THE EFFECTS OF GOVERNMENT STOCK ON INVESTMENT ACTIVITY IN BRICS COUNTRIES

by

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Submitted in fulfilment of the requirements for the degree of

MASTER OF COMMERCE

IN ECONOMICS

in the

FACULTY OF MANAGEMENT AND LAW

(School of Economics and Management)

at the

UNIVERSITY OF LIMPOPO

SUPERVISOR: PROF T. NCANYWA

2019

DECLARATION

I hereby declare that the above mentioned dissertation is my own work, that all the sources used or quoted have been identified and acknowledged by means of references. It has not been previously submitted to another university for any qualification. The University of Limpopo manual for postgraduate research was followed.

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DATE: 08 FEBRUARY 2019

ACKNOWLEDGEMENTS

I give all glory and hope to the Lord God Almighty - He Who is above all things. The Giver of pure life, wisdom, sound mind, strength, courage and sustenance. By His grace and guidance, I managed to complete this project. The book of Philippians 1 verse 6 expresses my gratitude succinctly.

I would also like to extend heartfelt appreciation to a number of people who influenced the quality of this work. Firstly, I genuinely appreciate my supervisor Prof T. Ncanywa for providing guidance and support throughout this research. Secondly, my parents and siblings for being there from the beginning and continuously praying for me. Lastly, all my friends and colleagues for constantly critiquing my judgement.

DEDICATION

I dedicate this dissertation to my parents, Mr Kwena E. and Mrs Mmaphala S. Kgomo, for always supporting and encouraging me through this journey of life. If it were not for their prayers, love and support, I would not have made it.

ABSTRACT

Financial markets and quite a diverse number of financial instruments have been growing in a controlled manner in recent decades in terms of value and volume. Brazil, Russia, India, China and South Africa (BRICS) are distinguished as having the fast growing markets in the universe compared to other markets of emerging economies, according to their promising economic prospective and demographic power. This study investigated the effects of government stock on investment activity in BRICS countries. This study used panel autoregressive distributed lag model (PARDL), Engel-Granger causality test, impulse response functions (IRF) and variance decomposition tests. Such techniques were applied to the annual data for the periods 2001 to 2016 in order to determine the effects of government stock on investment activity. The variables (government stock on bonds, government stock on mutual banks, government stock on corporations and government stock on liquid assets), including gross fixed capital formation which is a measure of investment activity, were subjected to panel unit root tests and that confirmed different orders of cointegration. The existence of a long run relationship between investment activity and other macroeconomic variables used in this study was determined by means of the panel cointegration tests, where one lag was used.

The PARDL showed that in the long run investment activity was positively influenced by government stock on mutual banks and government stock on liquid assets, and negatively related to government stock on bonds and government stock on corporations. The Engel-Granger causality test revealed existence of unidirectional movement between investment activity and government stock on corporations as well as from government stock on bonds to liquid assets. The impulse response function test showed the impulse percentage of fluctuation that the variables did contribute to each other, from various periods both in the short and long run. While the variance decomposition of investment indicated that Investment was shocked by its own innovations throughout all the periods. A critical evaluation is needed to avoid investment shocks, instability of investment activity, instability of financial markets and the economy as a whole.

Keywords: BRICS, Investment, Government stock, PARDL, Engel Granger, Impulse Response

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LIST OF ACRONYMS

BRICS: Brazil, Russia, India, China and South Africa

BRIC: Brazil, Russia, India and China

GDP: Gross Domestic Product

GFCF: Gross Fixed Capital Formation

GSB: Government Stock on Bonds

GSMUTUALB: Government Stock on Mutual Banks

GSCORP: Government Stock on Corporations

GSLA: Government Stock on Liquid Assets

U.S: United States

FDI: Foreign Direct Investments

IPI: Industrial Production Index

VECM: Vector Error Correction Model

ASEAN: Association of South East Asian Nations

VAR: Vector Auto-Regressive

BRL: Brazil Real

RUB: Russian Ruble

INR: Indian Rupee

CNY HML: Chinese Yuan Hundred Million

ZAR: South African Rand

VBS: Venda Building Society

JSE: Johannesburg Stock Exchange

CEO: Chief Executive Officer

SME: Small and Medium Enterprises

PP: Purchasing-Power Parity

EFM: Emerging Financial Markets

PARDL: Panel Autoregressive Distributed Lag

IRF: Impulse Response Function

ADF: Augmented Dickey Fuller

DF: Dickey Fuller

PP: Phillips Perron

RBI: Reserve Bank of India

MRTP: Monopolies and Restrictive Trade Practices

P-value: Probability value

LLC: Levin, Lin and Chu

IPS: Im, Pesaran and Shin

LL: Levin and Lin

OLS: Ordinary Least Squares

AIC: Akaike Information Criterion

SC: Schwarz Criterion

FPE: Final Prediction Error

HQ: Hannan-Quinn

ECT: Error Correction Term

CHAPTER ONE

ORIENTATION OF THE STUDY

1.1 Introduction and background

The investment industry, financial markets and quite a diverse number of financial instruments have been growing in a controlled manner for decades in terms of value and volume (Baur & Lucey, 2006). Irving (2005) stated that an increase in investments and improvement in its allocation would result to an efficient financial system, which would have a positive effect on economic growth. Furthermore, Abel, Bernanke & Croushore (2014) state that investments from other countries are as important as extensive trading between countries as financial relationships are created with other national economies.

Financial investments are risky assets mostly administered by the banking system, as banks are among the most regulated institutions in the world and a critical part of the financial system (Geetha, Mohidin, Chandran & Chong, 2011; Tabak, Noronha & Cajuerio, 2011). Such regulations are justified to preserve financial stability, correct market failures and protect deposits made by depositors (Tabak et al., 2011). Mutual banks were first established with a purpose of serving low-income earners, who do not have access to appropriate information regarding portfolio changes and how to undo them or who are unable to shift to other banks. However, mutual banks will not be able to survive in the long run if interest rate ceilings and deposit insurance were the only forms of regulations (Rasmusen, 1988). Okeahalam (1998) further states that such banks are subjected to economic regulations that aim to encourage higher competition, less collusion and lower industry concentration, and prudential regulations. In addition, banks ensure that all funds that belong to depositors are safe, and financial systems are not being compromised.

Zhang, Zhang, Wang & Zhang (2013) stress that both bonds and stocks are basic asset classes that are of utmost importance in asset allocation and risk management. Bond markets play a very significant role in the economy like stock markets do, as stock markets not only make tremendous contributions to the economic development, but also to globalisation and technological advancements (Onyuma, 2006).

Brazil, Russia, India, China and South Africa (BRICS) are distinguished as having the fast growing markets in the universe compared to other markets of emerging economies according to their promising economic prospective and demographic power (Mensi, Hammoudeh, Nguyen & Kang, 2015). These five emerging economies were only identified as four namely the BRIC states before the induction of South Africa in 2010. China and India are considered economic giants and are poised to possibly outtake many of the largest advanced economies of the West (Collins, 2013).

The motive and capacity of many transnational corporations of major economic entities in foreign investments were seriously crippled by the financial crisis, that resulted in their outward foreign direct investment (FDI) being slowed down (Ma & Zhang, 2010). Citizens have come to a point where they expect to live in a more transparent, democratic and safe environment in which the corporation's financial interests, such as foreign investors are not paramount. This is embodied by the concept of sustainability and economic prosperity. Continuation of development and prosperity in BRICS requires services to become a key feature, and such will depend on the expansion into foreign markets (Collins, 2013).

Many investors prefer assets with lower trading costs, as safer assets tend to have higher risk-adjusted returns than riskier assets. Company's value in past years was mostly based on its hard assets like its buildings and machines, unlike today the company's value is based more on its intangible assets such as intellectual property and human capital just to name a few (Bond & Cummins, 2000). Kasse-kengne (2015) indicates that, China and India's economy are relatively closed and dominated by capital markets that are state controlled. Unlike Brazil and Russia who are well known as commodity exporters and have primarily natural resource based economies.

1.2 Statement of the problem

Asness, Frazzini & Pedersen (2012) state that movement in the stock market tends to dominate the risk in the market portfolios because of stock being more volatile than bonds. Rasmusen (1988) stipulates that due to the banking deregulation, the importance of mutual banks is diminishing, which is not the only reason for such a decline. Furthermore, Pepper & Oliver (2006) note that trends in dividends, corporate earnings and corporate profits are factors affecting individual corporations. Russia has a high uneven development, while investing in emerging countries like China could be risky (Sibirskaya, Stroeva, Khokhlova & Oveshnikova, 2014; Geetha et al., 2011).

Liquid assets earn a low rate of return, also given the uncertain future internal funds including costly external financing leading to investments in liquidity being costly (Kim, Mauer & Sherman, 1998). South Africa, Brazil and India’s stock market dependency on other countries like the United States is much higher and more persistent than for China and Russia (Bianconi, Yoshino & de Sousa, 2013). It is evident that countries tend to invest in certain entities without determining the risks that come with such investments. Such as determining what kind of risks may occur or take place in both the short and long run, the magnitude of the risk and how such risks can be eliminated or avoided. Therefore, the study seeks to find out how risky assets such as government stock influence investment activity, as investment is a determinant of growth in an economy.

1.3 Research aim and objectives

The study aimed to investigate the effects of government stock on investment activity in BRICS countries in the period from 2001 to 2016.

The following objectives were pursued:

- To estimate the effects of government stock on investment activity,
- To investigate whether a long-run relationship exists between investment activity and government stock, and
- To find out if there is any causal relationship in the investment activity-government stock nexus.

1.4 Research questions

The following questions were answered in this study:

- What are the effects of government stock on investment activity?
- Does a long-run relationship exist between investment activity and government stock?
- Is there any causal relationship in the investment activity-government stock nexus?

1.5 Significance of the study

Many factors affect government stock and investment activity in every country, both negatively and positively, while there is limited literature on the underlying causes of those statistics. Love & Zicchino (2006) state that a vast literature has been developed regarding the relationship between the corporation's constraints and investment decisions. Therefore, it is important to recognise how investments are financed and impacted by various factors within economies, and government stock in this case. An increase in money and credit pushes the stock market and GDP of the country up, therefore there is a link between the stock market and the economy in aggregate (Lanine & Vennet, 2005).

Many economists have recognised for a long time that investment is one of the most volatile components of expenditure over the business cycle, while some economists link a higher level of investment within a country to long run and increased economic growth (Parker, 2010; Gomes, 2001). Government stock on bonds, mutual banks, liquid assets and corporations do not only play a vital role in investment decisions or activity, but also play an important role in the financial systems all over the world including in the macroeconomic environment as they have a huge influence on economic growth, monetary and fiscal policy and inflation. Banks are the cornerstone of a country's financial system as the capital markets tend to be underdeveloped in developing countries (Fonseca & Gonzalez, 2010). Thus, it is important to understand the drivers for increasing or decreasing the performance of government stock and investment activity in BRICS. According to Mensi et al. (2015), the four BRIC countries excluding South Africa are expected to account for 41% of the world's stock market capitalisation.

This study presents a different viewpoint to the problem at hand, by giving more attention to how investment activity is affected by government stock. When more information on such factors, causes and implications of investment activity are brought to light, this could be panacea to financial ills of BRICS.

1.6 Definition of concepts

1.6.1 Government stock

Government stock is one of the measures of financial market indicators and entails stock on bonds, mutual banks, corporations and liquid assets. Stock refers to the ownership of interest in a company, which pays dividends to owners usually when the company declares a dividend. It can further be explained as a company selling shares in exchange for cash or as a form of ownership stakes in an entity or company (Asness et al., 2012; Choudhry, 2006).

1.6.2 Mutual banks

Mutual banks are authorised financial service providers, in which the bank is a bearer of certain duties and rights given legal personality by law, and that is in accordance with the Mutual Bank Act No. 124 of 1993 (South African Reserve Bank, 1993).

1.6.3 Corporations

A corporation is a legal company, business or entity that is recognised by the law. Collins (2013) states that developed countries corporations have promoted themselves as socially conscious, sustainability minded citizens in order to serve the interests of increasingly informed and sustainability minded consumers.

1.6.4 Liquid assets

Liquid assets refers to assets that can simply be converted to cash in a short period, such assets include short-term government stock, money, mutual funds and bonds. (Kim et al., 1998)

1.6.5 Investment activity

According to Sibirskaya et al. (2014), investments can shape the inertial development of innovation activity. Investment activity in this study will be measured in terms of gross fixed capital formation (GFCF). Gross fixed capital formation can be described as an increase in physical assets within a particular measured period.

1.6.6 BRICS

BRICS refers to five countries with emerging stock markets i.e. Brazil, Russia, India, China and South Africa. The economies of the BRICS countries are becoming more integrated with the most developed economies in terms of trade and investment. Their economies have grown at a rapid pace, as they have fast growing markets (Mensi, Hammoudeh, Reboredo & Nguyen, 2014).

1.7 Ethical consideration

This study used secondary data and was conducted free from misquotations and intentional plagiarism. All sources used or quoted had been identified and acknowledged by means of complete references. The University manual for postgraduate research had been followed.

1.8 Structure of dissertation

This dissertation is divided into various chapters, namely:

- Chapter two: consists of the theoretical framework and empirical literature. The theoretical framework includes different theories, such as Keynes Theory of Investment, Neoclassical Theory of Investment Behaviour, Tobin's Q Theory of Investment Behaviour and the Financial Theory of Investment Behaviour. While the empirical literature focuses on evidence and findings from previous studies relevant to this study. Chapter two also includes the overview of the various trends of the government stock indicators and investment activity and the overview of government stock in the BRICS economy.

- Chapter three: deals with the methodology used in the study. Different econometric tests such as the panel autoregressive distributed lag are used in order to test the significance of the model used in this study.
- Chapter four: presents the various tests performed in the study and interpretation of the findings in detail.
- Chapter five: this is the final chapter and provides the summary, recommendations on further studies and conclusion. Limitations of the study are also discussed.

This chapter outlined an introduction and background of the study, statement of the problem, the research aim, and objectives relevant to the study were also explained. The significance of the study was also delineated. Different concepts pertaining to this study were defined in detail as the study attempted to bring a different viewpoint to phenomenon under study. The ethical consideration was included and the structure of the study. The next chapter comprises literature review and various trends of the government stock indicators and investment activity in the BRICS economy.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter deals with the theoretical framework, empirical literature and an overview of BRICS economy. It begins with the theoretical literature, which outlines the various theories on the effects of government stock (bonds, mutual banks, corporations and liquid assets) on investment activity. Secondly, the empirical literature, which provides evidence and findings from the aforementioned aim, and lastly gives an overview of the BRICS economy.

2.2 Theoretical framework

The following economic theories were used to explain the effects of government stock on investment activity. The theories included the Keynes Theory of Investment, Neoclassical Theory of Investment Behaviour, Tobin's Q Theory of Investment Behaviour and the Financial Theory of Investment Behaviour.

2.2.1 Keynes Theory of Investment

The Keynes Theory of Investment by John Maynard Keynes emerged in 1936 where he developed this theory based on the supply and demand price of capital. The capital prices of supply and demand are not similar as compared to the amount of money invested. Such results are from changes in prospective yields, including increased pressure on facilities that are usually used to produce capital goods. Keynes also believed that cyclical fluctuations were caused by fluctuations in investments (McKenna & Zanaoni, 1990). Wray & Tymoigne (2008) considered that the level of investments weighted against the market interest rate is equal to the function of capital marginal efficiency, where the demand and supply of money are equilibrated. Hence, a rise in investments also leads to an expansion in income; thus, consumption to increase until savings rises to a point of equality with the new level of investments.

Formal, the equation can be written as:

$$\Delta Y / \Delta I = 1/\left(1 - b(1-t)\right) + j \tag{2.1}$$

The level of national income is at Y, while I is the level of aggregate investment, b the marginal propensity to consume, t the income tax rate and j the marginal propensity to import.

Harcourt & Kriesler (2013) outline periods in which various innovations entail limited effects on cost structure or modest investments in certain industries and, in such cases, expansions will tend to be weak and short lived. Harcourt (2006) further states that in any given situation a higher investment rate often results in a higher share of gross profit. When prices relative to money wage rate are pushed up in gross income, they tend to lead total gross income to a higher level resulting from a higher level of employment, including utilisation of plants. In every income level when the share profits are greater, the value of planned investments will also be higher and such a higher level of planned investments usually has an expansionary effect.

According to Wray & Tymoigne (2008), the expected returns on holding assets that are measured in monetary terms are:

$$q - c + l + a \tag{2.2}$$

The q in the equation is the assets expected yield, c is the carrying cost, l a liquidity and a the expected price appreciation or depreciation. The nature of the returns differ by asset, with most of the return allocated to holding liquid assets consisting of l and also most of the return of illiquid assets (for example, capital) consisting of $q - c$. Most liquid assets are expected to generate a stream of income and capital gains, also to pay lower yields than more illiquid assets like corporate bonds or capital assets.

2.2.2 Neoclassical Theory of Investment Behaviour

Dale W. Jorgenson has made major contributions in 1967 to the development of the Neoclassical Theory of Investment Behaviour that is based on the determination of optimal capital stock or optimal accumulation of capital. The theory emphasises that investment goods demand will be controlled by the interest rate, when comparing two alternatives and continuous paths of capital accumulation that in turn depends on the interest rate time path (Eisner & Nadiri, 1968). The theory stipulates that capital usually earns a return that is equal to its marginal productivity, but Keynes and Minsky rejected such a relation, arguing that monetary return is very important in a capitalist economy (Wray & Tymoigne, 2008).

Investment is normally seen as one of the important paths to reduce unemployment, as it promotes economic growth. Such investment decisions are motivated by the expected profits, but the exact nature of such decisions in economic theory remains largely unresolved (Alexiou, Tsaliki & Tsoulfidis, 2016). Investment expenditure has also been estimated to be one of the key components of aggregate demand that usually conditions not only through the introduction and through diffusion of new technology, but also through economic activity and employment. According to Alexiou et al. (2016), there has been different theoretical frameworks with the attempt to effectively explain the variations in investment activity over the years, as investment activity is a source of economic growth, economic stability and its wellbeing.

