.0597	15.3830	0.2630
RUSSIA	36.7141	0.0068	21.5418	0.0438

BRAZIL	40.4126	0.0021	25.2896	0.0122
INDIA	24.6496	0.1744	13.5322	0.4046

Source: Author's compilation from World Bank data

The results in the BRICS model indicate the rejection of null hypothesis at no cointegration for South Africa, China, Brazil, Russia and India both in the trace test and maximum eigenvalue. Hypothesis at most 1 cointegration show that for South Africa the study rejects the null hypothesis under the trace test while on maximum eigenvalue it is accepted. Russia and Brazil indicates the rejection of null hypothesis both in trace test and maximum eigenvalue as the p-values are below the critical values of 0.05. Lastly, China rejects the null of no cointegration under the trace test but accept the null hypothesis on maximum eigenvalue. India also show no cointegration in both the tests and the conclusion is that of acceptance of the null hypothesis in these countries. In comparison to SADC, most BRICS countries show cointegration on the variables deployed in the study.

5.5.4 Panel Autoregressive distributive lag results

Panel ARDL provide the long and short run relationship estimates as well as the speed of adjustment in the models to determine how quickly the model come back to the equilibrium. The estimates are achieved over logged trade openness, real exchange rate and real interest rate. Table 5.10 illustrate long run relationship for SADC.

Table 5.10: Long run relationship in SADC

Long run relationship		
Variables	Coefficient	Prob.
LTD	2.613078	0.0002
LREX	0.516804	0.0006
LRIR	-0.057383	0.2633

Source: Author's compilation from World Bank data

Notes: LTD-Trade openness, LREX- Real interest rate, LRIR- Real interest rate

The results from table 5.10 above states that in the long run, trade openness and investment have a strong relationship as an increase in trade openness by 1% will lead to rise in investment by 2.61% and the same impact is experienced by investment when real exchange rate rise by 1% there will be an increase in investment by 0.51%. The results are consistent with those of Ralarala and Ncanywa (2020), Maphutha (2018) and Odiambo (2013) who found a long run relationship between investment and exchange rate in the Sub-Saharan countries, South Africa & Nigeria respectively. These results justifies the existence of cointegration in the model (Zehirun, 2014). This means the two variables have an important power on the performance of investment in the SADC region. However, in the long run there is a negative relationship between real interest rate leading to a decrease in investment by -5.73%. Ralarala and Ncanywa (2020) found a negative long run relationship between lending rate and investment which also confirms the findings in the SADC region. They further state that in order to have a high performing economies, interest rates should not be raised high as this may lead to discouragement of investing. Their argument is line with the theory of Keynes that a conducive environment on interest rates provide a long run survival of the investment. The results in SADC for interest for this study are in contrary with the theory. This means the region does not have competitive interest rates that encourage investors to yield returns on their investments.

Table 5.11: Short run relationship in SADC

Short run		
Variable	**Coefficient**	**Prob.**
LTD	-0.2051	0.4314
LREX	-0.2334	0.2112
LRIR	-0.0033	0.8055
ECT	-0.2286	0.0000
C	1.3157	0.0001

Source: Author's compilation from World Bank data

Notes: ECT-Error correction term, C-Constant, LTD-trade openness, LREX-real exchange rate and LRIR-real interest rate

Table 5.11 implies that in the short run, a 1% increase in trade openness will lead to a decrease in investment by 20.52% while increase in real exchange rate will lead to a decrease of investment by 23.34%. Finally, a rise of 1% in real interest rate in the economy will lead to a reduction of investment by 0.34%. From the results in the study, there is a negative short run relationship between trade openness, real exchange rate and real interest rate on investment. These results further imply that in the short run the variables have no positive effect on investment activities in the selected SADC countries.

Error correction model which is also known as the speed of adjustment is expected to be negative and significant (Brooks, 2019). Therefore, this study and for SADC region the speed of adjustment is at -0.2286 which translates to 22.86%. The error correction model has been found to be negative in this region in the studies of Ellyne & Chater (2013), Odiambo (2014) and Zehirun (2014).This Implies that investment is corrected in the current year, that is, it shows that variables should be adjusted accordingly by 22.86% to restore equilibrium in the short run. The speed of adjustment usually varies due to geographical factors and choice of variables. For this model of SADC, the study considered countries such as South Africa, Lesotho, Malawi, Angola, Namibia, Mauritius and Madagascar.

Table: 5.12: Long run relationship in BRICS

Long run relationship		
Variables	**Coefficient**	**Prob.**
LTD	-0.9437	0.3205
LREX	-1.3458	0.2554
LRIR	-0.1938	0.0623

Source: Author's compilation from World Bank data

Notes: LTD- Trade openness, LREX- Real interest rate, LRIR- Real interest rate

Long run relationship for BRICS shows a negative relationship between the variables and investment. This relation is shown when a 1% increase in investment lead to a decrease in trade openness by 94.37%. The findings of this study do not tie with the results by Jadhav (2012), Yukhanaev, Sharma & Nevidimova (2014) and Vijayakumar, Sridharan & Rao (2010) who found a positive relationship between trade openness, interest rate and investment in BRICS countries implying that when these countries open their trading systems in the long run their economies do not realise growth. It is further shown that in the long run a 1% increase in investment will lead to a decrease of real exchange rate by 134.48%.

Lastly, a rise in investment result in reduction of real interest rate by 19.37%. This negative relation of interest rate and investment is in line with the discoveries by Malawi and Bader (2010) as well as Ashraf et al (2016). The results are further in contradiction with the earlier findings in the cointegration tests of the study. The findings of this study were found to be in contradiction with the predominant view of the past literatures including those of Pattayat (2016), Alshammari et al., (2015). Maepa & Muzindutsi (2017) that indicated exchange rate plays a very vital role in determining investment activity worldwide. When compared to the SADC, BRICS countries are not having a positive economic growth in the long run as opposed to the results found in SADC. This can be mainly because countries in the SADC regions are developing nations and as a result, they prioritise on having stable exchange rate and interest rate whereas BRICS countries behaviour have been detected to be chaotic.

This chaotic behaviour in BRICS was discovered by Lavallin (2018), Balcilar (2013) and Lahmiri (2017) suggesting the free floating exchange rate system has made the path for exchange rate in this region more predictable. Maphuta (2018) further explain that exchange rate can have a significant impact on the performance of the economy. This will depend on whether the exchange rate is weak or strong in that economy. With the evidence of negative long run relationship between exchange rate and investment, countries in the BRICS may find it difficult to have a growing economy influenced by investment.

On the other hand, with negative relationship between trade openness and investment, this means in the BRICS region, the economic policies restrict and does not promote investment as compared to SADC region which encourages and promote

investment within its member states. When compared to SADC it is found in the study that the SADC region is having a positive long run relationship with trade openness and real exchange rate as opposed to negative long run relationship found in the BRICS region on trade openness, real exchange rate and real interest rate. This means in the long run the BRICS countries do not have a positive relation with the determinants of investment. This is against the expectations of the theoretical background of this study such as theory of Keynes and that of Heckscher-Ohlin theory while in SADC the Keynes investment theory. Since South Africa is a trading partner in both regions, the recent downgrades by credit agencies to put the country in the junk status had a negative impact and was expected as it alluded that trade openness was low (Lings, 2017).

Table: 5.13: Short run relationship in BRICS

Short run		
Variable	**Coefficient**	**Prob.**
LTD	0.1503	0.3861
LREX	-0.2493	0.0539
LRIR	-0.0138	0.4116
ECT	-0.0598	0.0000
C	1.0003	0.0000

Source: Author's compilation from World Bank data

Notes: ECT-Error correction term, C-Constant, LTD-trade openness, LREX-real exchange rate and LRIR-real interest rate

The results for trade openness show positive relationship between investments in the short run. A 1% increase in investment in the short run will lead to an increase in trade openness by 15.03% confirming the results of Jadhav (2012) who found a positive short run relationship in BRICS countries. However, the results for real exchange rate indicate a negative relationship between investment and exchange rate. This means that a 1% increase on investment will lead to a decrease in exchange rate by 24.93%

in the short run. The same results of negative relationship are found between real interest rate and investment. The results show that a 1% increase in investment in the short run will lead to a decrease in real interest rate by 1.39%. It can be concluded that in the short run there is a negative relationship between investment and its determinants in the BRICS countries.

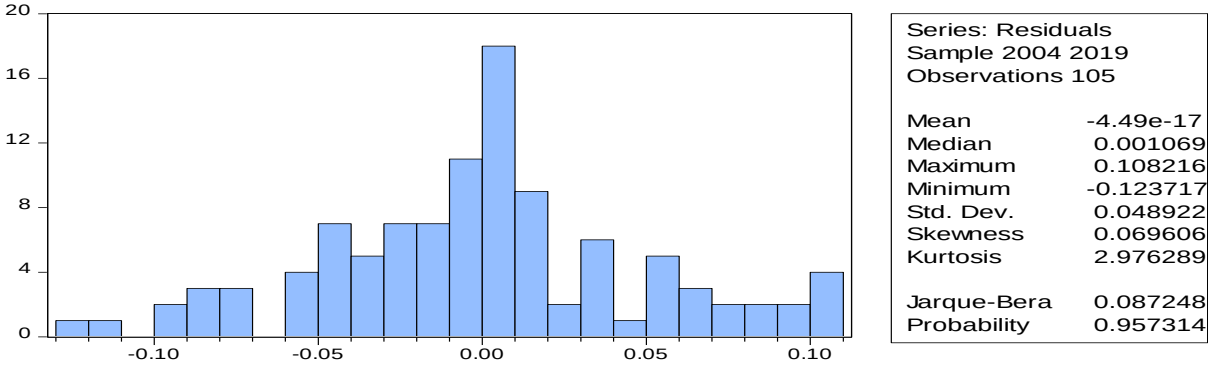
The error correction term for BRICS indicates a negative and is also significant statistically at 1%. The error term is -0.0598 which indicates that the model for BRICS region adjust quickly and converge to the equilibrium at a speed of 5.98%. The results are in contrary with the theory of Tobin's Q theory which says firms can borrow funds for investment purposes at any level or rate of interest. This further means to invest in the SADC and BRICS regions yields negative returns. In these regions, the study found that in the short run there is no relationship between the determinants of investment when compared to each other where South Africa is the trading partner. It is found in this study that the SADC has a higher speed of adjustment compared to the BRICS group.

5.5.5 Diagnostic tests results

The diagnostic test for the stability of the model is using the normality test assessing with probability value, Jarque-Bera, Kurtosis and Skewness. Lastly, the stability of the models is tested using the VAR stability test of inverse roots of AR characteristic polynomial.