The Neoclassical Theory of Investment was based on the presumption that the future is certain assumption, prior to Keynes' general theory of employment, interest and money in 1936. Also under this theory of investment, the marginal rate of investment is said to be equal to the interest rate (Gordon, 1992). Many heterodox economists and the Keynesian placed emphasis on the accelerator kind of models, unlike the standard Neoclassical Theory, which emphasised the significance of interest rate and prices in order to be able to determine the investment-saving decisions (Alexiou et al., 2016). Furthermore, Alexiou et al. (2016) state that, the Neoclassical idea is that the interest rate means an investment demand schedule in which the equality of savings and of investment is obtained usually through the variations in the interest rate. The level of output of employment can be determined by only assuming that there is enough price flexibility. The measurement of capital in which its consistency with the requirements of the Neoclassical Theory of value which leads to necessitate the hypothetical onecommunity-world economy can result due to the investment demand and associated trade-off between investment and the rate of interest (Alexiou et al., 2016).

2.2.3 Tobin's Q Theory of Investment Behaviour

A Nobel Laureate economist named James Tobin proposed the Tobin's Q Theory of Investment (Modigliani & Miller, 1958). This theory was formulated based on financial markets, with the aim of linking firms or corporations' investment decisions to fluctuations in the stock market (including the bond market). Such is evident when the corporation issues shares in the stock market to finance its capital for investment, the share price will reflect the investment decisions made by the corporation. Proper investment decisions by management are important in every corporation, big or small businesses, including mutual banks as well. The decisions help corporations to determine whether the investments made in certain entities or projects will yield an expected huge return, or if the corporation should expect a loss or no return at all from its investments into those particular entities or projects (Modigliani & Miller, 1958).

Investment decisions form part of risk management. Before making an investment, it is vital to determine any risks that may occur in the near future. This is because corporate decisions also affect the growth of the whole economy (Love & Zicchino, 2002). Corporations that do not have internal funds and are only left with an option to obtain loan from the bank may be prone to partake in risky investment projects that have low expected marginal productivity. According to Choudhry (2006), risk management involves the identification or forecasting and evaluation of financial risks that might occur. If corporations and mutual banks risk management functions are effective, there will be no unexpected losses that will lead to an increase in eventual costs to many times the original loss amount.

Love & Zicchino (2002) state that the q approach predicts that investment decisions made by corporations are not only determined by the present value of future marginal productivity of capital, but also depend on the level of collateral availability when firms or corporations enter into a loan contract. Parker (2010) says Tobin believed and argued that a corporation's investment levels should depend on the ratio, which is the Tobin's Q installed capital present value to the replacement cost of capital. As Tobin's Q theory does not only rule out the importance of uncertainty and finding the various structures of determining investment, but the theory can also be easily reconciled with other approaches of investment, which at the end lead to the same basic results (Wray & Tymoigne, 2008). Such a theory argues that corporations will only want to decrease their capital stock when q is less than one and increase its capital when q is greater than one (Wray & Tymoigne 2008).

In a situation where $q > 1$ firms or corporations would rise or have higher profits because investments are expected to be high if they invested in more capital and it is cheaper for corporations to buy new capital assets. If $q < 1$ investments will be expected to be near zero (decline), therefore, more investments would lower profits and the present value of the profits that are earned by installing new capital would be less than the cost of capital. This $(q < 1)$ can be reflected when an individual seeking to enter an industry would be able to acquire the capital assets at a cheaper price and when the price changed on buying an existing firm or corporation is lower than the cost of building a new one (Love & Zicchino, 2002; Parker, 2010; Wray & Tymoigne, 2008).

2.2.4 Financial Theory of Investment Behaviour

With the level of investment demand, the demand price declines whereas the supply price increases with investments. This is because an increase in aggregate investment would have a multiplier effect on the effective demand that could cause an increase in sales (Wray & Tymoigne, 2008). Since greater borrowing exposes the buyer or country to higher risk of insolvency, the price that a country is willing to pay usually depends on the amount of external finance required. Borrowers risk should be included in the demand prices; as such, a risk cannot be calculated for the future. The validation of expectations and encouragement of increased or more investments would occur when there is an investment boom where profits would be rising along investments. A decline in investments and profits might take place, as anything that might cause expected future profitability to be lower could also cause today’s demand price of capital to result as being lower than the supply price.

According to Kregel (2008), the relation between most banks and their borrowers has been more impersonal, where it is judged using credit scoring methods. Banks are moving away from seeking long-term individualised relationships with clients, mostly recurring borrowers. Banks' relation with borrowers must be based not only on trust between the parties, but also on the banks' recurring lending agreements. The banks, be it corporate or mutual banks, may acquire most of their profits from fees obtained by either selling or servicing structured financial instruments, such as mortgage backed securities. The banks are also responsible for, and in charge of, making sure that the making of money is established on interest rates that broaden across deposit rates. As banks are liable for paying and for the lending rates that are earned by banks, but paid by borrowers (Wray & Tymoigne, 2008).

2.3 Empirical literature

This section of the literature review is an overview of the relevant studies pertaining to government stock (bonds, mutual banks, corporations and liquid assets) and investment activity. Investments and government stock can be determined by many factors in the economy. Stubeli (2014) explains that the relationship between investments and profits is strong as it is extremely important for the economic system of a country. Furthermore, Fazzari, Habbard & Petersen (1987) state that investments tend to be more sensitive to cash flow.

2.3.1 Estimation of government stock on investment activity

Harcourt & Kriesler (2013) postulated that investments were the means in which the capital base had to be changed by incorporating new technology. The nationalisation of all key industries that ensure all corporations earn all of its business in a truthful manner, including financial intermediaries, will raise investments with fixed exchange rates being adjusted on regular bases to ensure external balance. Private risk of an investment is much greater than its social risk and such can cause an increase in the opportunity cost, as taxes on profits of corporations serve to increase the opportunity cost of resources that public projects tend to withdraw from private sectors (Arestis, Palma & Sawyer, 1997).

According to Modigliani & Miller (1958), investments are often driven to a point of physical assets marginal yield being equivalent to the market rate of interest when the corporations act rationally. Most important sources of investment funds for corporations that accumulated profits are used, including internal funding. Also, borrowing either from banks or through issuing of long-term bonds and short-term commercial paper and issuing of new shares of stock. Such funding methods may inflict costs that are explicit or implicit to the corporations or firms (Parker, 2010).

Lettau & Luduigson (2002) examined the time-varying risk premia and the cost of capital, with an alternative implication of the q theory of investment. Based on the long horizon forecasting regressions of the aggregate investment growth, the implications were tested. The evidence from the study suggested that the expected excess stock market returns were different and that the difference was larger than the expected real interest rate. In the standard investment models where the cost of capital was included, it was found that a greater fraction of movement must have resulted from movements in equity risk-premia. As equity risk premia movements were emphasised, such should have an impact on the future investment over horizon, but not merely on today's investments only.

This was supported by a study proposed by Almeida & Campello (2006), where they tested a large sample of manufacturing firms between the period 1985 and 2000. The data supported the hypothesis that they made about the rate of asset tangibility (as it has a huge influence) on corporate investment under financial constraints. When firms face credit constraints, investment cash flows become sensitive. These sensitivities will increase in the degree of tangibility of constrained firm's assets. However, investment cash flow sensitivities are not affected by asset tangibility when firms are unconstrained. It was further stated that firms with more tangible assets stood a great chance of having access to external funds than being financially constrained. The results also revealed that, due to constrained firms with tangible assets having a highly procyclical debt capacity, the income shocks would have a greater effect on them as compared to other firms. Investments and borrowing will become endogenous only when firms are capable of pledging their assets as collateral. Pledged assets make it easier for firms to borrow and turn results into more investments.

Another study conducted by Fazzari et al. (1987) compared investment behaviours of swiftly growing firms (which depleted all their internal finances) with well-established firms that paid dividends. Panel data was employed in the study on individual manufacturing firms and the q theory of investment was used to examine the significance of the hierarchy of finance resulting from the capital market. It was also found that investments were more sensitive to cash flow and that the q values remained at a high level on important periods for firms that usually paid no dividends as compared to well-established firms.

Bolton, Chen & Wang (2011) proposed a model of dynamic investments, financing and risk management for financially constrained firms. The model indicated that endogenous marginal value of liquidity played a substantial role in corporate decisions. In their paper, they noted in one of their main results that investments relied on the ratio of the marginal q to the marginal value of liquidity and such a relation between investment and the ratio of the marginal q did not change with the funding of the marginal source.

Kumbirai & Webb (2010) further analysed the overall performance of the commercial banking sector of South Africa between 2005 and 2009. It was indicated that the overall performance of banks increased incredibly in the first two years of their analysis from 2005 to 2007. The financial ratios were utilised to measure the performance of credit value, profitability and liquidity of the five South African based large commercial banks. As the world cup approached, banks did not decrease but were able to increase the size of their loan portfolios. It was also found that due to the global financial crisis in 2007, which affected both developed and developing countries, the bank performance deteriorated between 2008 and 2009. Because of the deterioration in the bank operating environment, there was also a deterioration of credit value, a decline in profitability and liquidity in the South African banking sector. Regardless of such a crisis, which affected both commercial and mutual banks around the world, South African banks were able to continue with their day-to-day business. South African banks were allowed to remain liquid and well capitalised, and that prevented any kind of need for state support of extraordinary liquidity due to the banks low leverage, high profitability, limited exposure to foreign assets and funding.

2.3.2 Long-run relationship between government stock and investment activity

Gomes (2001) explains investment fluctuations as responsible for a great fraction of cyclical volatility of output. Not only that but also income as investment is a central macroeconomic variable. The study examined the investment behaviour of firms when faced with costs, but which have the opportunity to access external funds. The main findings suggested that regardless of the presence of liquidity constraints, the standard investment regressions predicted that cash flows played a vital role in the determination of investments only if q was ignored. Yet, the presence of financial constraints is not sufficient in order to establish cash flows as an important regressor in standard investment equations beyond q. As financial constraints play a significant role in shaping corporate investment, cash flow becomes highly significant in investment regression. It was also found that even in the absence of financial frictions cash flow had a significant effect.

Bianconi et al. (2013) conducted a study in which daily data from January 2003 to July 2018 was used to examine the behaviour of stock and bonds from BRIC countries. The main findings suggested that BRIC bond markets in the long run deviated much more from the U.S (United States) financial stress measure than would the BRIC bonds and stock that usually deviated among one another. It was also found that the bond and stock return correlations for Brazil and Russia, were significantly great and negative.

Kim et al. (1998) developed a model that estimated that the optimal investment in liquidity would be rising in the cost of external financing. Also in the future investment opportunities return and variance of future cash flows, but such would be decreasing in the differential between liquid assets and physical asset returns. This model was developed focusing on the optimal corporate investment in liquid assets. The model was also based on the cost benefit trade-off between the holding of liquid assets cost (a low return) and the benefit of minimising needs in order to fund profitable investment opportunities in future with costly external financing. These predictions were tested using a large panel of industrial firms. It was found that greater market to book ratios that firms might have, significantly possessed a larger position in liquid assets and that liquidity was negatively related to the position of liquid assets. In addition, firms with a larger position of liquid assets had more volatile earnings and lower returns on physical assets as compared to liquid assets. But the results supported the predictions made by the model which showed that there was a positive relation between liquidity and the cost of external financing. It was concluded that firms built liquidity with the anticipation of promising future investment opportunities.

In a study where panel data was used and unit root tests performed, Sinha & Sinha (1998) analysed the exploration of the long run relationship between saving and investment in the developing economies of ten Latin American countries. The empirics showed that in four of the ten countries that were tested, saving and investment ratios had a long-run relationship when the number of cointegrating vectors equalled to one. The study concluded that macroeconomic instability in the long run might occur due to specific divergences between investment rate and savings rate in some countries.

2.3.3 Causal relationship between government stock and investment activity

Sridharan, Vijayakumar & Rao (2009) examined the causal nexus between FDI and economic growth in BRICS countries. Quarterly data was utilised and the Industrial Production Index (IPI) as a measure of economic growth was employed. Vector Error Correction Model (VECM) was employed as one of the tests, it was found that the long run relationship was present. The results also revealed that economic growth led FDI bi-directionally for various countries like Brazil, Russia and South Africa. As for FDI, it tends to lead the economic growth of India and China unidirectional.

Pradhan, Arvin, Hall & Bahmani (2014) studied the Association of South East Asian Nations (ASEAN) from 1961 to 2012. In order to determine the causal nexus between economic growth, the banking sector development, stock market development, and including other macroeconomic variables. In the study, it was found that both the bidirectional and unidirectional causality links between these variables was present as the panel vector auto-regressive (VAR) model was employed in order to perform a test for the Granger causalities. A well-functioning financial system, with well-established banking sectors and stock markets can lead to an increase in the growth rate of a country.

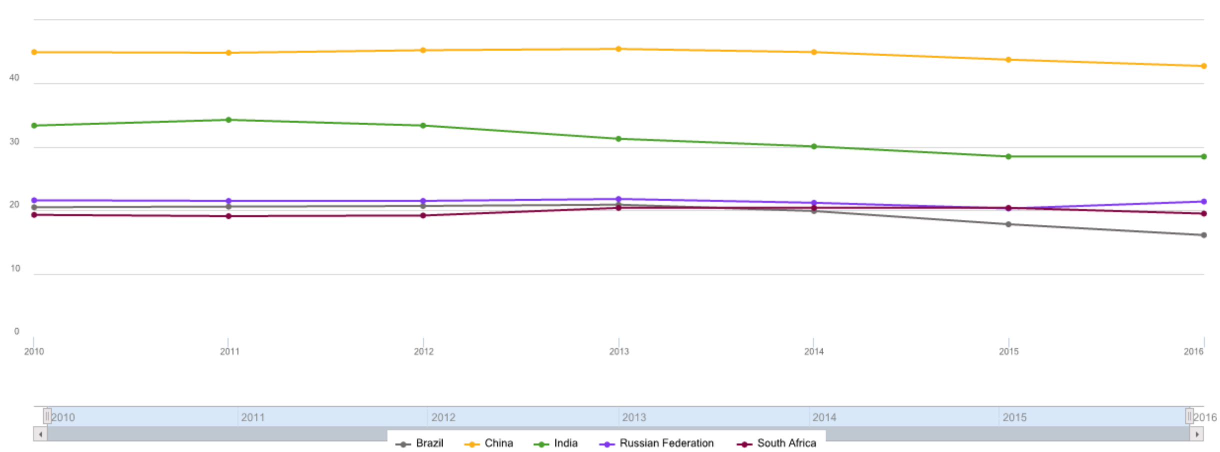
2.4 Overview of the BRICS economy

This section provides an analysis of the different trends of the indicators used in the model and an overview of government stock in the BRICS countries. The indicators are investment activity as measured by gross fixed capital formation, government stock on bonds, government stock on mutual banks, government stock on corporations, and government stock on liquid assets. The overview of the trends focused on was between 2010 and 2016 as the BRICS group came into existence when South Africa was inducted in 2010.

2.4.1 Trends in gross fixed capital formation

Trends in gross fixed capital formation showed the behaviour of investment activity from 2010 to 2016. According to Bertoni, Elia & Rabbiosi (2008) many investments follow an exploitation strategy, which is implemented through the horizontal and related investments.

Figure 2.1: Gross Fixed Capital Formation (% of GDP)



Series : Gross fixed capital formation (% of GDP)
Source: World Development Indicators

Figure 2.1 shows that Brazil, Russia and South Africa's gross fixed capital formation seems to be trending around the same percentage. However, India and China are trending alone at different percentages which are above those of Brazil, Russia and South Africa. India is trending between 27 and 35 percent rates, while China is between 45 and 48 percent. In Brazil, from 2010 to 2013 the gross fixed capital formation was trending along the same rate that eventually declined between 2013 and 2014. This sharp decline in Brazil continued until 2016 where it reached its lowest. According to Trading Economics (2018), gross fixed capital formation in Brazil averaged 146431.17 BRL Million from 1996 to 2018. However, in the first quarter of 1996 it reached a record low of 35403.16 BRL Million due to currency devaluation, but in the third quarter of 2013 it managed to reach an all-time high of 291365.72 BRL Million (Trading Economics, 2018; Adrangi, Chatrath & Sanvicente, 2000).

From 2011 to 2018, gross fixed capital formation in Russia averaged 3524.22 RUB Billion. In the fourth quarter of 2017 it reached an unprecedented high of 7490.40 RUB Billion and in the first quarter of 2011 a record low of 1709.70 RUB Billion (Trading Economics, 2018). According to Figure 2.1, Russia's gross fixed capital formation moved nearly along the same rate, between 2010 and 2014, but it declined between 2014 and 2015, reaching the 20 percent rate. In 2015, the gross fixed capital formation of Russia started to increase toward 2016. India experienced a slight increase in gross fixed capital formation between 2010 and 2011, but it started to decline significantly between 2011 and 2015. The trend, however, stabilised and moved along the same rate between 2015 and 2016 as shown in the figure. Trading Economics (2018) states that India's gross fixed capital formation from 2001 to 2018 averaged 5508.24 INR Billion. In the first quarter of 2002 India's gross fixed capital formation reached a low record of about 2021.90 INR Billion, but reached an all-time high of 11185.28 INR Billion in the first quarter of 2018.

China's gross fixed capital formation rate was above all the other countries' rate included in this study, going above 40 percent in Figure 2.1. The gross fixed capital formation of China slightly moved at the same rate between 2010 and 2013, which also showed a slight increase. Between 2013 and 2016, China's gross fixed capital formation decreased. China’s gross fixed capital formation increased in 2017 to 346440.80 CNY HML from 318083.60 CNY HML in 2016 (Trading Economics, 2018). As for South Africa’s gross fixed capital formation in Figure 2.1, it trended below 20 percent between 2010 and mid-2012, where it started increasing hovering around 20 percent until 2015. Between 2015 and 2016, there was a slight decline. Trading Economics (2018) further stated that South Africa’s gross fixed capital formation averaged 296856.91 ZAR Million from 1960 until 2018. According to Malope, Ncanywa & Matlasedi (2017) government bonds do have a greater effect in the prediction of South Africa’s future investments.

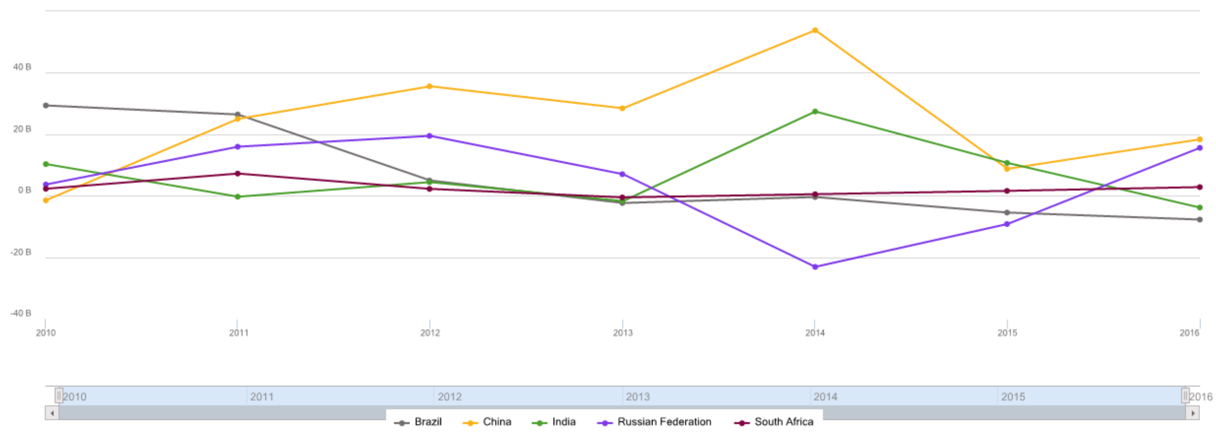
The dramatic increase in investment activity in the BRICS countries can be a result of their increase in wealth, liberalisation of investments and integration into the global economy. Most investments that are usually directed towards other developing countries are from BRIC countries and unstable and turbulent institutional and economic environments characterise countries that are emerging (Bertoni et al., 2008).

2.4.2 Trend of the indicators of government stock (2010-2016)

2.4.2.1 Government stock on bonds

Movements in stock indices can be influenced by changes in the economy’s fundamentals and changes regarding future prospects expectations among other things (Sharma & Mahendru, 2010). Stock indices are very sensitive to such changes. Authorities of a country need to pursue economic growth, a higher ratio of money supply to GDP, lower inflation rate, including fiscal and lower real interest rate. According to Taha, Colombage & Maslyuk (2010), if the stock market activities are increasing, including the high revenue collection then stable and strong growth within the country can be achieved. In order to be able to maintain a healthy and strong stock market of the country (Hsing, 2011). However, the activity of stock indices is dependent on the investor’s willingness to invest in the corporation shares and other securities (Sozinova, Zhelnina, Prokhorova, Zelinskaya & Putilina, 2016).

Figure 2.2: Government stock on bonds



Series : Portfolio investment, bonds (PPG + PNG) (NFL, current US$)
Source: World Development Indicators

In Figure 2.2 Brazil's government stock on bonds measured in U.S dollars declined significantly between 2011 and 2013, where it slightly increased until 2014. It however, decreases again until it reaches a negative value between 2014 to 2016. It is very crucial since the financial crisis that took place recently to understand the dependence structure of the stock market on the financial and global economic factors. Stock market performance depends not only on the changing structure of macroeconomic fluctuations, but also on changing structures of the risk factors and the business cycle (Mensi et al., 2014). The long-term bonds and common stock expected returns have a term premium that is related to business conditions. In Russia, government stock on bonds starts to increase in 2010 until 2012, however it experienced a tremendous decline between 2012 and 2014. The Russian Federation did recover from the significant decline, which resulted in a negative value in 2014, as it increased from 2014 to 2016.

India's government stock on bonds experienced many upward and declining trends, the trend is between $ -20 billion and $ 40 billion. The government stock on bonds increased significantly between 2013 and 2014, where it reached a value above $ 20 billion. It however, declined significantly from 2014 to 2016 reaching a negative value. The BRICS countries' current and potential growth has vital implications for their stock market capitalisation, as well as for their financial dependence on other stock markets. The capitalisation of the stock market between 1986 and 1995 increased ten-folds from

$171 billion to $1, 9 trillion. With the market share that was held in capitalisation increasing from 4 to 11 percent in the emerging markets, including that of Brazil, India and Hong Kong (Gay, 2016). Mensi et al. (2014) postulates that the four BRIC countries by the year 2030 are expected to account for 41 percent of capitalisation of the world's stock market. According to Kennedy, Kawachi & Brainerd (1998), a civil society was rich when it came to stocks of social capital.

The two official stock markets of China, namely Shanghai and Shenzhen Stock Exchange grew dramatically since the beginning of its operations, in the early 1990s. At the same time becoming one of the leading equity markets (Demirer & Kutan, 2006). In the figure, China's government stock on bonds increased from a negative value to a positive value above 20 billion, from 2010 to 2012. China faced a tremendous decrease between 2014 and 2015, which eventually recovered by a slight increase between 2015 and 2016. China is expected to have the largest equity market in the world, as it is also expected to overtake the U.S in the capitalisation of the equity market (Mensi et al., 2014).

South Africa's government stock on bonds moved along the same value from the end of 2012 to 2014 as shown in figure 2.2. In 2014, South Africa experienced a slight increase over the years up to 2016. The world stock is expected to have an impact on the South African stock market as international investors want to increase their financial assets rate of return by comparing the attractiveness of financial assets in various countries (Hsing, 2011). Sun & Tong (2000) further state that free capital to move across borders, it is usually attracted by the international diversification benefits. Investors will pay higher prices for foreign stocks than what they really pay at home because of such benefits. However, according to Sun & Tong (2000), additional diversification benefits are gained by foreign investors investing in domestic stocks that domestic investors cannot. Foreign investors usually require a lower rate of return compared to domestic investors. All investors give a close watch to what is happening in the economy around the world, especially investors operating in stock markets (Mensi et al., 2014).

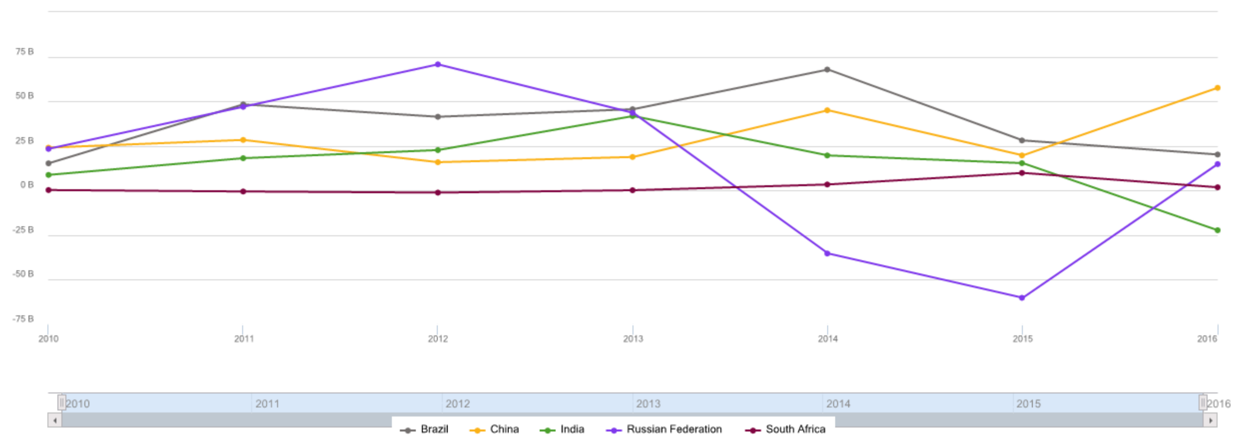
Over the past two decades, one of the most striking features of international financial development was the raise of stock markets in developing countries that had emerging markets (Smith, Jefferis & Ryoo, 2002).

For South Africa to be able to raise finance for emerging gold ventures, the Johannesburg Stock Exchange (JSE) was established for the country to be able to do so in the 19th century. Since the ending of apartheid and the lifting of sanctions in 1994, the JSE benefited from the substantial inflows of foreign portfolio investments. However, a dual exchange rate that applied to capital transactions also referred to as the financial rand was used prior March 1995 in order for transactions to be carried out. In 1996, the JSE shifted to an electronic trading system that was screen based (Smith et al., 2002). Due to the global financial crisis, the JSE index declined 43.5 percent during May 2008 to November 2008 (Hsing, 2011).

2.4.2.2 Government stock on mutual banks

Banks play a very vital role in the financial system of every country, as they contribute to economic development and growth. According to Said & Tumin (2011), the performance of the banking industry has a huge and broad effect on the economy. However, bank failure would have a negative impact on the economy (Lanine & Vennet, 2005). A sound and effective banking system ensures an effective allocation of resources and their use. Banking efficiency plays an important role at both the macro and micro levels. Demirguc-Kunt, Laeven & Levine (2003) further state that there are substantive repercussions on economic performance at the efficiency at which banks intermediate capital, as the societies' savings are mobilised and allocated by the bank. A bank can also be viewed as a company that uses deposits as inputs in order to produce investments and loans (Styrin, 2004). Mutual banks as compared to commercial banks do not have a substantial menu of products that are provided by commercial banks.

Figure 2.3: Government stock on mutual banks



Series : Commercial banks and other lending (PPG + PNG) (NFL, current US$)
Source: World Development Indicators

In Figure 2.3 Brazil and China had the same movement between 2011 and 2015, where they both experienced an increase in government stock on mutual banks between 2013 and 2014. Also a decline from 2014 to 2015. The decline in Brazil continued until 2016, while China's government stock on mutual banks started to increase in 2015. Therefore, a bank with sound financial health is equally important to the depositors, the employees, economy and shareholders. Lanine & Vennet (2005) stipulate that banks are faced with different risks, such as capital or leverage risk, liquidity risk and default risk, just to name a few. Banks' objective is to maximise the cash flows for a certain level of bank risk. Most theories assume that banks are risk neutral, but according to the portfolio management theory of banking, managers are risk averse. Such an assumption can be defended for small and manager-owned banks. The portfolio management theory still states that banks are able to sell credit using deposits as inputs (Alger & Alger, 1999).

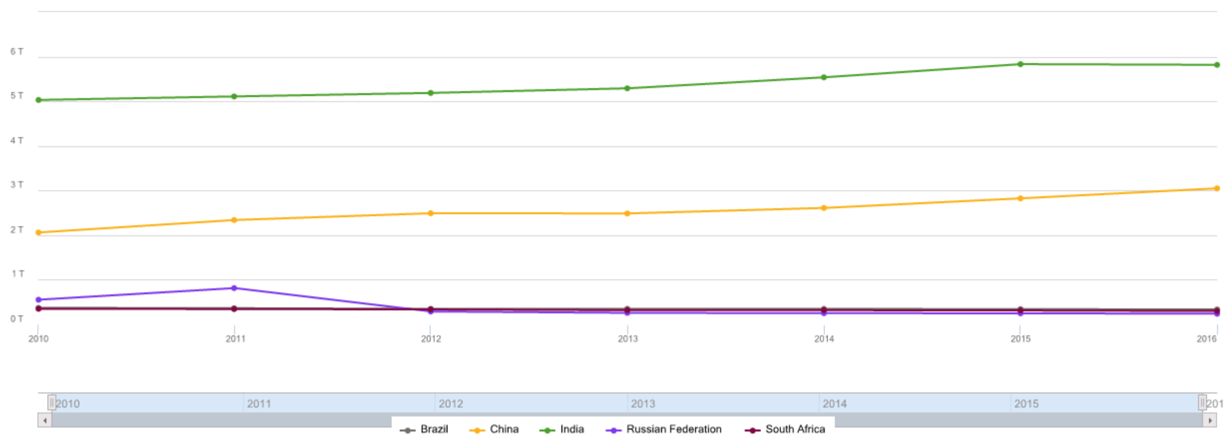
Around 1998 during the Russian banking crisis, the Russian banking sector experienced great disturbance also in the late 1990s. Figure 2.3 shows that Russia experienced a sharp decline in government stock on mutual banks between 2012 and 2015. However, Russia managed to slightly recover by going through an increase from 2015 to 2016. It is stated by Styrin (2004) that one of the most important prerequisites for successfully establishing an economic growth that is sustainable in Russia was the restructuring of the banking sector. A risk of bank runs can be created in the case of losses that were not expected on the lending portfolio. As liquid liabilities like deposits are used to finance illiquid assets. Default risk can also occur as banks tend to be faced with problems of asymmetric information about their borrowers as a lending business (Lanine & Vennet, 2005).

India increased significantly during 2010 to 2013. Although after such a great increase, India experienced a sharp decline from 2013 to 2016 in government stock on mutual banks. According to Sangmi & Nazir (2010), the concept of banking and banks has undergone a paradigm shift with the integration of the Indian financial sector with the rest of the world. In Figure 2.3, South Africa's government stock on mutual banks trended along the same value during 2010 to 2013. The government stock on mutual banks slightly increased during 2013 to 2015 and started declining again because of poor management of mutual banks. The Venda Building Society (VBS) mutual bank is one of the mutual banks in South Africa currently facing a financial crisis. The financial crisis was due to poor management, poor regulations, policies and conflict of interest. Such has resulted as a major concern for regulators and bank supervisory authorities. Bank failures involve large amounts or costs, people involved in the bankruptcy process and potential danger of systematic crisis (Lanine & Vennet, 2005).

2.4.2.3 Government stock on corporations

Corporate governance is not only based on the basis of waste, but also on existing standards in the field of management marketing, financing, securities and organisational structure (Sozinova et al., 2016). Mele, Debeljuh & Arruda (2003) state that many corporations have adopted some formal or informal ethical policies as they also consider business entities. Many people believe that ethical issues within a corporation are the primary responsibility of the Chief Executive Officer (CEO).

Figure 2.4: Government stock on corporations



Series : Listed domestic companies, total
Source: World Development Indicators

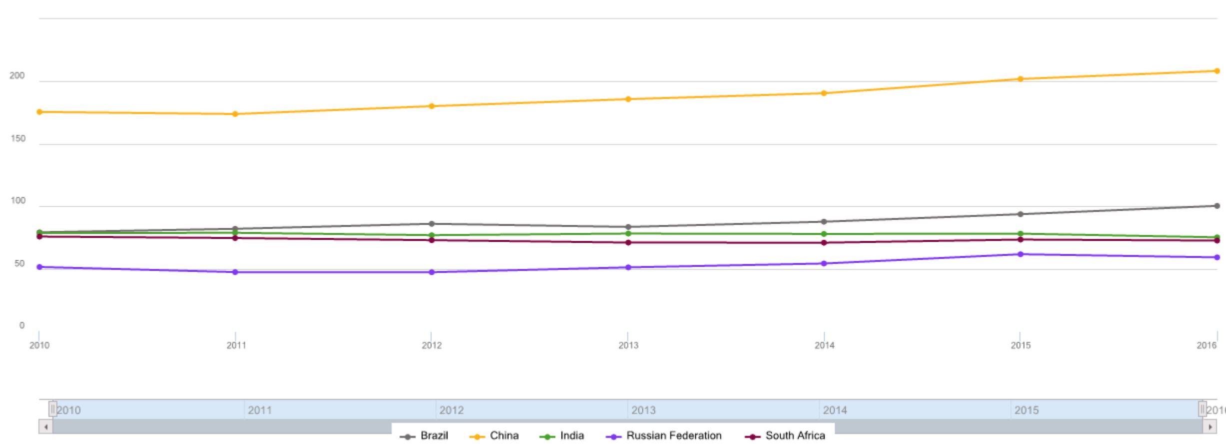
Figure 2.4 shows that Brazil's government stock on corporations hovered along the same value, which was nearly similar to South Africa's trend from 2010 to 2016. Russia's government stock on corporations increased during 2010 to 2011; from 2011 until 2012, it experienced a decrease. Russia's government stock on corporations started to trend along the same value from 2012 until 2016. India and China increased during 2010 until 2016. Corporations have a vital role to play in the economic growth and financial stability of a country. When the financial system of an economy becomes stable and does better than the previous years or improves in its size, activities and efficiency, the financial markets will be considered developed (Malope et al., 2017). For India during the period of 2015 towards 2016, government stock on corporations trended on the same value while for China it continued to increase. When corporations expand abroad, it provides such corporations with opportunities to access distribution networks and well established brands. For example, to promote long-term strategic objectives the BRIC companies invested in leading foreign in order to advance their position in global production and marketing (Bertoni et al., 2008). However, uncertainty of government intervention in the economy and markets has an impact on corporation investments (Chang, Chen, Gupta & Nguyen, 2015)

Furthermore, South Africa's government stock on corporations trended along the same value throughout the period of 2010 up to 2016, as seen in Figure 2.4. Stability of financial markets promotes the economic growth of a country by making it possible for funds to flow smoothly between savers and investors, and enabling the raising of capital. It is estimated that small and medium enterprises (SMEs) make up 91 percent of the formal business entities in South Africa. In which they contribute between 52 to 57 percent to GDP and provide employment of about 61 percent (Abor & Quartey, 2010).

2.4.2.4 Government stock on liquid Assets

Liquid assets tend to be less for banks facing a demand of more deposits (Alger & Alger, 1999). There are liquidity shocks that a bank could face and liquidity assets are used to meet such drastic liquidity shocks. Only small banks choose to rely on the liquid assets to deal with such a shock. The balance sheet of the banks reveals the amount of funds invested in liquid assets. However, liquidity comes at a price as liquid assets yield lower returns.

Figure 2.5: Government stock on liquid assets (% of GDP)



Series : Broad money (% of GDP)
Source: World Development Indicators

The BRICS government stock on liquid assets nearly have a similar movement, but at different rates with Brazil, China and Russia increasing between 2011 and 2015. However, Brazil and China continued to increase towards 2016, but Russia's government stock on liquid assets slightly decreased between 2015 and 2016. The level of liquid assets that a bank or corporation chooses can be explained by risk aversion. The amount of liquid assets can, however, be affected by the introduction of deposit insurance (Mertoni, 1977).