5.5.5.1 Normality test

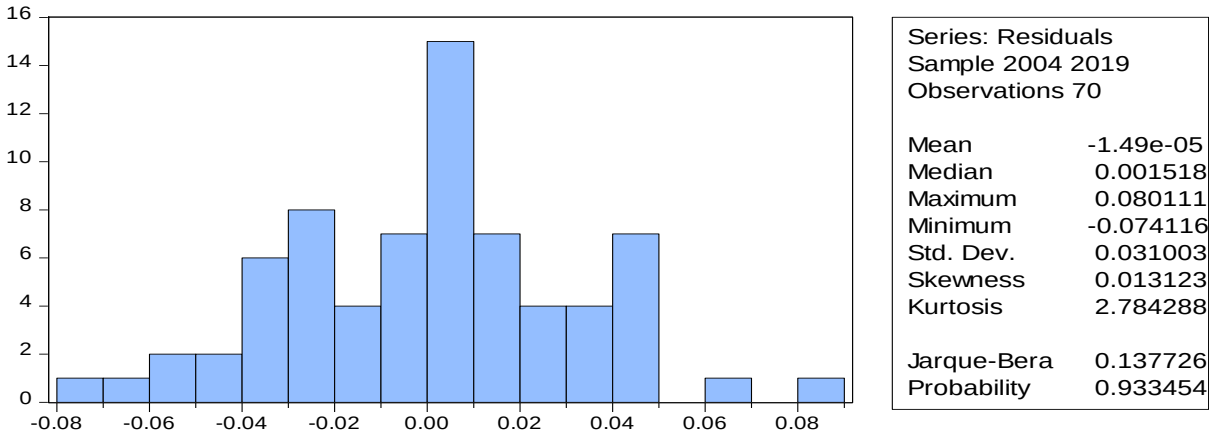
Figure 5.9: Normality test for SADC



Source: Author's compilation from World Bank data

Figure 5.9 shows the empirical distribution of the data it should be bell-shaped and resemble the normal distribution. Form the visual inspection, it is evident that the residuals are normally distributed as per the requirement of bell- shaped graph. Again, the normal distributions of residuals are confirmed by means of the probability value which is at 0.9573 which translated to 95.73%. This means the value is insignificant at 5% critical value and therefore becomes significant at more than 5% level. These findings are further confirmed by the Jarque-Bera of 0.0872 (8.72%) which is also at more than the 5% level of critical value. All these findings are confirming the visual inspection or normal distribution on the residuals of the SADC model. The Kurtosis goes further to confirm the normal distribution of the residuals. This is as it yelled results of 2.97 which is close to 3 as it is the required standard figure for normal distribution.

Figure 5.10: Normality test for BRICS

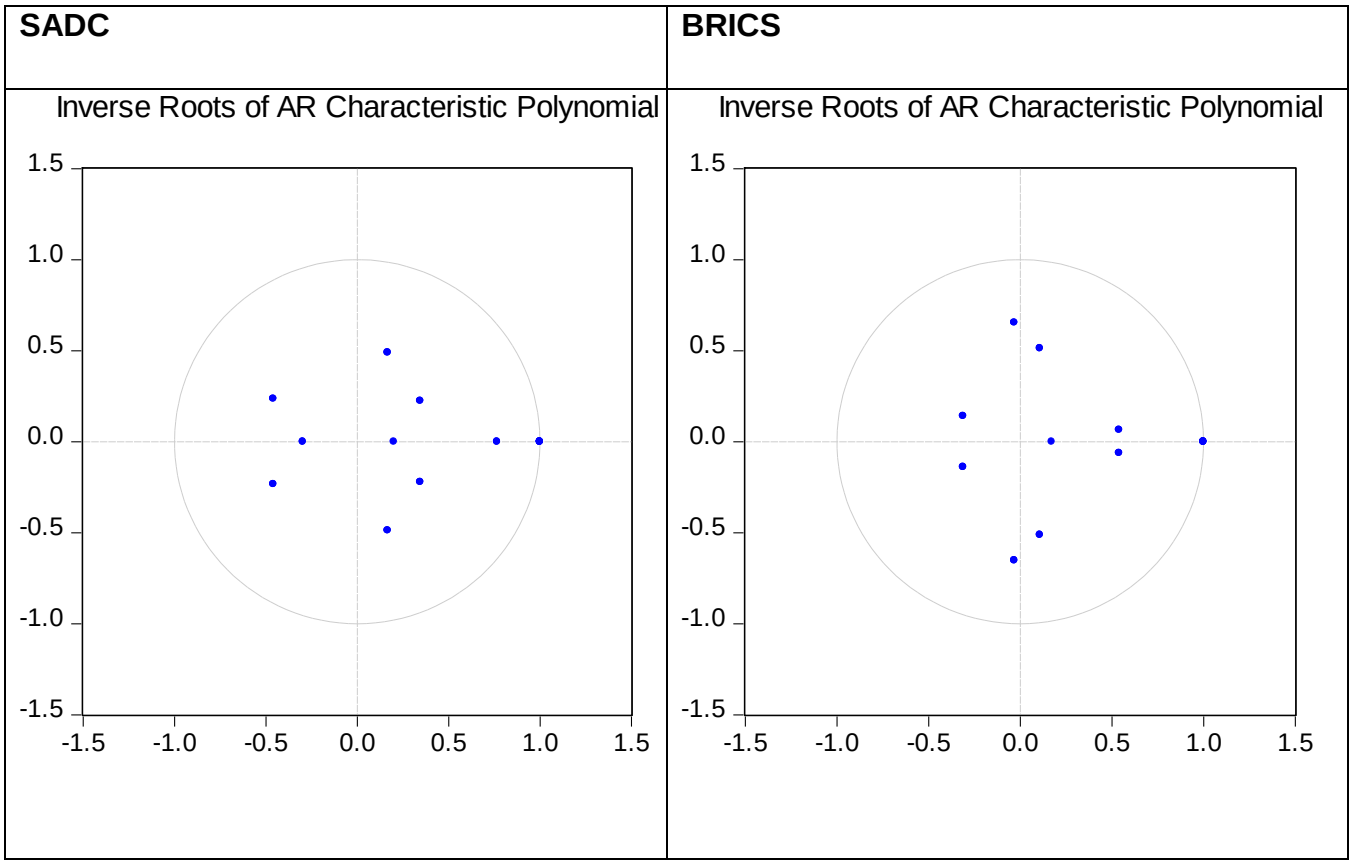


Source: Author's compilation from World Bank data

As indicated by figure 5.10 above there is a normal distribution of residuals in the BRICS model and this evidence is as a result of visual inspection which shows the bell-shaped graph. The normal distributions are further confirmed by the Jarque-Bera and the probability value which are more than the critical value of 0.05. The findings indicate 13.77% and 93.34% for Jarque-Bera and probability value respectively. The Kurtosis test is at 2.78 which can be translated to 3 as it is a requirement for the residuals to be distributed normally. Both models for SADC and BRICS in terms of comparison are found to be normally distributed in this study. These findings are comparable to the works of Mahembe & Odhiambo (2016) and Maphutha (2018) in

SADC and Bhattacharya (2016), Jodhav (2012) and Zehirun (2014) in BRICS who found the models to be normally distributed when diagnostic test was conducted.

Figure 5.11: VAR stability test results for SADC and BRICS



Source: Author's compilation from World Bank data

The stability of the model is confirmed by VAR inverse roots of AR characteristic polynomial which indicates the stability of the models. The first circle indicates the model stability for the SADC region by the dots within the circle. This confirms the findings in the normality test. The second circle is for BRICS region which follows the same conclusion of stability. Marius (2012) highlighted that in order for an estimated VAR to be stable, its roots should have a modulus less than one and remain within the unit circle. Therefore, it can be confirmed from figure 5.11 that all roots have a modulus less than one and also remains in the unit circle for SADC and BRICS regions respectively. From both observation of the circles, the models for these two regions are stable when compared to each other in this study.

5.5.6 Granger Causality tests

Granger causality test is used to predict the future values of one variable on another in forecasting their correlations. Table 5.14 displays the Granger causality test.

Table 5.14: Granger causality test results (SADC)

Null hypothesis	Obs	F-Statistic	P-value	Decision
LTD does not Granger cause LGFCF	98	2.0196	0.0385	Reject the null hypothesis
LGFCF does not Granger cause LTD		4.9313	0.0092	Reject the null hypothesis
LREX does not Granger cause LGFCF	98	0.8988	0.0105	Reject the null hypothesis
LGFCF does not Granger cause LREX		0.2617	0.0303	Reject the null hypothesis
LRIR does not Granger cause LGFCF	98	0.3475	0.7074	Accept the null hypothesis
LGFCF does not Granger cause LRIR		0.9432	0.3931	Accept the null hypothesis

Source: Author's compilation from World Bank data

Notes: Obs- observations, LGFCF-gross fixed capital formation LTD-trade openness, LREX-real exchange rate and LRIR-real interest rate

The Granger Causality tests results show that there are four causalities between investment and trade openness and another causality is observed between real exchange rate and investment. These causalities are all significant at 1% and 5% respectively. This causality indicates that investment does cause trade openness in the SADC region. The findings are a further confirmation of the long run relationship

between investment and trade openness which indicated that an increase in investment will cause an increase in trade openness by 261.30%.

The Granger causality also shows a causality between real exchange rate and investment. This means that in the long run, real exchange rate will cause investment to change in the economies of SADC and the vice versa will occur. Lastly, the study accepts the null hypothesis of no causality between investment and real interest rate in the SADC region as indicated by the insignificant p-values which are more than the required acceptable level of 0.05. The results of Granger causality are validated by the findings of other studies such as those by Seyoum (2015) and Wu & Lin (2014). This means SADC countries should allocate more resources for the preferment and attraction of investment in order to expand their productive capacity to produce and export; in this way, by addressing supply-side constraints, investment will have positive multiplier effects on trade.

Table 5.15: Granger causality test results (BRICS)

Null hypothesis	Obs	F-Statistic	P-value	Decision
LTD does not Granger cause LGFCF	70	0.9805	0.3806	Accept the null hypothesis
LGFCF does not Granger cause LTD		0.5315	0.5902	Accept the null hypothesis
LREX does not Granger cause LGFCF	70	0.9513	0.3915	Accept the null hypothesis
LGFCF does not Granger cause LREX		0.3630	0.6970	Accept the null hypothesis
LRIR does not Granger cause LGFCF	70	0.5777	0.5640	Accept the null hypothesis
LGFCF does not Granger cause LRIR		0.5577	0.5752	Accept the null hypothesis

Source: Author's compilation from World Bank data

Notes: Obs- observations, LGFCF-gross fixed capital formation, LTD-trade openness, LREX-real exchange rate and LRIR-real interest rate

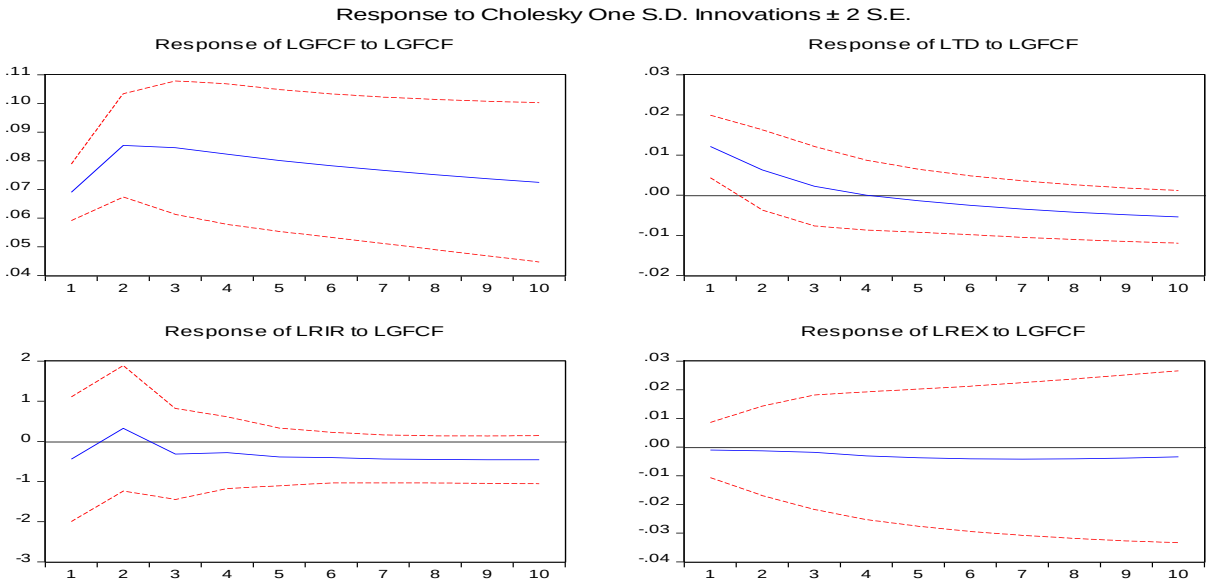
Under the BRICS region it was found that there is no causality between investment and other variables. This means investment does not have an effect on how the rest of other variables react in the long run. The results are a confirmation of earlier findings in the panel ARDL which found no relation between investment and the selected variables. Contrary to the outcomes of this study, Rani& Kumar (2019) argues that the direction of the causality of the variables is important as it enables investors on deciding whether they invest their resources in the economy or not. In comparison with the SADC countries, it is found in the BRICS model of this study that there is no causal long run relationship between trade openness, real exchange rate and real interest on investment.