India's government stock on liquid assets moved around the same rate from 2010 to 2016, but there was a trivial increase from 2012 to 2014. Furthermore, South Africa's government stock on liquid assets trended at the same rate between 2010 and 2011. South Africa's government stock on liquid assets declined a bit and remained low from 2011 to 2014. In mid-2014, South Africa's government stock on liquid assets began to increase through to 2016.

2.5 Overview of the individual BRICS countries government stock

2.5.1 Brazil

The economy of Brazil in the last few years gained a lot of significance, as it experienced currency devaluation in 1999. Adrangi et al. (2000) stated that the economy of Brazil was the flagship of the Latin American Economies and played an important role in the world markets, as 450 of the top 500 U.S corporations do business in Brazil. This is considered the eleventh market for the U.S exports. However, when the economic activity decreases the future corporate profits and stock prices are affected negatively. Furthermore, Ntim & Osei (2011) state that larger corporations generate greater corporate performance due to having good governance mechanisms. Corporate performance can be improved with the usage of debt to minimise the manager's ability to expropriate excess cash flows. If debt is used excessively, it could result in financial problems and thwart corporations from taking full advantage of growth opportunities.

Stability of emerging markets financial structure, also of the world and equity markets, could be threatened due to inflation and currency depreciation in the economy. The economic instability that occurred in Brazil in 1999 is a good example. As bonds and equities are often seen as potential hedge against expected inflation, also unexpected as they are claims against real assets (Adrangi et al., 2000). According to Gay (2016), the emerging economies share in world output, including the newly industrialising economies of Asia which was cut in 2005 to 46 percent with Brazil's GDP being low. GDP in Purchasing-Power Parity (PPP) terms, when market exchange rates are taken into account, China and Brazil rank among the world's top ten economies. Brazil and Russia producing more than India in terms of PPP, which is expected to increase in the coming years.

2.5.2 Russia

The Russian financial crisis that took place in 1998 uncovered a wide range of distortions and problems, such as speculations on the government bond market, concentration of risks, poor capitalisation and excessive unhedged exposure to currency risk just to name a few. These problems and distortions had been accumulating in the banking sector. The financial crisis in Russia represented a serious test for the Russian banking sector, which was triggered by sharp currency devaluation and the default on government debt (Lanine & Vennet, 2005). The Russian banking sector still grew as a result of further development of the international capital markets, high export incomes and budget surpluses (Juurikalla, Karas & Solanko, 2009). There is an assumption that banks reduce the supply of loans when faced with a decline in liquidity. Banks can keep liquid assets to deal with great liquidity shocks when they occur as the aggregate bank lending declines after the tightening of the monetary policy (Alger & Alger, 1999; Juurikalla et al., 2009). However, in the past few years bank lending has increased tremendously.

Sozinova et al. (2016) further state that investment activity is the most appropriate mechanism for corporation profit. Although large corporations, including commercial banks have borrowed larger amounts not only through Eurobonds, but also through syndicated loans. The demand for long-term financing which is driven by strong economic growth was not achieved by the domestic banking sector, which resulted in Russian corporations being forced to borrow abroad (Juurikalla et al., 2009). By obtaining great access to natural resources, segments of the global market and acquiring strategic assets worldwide, the Russian companies were able to enhance their international competitiveness through FDI. It is shown by the rapid increase in the

Russian FDI over the previous years that other countries' investment opportunities are more attractive to Russia's companies than domestic ones (Liuhto & Vahtra, 2007).

2.5.3 India

In India since the beginning of 1990, for economic liberalisation various measures were taken including a great number of steps to strengthen the stock market (Sharma & Mahendru, 2010). Such steps were implemented by the country and allowed international investors access to their stock market and trading in derivates. However, Gay (2016) states that for emerging financial markets (EFM) to have continued growth they need to resume their respective expansion that is pushed by external investors. Although, most emerging market economies since the late 1980s, have been characterised by the inflation variations (Adrangi et al., 2000). Sharma & Mahendru (2010) further state that the measures that were taken for economic liberalisation in India resulted in the depth and the size of the stock markets in India improving significantly. The India stock market movements are recently analysed carefully and viewed by quite a large number of global players.

Sangmi & Nazir (2010) expound that the Indian banks become operationally inefficient before the financial reforms. However, this changed when all banks were directed to follow the norms of capital adequacy, asset quality, prudential norms and disclosure requirements. As the Reserve Bank of India (RBI) based on the recommendations of the Narsimaha Committee, took strong measures that also changed the Indian banking landscape.

The changes brought about the Industrial Policy Resolution of June 1991 caused a major restructuring of the Indian corporate sector through mergers and acquisitions. The government during the period of 1985 to 1991 approved 58 mergers and 127 acquisitions of companies which were under the Monopolies and Restrictive Trade Practices (MRTP) Act of 1969 (Pawaskar, 2001). Such resulted in a sharp increase in the post 1991 period of the overall number of acquisitions and mergers. However, mergers can either decrease or increase the profits of the merging corporations from what they could have made if the corporations would have not merged. Increase in profitability would usually be a result of increased efficiency or even an enhanced monopoly. The managerial theory of the firm is a good explanation of a decline in profitability where the managers sometimes at the cost of some current profits pursue corporate growth. Some companies that are hard pressed for liquidity might merge with others which abound in liquid assets. The companies do so with the hope that there will be an improvement in the combined short-term financial situations (Marris, 1964; Pawaskar, 2001; Tzoannos & Samuels, 1972).

2.5.4 China

Restrictions on foreign ownership of domestic stocks are imposed by many emerging capital markets. Restricted shares that can be held by only the local citizens and unrestricted shares that are held by both the local and foreign investors are two types of shares that companies in the emerging capital markets issue. Such is done by these markets to avoid the loss of ownership control to foreign investors, but at the same time with the aim of attracting foreign investments. China might have more than one market for foreign investors to invest in. However, unrestricted shares as compared to restricted shares often trade at premium prices but China is an exception. Most people in China might invest in bonds as a substitute as they do not have any alternative means to invest (Sun & Tong, 2000).

The maturity and depth of a stock exchange observed in a developed country may not characterise the Chinese financial markets, despite its tremendous growth. Even though, as a result of the nation's strong savings habit, it is expected that China's stock market will continue to grow (Demirer & Kutan, 2006). Since 2000, China has had the highest saving rate in the world and also having a high gross capital formation (investment), with savings exceeding investments (Mongale, Mukuddem-Petersen, Petersen & Meniago, 2013). Such was also shown by Green (2003) that in 2001 the market capitalisation of China was about 45 percent as a proportion of GDP. However, savings exceeding investments might cause China to run at a net surplus that will result into a current account surplus. Demirer & Kutan (2006) further state that because of a thin corporate bond market, the central government tends to have a strong interest in the ability of the stock market to be able to finance state-owned enterprises.

2.5.5 South Africa

South Africa is globally known as the largest producer of some strategic commodities. The country was added to the BRIC group due to its fast growing economy. Opportunities do exist to establish a dedicated investment strategy in terms of economic diversification opportunities that the presence of South Africa in the BRICS group provides (Mensi et al., 2014). Strategic commodities such as gold, platinum and chrome are some of the important resources that do not only support but also contribute to the domestic and global economic growth.

The South African value of financial assets including stock suffered a significant decrease due to the global financial crisis (Hsing, 2011). Macroeconomic uncertainty has a great impact on the stock market volatility. However, Chinzara (2011) states that volatilities in short-term interest rates and exchange rates are the variables that are the most influential in affecting the volatility of the stock market for the volatility of the stock market can be increased by the financial crises. Although a bank's profitability is also a vital indicator of a financial crisis (Said & Tumin, 2011). Stock markets and economic growth are affected by changes in the global economic factors as it can be a channel for the transmission of fluctuations in the world's economic and financial conditions (Mensi et al., 2014). Jefferis & Okeahalam (2000) showed that the real GDP of South Africa and the real exchange rate positively affect the South African stock market. Unlike the long-term interest rate which has a negative influence on the South African stock market.

According to Lanine & Vennet (2005) the management objective is to ensure that the values of the owner's investments are maximised. The corporation's financial wealth and future prospects can be directly reflected by the capital budgeting and portfolio management decisions (Chang et al., 2015). As management decisions, can affect the overall performance of the corporation, including banks as the measurement of the bank's performance is usually done using accounting methods by comparing financial ratios related to costs and profitability.

2.6 Conclusion

This chapter reflected the theoretical framework and empirical literature, and provided an overview of the BRICS economy. This study was based on the theoretical framework of the Keynes Theory of Investment, Neoclassical Theory of Investment Behaviour, Tobin's Q Theory of Investment Behaviour, and the Financial Theory of Investment Behaviour. These theories play an important role in the choice of variables. This chapter provided an insight into empirical literature, which included relevant studies related to this study. In addition, an overview of the BRICS economy and various government stock indicators trends were analysed. The next chapter deliberates on the research methodology, explaining the process of data collection, model specification and estimation techniques for this study.

As discussed in the empirical literature, there are various findings by different authors on the estimation of government stock on investment activity, long run relationship between government stock and investment activity, and the causal relationship between government stock and investment activity. The empirical analysis showed that different indicators in various countries affected investment activity. Be it in developed or developing countries, such depends on the structure of the model being analysed. Some studies found that investments were more sensitive to cash flow. However, investment cash flow sensitivities are not affected by asset tangibility when firms are unconstrained. Risk management and decision-making play a big role in corporations.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter reviewed literature on various theories and empirical studies on the overall effects of government stock on investment activity in BRICS. This chapter provides an insight into the process of data collection, model specification and model estimation for this study.

3.2 Data

This study used panel data and the specified model comprised five variables. Secondary annual data from 2001 to 2016 is used. Data for the following variables: government stock on bonds, government stock on mutual banks, government stock on corporations, government stock on liquid assets and investment activity measured in terms of gross fixed capital formation (GFCF) was obtained from the World Bank.

Panel data makes it possible to study the significance of lags in behaviour or the result of decision making. The logging of data allows for the smooth running accurate tests. In econometric analysis the nonlinear function that plays a vital role, is the natural logarithm also referred to as the log function (Wooldridge, 2009).

Panel data usually requires a replication of the same units over time. Usually firms, individuals and households panel data sets are difficult to obtain than pooled cross sections (Wooldridge, 2009). Panel data has become increasingly available not only in developed countries, but also in developing countries. Although developing countries may not necessarily have a long tradition of statistical collection like developed countries. Panel data provides multiple observations, by following a given sample of individuals or countries being analysed over time (Hsiao, 2014). Panel data may possess some major advantages over time series or even conventional cross-sectional data, but it also has disadvantages.

Panel data gives accurate inference of the model parameters as it contains a large number of data points, the degrees of freedom increases. However, the collinearity among explanatory variables declines resulting in an improvement in the econometric estimates efficiency. Panel data involves a time series dimension T and a cross-sectional dimension N; therefore, simplifying the statistical inference and computation - reducing or resolving the magnitude of key econometric problems that usually occur in the empirical studies (Hsiao, 2003; Hsiao, 2014). Panel data also generates accurate predictions for individual outcomes, which can be obtained by pooling of the data. It has a greater capacity in constructing behavioural hypotheses that are more realistic and making it possible to test more complicated behavioural models. Panel data makes it easy for aggregate data analysis through the provision of micro-foundations, controlling the impact of omitted variables and uncovering dynamic relationships (Hsiao, 2003; Baltagi, 2005; Hsiao, 2014).

However, problems arise when panel data is utilised. Panel data can be heterogeneity bias, meaning there is unobserved heterogeneity across individuals and over time (Hsiao, 2003; Hsiao, 2014). When heterogeneity is being ignored, such could result in estimates of interesting parameters being meaningless or inconsistent. In the model specification, parameter heterogeneity can take place due to the time specific or individual effects that are ignored. That usually exists among the time series or cross-sectional units, but not captured by the included explanatory variables. Baltagi (2005) states that panel data can also be selectivity bias, meaning sample cannot be easily or randomly drawn from the population. Selectivity problems include attrition, nonresponse and self selectivity. The panel autoregressive distributed lag is one of the models that account to minimize issues of heterogeneity. When analysing panel data, models with constant slopes and variable intercepts are usually used. As they provide a simple and reasonable alternatives to the assumption that parameters take values common to all agents at all times (Hsiao, 2005).

3.3 Model specification

In the model, investment is a function of government stock on bonds, government stock on mutual banks, government stock on corporations and government stock on liquid assets. The specified model is based on the financial theory, which emphasise the importance of stock markets, decision-making and risk taking when investors have to select better investment instruments (Wray & Tymoigne, 2008). The estimated model is written as functional form as follows:

$$Investment = f(GovernmentStock) \quad (3.1)$$

$$GFCF = f(GovStockonB, GovStockonMutualB, GovStockonCorp, GovStockonLiquidA) \quad (3.2)$$

The linear form of the estimated model is as follows:

$$GFCF_{it} = \beta_0 + \beta_1 GSB_{it} + \beta_2 GSMutualB_{it} + \beta_3 GSCorp_{it} + \beta_4 GSLA_{it} + \varepsilon_{it} \quad (3.3)$$

where β_0 is the constant and ε_{it} is the error term.

Logged form:

$$LGFCF_{it} = \beta_0 + \beta_1 LGSB_{it} + \beta_2 LGSMutualB_{it} + \beta_3 LGSCorp_{it} + \beta_4 LGSLA_{it} + \varepsilon_{it} \quad (3.4)$$

where $LGFCF_{it}$ = the natural log of gross fixed capital formation, $LGSB_{it}$ = the natural log of government stock on bonds, $LGSMutualB_{it}$ = the natural log government stock on mutual banks, $LGSCorp_{it}$ = the natural log of government stock on corporations and $LGSLA_{it}$ = the natural log of government stock on liquid assets of the BRICS country. Logs denote natural logarithms and are useful in obtaining a constant elasticity model. According to Wooldridge (2009), logarithms can also be used for different approximations that would arise in econometric applications.

Government stock consists of bonds that the government sells in order to be able to finance its budget deficit. While government bonds are a kind of debt-based investment, which are more liquid than corporate bonds and very safe (JSE, 2018). The national government usually issues government bonds (Trading Economics, 2018). Government stock on bonds is preferred as an indicator as bonds are debt instruments that can be used to raise capital. The prior expectation for this variable is that it has a positive influence on investment activity. Since an investment in bonds can be the safest way to protect oneself from market volatility, if heavily invested in stock. Investment that is financed by common stock can be advantageous according to Modigliani & Miller (1958), however, only if its yield is more than the capitalisation rate. Stock markets can be significant proxies for financial development in both the industrialised and developing countries.

Mutual banks refer to financial institutions that were first established with a purpose of serving low-income earners. This indicator is preferred due to the banking sectors' central position in the economy. The prior expectation for government stock on mutual banks is that it has a positive influence on investment activity, since the banking sector is a major contributor to a nation's economy. Furthermore, the banking sector has become one of the sectors that are strictly regulated in modern economies (Lanine & Vennet, 2005).

Government stock on corporations consists of corporations that are legal entities, with rights and responsibilities. According to Kannadhasan (2015), the objective of an investment is to make money; therefore, the prior expectation of the variable is that it has a positive influence on investment activity. However, such will depend on the kind of investments that the corporation makes, taking into consideration the risks and returns.

Government stock on liquid assets consists of assets that can easily be converted into cash or purchasing power immediately. The prior expectation for this variable is that it will have a positive influence on investment activity because holding of liquid assets that are enough can help to cover any future shortfall (Martin & Morgan, 1988). However, investments can be considered to be liquid assets or expected to be liquid as they can be easily liquidated, but it depends on the kind of investment. Corporations invest large amounts of money in liquid financial securities, as liquid assets have a stable market price. Holding of liquid assets can both be costly and beneficial (Kim et al., 1998).

3.4 Estimation techniques

In this chapter, panel unit root tests are explained first, followed by the lag length criteria, panel cointegration test, panel autoregressive distributed lag model (PARDL), Engel-Granger causality test, the diagnostic tests, and lastly the impulse response function (IRF) and variance decomposition tests.

3.4.1 Panel unit root test

Panel unit root tests have become popular among many empirical researchers who have access to a set of panel data, as panel data has space and dimensions. Panel is one of the efficient econometric methods than cross sectional and time series (Brooks, 2008). It denotes data sets that have a time dimension as well as a non-time dimension. Costantini & Martini (2009) suggest that unit root tests based on panel are poised to have a higher power than individual time series unit root tests. Panel data techniques make it possible for models that are yet to be estimated to be selected with a high degree of flexibility and to be preferred due to their restrictions. According to Maddala & Wu (1999), panel unit root tests can be used as a way of setting the power of unit root tests to increase which are usually based on a single series. Panel unit root tests can simply be referred to as multiple series unit root tests that have been applied to panel data structures. In which the cross sectional presence generates a multiple series out of a single series. In this case, panel unit root tests are used as the individual unit root tests power tends to be distorted as a result of the span of data being short (Christopoulos & Tsiona, 2004). Furthermore, Costantini & Martini (2009) state that in some cases unobserved heterogeneity with parameters that are cross section specific characterise panel data.

It is critical to first determine if unit roots in a data series exist, in order to investigate the possibility of panel cointegration. As Junkin (2011) postulated that stationarity of a series is of outmost importance as the possibility of spurious regression is not only reduced, but also because forecasting is only possible when using stationary series. It has been a generally accepted argument that unit root tests like the Dickey-Fuller (DF), ADF and Phillips-Perron (PP) tests, which are commonly used, often lack enough power to distinguish the unit root null from stationary alternatives (Maddala & Wu, 1999).

However, serious implications in empirical work may occur due to the presence even the absence of power against alternatives in the case where a subset of the series is said to be stationary (Karlsson & Lothgren, 2000).