The positive impact of real exchange rate on investment in the SADC region in the long run is as a result of stronger rand against the currencies of the selected SADC countries in this study. This might be due to investors prefer to put their investments in a more stable and efficient economies. These discoveries of the study are supported by findings of Yagan (2015) and Alstadsater et al. (2016) who found no causal relationship between trade openness and exchange rate on investment in BRICS. This means investments made in SADC are influenced by the behaviour and stability of exchange rate and trade openness while in BRICS they have no long run causal. While a negative impact is found in the BRICS region, it is because of a weaker rand against the currencies of other BRICS countries. Investors will be reluctant to invest in an economy which has a weaker currency. The Granger causality tests indicated a bi-directional causality in the exchange rate-investment and trade openness-investment nexus in the SADC while there was no causality in the BRICS group.

5.5.7 Generalised Impulse Response Function results

This test for the unit response of the variables in the model on how they will cause a reaction to each other.

Figure 5.12: Impulse response function result (SADC)



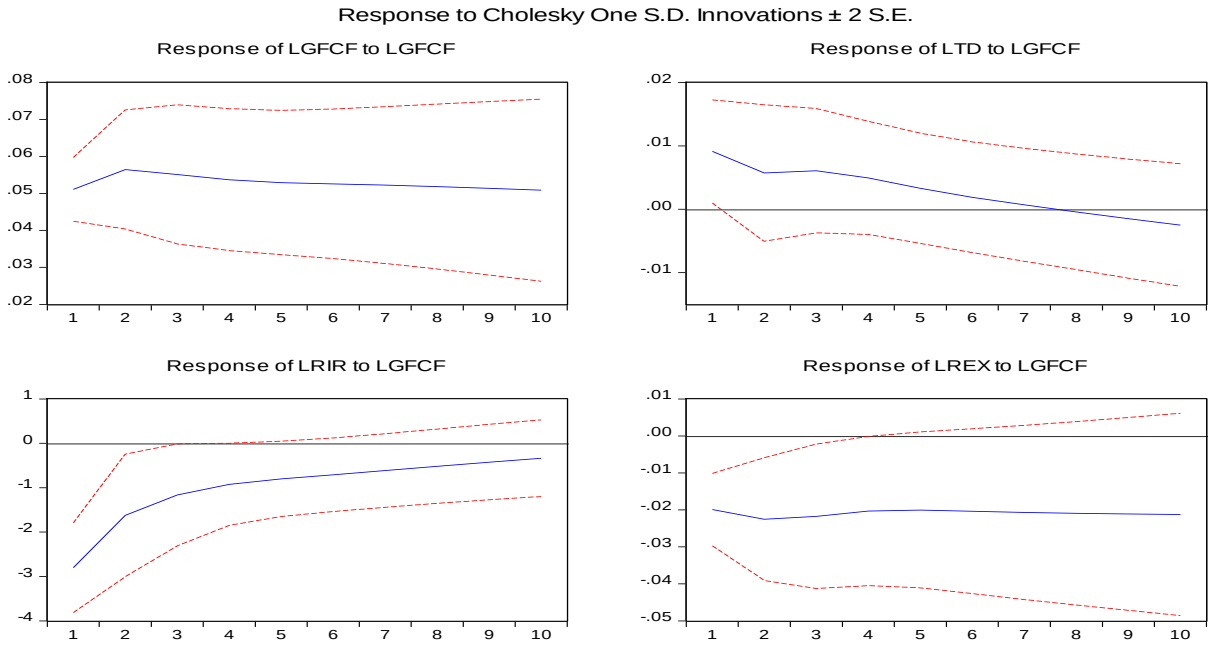
Source: Author's compilation from World Bank data

Early panel ARDL estimation system causal analysis was extended by examining the impulse response function (IRF) in this section. Koop, Perasan, & Porter (1996) show that the impact of the current and future value of IRF can capture one-time impact of an innovative endogenous variable. Figure 5.12 presents the results for the impulse response function which indicates how one standard deviation shock to the residual will induce the reaction of other variables on one another over a period of 10. The blue line is the impulse response function while the two red lines indicate the 95% confidence intervals. As illustrated in the variance decomposition, period 1-2 are short run while 9-10 are long run. The results start by demonstrating the reactions of investment on investment. The results as indicated by the figure of gross fixed capital formation show that investment in the short run has a positive impact from low standard deviation on itself from period 1 to 2 and start to gradually decline from period 3 up until in the long run in period 10. This means in the short run there is positive impact while in the long run it is negative.

Secondly, the results of trade openness show a sharp decline from period 1 up until in period 10 when it hits the negative standard deviation shock to investment. This means trade openness has no impact on investment in the short run. Thirdly, during the periods 1-3 there shows a constant and positive relation between real exchange rate and investment in the short run while from period 3-10 there shows a small negative

decline as it remained in the negative region until the end of the period 10. Lastly, real interest rate on investment indicate a significant increase from the negative region from period 1 up until period 2 when it reach steady state in the positive region in the short run. These outcomes confirms the results of researchers such as (Ralarala & Ncanywa, 2020 and Dufrenot, Mignon & Tsangarides, 2010). In the long, it is observed that from period 2 till 10 in the long run there has not been an improvement in the reaction between the variables.

Figure 5.13: Impulse response results (BRICS)



Source: Author's compilation from World Bank data

Figure 5.13 present the Cholesky impulse response function for the BRICS region showing how one standard deviation shock induces the reaction of variables towards each other. In order to trace the inclusiveness, three competing variables are provided in the system and it captures 10 years for tracing the effect of shocks. The results for investment on investment show that the standard deviation shock in the short run induces a small reaction on investment for only 1 period and from period 2 it shows small reaction until period 10 in the long run. This means in the short run there is slight positive reaction while in the long run there is small negative reaction on itself. Response of trade openness on investment starts of in the positive shock but with a decline in the short run until period 8 where it continues to have a decreased negative shock. This means from short run until long run there is negative influence of trade

openness on investment. A shock in real interest rate show a negative shock between it and investment both in the short and long run. Lastly there is a negative shock between interest rate and investment for short and long run, however there is an upward trend of the shock from short run to long run. The results are consistent with those found by Shahbaz (2012) in the BRICS region.

Comparing SADC and BRICS, this study found that real interest rate in the SADC has a fair share of positive trend while in BRICS it remained significantly negative throughout the periods. Another observation is experienced by real exchange rate in both regions as it remained significantly negative in BRICS and SADC, in SADC it the trend line is lying not so far from the positive trend. This means should the exchange rate remain stable in SADC in the future it could see a positive shock in the long run.

5.2.8 Variance Decomposition results

This test will indicate how much information each variable contribute to the other variables. It decides how much of the estimate blunder fluctuation of each of the variables can be clarified by the exogenous stuns to the other variable.

Table 5.16: Variance decomposition test results (SADC)

Period	S.E	LGFCF	LTD	LREX	LRIR
1	0.0691	100.0000	0.0000	0.0000	0.0000
2	0.1108	98.7957	1.0819	0.0016	0.1207
9	0.2369	99.1484	0.7333	0.0649	0.0533
10	0.2475	99.1721	0.6715	0.0992	0.0572

Source: Author's compilation from World Bank data

Table 5.16 analyse the variance decomposition to forecast the error in investment for the SADC region. The periods 1-2 show the variations for the short run while 9-10 represents the long run variations. From the results obtained, the study firstly forecast the error in the variance on its own innovation that is investment account for 98.79% variation of the fluctuation in investment in the 2nd period of the short run. This means

the shock in investment can cause about 98.79% variation of the fluctuation of investment. The findings further show that in the short run, trade openness, real exchange rate and real interest rate account for 1.08, 0.00 and 0.12 respectively of the shock variation on investment. In the long run using the period 10th, the forecast error variance in the variance on its own innovation accounts for 99.17% of investment. This means that investment in the long run can cause about 99.17% variation of the fluctuation on investment. Lastly, trade openness, real exchange rate and real interest rate were found to be accounting for 0.67, 0.09 and 0.57% respectively of the shock on variation of investment.

Table 5.17: Variance decomposition test results (BRICS)

Period	S.E	LGFCF	LTD	LREX	LRIR
1	0.0512	100.0000	0.0000	0.0000	0.0000
2	0.0764	98.3818	0.9045	0.4548	0.2588
9	0.1738	97.2836	0.9863	0.4834	1.2466
10	0.1833	97.3620	0.8916	0.4712	1.2751

Source: Author's compilation from World Bank data

The variance decomposition analysis for BRICS region is analysed by table 5.17 which selected period 1-2 as short run and 9-10 as the long run. The results indicate that in the short run 98.38% of the variations of investment are explained by shocks to investment using 2nd period as the determinant of the short run. The findings also reveal that trade openness, real exchange rate and real interest rate are accounting for 0.90, 0.45 and 0.25% respectively of the shock on investment. In the long run the variations of investment are caused by 97.36% to investment. This means that in the long run investment cause a shock of 97.36% on itself using the 10th period as the last period of long run. Other variables such as trade openness, real exchange rate and real interest rate have been found to be accounting for 0.89, 0.47 and 1.27% on investment variation shock. In both the regions of SADC and BRICS, it is observed that in the short run on period 1 & 2, the shock on investment by itself accounts for 100% in period 1 and 98% in period 2. This means in the short run in both the regions the shocks by other variables accounts for only 2%. Comparing the long run shocks in

these regions, SADC experienced a shock of 99% by investment on itself with its determinants accounting for only 1%. However, in BRICS, trade openness, real exchange rate and real interest rate take a portion of 3% on shocks while investment on itself is at 97%.

5.3 Conclusion

This chapter presented the findings conducted by econometric techniques as discussed in chapter 4 for a comparative analysis on the key determinants of investment activities in SADC and BRICS for the period of 2004 to 2019. The chapter began by reporting the informal testing of unit root results for all the variables which indicated that some variables integrate at different orders of I(0) and at I(1). These informal observations was confirmed by the formal testing in using the Im, Perasan and Shin, Fisher Augmented Dickey Fuller and Fisher Phillips-Perron tests for presence or no presence of unit root at level and 1st difference. After conducting the unit root tests, the next step was to find the lag order for the models and the study found that the order of lag be 1 using the Schwarz information criterion. Panel cointegration used the panel Johansen cointegration test, Pedroni test, Kao test and the Johansen Fisher cointegration test to confirm the long run relationship between the variables in both the SADC and the BRICS. Furthermore, Granger causality test was employed which indicated a bi-directional causality in the exchange rate-investment and trade openness-investment nexus in the SADC while there was no causality in the BRICS group.

Variance decomposition was deployed and found that there is a shock on investment and its determinants in both the regions of SADC and BRICS. Impulse response function in SADC and BRICS found that real interest rate in the SADC has a fair share of positive trend while in BRICS it remained significantly negative throughout the periods. Another observation is experienced by real exchange rate in both regions as it remained significantly negative in BRICS and SADC, in SADC its trend line is lying not so far from the positive trend. VAR inverse roots of AR characteristic polynomial indicated the stability of the models as the dots in SADC and BRICS model are within the circle meaning they are all stable. It can be concluded that trade openness and exchange rate are key determinants of investment in the SADC region while interest rates are key in the BRICS group. It is therefore recommended that in order to attract investors and boost investment activities the SADC need to focus more on exchange

rate and trade openness while the BRICS group need to pay more attention in the interest rates. This is beneficial on trading patterns, more for South Africa as it can be found in both groups.

CHAPTER 6

SUMMARY, RECOMMENDATIONS, CONCLUSION

6.1 Summary and interpretations of findings

The study centred on the benchmarking of investments determinants for the period from 2004 to 2019 in SADC and BRICS countries. The priority was to define main factors influencing investments in SADC and BRICS (gross fixed capital formation), since investment is low in both regions. The study used real exchange rate, trade openness and real interest rates. There is a scarcity of studies focused on the literature relating to determinants of SADC and BRICS investment, foreign direct investment and private investment, and certain determinants (GDP, inflation and interests rates) in other countries are discussed in the studies available. Research has been created to examine the determinants of stagnant growth, following the slow growth of investment in the largest economies in the SADC and BRICS sectors. The goal is also to contribute to investment literature and its determinants, with South Africa as the key trading partner of SADC and BRICS being the centre of attention. The overview of the research results is presented in this chapter, followed by theoretical objectives, empirical objectives, conclusions and recommendations based on the empirical findings.

The cointegration test showed that the relationship between the variables tested exists for a long time. A positive relationship between trade openness and investment, as well as between exchange rate and investment, and finally a negative relationship between interest rate and investment in the SADC zone turns to be positive in the long term. It was found, however, that there were negative long term relationships for the same variables in the BRICS region. The panel ARDL confirmed that, there is negative short run relationship among those variables in the series, and the system can adjust to equilibrium at a speed of 22.86 percent in the SADC region. In BRICS, short-run validation also occurs between the variables except for positive trade openness and the system is balanced back to equilibrium at 5.98%.

The Granger Causality indicated a bi-directional causality in the exchange rate-investment and trade openness-investment nexus in the SADC while there was no causality in the BRICS economies. Under the BRICS region it was found that there is

no causality between investment and other variables. The impulse response for SADC indicated that investment in the short run has a positive impact from low standard deviation on itself from period 1 to 2 and start to gradually decline from period 3 up until in the long run in period 10. This means in the short run there is positive impact while in the long run it is negative. In the BRICS region, the results for investment on investment show that the standard deviation shock in the short run induces a small reaction on investment for only 1 period and from period 2 it shows small reaction until period 10 in the long run. In terms of variance decomposition for SADC, in the long run the forecast error variance in the variance on its own innovation accounts for 99.17% of investment while in BRICS in the long run the variations of investment are caused by 97.36% to investment.

The SADC Granger Causality test shows that between investment and trade openness four causalities have been found and another is between real exchange rate and investment. In the BRICS field, no causality between investment and other variables was found. The SADC impulse response revealed that short-run investment has a positive effect on itself from a low standard deviation of period 1 to 2 and begins to decrease steadily from period 3 to long run in the period 10. This means that it has a positive effect in the short-run although it is negative in the long run. In BRICS, investing results show that a typical short-run divergence shock causes a small investment reaction for just one moment, with a short-run reaction from period 2 to period 10. Investment results show a small investment reaction. As for the decomposition of variances, the forecast error in the variance on SADC's own invention accounts for 99.17% of investments, while in the long run BRICS accounts for 97.36% of investments.

6.2 Conclusions

In view of the findings contained in the study, it is possible to conclude that trade openness and exchange rates have a strong effect on investment in SADC, while interest rates are the key determinants in BRICS by denoting long run relationship to investment. Therefore, it can be concluded that since South Africa is a trading partner in both regions it has to intensify on its measures to encourage and maintain the level of investments needed to boost growth. In terms of the investment climate discussed for both countries, from the literature discussion, the determinants influence both gross

fixed capital formation of SADC and BRICS. The slow growth of investments is driven by the determinants employed in the SADC and BRICS research. Stable exchange rates in the SADC will play a vital role in the long run as it is critical to the free market economies. For this reason, exchange rates are among the most watched, analysed and governmentally manipulated economic measure. Furthermore, freeing trade in the SADC region will create a larger market, investment opportunities, job creation and economic growth in the long run. In the BRICS economies, when the interest rates are significant in the long run. The determinants must be better studied in the future for safe and stable growth of investment activity in both regions.

6.3 Recommendations

Design an investment code: In addition to the simplification carried out by the government, the countries under investigation would benefit from a code articulating all investment-related laws and regulations, providing clarity and coherence. This would provide greater predictability and transparency to investors.

Update the country's investment strategy: All sectors of the economy currently have incentives available, although specific incentives for the production of goods and property exist. In order to extend existing incentives to all sectors of the economy, the government ought to evaluate. In this sense, the government should review the policies in place to support domestic investors and develop a package of incentives that could include stable exchange rates, capital goods importer discounts and infrastructural incentives. A feasibility study for the establishment of specific sectorial economic zones might also benefit the government. On the other hand, these BRICS and SADC economies need a stable and most affordable interest rate to enhance investor confidence in the regions and prevent these countries from moving or withdrawing its investment. This can, for example, improve and increase the confidence of business, consumers and investors.

Exchange rate volatility will lead to uncertainty regarding imports and export prices, affecting the country's business areas and investment areas. The exchange rate in the regions is not stable enough and this hinders the country's opportunities. It is observable from the study that investment is sensitive to real interest rate changes,

and its changes should influence the actual rate if a central bank's monetary policy is to be effective.

Therefore, the study recommends that policy makers in governments need to pay attention in formulating policies that promote sound economic instruments. This has been proved in this study for underdeveloped and developing SADC countries, trade openness and real exchange rates are key determinants while for BRICS countries interest rates were key. The study recommends making efforts to promote and encourage gross fixed capital formation in SADC and BRICS countries on the basis of the findings. The infrastructure facilities can be improved by a strong and stable gross fixed capital formation and much needs to be done (schools, hospitals & clinics), as most countries in these areas, including South Africa's key trading partners, still have volatile facilities. This would draw investors in the member states. Inflationary patterns should be reduced, and policies should be introduced to promote and facilitate the creation of gross fixed capital formation by policy makers.

6.4 Limitations of the study

The study limited its attention on the pre-global financial crisis and post-global financial crisis, that is, 2004 to 2019 to assess how gross fixed capital formation has been influenced during that period. Consequently, no conditions have been taken into account in this study that could have impacted the data before and beyond that period. The study also used the panel ARDL model and Granger causality tests for the intended results. That being said, for future research, various models might be used, and various findings can be achieved.

6.5 Areas of future research

The study measured the determinants of investment activities using annual data. This study does not distinguish the effect of quarterly contribution of all possible determinants on investment. Furthermore, the study does not investigate all the determinants that could affect investment levels in the SADC and BRICS regions. Therefore, these areas could be where future research focus on.

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APPENDICES

APPENDIX A: DATA

DATA FOR SADC

PERIOD	LGCF	LTD	LREX	LRIR
S.A - 04	11.43566	1.708234	0.810212	1.699773
S.A - 05	11.47745	1.725496	0.803411	1.776380
S.A - 06	11.56966	1.780154	0.830688	1.726738
S.A - 07	11.64610	1.804024	0.847903	1.602670
S.A - 08	11.73913	1.862521	0.917044	1.914388
S.A - 09	11.71534	1.743653	0.928072	1.591347
S.A - 10	11.72934	1.748103	0.864584	1.452630
S.A - 11	11.77546	1.778966	0.861004	1.198896
S.A - 12	11.81269	1.784615	0.914341	1.457045
S.A - 13	11.87459	1.807817	0.984755	1.165893
S.A - 14	11.89214	1.809118	1.035536	1.479319
S.A - 15	11.92796	1.789701	1.105814	1.616870
S.A - 16	11.92181	1.782746	1.167601	1.394607
S.A - 17	11.94209	1.763232	1.124628	1.766778
S.A - 18	11.94171	1.774300	1.121689	1.936490
S.A - 19	11.95090	1.772355	1.159821	1.926847
LESOTHO - 04	9.009946	2.234058	0.810212	1.261742
LESOTHO - 05	9.320173	2.230987	0.803411	1.867153
LESOTHO - 06	9.403573	2.206454	0.830688	1.282904
LESOTHO - 07	9.458536	2.208887	0.847903	3.073338
LESOTHO - 08	9.599819	2.209230	0.917044	1.440627
LESOTHO - 09	9.641619	2.193123	0.928072	2.534398
LESOTHO - 10	9.709290	2.169682	0.864584	0.886935
LESOTHO - 11	9.676114	2.168334	0.861004	0.924566
LESOTHO - 12	9.847916	2.168279	0.914341	2.182928
LESOTHO - 13	9.874981	2.115183	0.984755	0.985650
LESOTHO - 14	9.967892	2.091049	1.035536	-1.172514
LESOTHO - 15	9.970854	2.110706	1.105814	1.005364
LESOTHO - 16	9.931242	2.124198	1.167601	2.515781
LESOTHO - 17	9.931657	2.132716	1.124628	2.345173
LESOTHO - 18	10.00488	2.155487	1.121689	1.650883
LESOTHO - 19	10.05780	2.129116	1.159821	2.237442
MALAWI - 04	10.71659	1.711522	2.037018	3.002927
MALAWI - 05	10.86928	1.759275	2.073425	3.052823
MALAWI - 06	11.03676	1.735279	2.133579	2.419337
MALAWI - 07	11.15572	1.751619	2.145996	3.164864
MALAWI - 08	11.23977	1.792152	2.147743	2.556487
MALAWI - 09	11.33001	1.713348	2.149737	2.837902
MALAWI - 10	11.37846	1.760781	2.177496	2.497009
MALAWI - 11	11.19215	1.688312	2.194558	2.249241
MALAWI - 12	11.25756	1.831752	2.396385	2.600594
MALAWI - 13	11.40733	1.893590	2.561585	2.753542
MALAWI - 14	11.48854	1.865262	2.628283	3.013686
MALAWI - 15	11.59011	1.812320	2.698628	3.034422
MALAWI - 16	11.62380	1.891580	2.856127	3.070439
MALAWI - 17	11.78336	1.815112	2.863485	3.141983
MALAWI - 18	11.74068	1.838762	2.864709	3.219631
MALAWI - 19	11.84749	1.823504	2.872471	3.219631
ANGOLA - 04	11.78380	2.015276	1.921902	3.628097
ANGOLA - 05	11.94840	2.027720	1.940313	2.933846
ANGOLA - 06	11.99163	1.976007	1.905084	1.112842