In all the panel unit root tests, in the case of the null hypothesis, each series in the panel is said to contain a unit root, and whilst the alternative hypothesis tends to be more ambiguously specified or at least one of the individual series in the panel is stationary (Karlsson & Lothgren, 2000; Costantini & Martini, 2009). However, the asymptotic properties of a time series regression estimates and test statistics can be tremendously affected by the presence of unit roots, which is one of the weak stationary assumptions. As in the panel, each individual time series data is assumed weakly stationary and the panel regression analysis asymptotic properties are derived under such an assumption (Levin & Lin, 1992). In some time series literature, the regression estimators and test statistics will converge at a way faster rate due to the presence of unit root. Levin & Lin (1992) further state that the super-consistency results usually take place because each individual observed in panel tends to rise more rapidly over time in the presence of a unit root than it would in the situation of weakly stationary data. When conducting a separate unit root test for every variable, the pooling approach is appropriate as it provides a higher test power (Levin, Lin & Chu, 2002).

Thus, to overcome stationarity problems, the Levin, Lin and Chu test (2002); Im, Pesaran & Shin (2003); and Fisher type tests using ADF and PP tests are conducted, which also provide the differentiation of variables being considered in the study until stationarity is achieved. The panel cointegration test will be conducted, once stationarity among the variables is confirmed and the lag length (Ahmad, 2015). The use of unit root test usually becomes relevant in overcoming misleading and spurious results. If at levels the variables series is non-stationary, then unit root test must be conducted at first if that is still the case where the variables are still non-stationary at first difference then the test will have to be carried out at second difference, until stationarity is induced among the variables (Ahmad, 2015).

Lutkepohl (1993) points out that the level of integration explains whether data is stationary or non-stationary and this level of integration is presented by $Y_t \sim I(d)$, where d stands for order of integration. All these procedures normally rely on the various ways of joining the significance levels (p-value) being observed from the different tests (Maddala & Wu, 1999). The Levin, Lin and Chu test (LLC); Im, Pesaran & Shin test (IPS); and Fisher type tests using ADF and PP panel unit root tests can also be termed as the multiple series unit root tests (Alexiou et al., 2016).

For the purpose of this study, the LLC test (2002), IPS test (2003), and Fisher type tests using ADF and PP tests were conducted. An informal test was also carried out, which included the use of line graphs to determine whether there was a unit root or not. The null and alternative hypotheses under each testing approach are as follows:

$$\mathrm{H}_0 : Y_{it} \sim I(1) \tag{3.5}$$

$$\mathrm{H}_1 : Y_{it} \sim I(0) \tag{3.6}$$

there are also two possible outcomes: Reject H_0 and do not reject H_0.

3.4.1.1 LLC panel unit root test

According to Levin et al. (2002) the degree of persistence is allowed to differ freely across individuals, in the individual regression error, intercept and the trend coefficient. The pooled t-statistic will have a limited normal distribution when the time series and cross section dimensions of the panel become large; such will depend on the regression specification but is free from the inconvenience of other parameters. In 1993, Levin and Lin provided new results in their paper on panel unit root tests, such tests were designed to deal with the heteroscedasticity, including the autocorrelation problem (Maddala & Wu, 1999). The Levin and Lin tests (LL) are usually based on the homogeneity of the autoregressive parameter and such a test tests very restrictive hypothesis that is seldom of practical interest (Maddala & Wu, 1999). According to Westerlund (2009) the LLC test is one of the most widely applied test in research in determining the null hypothesis of a common panel unit root versus the alternative of stationarity when the cross sectional unit appear to be independent of each other. The LLC panel unit root test might have a few weaknesses as that maybe a problem in the adjustment term. It is usually required to account for the nonzero mean of the test statistic in the existence of the deterministic intercept and trend terms (Westerlund, 2009).

The LLC panel unit root tests formula can be written as:

$$\Delta Y_{it} = \alpha_i d_t + \delta Y_{it-1} + u_{it} \tag{3.7}$$

where the $t = 1...,T$ and $i = 1...,N$ shows the time series and cross sectional units. d_t indicating the deterministic trend and u_{it} being the error term which is assumed to satisfy the stationarity and invertible autoregressive (AR) process that is given as:

$$\phi_i(L)u_{it} = \ell_{it} \tag{3.8}$$

where $\phi_i(L) = 1 - \sum_{j=1}^{p_i} \phi_{ij} L^j$ which is polynomial in the lag operator of L and ℓ_{it} which has a variance of ϕ_i^2 is the mean zero error, but it is usually independent across both i and t (Westerlund, 2009).

3.4.1.2 IPS panel unit root test

The IPS is normally based on the heterogeneity of the autoregressive parameters unlike the LLC test. Such a test can also be referred to as an asymptotic test, which is directly comparable to the Fisher test. As the aim of both tests is the merging of the significance of a variety of independent tests (Maddala & Wu, 1999). But such can vary as the IPS test is based on combining the test statistics, while the Fisher tests on the significance levels of various tests.

The heterogeneous IPS panel data model is usually given by:

$$\Delta Y_{it} = \mu_i + \beta_i Y_{i,t-1} + \sum_{k=1}^{p_i} \phi_{i,k} \Delta Y_{i,t-k} + \gamma_i t + \varepsilon_{it} \tag{3.9}$$

where $i = 1,...,N$ and $t = 1,...,T$. The relevant hypothesis will be given as equation 3.9, as the maintained hypothesis of common dynamics seems relaxed:

$$\mathrm{H}_0 : \beta_i = 0, \forall_i \quad (3.10)$$

$$\mathrm{H}_1 : \exists_{i.s.t.} \quad (3.11)$$

$$\beta_i < 0 \quad (3.12)$$

Each equation is usually estimated separately by ordinary least squares (OLS) due to heterogeneity as the IPS tends to use different unit root tests for the N cross section units and for each equation the test statistics will be determined as averages of the test statistics (Karlsson & Lothgren, 2000). The IPS test has high-test power. However, when a fraction of the series is stationary it tends not to investigate the power of the tests with small samples.

The IPS test is also able to combine both the evidence from the unit root hypothesis which is from the N unit root tests that are performed on the N cross section units. It is always important to note that the IPS test is usually used for testing whether the results from the N independent tests of a hypothesis are significant (Maddala & Wu, 1999).

3.4.1.3 Panel unit root Fisher type test (ADF and PP)

The Fisher test can also be referred to as the exact test, which is a statistical significance test that is usually used in the analysis of contingency tables. According to Maddala & Wu (1999), the Fisher test does not necessarily require the panel data to be balanced, unlike the IPS test. As different lag lengths can also be used in the regression of the individual ADF and the Fisher test. The Fisher test has the advantage of being carried for any stationarity tests derived, but it also has some disadvantages where the p-value has to be obtained through the simulation of Monte Carlo (Maddala & Wu, 1999).

3.4.2 Lag length criteria

The lag length has to be determined first before testing for cointegration. The optimum lag order refers to the appropriate number of lags for each variable included, that should be part of the econometric model (Brooks, 2008). According to Ozcicek & McMillin (1999), the determination and verification of the lag length of the vector autoregression (VAR) is a critical element in the specification of VAR models. By showing that estimates of a VAR whose lag length differs from the true lag length are inconsistent as are the impulse response functions and variance decompositions that are derived from the estimated VAR. Braun & Mittnik (1993) was able to demonstrate the importance of the lag length determination.

Brooks (2008) supported by Lutkepohl (1993) indicates that it is important to attempt to use an optimum number of lags, since over-fitting (selecting a higher order lag length than the true lag length) can cause an increase in the mean square forecast errors of the model. In addition, under-fitting the lag length often generates auto correlated errors leading to biased results. The estimation of the lag length is frequently selected using explicit statistical criterion such as the Akaike information criterion (AIC) and Schwarz information criterion (SC) (Ozcicek & McMillin, 1999). However, when dealing with small samples the Final prediction error (FPE) does also have better properties like the AIC in selecting the correct order, unlike the Hannan-Quinn information criterion (HQ) and SC criteria's. Although the AIC is not consistent, but generally efficient as it will deliver on average too large a model even with infinite amount of order. The SC and HQ criteria's are justified by their ability to choose the order correctly in large samples, meaning the criteria's are consistent. In other words, the consistency property of the SC and HQ criteria's is maintained for integrated processes (Brooks, 2008; Lutkepohl, 2005).

3.4.3 Panel cointegration test

The panel data cointegration test is used to determine whether a long-run relationship exists between investment activity and other variables used in the model specification. As there is an increasing popularity in the empirical literature on the use of cointegration techniques that are used for testing whether a long run relationship exists or not (Pedroni, 1995). According to Dunis & Ho (2005), the cointegration concept provides a sound methodology for modelling both the long run and short run dynamics in a system. Furthermore, Alexiou et al. (2016) state that the cointegration methodology is primarily used when one wants to determine if spurious estimation results are evident. It was hypothesised by Johansen & Juselius (1990) that this test examines the null hypothesis of no cointegration in the variables against the alternative that there exists cointegration. It has to also be verified first that all variables used in the study are integrated of a specific order in levels before the long run relationship can be identified (Christopoulos & Tsiona, 2004).

The linear stationarity combination is sometimes referred to as the cointegrating vector, which indicates the long run relationship between variables (Gujarati, 2003). According to Costantini & Martini (2009), the Johansen's VAR procedure and Pedroni's heterogeneous panel cointegration are only capable of showing whether or not there is cointegration between the variables and also if there is a long run relationship.

The Kao test has the same approach as the Pedroni test as they are both based on the Engel-Granger (1987) two-step that is residual based cointegration test (Dritsakis, 2012; Ahmad, 2015). Ahmad (2015) further stipulates that the Pedroni and Kao cointegration tests are commonly used to determine the long run association between respective variables used in the study. Such tests can be sensitive to the correct lag length selection in the VAR. Pedroni (1995) also states that many of these tests have inherently low power and it has been confirmed by Shiller & Perron (1985) that the frequency of data does not matter but the duration of the data does for the power of these tests.

3.4.3.1 Panel Johansen cointegration test

The panel Johansen's cointegration test is proven suitable when dealing with multivariate time series data (Brooks, 2008; Gujarati & Porter, 2009). The cointegration test is performed after the order of integration between the variables has been identified through the stationarity test and after the optimum lag length has been determined. The test is employed as it has been proven suitable also when dealing with multivariate time series data. A linear combination of two or more series can be stationary, despite being individually non-stationary. If there is cointegration of two or more-time series, it means that there is a long-run or equilibrium relationship between the two (Johansen, 1988).

There are two test statistics under the Johansen approach for cointegration, namely the trace equation and the max-eigenvalue equation, which are formulated as:

$$\lambda_{trace}(r) = -\mathrm{T}\sum_{i=r+1}^{g}\ln(1-\hat{\lambda}_i) \tag{3.13}$$

$$\lambda_{\max}(r, r+1) = -\mathrm{T}\ln(1-\hat{\lambda}_{r+1}) \tag{3.14}$$

Where r is the number of cointegrating vectors under the null hypothesis, $\hat{\lambda}_i$ is the estimated value for the i^{th} ordered eigenvalue from the π matrix and T is the number of usable observations. The number of cointegration vectors (r) is always smaller or equal to the number of endogenous variables (n). And the larger is the $\hat{\lambda}_i$, the more large and negative will be $\ln(1-\hat{\lambda}_i)$. The trace test is a joint test that test the null hypothesis of r cointegrating vectors against an unspecified or general alternative hypothesis of r cointegrating vectors. On the other hand, the maximum eigenvalue test conducts separate tests on each eigenvalue and tests the null hypothesis of r cointegrating vectors against an alternative hypothesis of $r+1$ cointegrating vectors (Brooks, 2008).

3.4.3.2 Pedroni panel cointegration test

The Pedroni panel cointegration test usually makes use of the long run variance, both the parametric and non-parametric kernel estimations (Dritsakis, 2012; Ahmad, 2015). Pedroni proposed various tests for cointegration that allowed heterogeneous intercepts and trend coefficients across cross sections. Pedroni also described various methods that involved establishing statistics for testing the null hypothesis of no cointegration. The regression is given as follows:

$$Y_{it} = \alpha_i + \delta_i t + \beta_{1t} X_{1i,t} \beta_{2i} X_{2i,t} + ... + \beta_{mi} X_{mi,t} + \ell_{i,t} \tag{3.15}$$

Where Y and X are assumed to be $I(1)$, $t = 1,...,N$ and $m = 1,...,M$. α_i and δ_i are parameters which can also be set as zero, are the individual and trend effects. When there is no cointegration under the null hypothesis, the residuals $\ell_{i,t}$ will always tend to be $I(1)$ (Gutierrez, 2003).

There are two kind of alternative hypothesis, namely the heterogeneous alternative where $\rho < 1$ for all i and homogenous alternative $(\rho_i = \rho) < 1$ for all i. According to Gutierrez (2003), Pedroni (1999) introduced seven residual based tests that allowed for heterogeneity among individual units of the panel and where no exogeneity requirements on the regressors in the cointegrating regressions are imposed. The residual based tests dealt with multiple regressors for the null of no cointegration in dynamic panels. Four of which are based on a within-dimension and three on the between dimension (Alexiou et al., 2016). All the seven tests can be formulated as:

$$Y_{it} = \alpha_i + \beta_1 X_{1,i,t} + \beta_2 X_{2,i,t} + ... + \beta_n X_{n,i,t} + \mu_{it} \tag{3.16}$$

where $X_{i,t}$ are referred to as the regressors for n cross sections. A regression can also be conducted using the above formula, equation (3.16) and can be written as:

$$\mu_{i,t} = \zeta_i \mu_{i,t-1} + Z_{i,t} \tag{3.17}$$

Seven different statistics can be generated from the preceding estimation process, namely the panel $-\upsilon$, panel $-\rho$, and panel non-parametric $-t$. Under the within-dimension framework, the null of no cointegration and the alternative of cointegration are usually tested as follows:

$$H_0 : \zeta_i = 1 \text{ for all } i \tag{3.18}$$

$$H_1 : \zeta_i = \zeta < 1 \text{ for all } i \tag{3.19}$$

The group of non-parametric $-t$ and group of parametric $-t$, which fall in the between dimension framework of the panel, the alternative hypothesis states that $H_1 : \zeta_i < 1$ for at least one i, as the between dimension test allows for heterogeneity as it is less restrictive (Alexiou et al., 2016).

3.4.3.3 Kao panel cointegration test

The Kao and Pedroni cointegration tests follow the same approach, but the Kao test usually specifies the cross-section homogeneous coefficients and intercepts usually of the regressors first stage. Kao (1999) described the bivariate case as: $Y_{it} = \alpha_i + \beta X_{it} + \ell_{it}$ for $Y_{it} = Y_{it-1} + U_{i,t}$ and $X_{it} = X_{it-1} + \varepsilon_{it}$ (3.20)

Where $t = 1,...T$ and $i = 1,.....N$. And α_i is referred to as individual constant terms, β being the slope of the parameter, ℓ_{it} is the stationary disturbance terms, Y_{it} and X_{it} are the integrated process of order one for all i (Kao, 1999; Gutierrez, 2003). Unlike the Pedroni auxiliary regression, Kao pooled auxiliary regression is given as: $\ell_{it} = \rho \ell_{i,t-1} + \upsilon_{it}$ (3.21)

According to Gutierrez (2003), Kao derived the DF and the ADF two type tests as part of the cointegration tests in 1999. Which can be estimated from the following formula:

$$\hat{U}_{it} = \rho \hat{u}_{it-1} + \sum_{j=1}^{P} \phi_j \Delta \hat{u}_{it-j} + \upsilon_{it} \quad (3.22)$$

the residuals of $\hat{u}_{it}$ can be obtained from the equation below:

$$Y_{it} = \alpha_i + X_{it}\beta + u_{it} \quad (3.23)$$

In which the specifications are used in the Kao cointegration test for the null and alternative hypothesis:

$$H_0 : \rho = 1 \quad (3.24)$$

$$H_A : \rho < 1 \quad (3.25)$$

Kao also introduced four kinds of DF type statistics and ADF test statistics, where two DF statistics are based on the assumption of strict exogeneity of the regressors and the other two do allow for the endogeneity of the regressors in respect to the errors used in equations. With the ADF test statistic, from the long-run conditional variances Ω some of the nuisance parameters can be estimated (Kao, 1999; Gutierrez, 2003). All the tests, both the DF type test statistics and ADF type test statistic that Kao proposed, have asymptotic distributions that tend to converge to standard normal distribution $N(0.1)$ as the $T \to \infty$ and also $N \to \infty$ (Gutierrez, 2003).

3.4.3.4 Johansen-Fisher panel cointegration test

In 1932, Fisher derived a combined test that used individual independent test results. In the Johansen-Fisher panel cointegration test the number of cointegrating vectors is determined by the trace statistics and the maximum-eigenvalue statistics (Ahmad, 2015).

3.4.4 Panel Autoregressive Distributed Lag (PARDL) model

According to Pesaran, Shin & Smith (2001), PARDL models have gained a lot of popularity in recent years, as it is one of the most used methods in examining cointegrating relationships between variables. PARDLs are referred to as the standard least squares regressions that incorporate both lags of the explanatory variables as regressors as well as the response variables. The distributed lag model can also be referred to as the inclusion of the unrestricted lag of the regressors in a regression function (Nkoro & Uko, 2016). Where the ordinary least squares (OLS) are consistently used to estimate the PARDL models. Both the dependent variable and independent variables are related not only contemporaneously, but across the historical lagged values as well as models of the PARDL are linear time series models (Pesaran et al., 2001).

Nkoro & Uko (2016) state that, when variables are integrated of different orders, $I(0)$, $I(1)$ or a combination of both, the PARDL cointegration technique is usually preferred.

As the PARDL will give appropriate, realistic and efficient estimates or results. Furthermore, Pesaran et al. (1997) state that, irrespective of whether the regressors are integrated of order one or zero the PARDL approach still has an advantage to yielding estimates that are consistent of the long run coefficients that are asymptotically normal. The PARDL model is also advantageous when it comes to identifying the cointegrating vectors in a case where there are multiple cointegration vectors (Nkoro & Uko, 2016). Another advantage of the PARDL model is that it is able to distinguish between the dependent and explanatory variables, when there is a single long run relation and it is very free from residual correlation when all variables are assumed endogenous, as it also enables one to analyse the reference model (Nkoro & Uko, 2016). However, it has disadvantages, as it will crash in the integrated stochastic trend of $I(2)$. Estimates of long run coefficients that are PARDL can be super consistent, but also tends to be robust when there is a single long run relationship among variables when the sample size is small (Pesaran et al., 1997; Nkoro & Uko, 2016).