ANGOLA - 07	12.10997	2.033665	1.884830	2.627370
ANGOLA - 08	12.31100	2.084092	1.875254	-1.906129
ANGOLA - 09	12.37808	2.087945	1.899427	3.688278
ANGOLA - 10	12.33679	2.017549	1.963343	-2.072525
ANGOLA - 11	12.44323	1.999924	1.972826	-2.386597
ANGOLA - 12	12.51323	1.962843	1.979858	2.278779
ANGOLA - 13	12.53776	1.938579	1.984610	2.610862
ANGOLA - 14	12.59540	1.899453	1.992564	2.593806
ANGOLA - 15	12.67864	1.798571	2.079401	3.097575
ANGOLA - 16	12.65359	1.727298	2.213933	-1.778683
ANGOLA - 17	12.68925	1.718143	2.219888	-1.879876
ANGOLA - 18	12.66082	1.822024	2.402873	-2.014862
ANGOLA - 19	12.69289	1.834487	2.562086	-2.581626
MADAGASCAR - 04	12.30146	1.688201	3.271576	2.332894
MADAGASCAR - 05	12.35570	1.771809	3.301687	1.994134
MADAGASCAR - 06	12.44451	1.793111	3.330881	2.815093
MADAGASCAR - 07	12.62696	1.824144	3.272741	3.338959
MADAGASCAR - 08	12.85121	1.871324	3.232582	3.554507
MADAGASCAR - 09	12.84525	1.795266	3.291415	3.590374
MADAGASCAR - 10	12.75119	1.762490	3.320136	3.510473
MADAGASCAR - 11	12.73741	1.751918	3.306450	3.667434
MADAGASCAR - 12	12.70978	1.721412	3.341428	3.892498
MADAGASCAR - 13	12.65586	1.751029	3.343785	3.946620
MADAGASCAR - 14	12.69783	1.792177	3.382883	3.930030
MADAGASCAR - 15	12.72525	1.786896	3.467387	3.874251
MADAGASCAR - 16	12.78956	1.784151	3.501954	3.867920
MADAGASCAR - 17	12.81224	1.815202	3.493613	3.978500
MADAGASCAR - 18	12.95712	1.795893	3.523064	3.816339
MADAGASCAR - 19	13.04837	1.776862	3.558507	3.750230
MAURITIUS - 04	10.64472	2.035305	1.439309	2.656595
MAURITIUS - 05	10.63734	2.090773	1.469767	2.859015
MAURITIUS - 06	10.67077	2.104019	1.501170	2.306749
MAURITIUS - 07	10.82162	2.082342	1.495734	2.604556
MAURITIUS - 08	10.85762	2.062542	1.454126	1.877927
MAURITIUS - 09	10.84097	2.018824	1.504604	2.395111
MAURITIUS - 10	10.92154	2.054832	1.488331	2.158977
MAURITIUS - 11	10.89861	2.070182	1.457972	1.883857
MAURITIUS - 12	10.93191	2.077368	1.477844	1.953302
MAURITIUS - 13	10.91406	2.041273	1.487158	1.886342
MAURITIUS - 14	10.88729	2.033981	1.486028	2.069006
MAURITIUS - 15	10.87013	2.021229	1.544771	2.136230
MAURITIUS - 16	10.89113	1.991162	1.550740	1.976699
MAURITIUS - 17	10.92197	1.988405	1.537585	2.093210
MAURITIUS - 18	10.90833	1.978232	1.530641	2.073608
MAURITIUS - 19	11.00321	1.967590	1.549904	2.132827
NAMIBIA - 04	9.910495	1.921628	0.810212	2.276638
NAMIBIA - 05	9.958665	1.915659	0.804624	1.762992
NAMIBIA - 06	10.08018	1.947553	0.830406	0.961325
NAMIBIA - 07	10.17621	2.026533	0.848460	1.246610
NAMIBIA – 08	10.29034	2.083529	0.916546	1.266946
NAMIBIA – 09	10.29877	2.098566	0.930583	1.586157
NAMIBIA – 10	10.29943	2.035083	0.865119	1.937879
NAMIBIA – 11	10.30453	2.012842	0.863324	1.748227
NAMIBIA – 12	10.45571	2.015220	0.913484	-1.557572
NAMIBIA – 13	10.53296	1.990961	0.989008	1.679387
NAMIBIA – 14	10.67116	2.015889	1.035145	0.394287
NAMIBIA – 15	10.64700	1.989257	1.109981	1.862234
NAMIBIA – 16	10.53615	1.977147	1.167576	0.869788
NAMIBIA – 17	10.47298	1.914859	1.124273	0.938297
NAMIBIA – 18	10.41462	1.917763	1.121689	1.887436
NAMIBIA – 19	10.35741	1.921559	1.159828	2.224606

DATA FOR BRICS

PERIOD	LGCF	LREX	LTD	LRIR
S.A - 04	11.43566	0.810212	1.708234	1.699773
S.A - 05	11.47745	0.803411	1.725496	1.776380
S.A - 06	11.56966	0.830688	1.780154	1.726738
S.A - 07	11.64610	0.847903	1.804024	1.602670
S.A - 08	11.73913	0.917044	1.862521	1.914388
S.A - 09	11.71534	0.928072	1.743653	1.591347
S.A - 10	11.72934	0.864584	1.748103	1.452630
S.A - 11	11.77546	0.861004	1.778966	1.198896
S.A - 12	11.81269	0.914341	1.784615	1.457045
S.A - 13	11.87459	0.984755	1.807817	1.165893
S.A - 14	11.89214	1.035536	1.809118	1.479319
S.A - 15	11.92796	1.105814	1.789701	1.616870
S.A - 16	11.92181	1.167601	1.782746	1.394607
S.A - 17	11.94209	1.124628	1.763232	1.766778
S.A - 18	11.94171	1.121689	1.774300	1.936490
S.A - 19	11.95090	1.159821	1.772355	1.926847
CHINA - 04	12.83075	0.917863	1.774557	-0.826349
CHINA - 05	12.87838	0.913513	1.793845	0.961018
CHINA - 06	12.94240	0.901646	1.809418	1.134378
CHINA - 07	13.03878	0.881244	1.793744	-0.230398
CHINA - 08	13.13015	0.841901	1.760518	-1.194650
CHINA - 09	13.19886	0.834511	1.654993	1.876741
CHINA - 10	13.28300	0.830606	1.705154	-0.694238
CHINA - 11	13.35731	0.810331	1.705358	-0.876447
CHINA - 12	13.39613	0.800190	1.683655	1.521972
CHINA - 13	13.43954	0.792094	1.669729	1.559780
CHINA - 14	13.46968	0.788411	1.652297	1.708577
CHINA - 15	13.47396	0.794313	1.596203	1.677767
CHINA - 16	13.50270	0.822461	1.566961	1.361431
CHINA - 17	13.55374	0.829867	1.575562	0.105826
CHINA - 18	13.60486	0.820593	1.573524	0.600614
CHINA - 19	13.60486	0.839377	1.552426	1.315100
RUSSIA - 04	12.55132	1.459600	1.752677	-2.119742
RUSSIA - 05	12.63736	1.451548	1.753685	-2.104950
RUSSIA - 06	12.75578	1.434425	1.738252	-1.625054
RUSSIA - 07	12.90494	1.407915	1.713542	-1.469009
RUSSIA - 08	13.02227	1.395377	1.727399	-1.775793
RUSSIA - 09	12.86598	1.501612	1.685160	2.644753
RUSSIA - 10	13.02006	1.482415	1.702047	-1.375002
RUSSIA - 11	13.16388	1.468086	1.681561	-2.628786
RUSSIA - 12	13.22329	1.489112	1.673495	0.162473
RUSSIA - 13	13.23007	1.502934	1.665460	1.596772
RUSSIA - 14	13.24786	1.584085	1.679440	1.480956
RUSSIA - 15	13.26488	1.784886	1.693369	2.185444
RUSSIA - 16	13.29608	1.826437	1.667622	2.349884
RUSSIA - 17	13.33608	1.765987	1.670955	1.782652
RUSSIA - 18	13.36166	1.797047	1.708702	-1.103185
RUSSIA - 19	13.40531	1.811157	1.690852	1.755781
BRAZIL - 04	11.54492	0.466144	1.472438	3.801743
BRAZIL - 05	11.57223	0.386390	1.432758	3.820679
BRAZIL - 06	11.63274	0.337524	1.415669	3.743375
BRAZIL - 07	11.73170	0.289379	1.402994	3.584144
BRAZIL - 08	11.82758	0.263344	1.435487	3.593655
BRAZIL - 09	11.79691	0.300906	1.344510	3.577725
BRAZIL - 10	11.92797	0.245322	1.357405	3.405050
BRAZIL - 11	11.98009	0.223451	1.379023	3.521451

BRAZIL - 12	12.01334	0.290718	1.399921	3.317164
BRAZIL - 13	12.06319	0.333667	1.411384	2.970357
BRAZIL - 14	12.07463	0.371613	1.392440	3.152893
BRAZIL - 15	12.01869	0.522040	1.430617	3.550546
BRAZIL - 16	11.97243	0.542989	1.389763	3.730462
BRAZIL - 17	11.98370	0.503980	1.386101	3.755610
BRAZIL - 18	12.00929	0.562748	1.468315	3.574007
BRAZIL - 19	12.04010	0.595989	1.462048	3.496256
INDIA - 04	13.06064	1.656256	1.574075	1.776668
INDIA - 05	13.14081	1.644438	1.623267	1.767321
INDIA - 06	13.21878	1.656165	1.660149	1.272736
INDIA - 07	13.31261	1.616460	1.659786	1.899394
INDIA - 08	13.31955	1.638541	1.727283	1.562714
INDIA - 09	13.40717	1.684893	1.665326	1.759338
INDIA - 10	13.48722	1.660161	1.692452	-1.093218
INDIA - 11	13.53892	1.669042	1.745261	0.840697
INDIA - 12	13.58130	1.727844	1.746585	1.245168
INDIA - 13	13.58229	1.767882	1.731138	1.582271
INDIA - 14	13.63068	1.785540	1.689506	2.040594
INDIA - 15	13.64572	1.807210	1.622451	2.146690
INDIA - 16	13.66690	1.827339	1.602955	1.978614
INDIA - 17	13.72177	1.813725	1.609838	1.875123
INDIA - 18	13.77913	1.834989	1.637539	1.737864
INDIA - 19	13.78951	1.847698	1.602261	2.078658