3.4.5 Engel-Granger causality test

It is important to test for cointegration before granger causality analysis. Brooks (2008) states that finding of causality in a test does not necessary mean that the movements in one variable physical will cause movements in other variables. That is why it is important to note that the term granger causality is somewhat of a misnomer. Therefore, Granger causality refers to having a correlation only among the current value of one variable and of the previous values of other variables. Granger causality tests are frequently used and can be misused in applied research, as the number of lagged terms that are used in a model can cause sensitivity to the test (Gujarati, 2004). According to Li & Liu (2004), many studies made use of the test in a bivariate framework, although such tests can easily be computed, spurious causality could occur as a result of an exclusion of other relevant variables. Panel data is also used more in testing for causality between variables as there is a problem associated with testing or using small samples (Costantini & Martini, 2009). Causality can be evident among variables at least in one direction where cointegration vector exists between these variables (Cetintas &

Barisik, 2008). Higher power of Granger causality tests can occur as panel data allows us to be able to get more observations, as a result of pooling the time series data across sections (Costantini & Martini, 2009).

Brooks (2008) further states that the Engel-Granger two-step method has several problems. The method involves testing residuals in order to ensure that they are $I(0)$ integrated of order 0 to proceed to step two. But if residuals are $I(1)$ a model containing only first differences should be estimated and it is important to make sure that all individual variables are $I(1)$. Step two of the Engel-Granger two-step method involves making use of the step one residuals as one variable in the ECM correction model, for example:

$$\Delta \mathrm{Y}_t = \beta_1 \Delta \chi_t + \beta_2 (\hat{\mu}_{t-1}) \times \gamma_t \tag{3.26}$$

where $\hat{\mu}_{t-1} = y_{t-1} - \hat{\tau}\, \chi_{t-1}$ (3.27)

Problems such as simultaneous equations are bias when it happens that causality between Y and X runs in both directions and the finite sample problem of a lack of power in both cointegration and unit root tests (Brooks, 2008). Ahmad (2015), also postulates that Granger causality is very useful in deciding if the past value of the independent variables (X) does help in the prediction of the value of the explanatory variable (Y_{t+1}), the X granger causes the Y. The Granger causality can also be used to determine the bidirectional and including the unidirectional between the variables (Ahmad, 2015).

3.4.6 Diagnostic tests

Diagnostic testing needs to be performed to allow earlier inferences in the model-building process valid.

3.4.6.1 Normality test

According to Oztuna, Elhan & Tuccar (2006), the normality test is appropriate when evaluating graphs together to decide whether data is normally distributed or not. The normality assumption is usually given as $(u_t \sim N(0, \sigma^2))$. The normality test has potential problems, which includes a small sample size that causes the normality test to have little power to reject the null hypothesis. Therefore, small samples always pass the normality tests. A large sample size is required to detect departures from normality (Oztuna et al., 2006).

The Jarque-Bera test, which uses the property of a normally distributed random variable that the entire distribution is characterised by the mean and the variance (the first two moments), is the most commonly applied test for normality. The histogram should be bell-shaped and the Jarque-Bera statistic should not be significant when residuals are normally distributed. The skewness that measures the extent to which a distribution is not symmetric about its mean value and kurtosis which measures how fat the tails of the distribution are, both are the standardised third and fourth moments (Gujarati & Porter, 2009; Brooks, 2008). Brooks (2008) states that the coefficient of kurtosis of 3, defines the normal distribution as not being skewed. A normal distribution is said to be mesokurtic and symmetric about its mean, while a skewed distribution will have one tail longer than the other will.

3.4.6.2 Serial correlation testing

According to Wooldridge (2009), estimation of models by OLS has become more popular and corrects the standard errors for arbitrary forms of heteroskedasticity and serial correlation. Serial correlation has a great impact on not only standard errors but also the efficiency of estimates than heteroskedasticity. Ignoring the presence of random effects among the spatial units and serial correlation overtime could result in misleading inference when one or even both of the left out components are significant (Baltagi, Song, Jung & Koh, 2003).

3.4.7 Impulse response function and variance decomposition

3.4.7.1 Impulse response function

The impulse response function (IRF) in modelling are usually examined in order to determine how the dependent variable responds to a shock in the error term directed to one or several equations included in the VAR system. As the individual coefficients that are estimated in the VAR models tend to be difficult to interpret, so the impulse response including the variance decomposition are calculated for the estimated VAR (Gujarati, 2004; Brooks, 2008). According to Ahmad (2015), the IRF does not only measure each variable time profile, how each variable responses to shocks in itself, but it does so also in other variables over a period of time. Furthermore, states that, shocks to every individual variable may not be appropriately represented due to shocks in one variable contemporaneously correlated with another variable innovation. But such a problem can be solved by using the cholesky decomposition, even though this approach can be sensitive to ordering of variables (Ahmad, 2015; Sims, 1980).

3.4.7.2 Variance decomposition

Brooks (2008) stipulates that the variance decompositions examine the VAR system dynamics differently and thus provide relevant information about the relative significance of each random innovation in affecting the VAR variables. It also separates the endogenous variable variation into the component shocks to the VAR. The variance decomposition provides a proportion of the dependent variables movements that are normally due to their own shocks versus shocks to other variables (Gujarati, 2004; Brooks, 2008).

3.5 Conclusion

This chapter outlined the research methodology, where data was collected and explained, with the model specified. In the model investment is a function of government stock. The estimation technique outlined the various tests conducted in the study for testing the significance and stability of the model. Panel unit root tests were employed to determine stationarity among the variables, while panel cointegration tests determined the existence of a long-run relationship between the dependent and independent variables. These were complemented by the panel ARDL which determined the relationship between the dependent and independent variables, and if the model would return to equilibrium. In addition, the Engel-Granger casualty test was used to determine whether one variable could forecast another, while diagnostic tests were employed to determine the significance of the model. Moreover, the impulse response function and the variance decomposition were used to establish how the dependent variable responded to a shock in the error term or model.

The next chapter, chapter four focuses on the empirical results obtained from the estimated model.

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSIONS

4.1 Introduction

The previous chapter outlined the process used to estimate the model of the study. The nature type and sources of data was also outlined. This current chapter presents the results and discussions obtained from the estimated model.

4.2 Empirical test results

4.2.1 Panel unit root test results

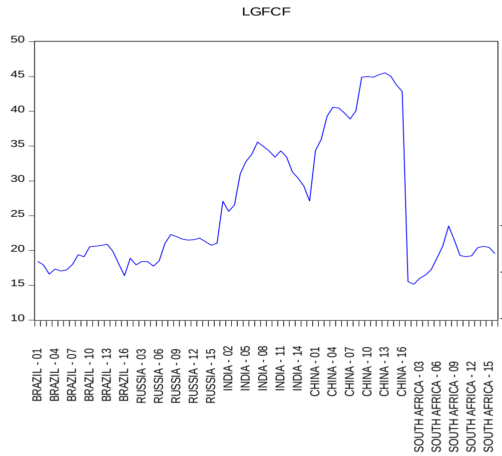
The LLC, IPS, ADF-Fisher Chi-square and PP-Fisher Chi-square tests were conducted to determine the order of integration of the variables. Both the informal, which includes visualisation of the graphs and formal panel unit root tests were conducted to show the order of integration. As Lutkepohl (1993) pointed out, the level of integration explains whether data is stationary or non-stationary.

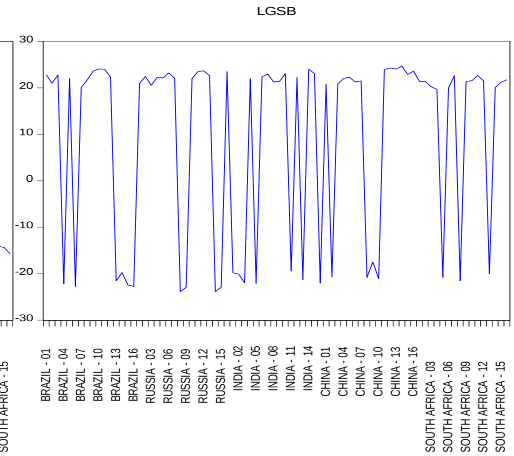
4.2.1.1 Informal panel unit root test

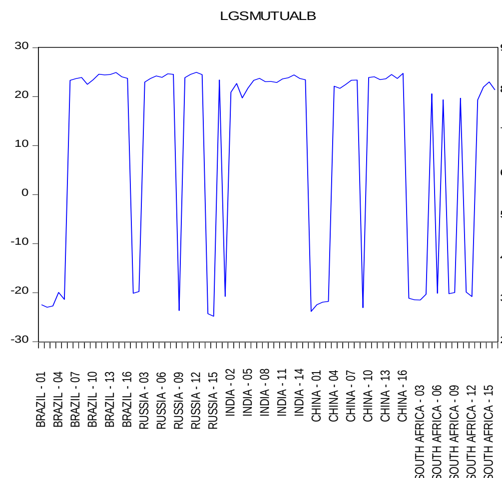
Figure 4.1 shows that at levels the data is non-stationary, as all variables are trending away from the mean. In order to induce stationarity all variables were differenced once. As stationarity is induced, the variables appear to trend along the mean. Meaning that the series are all of $I(1)$. In this study, the informal unit root test conclusions were then verified by the application of formal techniques, such as the LLC, IPS, ADF-Fisher Chi-square and PP-Fisher Chi-square unit root tests.

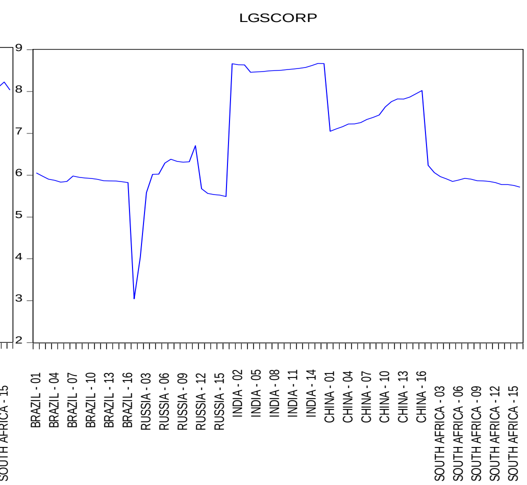
Figure 4.1: Informal panel unit root tests (visualisation of graphs)

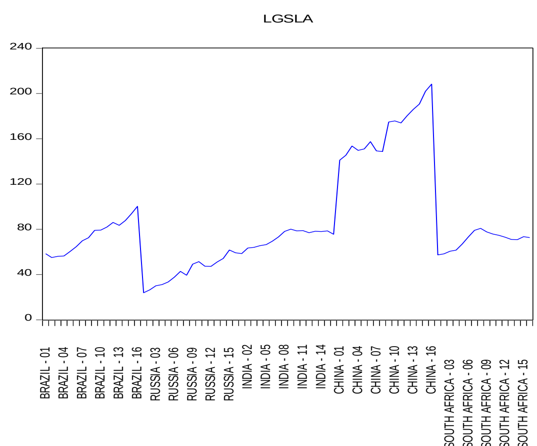
Levels











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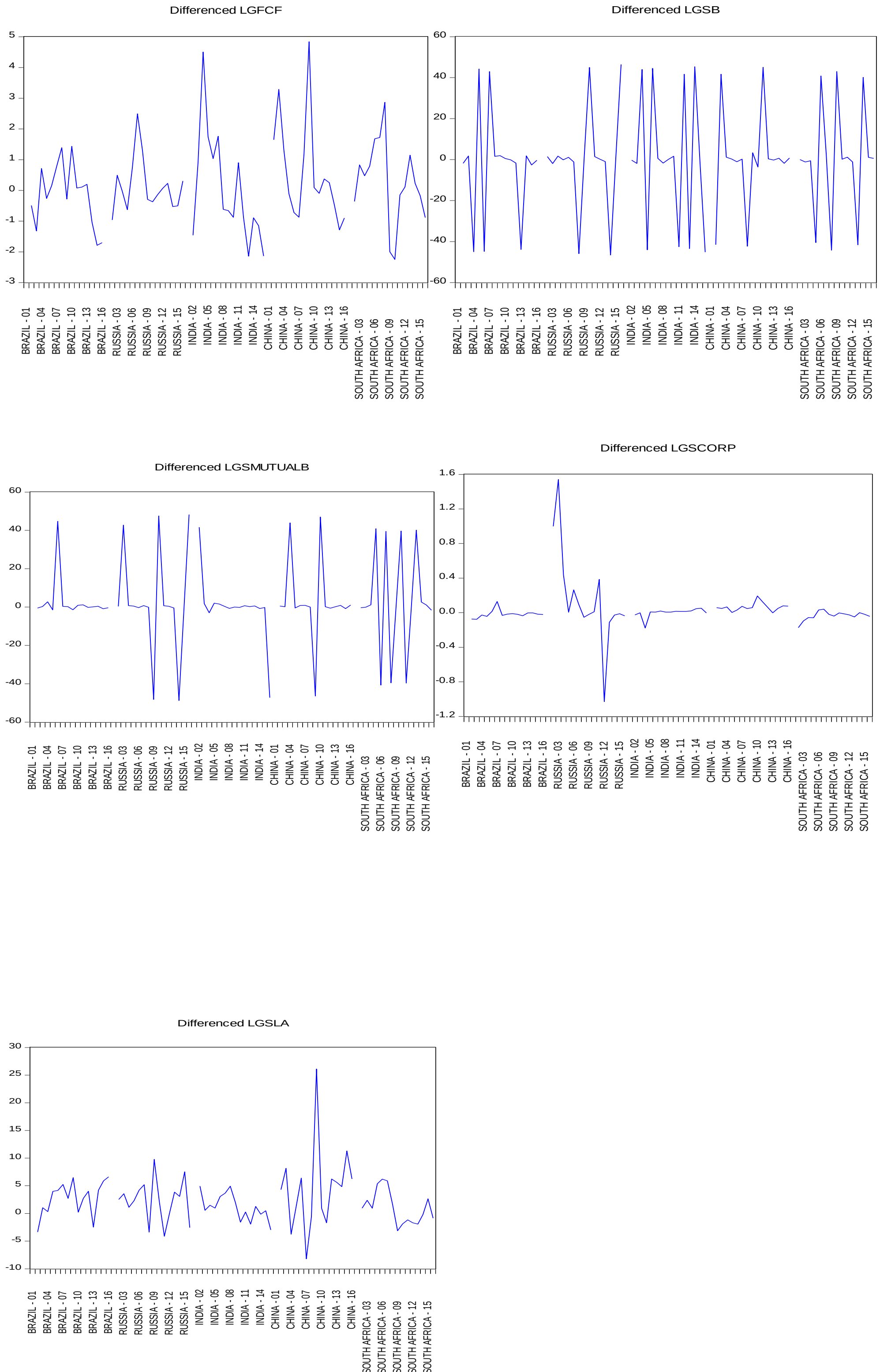


Source: Authors own computations.

4.2.1.2 Formal panel unit root tests

Table 4.1 of the formal panel unit root test indicates the results of the LLC, IPS, ADF-Fisher Chi-square and PP-Fisher Chi-square tests.

Table 4.1 Formal panel unit root tests results

VARIABLE	TEST	TEST EQUATION	LEVEL	1ST DIFFERENCE
LGFCF	Im, Pesaran and Shin	Individual intercept	0.0944	
		Individual intercept and trend	0.8415	0.0161
	Fisher-ADF	Individual intercept	0.1498	0.0702
		Individual intercept and trend	0.8648	0.0116
		None	0.9581	0.0001
	Fisher-PP	Individual intercept	0.6173	0.0999
		Individual intercept and trend	0.9996	0.0005
		None	0.9703	0.0001
	Levin, Lin and Chu	Individual intercept	0.0063	
		Individual intercept		

		and trend	0.5199	0.0000
		None	0.6539	0.0000
LGSB	Im, Pesaran and Shin	Individual intercept	0.0064	
		Individual intercept and trend	0.1940	0.0009
	Fisher-ADF	Individual intercept	0.0064	
		Individual intercept and trend	0.1410	0.0015
		None	0.0012	
	Fisher-PP	Individual intercept	0.0000	
		Individual intercept and trend	0.0003	
		None	0.0000	
	Levin, Lin and Chu	Individual intercept	0.0102	
		Individual intercept and trend	0.0667	
		None	0.0000	
LGSMUTUALB	Im,	Individual intercept		

	Pesaran and Shin		0.1276	0.0018
		Individual intercept and trend	0.6854	0.0729
	Fisher-ADF	Individual intercept	0.1005	0.0008
		Individual intercept and trend	0.3001	0.0243
		None	0.0138	
	Fisher-PP	Individual intercept	0.0033	
		Individual intercept and trend	0.0265	
		None	0.0004	
	Levin, Lin and Chu	Individual intercept	0.0769	
		Individual intercept and trend	0.1830	0.0561
		None	0.0030	
LGSCORP	Im, Pesaran and Shin	Individual intercept	0.3746	0.0025
		Individual intercept and trend	0.0445	
	Fisher-ADF	Individual intercept	0.1812	0.0046

		Individual intercept and trend	0.0488	
		None	0.7779	0.0000
	Fisher-PP	Individual intercept	0.0049	
		Individual intercept and trend	0.0000	
		None	0.2833	0.0000
	Levin, Lin and Chu	Individual intercept	0.5547	0.0000
		Individual intercept and trend	0.0017	
		None	0.4114	0.0000
LGSLA	Im, Pesaran and Shin	Individual intercept	0.9302	0.0112
		Individual intercept and trend	0.7397	0.0350
	Fisher-ADF	Individual intercept	0.7644	0.0095
		Individual intercept and trend	0.7021	0.0298

		None	0.9996	0.0043
	Fisher-PP	Individual intercept	0.7265	0.0000
		Individual intercept and trend	0.5964	0.0000
		None	1.0000	0.0000
	Levin, Lin and Chu	Individual intercept	0.3125	0.0467
		Individual intercept and trend	0.2766	0.0338
		None	0.9943	0.0003

Source: Authors own computations.

Table 4.1 indicates that the series are all of $I(1)$, in which the full results of the formal panel unit roots tests are shown in Appendix B. In summary:

LGFCF : Stationary at $I(1)$ for all tests.

LGSB : Stationary at $I(0)$ for Fisher-PP and LLC; $I(1)$ for IPS and Fisher-ADF.

LGSMUTUALB : Stationary at $I(0)$ for Fisher-PP and $I(1)$ for the other tests.

LGSCORP : Stationary at $I(1)$ for all the tests

LGSLA : Stationary at $I(1)$ for all the tests.

According to Ahmad (2015), bias and spurious findings, including conclusions might result when there is no significant association between the variables being analysed. Therefore, Nkoro & Uko (2016) state that when variables are integrated of different orders, $I(0)$, $I(1)$ or a combination of both, the PARDL cointegration technique is usually preferred. Table 4.1 shows the results of all the variables used in the study.

4.2.2 Lag length criteria results

The determination of the lag length is crucial, as it allows progression to cointegration. Therefore, the appropriate lag length that is suitable for the model in this study is computed. However, the study used AIC and SC to obtain the appropriate lag. When dealing with small samples the AIC may have better properties in choosing the correct order more often than the SC would. As models based on the AIC may produce superior forecasts although the AIC may not correctly estimate the orders in small and large samples (Brooks, 2008; Lutkepohl, 2005).

Table 4.2 Lag length results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-890.8577	NA	2.51e+09	35.83431	36.02551	35.90712
1	-632.8265	454.1350	226269.9*	26.51306*	27.66027*	26.94992*
2	-608.4323	38.05491*	239059.5	26.53729	28.64052	27.33821
3	-583.0783	34.48146	255305.8	26.52313	29.58237	27.68811
4	-559.9353	26.84587	322851.2	26.59741	30.61266	28.12644
5	-541.0934	18.08827	550040.0	26.84373	31.81499	28.73682
6	-516.5242	18.67258	910393.8	26.86097	32.78824	29.11811

Note: * indicates the lag order selected by the criterion.

Source: Authors own computations.

Table 4.2 presents the results of the lag length obtained (full results are shown in Appendix C). The criteria with the lowest value (26.51306*) was chosen to determine the number of lags used in building the model. However, not only the AIC indicates lag one but also FPE, SC and HQ so that some misspecification problems in the analysis can be avoided. The use of one lag was justified by the AIC, as it is more efficient and minimises the value of the information criteria, and also that one lag is chosen by most criteria's (Brooks, 2008).

4.2.3 Panel cointegration test results

The panel cointegration tests were conducted in order to determine if there was cointegration among the variables. The Johansen, Pedroni, Kao and Johansen Fisher panel cointegration results are fully shown in Appendix D. As Guttierrez (2003) states, the Pedroni (1999) and Kao (1999) tests assume that with the null and including the alternative hypotheses either all the relationships are not cointegrated or all the relationships are cointegrated.

4.2.3.1 Panel Johansen cointegration test results

The trace test in Table 4.3 indicates one cointegrating equations, while the max-eigenvalue test also indicates one cointegrating equations both at the 5 percent significant level.

Table 4.3: Panel Johansen cointegration test results

Null hypothesis	Trace Statistic	Critical value at 0.05	Max-Eigen Statistic	Critical value at 0.05
None	80.31828*	69.81889	36.24883*	33.87687
At most 1	44.06946	47.85613	22.74099	27.58434
At most 2	21.32846	29.79707	15.98616	21.13162
At most 3	5.342303	15.49471	5.247752	14.26460
At most 4	0.094551	3.841466	0.094551	3.841466

Trace test indicates 1 cointegrating equation(s) at the 0.05 level

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Source: Authors own computations.

The results provided by the panel Johansen cointegration test in Table 4.3, indicate that there is a long run relationship between the variables. As there is cointegration between the dependent variable and independent variables both at the trace and maximum eigenvalue test. The null hypothesis of no cointegration is rejected at none for both tests. Johansen & Juselius (1990) stipulated that this test examined the null hypothesis of no cointegration in the variables against the alternative that there exists cointegration. However, common geographic and economic ties between countries do not mean the national financial markets will follow the same stochastic trend (Chan, Gup & Pan, 1997).

4.2.3.2 Pedroni panel cointegration test results

A summary of the Pedroni panel cointegration tests results is shown in the table below. Table 4.4 presents the Pedroni panel cointegration tests results with no deterministic intercept or trend, in which the null hypothesis states no cointegration.

Table 4.4: Pedroni panel cointegration test results

Panel Statistics	**Probability**	
Panel v-Statistic	0.8557	0.9245
Panel rho-Statistic	0.8726	0.8372
Panel PP-Statistic	0.3634	0.0431
Panel ADF-Statistic	0.3369	0.1302
Group Statistics	**Probability**	
Group rho-Statistic	0.9882	
Group PP-Statistic	0.1015	
Group ADF-Statistic	0.5574	

Source: Authors own computations.

Table 4.4 shows that out of the eleven statistics there is only one cointegrating equation at Panel PP-Statistic, in which the p-value is 0.043. Since 0.043<0.05, meaning the null hypothesis of no cointegration is rejected in this instance. The concept of cointegration provides a sound methodology for modelling both the long run and short run dynamics in the system (Dunis & Ho, 2005). Stock prices of two stock markets that are collectively efficient in the long run cannot be cointegrated. When there is cointegration between two markets, the profitable arbitrage opportunities can be explored (Chan et al., 1997).

4.2.3.3 Kao panel cointegration test results

Table 4.5 shows the Kao panel cointegration results, in which the full results are shown in Appendix D.

Table 4.5: Kao panel cointegration test results

	t-Statistic	**Probability**

ADF	-2.526282	0.0058
Residual variance	1.673299	
HAC Variance	1.736239	

Source: Authors own computations.

According to the ADF test or method in the Kao cointegration test, the probability value of 0.0058 is less than 0.05 meaning that (0.0058<0.05) we reject the null hypothesis of no cointegration and accept the alternative hypothesis as there is cointegration between the variables. Therefore, the variables have a long run relationship according to the Kao panel cointegration test. When there is cointegration and a long run relationship between the variables it shows that the model is significant and the variables will be able to return to equilibrium (Brooks, 2008). According to Chan et al. (1997) cointegration test results do have a significant implication for diversification through international investing. If markets have co-movements then diversifying into international stock markets will not be effective.

4.2.3.4 Johansen Fisher panel cointegration test results

The Johansen Fisher panel cointegration test also indicates if there is any cointegration or not. Also if there is any long run relationship between the variables, just like other panel cointegration tests. The Johansen Fisher panel cointegration test also provides individual cross section results, which will be shown in Table 4.7. Table 4.6 shows the results obtained from the Johansen Fisher panel cointegration test conducted.

Table 4.6: Johansen Fisher panel cointegration test results

Hypothesized No. of CE(s)	Fisher stat* (from trace test)	Probability	Fisher stat* (from max-eigen test)	Probability
None	23.97	0.0077*	23.97	0.0077*
At most 1	75.07	0.0000*	75.07	0.0000*
At most 2	85.00	0.0000*	69.66	0.0000*
At most 3	31.73	0.0004*	24.78	0.0058*
At most 4	22.09	0.0147*	22.09	0.0147*

*denotes rejection of the null hypothesis at 0.05 significance level

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

Source: Authors own computations.

Table 4.6 shows that the Johansen Fisher panel cointegration test results indicate that the trace statistic has five cointegrating equations. The Fisher maximum-eigen test also shows five cointegrating equations at a 5 percent significance level. As all the p-values are less than 0.05, meaning we reject the null hypothesis of no cointegration and accept the alternative. Therefore, there is definitely a long-run relationship in the model and cointegration among the variables. Due to the contagion effect, it has been argued that the world stock markets can become integrated following some instability in the markets. However, there has been an argument that less market segmentation can cause an increase over time in the number of significant cointegrating vectors among the world stock markets (Chan et al., 1997).

Table 4.7: Individual cross section results

Cross Section	Trace Test Statistics	Probability**	Max-Eign Test Statistics	Probability**
Hypothesis of no cointegration				
BRAZIL	NA	0.5000	NA	0.5000
RUSSIA	NA	0.5000	NA	0.5000
INDIA	1009.3756	0.0001	494.9071	0.0001
CHINA	NA	0.5000	NA	0.5000
SOUTH AFRICA	NA	0.5000	NA	0.5000
Hypothesis of at most 1 cointegration relationship				
BRAZIL	516.8459	0.0001	480.7447	0.0001
RUSSIA	524.7243	0.0001	485.2030	0.0001
INDIA	514.4685	0.0001	479.5265	0.0001
CHINA	NA	0.5000	NA	0.5000
SOUTH AFRICA	538.9155	0.0001	476.4025	0.0001

Source: Authors own computations.

Table 4.7 indicates the individual cross section results of the BRICS countries. Only the hypothesis of none and at most 1 are interpreted. At none for the countries of Brazil, Russia, China and South Africa there is no cointegration meaning we cannot reject the null hypothesis of no cointegration as the p-value is greater than 0.05. However, for

India, both at none and at most 1 under the trace test and maximum-eigen test there is cointegration. At most 1 shows that for the countries of Brazil, Russia and South Africa there is cointegration under the trace test and maximum-eigen test, unlike China that still experiences no cointegration at most 1.

4.2.4 Panel Autoregressive Distributed Lag (PARDL) model results

The results of the PARDL model, both for the long and short run are shown in Appendix E. The long run equation indicates how the independent variables influence the dependent variable. The short run, however, indicates the speed of adjustment on whether the model or investment activity of the BRICS countries will ever return to equilibrium.

Table 4.8: PARDL long run results

LONG RUN		
	Coefficient	**Probability**
LGSB	-0.033838	0.0000
LGSMUTUALB	0.029584	0.0000
LGSCORP	-0.464305	0.0001
LGSLA	0.276565	0.0000
SHORT RUN (SPEED OF ADJUSTMENT): -0.543092		

Source: Authors own computations.

4.2.4.1 Long run equation:

The estimated parameters that represent the long run elasticities are used to derive the long-run equation as follows:

$$GFCF = -0.033838 LGSB + 0.029584 LGSMUTUALB - 0.464305 LGSCORP + 0.276565 LGSLA \quad (4.1)$$

From the results in Table 4.8 and the long run equation (4.1), it is evident that gross fixed capital formation is negatively influenced by government stock on bonds. The outcome of the results confirms that a 1 percent increase in government stock on bonds will lead to a decrease of 3.3838 percent in gross fixed capital formation. Arouri, Estray, Rault & Roubaud (2016) state that an increase in the policy uncertainty has a huge impact on stock returns, an increase will result in a decline in the stock returns. Such effects are persistent and stronger only during extreme volatility periods.

For each 1 percent increase in government stock on mutual banks, gross fixed capital formation will increase by 2.9584 percent in the long run. When there is stability in the financial system, there is also stability in the investment activity of a country. Also economic growth of a country can increase as a result of a well-functioning and stable financial system (Pradhan et al., 2014). As noted in the literature review mutual banks may acquire most of its profit from fees obtained by either selling or servicing structured financial instruments. Therefore, the BRICS countries should continue keeping a close eye on their mutual banks, as well-functioning mutual banks could lead to a stable financial system in the economy.

This study shows that in BRICS countries during the period under consideration, gross fixed capital formation is also negatively related to government stock on corporations. A 1 percent increase government stock on corporations leads to a 46.4305 percent decrease in gross fixed capital formation. Corporations' performance also has a major impact on the economy of a country resulting from their investment decisions. Proper investment decisions lead to growth and stability in a corporation or financial market, which will in turn lead to a positive impact on the economic growth of a country. As it was found in the study of Wray & Tymoigne (2008), a decline in investments and profits may take place, as anything that might cause expected future profitability to be lower can also cause today's demand price of capital to result as being lower than the supply price.

Gross fixed capital formation is positively related to government stock on liquid assets. Which implies that a 1 percent increase in government stock on liquid assets will lead to a 27.6565 percent increase in gross fixed capital formation in the long run. A performance of the economy will also depend on investment decisions made by corporations. According to Martin & Morgan (1988), holding of liquid assets can help when having to cover any future fund shortfalls. Risk analysis or management also plays a major role in mutual banks, as mutual banks also deal with lending and borrowing of money.

4.2.4.2 Short run

In the short run, the most important part of the analysis is the Error Correction Term (ECT). According to the theory, ECT should always be negative. If the economic model has a positive ECT, it will imply that the model is explosive and will never return to equilibrium (Brooks, 2008; Gujarati & Porter, 2009). The results of the error-correction analysis also give insight into the deviations from the long-run relationship. Table 4.9 provides the speed of adjustment and the short run coefficients.

Table 4.9: PARDL short run results

SHORT RUN		
	Coefficient	**Probability**
D(LGSB)	0.015469	0.2242
D(LGSMUTUALB)	-0.024016	0.3269
D(LGSCORP)	-3.658543	0.5719
D(LGSLA)	-0.064621	0.6975
(SPEED OF ADJUSTMENT): -0.543092		

Source: Authors own computations.

Concerning the coefficients of the short-run equation, only the variables government stock on mutual banks, government stock on corporations and government stock on liquid assets bear the correct negative sign. According to Brooks (2008), the speed of adjustment which is also referred to as the ECT, shows whether the economic models will be able to return to equilibrium or not and at what speed.

The estimated speed of adjustment, which is at -0.543092, has a negative sign and is highly significant, as expected by theory. A highly significant speed of adjustment does also confirm the existence of cointegration among the variables and a stable long run relationship. This implies that there is a long-run causality running from the independent variables to the dependent variable and that approximately 54 percent of disequilibrium is corrected each year. It will take 54 percent each year for investment activity to return to equilibrium, which is not a slow movement back to equilibrium.

4.2.5 Engel-Granger causality test results

The Granger causality test is usually employed to investigate the presence of causality and the direction of causality between the variables being examined (Ahmad, 2015). Engel-Granger causality test reveals that investment activity.

Table 4.10: Engel-Granger causality results

NULL HYPOTHESIS	PROBABILITY
LGSB does not Granger Cause LGFCF **LGFCF does not Granger Cause LGSB**	0.6082 0.6391
LGSMUTUALB does not Granger Cause LGFCF **LGFCF does not Granger Cause LGSMUTUALB**	0.9871 0.1612
LGSCORP does not Granger Cause LGFCF **LGFCF does not Granger Cause LGSCORP**	0.7885 0.0033
LGSLA does not Granger Cause LGFCF **LGFCF does not Granger Cause LGSLA**	0.7290 0.7543
LGSMUTUALB does not Granger Cause LGSB **LGSB does not Granger Cause LGSMUTUALB**	0.7124 0.6227
LGSCORP does not Granger Cause LGSB **LGSB does not Granger Cause LGSCORP**	0.7049 0.7819
LGSLA does not Granger Cause LGSB **LGSB does not Granger Cause LGSLA**	0.6910 0.0445
LGSCORP does not Granger Cause LGSMUTUALB **LGSMUTUALB does not Granger Cause LGSCORP**	0.2103 0.7941
LGSLA does not Granger Cause LGSMUTUALB **LGSMUTUALB does not Granger Cause LGSLA**	0.3779 0.4904
LGSLA does not Granger Cause LGSCORP **LGSCORP does not Granger Cause LGSLA**	0.5405 0.4547

Source: Authors own computations.

According to Engel-Granger causality results shown in Table 4.10, government stock on bonds and gross fixed capital formation do not influence each other. Therefore, reflect insignificance for the null hypothesis cannot be rejected. Government stock on mutual banks does not Granger cause gross fixed capital formation or verse vice, as the p-values are greater than 5 percent. Gross fixed capital formation does Granger cause government stock on corporations as 0,0033<0,01 meaning the null hypothesis is rejected at 1 percent significance level, as it is unidirectional. However, government stock on corporations does not Granger cause gross fixed capital formation.

Government stock on liquid assets and gross fixed capital formation do not Granger cause each other, therefore insignificant. Government stock on mutual banks and government stock on bonds do not influence each other as the null hypothesis cannot be rejected and is insignificant. Government stock on corporations and government stock on bonds also do not Granger cause each other. The results also indicate that the government stock on liquid assets does not Granger cause government stock on bonds. Although, government stock on bonds does Granger cause government stock on liquid assets rejecting the null hypothesis at 5 percent significance level. Government stock on corporations and government stock on mutual banks do not Granger cause each other. In addition, government stock on liquid assets and government stock on mutual banks do not influence each other, including government stock on liquid assets and government stock on corporations. As the p-values are greater than 5 percent, therefore insignificant.

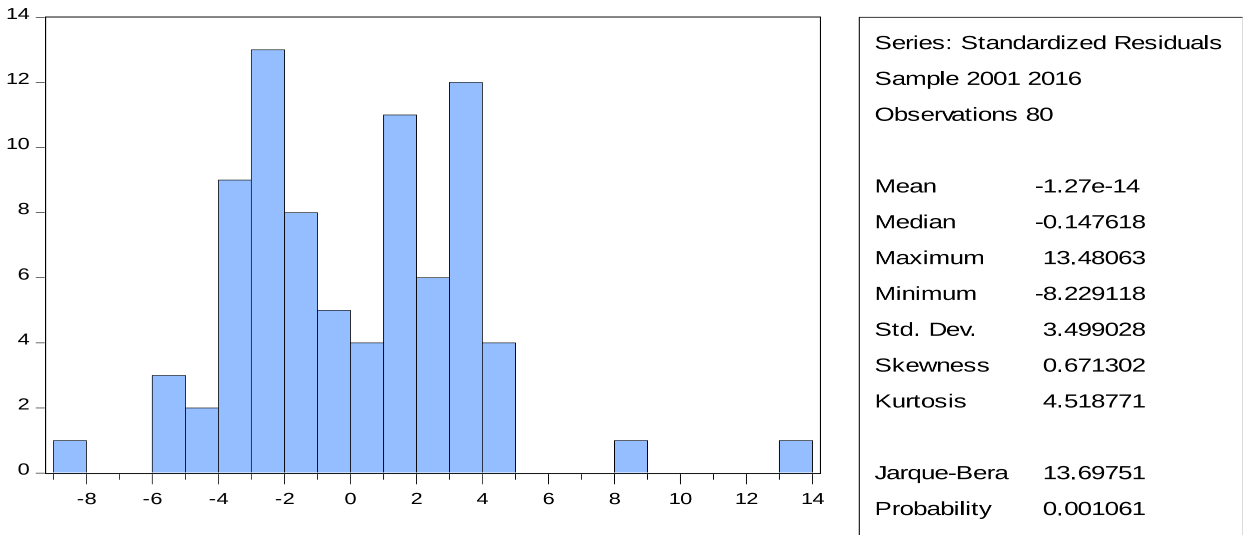
The results revealed that there is a unidirectional relationship between investment activity and government stock on corporations. And between government stock on bonds and government stock on liquid assets. The unidirectional relationship implies that investments are not useful in forecasting government stock on corporations. Therefore, government stock on bonds, also, cannot be useful in forecasting government stock liquid assets.