APPENDIX B: PANEL UNIT ROOT TESTS

SADC PANEL UNIT ROOT TESTS

GROSS FIXED CAPITAL FORMATION: AT LEVEL

Panel unit root test: Summary
Series: LGCF
Date: 10/02/20 Time: 11:54
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.79647	0.0362	7	98
ADF - Fisher Chi-square	22.9315	0.0614	7	98
PP - Fisher Chi-square	46.9915	0.0000	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LGCF
Date: 10/02/20 Time: 11:56

Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.46632	0.6795	7	98
ADF - Fisher Chi-square	10.7392	0.7064	7	98
PP - Fisher Chi-square	11.5780	0.6402	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LGCF
Date: 10/02/20 Time: 11:58
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	0.93170	1.0000	7	98
PP - Fisher Chi-square	0.30814	1.0000	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

GROSS FIXED CAPITAL FORMATION: AT 1ST DIFFERENCE

Panel unit root test: Summary
Series: D(LGCF)
Date: 10/02/20 Time: 12:00
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.88892	0.0295	7	91
ADF - Fisher Chi-square	23.2258	0.0567	7	91
PP - Fisher Chi-square	45.6218	0.0000	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: D(LGCF)
Date: 10/02/20 Time: 12:01
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.66967	0.0475	7	91
ADF - Fisher Chi-square	23.5281	0.0522	7	91
PP - Fisher Chi-square	51.3347	0.0000	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LGCF)
Date: 10/02/20 Time: 12:02
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	37.7698	0.0006	7	91
PP - Fisher Chi-square	56.4368	0.0000	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

TRADE OPENNESS: AT LEVEL

Panel unit root test: Summary
Series: LTD
Date: 10/02/20 Time: 12:07
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.11200	0.1331	7	98
ADF - Fisher Chi-square	19.5278	0.1457	7	98
PP - Fisher Chi-square	22.4669	0.0695	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LTD
Date: 10/02/20 Time: 12:08
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.98943	0.1612	7	98
ADF - Fisher Chi-square	17.5430	0.2284	7	98
PP - Fisher Chi-square	19.7486	0.1383	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LTD
Date: 10/02/20 Time: 12:09
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	11.4523	0.6502	7	98
PP - Fisher Chi-square	10.0560	0.7581	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

TRADE OPENNESS: AT 1ST DIFFERENCE

Panel unit root test: Summary
Series: D(LTD)
Date: 10/02/20 Time: 12:11
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.19857	0.0007	7	91
ADF - Fisher Chi-square	34.1681	0.0019	7	91
PP - Fisher Chi-square	64.0446	0.0000	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LTD)
Date: 10/02/20 Time: 12:12
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.40048	0.0807	7	91
ADF - Fisher Chi-square	20.3025	0.1209	7	91
PP - Fisher Chi-square	45.0743	0.0000	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LTD)
Date: 10/02/20 Time: 12:13
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	63.1899	0.0000	7	91
PP - Fisher Chi-square	95.2400	0.0000	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

REAL EXCHANGE RATE: AT LEVEL

Panel unit root test: Summary
Series: LREX
Date: 10/02/20 Time: 12:15
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	3.44095	0.9997	7	98
ADF - Fisher Chi-square	2.71012	0.9995	7	98
PP - Fisher Chi-square	2.71174	0.9995	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LREX
Date: 10/02/20 Time: 12:15
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.46820	0.6802	7	98
ADF - Fisher Chi-square	13.1289	0.5164	7	98
PP - Fisher Chi-square	7.46047	0.9155	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LREX
Date: 10/02/20 Time: 12:16
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	0.85144	1.0000	7	98
PP - Fisher Chi-square	0.15318	1.0000	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

REAL EXCHANGE RATE: AT 1ST DIFFERENCE

Panel unit root test: Summary
Series: D(LREX)
Date: 10/02/20 Time: 12:17
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.34697	0.0004	7	91
ADF - Fisher Chi-square	38.7574	0.0004	7	91
PP - Fisher Chi-square	45.2179	0.0000	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LREX)
Date: 10/02/20 Time: 12:18
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.64705	0.0041	7	91
ADF - Fisher Chi-square	31.2525	0.0051	7	91
PP - Fisher Chi-square	41.8397	0.0001	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LREX)
Date: 10/02/20 Time: 12:19
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	50.4291	0.0000	7	91
PP - Fisher Chi-square	53.2263	0.0000	7	98

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

REAL INTEREST RATE: AT LEVEL

Panel unit root test: Summary
Series: LRIR
Date: 10/02/20 Time: 12:20
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.03124	0.0000	7	98
ADF - Fisher Chi-square	43.2395	0.0001	7	98
PP - Fisher Chi-square	41.0195	0.0002	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LRIR
Date: 10/02/20 Time: 12:21
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.56337	0.2866	7	98
ADF - Fisher Chi-square	18.4864	0.1855	7	98
PP - Fisher Chi-square	23.4529	0.0533	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LRIR
Date: 10/02/20 Time: 12:21
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	17.2878	0.2412	7	98
PP - Fisher Chi-square	22.1917	0.0748	7	105

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

BRICS UNIT ROOTS

GROSS FIXED CAPITAL FORMATION: AT LEVEL

Panel unit root test: Summary
Series: LGCF
Date: 10/02/20 Time: 12:48
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.50245	0.0062	5	70

ADF - Fisher Chi-square	22.6816	0.0120	5	70
PP - Fisher Chi-square	48.5691	0.0000	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LGCF
Date: 10/02/20 Time: 12:49
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.78562	0.7840	5	70
ADF - Fisher Chi-square	5.36971	0.8652	5	70
PP - Fisher Chi-square	3.84677	0.9540	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LGCF
Date: 10/02/20 Time: 12:50
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	0.51177	1.0000	5	70
PP - Fisher Chi-square	0.02703	1.0000	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

GROSS FIXED CAPITAL FORMATION: AT 1ST DIFFERENCE

Panel unit root test: Summary
Series: D(LGCF)
Date: 10/02/20 Time: 12:51
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Cross-

Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.17744	0.1195	5	65
ADF - Fisher Chi-square	14.5395	0.1498	5	65
PP - Fisher Chi-square	24.8614	0.0056	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LGCF)
Date: 10/02/20 Time: 12:52
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.94833	0.0257	5	65
ADF - Fisher Chi-square	19.6817	0.0324	5	65
PP - Fisher Chi-square	40.5075	0.0000	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LGCF)
Date: 10/02/20 Time: 12:52
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	22.8904	0.0112	5	65
PP - Fisher Chi-square	28.1523	0.0017	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

TRADE OPENNESS: AT LEVEL

Panel unit root test: Summary
Series: LTD
Date: 10/02/20 Time: 12:56
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.17350	0.1203	5	70
ADF - Fisher Chi-square	16.0917	0.0970	5	70
PP - Fisher Chi-square	19.8026	0.0312	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LTD
Date: 10/02/20 Time: 12:57
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.26518	0.3954	5	70
ADF - Fisher Chi-square	12.4617	0.2553	5	70
PP - Fisher Chi-square	17.9324	0.0561	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LTD
Date: 10/02/20 Time: 12:57
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	10.3664	0.4090	5	70
PP - Fisher Chi-square	16.0596	0.0979	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

TRADE OPENNESS: AT 1ST DIFFERENCE

Panel unit root test: Summary
Series: D(LTD)
Date: 10/02/20 Time: 12:58
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.21045	0.0007	5	65
ADF - Fisher Chi-square	28.2175	0.0017	5	65
PP - Fisher Chi-square	64.3145	0.0000	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LTD)
Date: 10/02/20 Time: 12:59
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.97430	0.0015	5	65
ADF - Fisher Chi-square	26.9499	0.0027	5	65
PP - Fisher Chi-square	69.5508	0.0000	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LTD)
Date: 10/02/20 Time: 13:00
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	47.8479	0.0000	5	65
PP - Fisher Chi-square	79.6173	0.0000	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

REAL EXCHANGE RATE: AT LEVEL

Panel unit root test: Summary
Series: LREX
Date: 10/02/20 Time: 13:01
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.41405	0.9213	5	70
ADF - Fisher Chi-square	4.75701	0.9068	5	70
PP - Fisher Chi-square	3.50583	0.9669	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LREX
Date: 10/02/20 Time: 13:03
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.22687	0.5897	5	70
ADF - Fisher Chi-square	8.48273	0.5818	5	70
PP - Fisher Chi-square	14.1659	0.1656	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LREX
Date: 10/02/20 Time: 13:04
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	2.21790	0.9944	5	70
PP - Fisher Chi-square	3.56562	0.9648	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi

-square distribution. All other tests assume asymptotic normality.

REAL EXCHANGE RATE: AT 1ST DIFFERENCE

Panel unit root test: Summary
Series: D(LREX)
Date: 10/02/20 Time: 13:05
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.29861	0.0108	5	65
ADF - Fisher Chi-square	21.8148	0.0161	5	65
PP - Fisher Chi-square	27.9926	0.0018	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LREX)
Date: 10/02/20 Time: 13:05
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.17812	0.0147	5	65
ADF - Fisher Chi-square	21.1678	0.0200	5	65
PP - Fisher Chi-square	30.0683	0.0008	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LREX)
Date: 10/02/20 Time: 13:06
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	33.2202	0.0003	5	65
PP - Fisher Chi-square	40.2889	0.0000	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi

-square distribution. All other tests assume asymptotic normality.

REAL INTEREST RATE: AT LEVEL

Panel unit root test: Summary
Series: LRIR
Date: 10/02/20 Time: 13:08
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.31493	0.0943	5	70
ADF - Fisher Chi-square	15.1940	0.1251	5	70
PP - Fisher Chi-square	20.3038	0.0265	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LRIR
Date: 10/02/20 Time: 13:08
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.48337	0.3144	5	70
ADF - Fisher Chi-square	12.9594	0.2260	5	70
PP - Fisher Chi-square	16.7793	0.0794	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LRIR
Date: 10/02/20 Time: 13:09
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	15.8614	0.1037	5	70
PP - Fisher Chi-square	21.7710	0.0163	5	75

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

REAL EXCHANGE RATE: AT 1ST DIFFERENCE

Panel unit root test: Summary
Series: D(LRIR)
Date: 10/02/20 Time: 13:10
Sample: 2004 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.72633	0.0000	5	65
ADF - Fisher Chi-square	40.1738	0.0000	5	65
PP - Fisher Chi-square	83.7557	0.0000	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(LRIR)
Date: 10/02/20 Time: 13:10
Sample: 2004 2019
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.37872	0.0004	5	65
ADF - Fisher Chi-square	29.7140	0.0010	5	65
PP - Fisher Chi-square	72.6567	0.0000	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(RIR)
Date: 10/02/20 Time: 13:11
Sample: 2004 2019
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	68.1059	0.0000	5	65

PP - Fisher Chi-square	95.4659	0.0000	5	70

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

APPENDIX C: SELECTION LAG LENGTH CRITERIA

SADC LAG LENGTH

VAR Lag Order Selection Criteria
Endogenous variables: LGCF LTD LREX LRIR
Exogenous variables: C
Date: 10/02/20 Time: 13:25
Sample: 2004 2019
Included observations: 77

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-234.6525	NA	0.005784	6.198766	6.320522	6.247468
1	254.0579	913.9520	2.69e-08	-6.079427	-5.470647*	-5.835920
2	278.3742	42.94816	2.18e-08*	-6.295434*	-5.199628	-5.857121*
3	288.8040	17.33781	2.54e-08	-6.150752	-4.567923	-5.517634
4	298.1387	14.54762	3.07e-08	-5.977628	-3.907774	-5.149705
5	316.7704	27.10069*	2.94e-08	-6.045985	-3.489106	-5.023256

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

BRICS LAG LENGTH

VAR Lag Order Selection Criteria
Endogenous variables: LGCF LTD LREX LRIR
Exogenous variables: C
Date: 10/02/20 Time: 13:43
Sample: 2004 2019
Included observations: 55

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-117.7006	NA	0.000982	4.425477	4.571465	4.481932
1	234.9914	641.2582*	4.74e-09*	-7.817868*	-7.087928*	-7.535594*
2	247.7558	21.35142	5.38e-09	-7.700211	-6.386320	-7.192118
3	259.3196	17.66109	6.48e-09	-7.538895	-5.641052	-6.804984
4	276.5063	23.74886	6.51e-09	-7.582047	-5.100253	-6.622317
5	292.2454	19.45926	7.11e-09	-7.572559	-4.506814	-6.387011

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

APPENDIX D: JOHANSEN COINTEGRATION TEST

SADC COINTEGRATION TEST

Date: 10/02/20 Time: 22:06
Sample (adjusted): 2006 2019
Included observations: 98 after adjustments
Trend assumption: Linear deterministic trend
Series: LGCF LTD LREX LRIR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.347957	52.45045	47.85613	0.0174
At most 1	0.072739	10.54120	29.79707	0.9712
At most 2	0.027885	3.140272	15.49471	0.9602
At most 3	0.003755	0.368710	3.841466	0.5437

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.347957	41.90925	27.58434	0.0004
At most 1	0.072739	7.400928	21.13162	0.9364
At most 2	0.027885	2.771563	14.26460	0.9608
At most 3	0.003755	0.368710	3.841466	0.5437

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LGCF	LTD	LREX	LRIR
1.265306	7.167298	-1.249939	0.952067
0.517018	7.028273	0.747645	-0.581949
1.289257	-0.558964	-1.428757	-0.078464
-0.391063	0.462012	-0.674004	-0.084801

Unrestricted Adjustment Coefficients (alpha):

D(LGCF)	-5.88E-05	-0.002668	-0.008455	-0.002574
D(LTD)	-0.018238	-0.006911	-0.001703	-0.000100
D(LREX)	-0.014474	-0.000390	0.004422	-0.001832
D(LRIR)	-0.445115	0.223994	-0.047505	0.022781

1 Cointegrating Equation(s): Log likelihood 334.7053

Normalized cointegrating coefficients (standard error in parentheses)

LGCF	LTD	LREX	LRIR

1.000000	5.664480	-0.987856	0.752440
	(0.89870)	(0.17936)	(0.11661)

Adjustment coefficients (standard error in parentheses)

D(LGCF)	-7.44E-05
	(0.00878)
D(LTD)	-0.023076
	(0.00491)
D(LREX)	-0.018314
	(0.00588)
D(LRIR)	-0.563206
	(0.14926)

2 Cointegrating Equation(s): Log likelihood 338.4058

Normalized cointegrating coefficients (standard error in parentheses)

LGCF	LTD	LREX	LRIR
1.000000	0.000000	-2.726569	2.094039
		(0.78142)	(0.56805)
0.000000	1.000000	0.306950	-0.236844
		(0.13070)	(0.09501)

Adjustment coefficients (standard error in parentheses)

D(LGCF)	-0.001454	-0.019170
	(0.00947)	(0.06957)
D(LTD)	-0.026649	-0.179284
	(0.00521)	(0.03829)
D(LREX)	-0.018515	-0.106480
	(0.00636)	(0.04668)
D(LRIR)	-0.447397	-1.615977
	(0.15805)	(1.16069)

3 Cointegrating Equation(s): Log likelihood 339.7916

Normalized cointegrating coefficients (standard error in parentheses)

LGCF	LTD	LREX	LRIR
1.000000	0.000000	0.000000	-1.420459
			(0.70652)
0.000000	1.000000	0.000000	0.158809
			(0.07367)
0.000000	0.000000	1.000000	-1.288982
			(0.36882)

Adjustment coefficients (standard error in parentheses)

D(LGCF)	-0.012354	-0.014444	0.010159
	(0.01292)	(0.06911)	(0.01403)
D(LTD)	-0.028845	-0.178332	0.020062
	(0.00716)	(0.03831)	(0.00777)
D(LREX)	-0.012815	-0.108952	0.011482
	(0.00869)	(0.04652)	(0.00944)
D(LRIR)	-0.508644	-1.589423	0.791708
	(0.21706)	(1.16143)	(0.23569)

BRICS COINTEGRATION TEST

Date: 10/02/20 Time: 22:13
Sample (adjusted): 2006 2019
Included observations: 70 after adjustments
Trend assumption: Linear deterministic trend
Series: LGCF LTD LREX LRIR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.357375	40.14438	47.85613	0.2174
At most 1	0.110717	9.190833	29.79707	0.9898
At most 2	0.013433	0.977061	15.49471	1.0000
At most 3	0.000434	0.030373	3.841466	0.8616

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.357375	30.95354	27.58434	0.0177
At most 1	0.110717	8.213772	21.13162	0.8901
At most 2	0.013433	0.946688	14.26460	0.9999
At most 3	0.000434	0.030373	3.841466	0.8616

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LGCF	LTD	LREX	LRIR
0.727851	6.194079	-0.380940	1.129510
-1.630890	-7.732959	2.743558	-0.102619
-0.638621	5.678703	1.414889	0.174036
0.840913	-3.333419	1.197751	0.060598

Unrestricted Adjustment Coefficients (alpha):

D(LGCF)	-0.005351	0.001285	0.005231	-0.000306
D(LTD)	0.000981	0.011324	0.000898	0.000103
D(LREX)	-0.000725	0.001399	-0.000928	0.000842
D(RIR)	-0.521919	-0.051130	-0.079391	0.002624

1 Cointegrating Equation(s): Log likelihood 303.8955

Normalized cointegrating coefficients (standard error in parentheses)

LGCF	LTD	LREX	LRIR
1.000000	8.510096	-0.523377	1.551843
	(2.46937)	(0.56831)	(0.24368)

Adjustment coefficients (standard error in parentheses)

D(LGCF)	-0.003895
	(0.00438)
D(LTD)	0.000714
	(0.00321)
D(LREX)	-0.000528
	(0.00377)
D(LRIR)	-0.379879
	(0.09091)

2 Cointegrating Equation(s): Log likelihood 308.0024

Normalized cointegrating coefficients (standard error in parentheses)

LGCF	LTD	LREX	LRIR
1.000000	0.000000	-3.140331	-1.810432
		(1.34028)	(0.50249)
0.000000	1.000000	0.307512	0.395092
		(0.19763)	(0.07409)

Adjustment coefficients (standard error in parentheses)

D(LGCF)	-0.005990	-0.043078
	(0.01075)	(0.05962)
D(LTD)	-0.017755	-0.081497
	(0.00746)	(0.04138)
D(LREX)	-0.002809	-0.015310
	(0.00924)	(0.05129)
D(LRIR)	-0.296491	-2.837416
	(0.22279)	(1.23595)

3 Cointegrating Equation(s): Log likelihood 308.4757

Normalized cointegrating coefficients (standard error in parentheses)

LGCF	LTD	LREX	LRIR
1.000000	0.000000	0.000000	2.524421
			(1.17767)
0.000000	1.000000	0.000000	-0.029391
			(0.10949)
0.000000	0.000000	1.000000	1.380381
			(0.44227)

Adjustment coefficients (standard error in parentheses)

D(LGCF)	-0.009330	-0.013374	0.012964
	(0.01134)	(0.06831)	(0.01860)
D(LTD)	-0.018329	-0.076395	0.031967
	(0.00792)	(0.04768)	(0.01299)
D(LREX)	-0.002216	-0.020580	0.002801
	(0.00982)	(0.05910)	(0.01610)
D(LRIR)	-0.245790	-3.288257	-0.053789
	(0.23585)	(1.42004)	(0.38677)

APPENDIX E: PANEL COINTEGRATION TESTS

SADC: KAO RESIDUAL COINTEGRATION TEST

Series: LGCF LTD LREX LRIR
Date: 10/02/20 Time: 14:19
Sample: 2004 2019
Included observations: 112
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-2.997309	0.0014
Residual variance	0.007313	
HAC variance	0.014665	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 10/02/20 Time: 14:19
Sample (adjusted): 2006 2019
Included observations: 98 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.323570	0.061915	-5.226018	0.0000
D(RESID(-1))	0.305247	0.081800	3.731647	0.0003

R-squared	0.266687	Mean dependent var	0.013978
Adjusted R-squared	0.259048	S.D. dependent var	0.091212
S.E. of regression	0.078514	Akaike info criterion	-2.230893
Sum squared resid	0.591781	Schwarz criterion	-2.178138
Log likelihood	111.3137	Hannan-Quinn criter.	-2.209555
Durbin-Watson stat	2.103631		

BRICS: KAO RESIDUAL COINTEGRATION TEST

Series: LGCF LTD LREX LRIR
Date: 10/02/20 Time: 14:33
Sample: 2004 2019
Included observations: 80
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.

ADF	-3.672330	0.0001
Residual variance	0.004020	
HAC variance	0.010809	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 10/02/20 Time: 14:33
Sample (adjusted): 2006 2019
Included observations: 70 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.474315	0.081311	-5.833329	0.0000
D(RESID(-1))	0.130227	0.096708	1.346606	0.1826

R-squared	0.310154	Mean dependent var	0.021968
Adjusted R-squared	0.300010	S.D. dependent var	0.112135
S.E. of regression	0.093818	Akaike info criterion	-1.866755
Sum squared resid	0.598529	Schwarz criterion	-1.802513
Log likelihood	67.33643	Hannan-Quinn criter.	-1.841237
Durbin-Watson stat	2.140807		

PEDRONI COINTEGRATION TEST FOR BRICS

Pedroni Residual Cointegration Test
Series: LGFCF LTD LREX LRIR
Date: 11/09/20 Time: 13:39
Sample: 2004 2019
Included observations: 112
Cross-sections included: 7
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	2.229365	0.0129	1.811473	0.0350
Panel rho-Statistic	1.654202	0.9510	1.649966	0.0505
Panel PP-Statistic	-0.927696	0.1768	-0.587319	0.0785
Panel ADF-Statistic	1.086136	0.1613	1.773220	0.0619

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	2.650165	0.9960
Group PP-Statistic	-1.651048	0.0494
Group ADF-Statistic	0.877657	0.0099

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
S.A	0.184	0.000475	0.000432	2.00	15
LESOTHO	0.010	0.003781	0.004123	1.00	15
MALAWI	0.381	0.005564	0.005564	0.00	15
ANGOLA	-0.029	0.001193	0.000240	14.00	15
MADAGASCAR	0.119	0.005824	0.005591	3.00	15
MAURITIUS	0.064	0.002275	0.002156	1.00	15
NAMIBIA	0.551	0.005407	0.005638	1.00	15

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
S.A	0.082	0.000493	1	--	14
LESOTHO	0.104	0.003973	1	--	14
MALAWI	0.205	0.005407	1	--	14
ANGOLA	-0.541	0.000738	1	--	14
MADAGASCAR	-0.043	0.005056	1	--	14
MAURITIUS	0.293	0.002174	1	--	14
NAMIBIA	0.516	0.005735	1	--	14

PEDRONI COINTEGRATION TEST FOR BRICS

Pedroni Residual Cointegration Test
Series: LGFCF LTD LREX LRIR
Date: 11/09/20 Time: 13:49
Sample: 2004 2019
Included observations: 80
Cross-sections included: 5
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	14.98951	0.0000	14.58989	0.0000
Panel rho-Statistic	1.435902	0.9245	1.275078	0.8989
Panel PP-Statistic	-1.128067	0.0296	-0.710722	0.0186
Panel ADF-Statistic	-0.566367	0.0156	0.176345	0.0300

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.899172	0.0712
Group PP-Statistic	-1.089891	0.0079
Group ADF-Statistic	0.675500	0.7503

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
S.A	0.184	0.000475	0.000432	2.00	15
CHINA	0.222	0.000259	0.000270	1.00	15

RUSSIA	0.101	0.001973	0.000814	5.00	15
BRAZIL	0.328	0.000749	0.000858	1.00	15
INDIA	-0.313	0.000422	0.000407	1.00	15

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
S.A	0.082	0.000493	1	--	14
CHINA	0.102	0.000270	1	--	14
RUSSIA	-0.246	0.001836	1	--	14
BRAZIL	0.120	0.000691	1	--	14
INDIA	-0.433	0.000436	1	--	14

APPENDIX F: JOHANSEN FISHER PANEL COINTEGRATION TEST

SADC JOHANSEN PANEL COINTEGRATION TEST

Series: LGCF LTD LREX LRIR
Date: 10/02/20 Time: 14:41
Sample: 2004 2019
Included observations: 112
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	166.6	0.0000	109.8	0.0000
At most 1	77.62	0.0000	46.24	0.0000
At most 2	47.91	0.0000	37.38	0.0006
At most 3	33.73	0.0023	33.73	0.0023

* Probabilities are computed using asymptotic Chi-square distribution.

Individual cross section results

Cross Section	Trace Test Statistics	Prob.**	Max-Eign Test Statistics	Prob.**
Hypothesis of no cointegration				
S.A	85.5703	0.0000	46.3565	0.0001
LESOTHO	79.4660	0.0000	38.2014	0.0015
MALAWI	77.7032	0.0000	36.9563	0.0024
ANGOLA	59.2057	0.0030	33.5233	0.0077

MADAGASCAR	99.5262	0.0000	55.8454	0.0000
MAURITIUS	49.6524	0.0336	26.2921	0.0724
NAMIBIA	103.8176	0.0000	53.3113	0.0000
Hypothesis of at most 1 cointegration relationship				
S.A	39.2138	0.0031	18.7159	0.1054
LESOTHO	41.2646	0.0016	20.6419	0.0584
MALAWI	40.7469	0.0019	30.0822	0.0021
ANGOLA	25.6824	0.1385	19.8091	0.0757
MADAGASCAR	43.6808	0.0007	22.3208	0.0339
MAURITIUS	23.3603	0.2288	16.5016	0.1969
NAMIBIA	50.5063	0.0001	24.9486	0.0138
Hypothesis of at most 2 cointegration relationship				
S.A	20.4979	0.0081	16.4497	0.0222
LESOTHO	20.6227	0.0077	15.0533	0.0374
MALAWI	10.6647	0.2330	9.2214	0.2682
ANGOLA	5.8733	0.7104	5.1318	0.7251
MADAGASCAR	21.3600	0.0058	21.3270	0.0033
MAURITIUS	6.8587	0.5941	5.8351	0.6345
NAMIBIA	25.5577	0.0011	16.3870	0.0227
Hypothesis of at most 3 cointegration relationship				
S.A	4.0482	0.0442	4.0482	0.0442
LESOTHO	5.5694	0.0183	5.5694	0.0183
MALAWI	1.4433	0.2296	1.4433	0.2296
ANGOLA	0.7415	0.3892	0.7415	0.3892
MADAGASCAR	0.0330	0.8557	0.0330	0.8557
MAURITIUS	1.0236	0.3117	1.0236	0.3117
NAMIBIA	9.1707	0.0025	9.1707	0.0025

**MacKinnon-Haug-Michelis (1999) p-values

BRICS JOHANSEN PANEL COINTEGRATION TEST

Series: LGCF LTD LREX LRIR
Date: 10/02/20 Time: 14:52
Sample: 2004 2019
Included observations: 80
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	97.26	0.0000	66.85	0.0000
At most 1	43.00	0.0000	24.04	0.0075
At most 2	29.12	0.0012	24.67	0.0060
At most 3	21.38	0.0186	21.38	0.0186

* Probabilities are computed using asymptotic Chi-square distribution.

Individual cross section results

	Trace Test	Max-Eign Test

Cross Section	Statistics	Prob.**	Statistics	Prob.**
Hypothesis of no cointegration				
S.A	85.5703	0.0000	46.3565	0.0001
CHINA	60.6758	0.0020	31.5539	0.0146
RUSSIA	63.2121	0.0010	26.4980	0.0683
BRAZIL	99.6189	0.0000	59.2063	0.0000
INDIA	50.9876	0.0247	26.3380	0.0715
Hypothesis of at most 1 cointegration relationship				
S.A	39.2138	0.0031	18.7159	0.1054
CHINA	29.1219	0.0597	15.3830	0.2630
RUSSIA	36.7141	0.0068	21.5418	0.0438
BRAZIL	40.4126	0.0021	25.2896	0.0122
INDIA	24.6496	0.1744	13.5322	0.4046
Hypothesis of at most 2 cointegration relationship				
S.A	20.4979	0.0081	16.4497	0.0222
CHINA	13.7388	0.0904	12.3578	0.0979
RUSSIA	15.1723	0.0559	13.2872	0.0709
BRAZIL	15.1231	0.0568	12.7894	0.0844
INDIA	11.1174	0.2044	8.4115	0.3384
Hypothesis of at most 3 cointegration relationship				
S.A	4.0482	0.0442	4.0482	0.0442
CHINA	1.3811	0.2399	1.3811	0.2399
RUSSIA	1.8850	0.1698	1.8850	0.1698
BRAZIL	2.3337	0.1266	2.3337	0.1266
INDIA	2.7059	0.1000	2.7059	0.1000

**MacKinnon-Haug-Michelis (1999) p-values

APPENDIX G: PANEL AUTOREGRESSIVE DISTRIBUTIVE LAG

AUTOREGRESSIVE DISTRIBUTIVE LAG FOR SADC

Dependent Variable: D(LGCF)
Method: ARDL
Date: 10/03/20 Time: 08:01
Sample: 2006 2019
Included observations: 98
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): LTD LREX LRIR
Fixed regressors: C
Number of models evalulated: 4
Selected Model: ARDL(2, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LTD	1.291373	0.457213	2.824448	0.0062
LREX	0.619074	0.085141	7.271128	0.0000
LRIR	-0.079129	0.036388	-2.174577	0.0332
Short Run Equation				

COINTEQ01	-0.342267	0.080961	-4.227544	0.0001
D(LGCF(-1))	-0.090954	0.141608	-0.642297	0.5229
D(LTD)	-0.237927	0.158875	-1.497581	0.1389
D(LREX)	-0.482466	0.276006	-1.748025	0.0850
D(LRIR)	-0.017959	0.036487	-0.492205	0.6242
C	2.771052	0.680062	4.074708	0.0001

Mean dependent var	0.044807	S.D. dependent var	0.070961
S.E. of regression	0.048714	Akaike info criterion	-2.558123
Sum squared resid	0.158997	Schwarz criterion	-1.465869
Log likelihood	188.2549	Hannan-Quinn criter.	-2.114960

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

BRICS AUTOREGRESSIVE DISTRIBUTIVE LAG

Dependent Variable: D(LGCF)
Method: ARDL
Date: 10/03/20 Time: 07:57
Sample: 2006 2019
Included observations: 70
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): LTD LREX LRIR
Fixed regressors: C
Number of models evalulated: 4
Selected Model: ARDL(2, 2, 2, 2)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LTD	4.276738	1.071741	3.990458	0.0004
LREX	-0.668139	0.564723	-1.183127	0.2455
LRIR	-0.143361	0.050177	-2.857116	0.0075
Short Run Equation				
COINTEQ01	-0.077212	0.019469	-3.965966	0.0004
D(LGCF(-1))	-0.154452	0.237672	-0.649853	0.5204
D(LTD)	0.462050	0.347243	1.330622	0.1927
D(LTD(-1))	-0.012737	0.194744	-0.065403	0.9483
D(LREX)	-0.427366	0.117673	-3.631823	0.0010
D(LREX(-1))	0.362226	0.223976	1.617248	0.1156
D(RIR)	-0.014019	0.019737	-0.710273	0.4827
D(LRIR(-1))	-0.003693	0.014557	-0.253685	0.8014
C	0.537570	0.097431	5.517457	0.0000

Mean dependent var	0.044064	S.D. dependent var	0.049936
S.E. of regression	0.025107	Akaike info criterion	-4.189027
Sum squared resid	0.020171	Schwarz criterion	-2.759811
Log likelihood	215.5611	Hannan-Quinn criter.	-3.616013

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

APPENDIX G: GRANGER CAUSALITY TEST

SADC GRANGER CAUSALITY TEST

Pairwise Granger Causality Tests
Date: 10/11/20 Time: 11:00
Sample: 2004 2019
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LTD does not Granger Cause LGCF	105	0.01686	0.8969
LGCF does not Granger Cause LTD		9.66155	0.0024
LREX does not Granger Cause LGCF	105	3.10796	0.0809
LGCF does not Granger Cause LREX		0.41973	0.5185
LRIR does not Granger Cause LGCF	105	0.46735	0.4958
LGCF does not Granger Cause LRIR		0.27856	0.5988
LREX does not Granger Cause LTD	105	1.33441	0.2507
LTD does not Granger Cause LREX		3.22941	0.0753
LRIR does not Granger Cause LTD	105	2.01178	0.1591
LTD does not Granger Cause LRIR		0.90338	0.3441
LRIR does not Granger Cause LREX	105	4.53892	0.0355
LREX does not Granger Cause LRIR		7.21055	0.0085

BRICS GRANGER CAUSALITY TEST

Pairwise Granger Causality Tests
Date: 10/11/20 Time: 11:08
Sample: 2004 2019
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LTD does not Granger Cause LGCF	70	0.98053	0.3806
LGFC does not Granger Cause LTD		0.53157	0.5902
LREX does not Granger Cause LGCF	70	0.95138	0.3915
LGCF does not Granger Cause LREX		0.36302	0.6970
LRIR does not Granger Cause LGCF	70	0.57773	0.5640
LGCF does not Granger Cause LRIR		0.55774	0.5752
LREX does not Granger Cause LTD	70	1.29421	0.2811
LTD does not Granger Cause LREX		3.79881	0.0275
LRIR does not Granger Cause LTD	70	0.31672	0.7297
LTD does not Granger Cause LRIR		4.05095	0.0220
LRIR does not Granger Cause LREX	70	0.00055	0.9995
LREX does not Granger Cause LRIR		1.27826	0.2854