4.2.6 Diagnostic test results

4.2.6.1 Normality test results

As stated in the research methodology, diagnostic tests need to be performed to make earlier inference in the model building process valid. The Jarque-Bera test of normality is often referred to as a test of joint hypothesis and is also used to find out whether the error term does follow the normal distribution (Gujarati & Porter, 2009).

Figure 4.2: Jarque-Bera normality results



Source: Authors own computations.

It is evident from the results obtained from the Jarque-Bera normality results that the residuals are normally distributed, as the Kurtosis is about 4.518771 and greater than 3 percent. The probability of obtaining such a statistic under the normality assumption is also significant.

4.2.6.2 Serial correlation LM test results

The serial correlation test is conducted to determine if correlation is present among the variables or not. When there is no correlation, it means that the model is significant.

Table 4.11: Autocorrelation LM test results

Lags	LM-Stat	Prob
1	36.54905	0.0637

2	28.19414	0.2990
3	22.64276	0.5984
4	17.42594	0.8658
5	20.50802	0.7197

Source: Authors own computations.

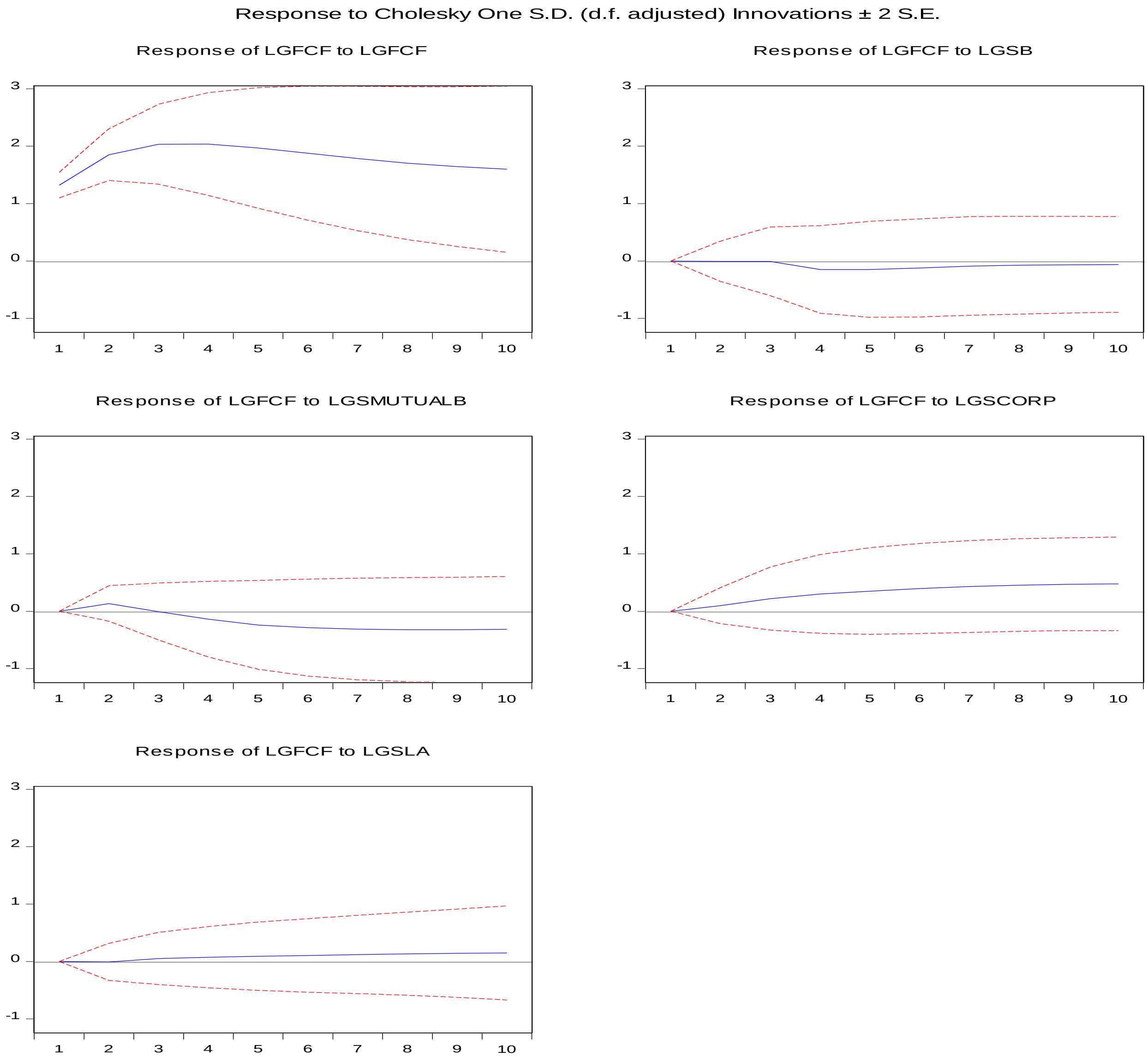
Table 4.11 shows that there is no serial correlation in the model as the probability values of all lags are greater than 5 percent. Therefore, the null hypothesis of no serial correlation is not rejected as the model is significant.

4.2.7 Impulse response function and variance decomposition results

4.2.7.1 Impulse response function (IRF) results

The IRF shows the impulse percentage of fluctuation that the variables do contribute to each other, from various periods both in the short and long run. A time horizon of 10 years was observed in order to be able to get appropriate results when checking the persistence of gross fixed capital formation during the long run. Ahmad (2015) stipulates that the impulse response plots are usually given with a zero line, so when the responses are statistically insignificant it basically means that the responses are below the zero line. Whereas, responses that are above the zero line are statistically significant. The generalised responses of gross fixed capital formation to the shocks in explanatory variables are given in the figures below. The figures show that gross fixed capital formation responds immediately to government stock on bonds, government stock on mutual banks, government stock on corporations and government stock on liquid assets.

Figure 4.3: IRF graphs.



Source: Authors own computations.

The IRF graphs above shows that gross fixed capital formation is being represented by the blue line. The response of gross fixed capital formation to gross fixed capital formation graph shows own shock, and significance as the gross fixed capital formation line is above the zero line and positive. The response of gross fixed capital formation to government stock on bonds graph indicates that shocks in government stock on bonds have a negative impact on gross fixed capital formation. At the start, the magnitude of response of gross fixed capital formation is positive at zero until year 2, and becomes negative and in turn reaches the lowest level between years 3 to 5. This suggests that shocks in government stock on bonds have a negative influence on the gross fixed capital formation level. The response of gross fixed capital formation to government stock on mutual banks graph shows similar results as the response of gross fixed capital formation to government stock on bonds, which shows that shocks in government stock on mutual banks have a negative impact on gross fixed capital formation.

The response of gross fixed capital formation to government stock on corporations graph suggested that at the start gross fixed capital formation responded positively to maintain the investment activities by investing more. This trend suggests that at the beginning, the BRICS countries invested more and continued to do so as corporations performance improved. The results from the response of gross fixed capital formation to government stock on liquid assets graph suggests that gross fixed capital formation responds positively to the shocks of government stock on liquid assets. This means that investment activity level increases, because the BRICS are investing more.

4.2.7.2 Variance decomposition results

The variance decomposition also shows how a shock to one variable impacts the (variance of the) forecast error of another.

Table 4.12: Variance decomposition results

Variance Decomposition of LGFCF:						
Period	S.E.	LGFCF	LGSB	LGSMUTUALB	LGSCORP	LGSLA
1	1.320795	100.0000	0.000000	0.000000	0.000000	0.000000
2	2.280902	99.47338	0.000981	0.347337	0.177161	0.001145
3	3.063456	99.16725	0.000959	0.193124	0.608439	0.030229
4	3.696811	98.42718	0.163273	0.275626	1.071810	0.062115
5	4.213196	97.60772	0.248154	0.534300	1.516748	0.093073
6	4.640195	96.80969	0.273226	0.819083	1.971190	0.126814
7	5.001792	96.03809	0.266591	1.092120	2.435651	0.167550
8	5.315837	95.31074	0.255561	1.331704	2.889633	0.212359
9	5.595226	94.65244	0.244479	1.532763	3.312663	0.257655
10	5.849068	94.07620	0.234883	1.694534	3.693841	0.300540

Source: Authors own computations.

In Table 4.12 in the short run in period 3, the innovation to LGFCF accounts for 99.16725 percent variation of the fluctuation in LGFCF (own shock) which is significant.

Shock to LGSB can cause 0.000959 percent fluctuation in LGFCF, while shock to LGSMUTUALB can cause 0.193124 percent fluctuation in LGFCF. Shock to LGSCORP can cause 0.608439 percent fluctuation in LGFCF and shock to LGSLA can cause 0.030229 percent fluctuation in LGFCF. However, total fluctuation becomes 100 percent, in the short run in year 3. In period 3, which is the short run, shows LGFCF is shocked by its own innovations, even throughout the other periods.

In the long run in period 10, the shock to LGFCF can contribute 94.07620 percent variation of the fluctuation in LGFCF (own shock). Shock to LGSB can contribute 0.234883 percent fluctuation in the variance of LGFCF and shock to LGSMUTUALB can contribute 1.694534 percent fluctuation in LGFCF. The shock to LGSCORP can contribute 3.693841 percent fluctuation in LGFCF and shock to LGSLA can contribute 0.300540 percent fluctuation in LGFCF. From the results it is evident that LGSB, LGSMUTUALB, LGSCORP and LGSLA do not have a lot of influence on LGFCF.

The results show that in all the periods, from period 1 until 10 LGFCF is shocked by its own innovations (own shock), as the LGFCF percentages are greater than percentages of other variables.

4.3 Conclusion

In this chapter, an empirical analysis of the effects of government stock on investment activity in BRICS countries was conducted. This chapter focused on the models estimated results by means of interpreting and analysing them. The panel unit root tests, both the formal and informal panel unit root tests, confirmed that the series are all integrated of order one. The panel variables were differenced once in order to induce stationarity. The lag length criteria revealed that only one lag should be used. The panel cointegration test was also conducted, where the Johansen cointegration test showed cointegration. Pedroni panel cointegration test showed that there is one cointegrating equation between the variables out of eleven statistics. The Kao panel cointegration test suggested that there was cointegration between the variables. The Johansen Fisher panel cointegration also indicated cointegration among the variables.

It is also shown by the PARDL model that investment activity positively influenced government stock on mutual banks and government stock on liquid assets. Therefore, an increase in government stock on mutual banks and government stock on liquid assets will cause the countries' investment activity to increase. Such an outcome is supported by Wray & Tymoigne (2008), who said that most liquid assets are expected to generate a stream of income and capital gains, also to pay lower yields than more illiquid assets such as corporate bonds or capital assets as noted in the literature review. This happens while negatively related to government stock on bonds and government stock on corporations. This outcome is contra to other studies conducted in other developing and developed countries. Modigliani & Miller (1958) stated that a corporation's investment decisions can be linked to fluctuations in the stock market, including the bond markets. Which is evident when a corporation's issues shares in the stock market in order to finance its capital for investment, the share price will reflect the investment decisions made by the corporation. As noted in the literature review, Choudhry (2006) argued that if corporations and mutual banks risk management functions were effective, there would be no unexpected losses. Unexpected losses would lead to an increase in eventual costs far more than the original loss. In the short run, the PARDL model shows that only government stock mutual banks, government stock on corporations and government stock liquid assets bear the correct negative signs. In the short run PARDL model results, it is shown that about 54 percent of disequilibrium will be corrected each year, meaning it will take 54 percent each year for investment activity to get back to equilibrium.

The Engel-Granger causality test revealed a unidirectional movement between investment activity and government stock on corporations and unidirectional movement between government stock on bonds and government stock on liquid assets. The unidirectional movement showed that the variables are not useful in forecasting the other variables. The diagnostic tests that included the Jarque-Bera normality test showed that the residuals were normally distributed and serial correlation LM test revealed that the model was also significant. The IRF test was also conducted, which showed the impulse percentage of fluctuation that the variables contributed to each other from various periods both in the long and short run. At the same time, the variance decomposition of gross fixed capital formation indicated that gross fixed capital formation was shocked by its own innovations throughout all the periods.

The next section, chapter five, will provide an overview of these findings and make a conclusion and recommendations were applicable and relevant.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Summary and interpretation of findings

This chapter outlines an overview of the findings, conclusion and recommendations of this study. It also provides the limitations of the study and areas for future research. This study provided an account of the effects of government stock on investment activity in BRICS countries, using annual data from 2001 to 2016.

Various theories were used to give more insight into the behaviour of investment activity. The theories included Keynes Theory of Investment (which emerged in 1936), Neoclassical Theory of Investment Behaviour, Tobin's Q Theory of Investment Behaviour and the Financial Theory of Investment Behaviour. The PARDL was employed as the econometric methodology. Variables used in this study were investment activity measured in terms of gross fixed capital formation, government stock on bonds, government stock on mutual banks, government stock on corporations, and government stock on liquid assets. All the variables were in natural log form and tested to determine stationarity, using LLC, IPS, ADF-Fisher Chi-square and PP-Fisher Chi-square panel unit root tests. The panel unit root tests showed the presence of unit root in the series which is in line with the economic theory. However, stationarity was induced by differencing the variables once. The panel cointegration analysis revealed that all the variables used in this study move together in the long run.

The aim of this study was to determine the effects of government stock on investment activity in BRICS countries. The PARDL results showed that investment activity was positively related to government stock on mutual banks and government stock on liquid assets. Therefore, an increase in government stock on mutual banks and government stock on liquid assets will cause the countries' investment activity to increase. It was also revealed in this study that government stock on bonds and government stock on corporations negatively influenced investment activity in the long run.

The bond and the stock market have a major impact on the financial system of any economy, as there is a link between the stock market and the economy in aggregate. Mutual banks also play a significant role in the investment activity of a country, and this study found that government stock on mutual banks has a positive sign in the long run. As stated in the literature review Wray & Tymoigne (2008) postulated that banks, both commercial and mutual banks, are responsible for, and also in charge of ensuring that the making of money is established on interest rates that will broaden across deposit rates. Therefore, it is important that the estimation or prediction of bank failures is always accurate due to the central role that the banking sector plays in the economy. This is earmarked to identify problems that banks might face or to avoid bankruptcies, which involves preventing systematic banking crisis. Bank regulators should develop or have an up to date early warning system (Lanine & Vennet, 2005).

Government stock on corporations also has a notable influence on investment activity, judging from its coefficients. There is a need for taking measures that would ensure that corporations make appropriate investment decisions that will not only benefit them in the short run but also in the long run.

Government stock on liquid assets usually had a positive influence on investment activity as noted in this study. According to the theory, liquid assets have a stable market price, as they can be easily sold or converted to cash. Therefore, corporations or the government should invest more in liquid assets. All the variables included in this study play a vital role in influencing the investment activity of the BRICS economy. In particular, because of the negative relationship that the two variables (government stock on bonds and government stock on corporations) have towards investment activity, measures should be instituted to avoid large investment shocks-since shocks on these variables can have a major impact on other macroeconomic variables.

5.2 Conclusion

The stock and bond markets play a significant role in investment activity, as the bond market is by far one of the largest securities market in the world which can be used to finance different projects and activities. Corporations should always make investment decisions that have the potential to increase corporations' profits, and consider all the risks associated with such decisions. Risk analysis or management is very crucial in financial institutions. It helps to determine the performance and different threats that corporations or banks are exposed to. It also helps to determine how such threats can be avoided or eliminated. Risk management also helps in maintaining stability.

Therefore, investing in assets that will generate profit not only in the short run, but also in the long run is important for any financial institution, because investments also determine profits.

5.3 Recommendation of the study

The results showed a long-run relationship between the variables and a positive influence of government stock on mutual banks and government stock on liquid assets towards investment activity in the long run. Bank policy makers should make policies that will lead to financial stability and argument the performance of financial institutions. These policies will also help financial institutions in making investment decisions that will further benefit them and the country's economy in the long term, considering the risks afflicting financial institutions on a daily basis. Well-performing financial institutions have potential to grow the economy. The growth of the economy has prospects of augmenting employment rate while providing more opportunities that could help alleviate poverty.

A critical evaluation is needed to avoid investment shocks, instability of investment activity, instability of financial markets and the economy as a whole resulting from negative influence from government stock on bonds and government stock on corporations. Policy uncertainty can also have a major impact on stock returns and corporations. Therefore, this study recommends an institution of policies that promote financial stability in all financial sectors or institutions. The policies will ensure that proper investment decisions are made with an assessment of associated risks.

5.4 Limitations of the study

Although the BRICS economy or group began in 2010, this study's tests were conducted based on the data from 2001 to 2016. This was because of inadequate data between 2010 and 2016, which made it impossible to perform certain tests that are critical to this study. There was also limited literature related to this study.

5.5 Areas of future research

Despite limited literature related to this study, this phenomenon could further be explored and developed by analysing other countries' investment activity on how they respond to government stock. Further studies could use either similar variables as in this study or different variables.

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APPENDICES

Appendix A

DATA USED IN THE STUDY

	LGFCF	LGSB	LGSMUTUALB	LGSCORP	LGSLA
BRAZIL – 01	18.41800	22.84970	-22.45023	6.054439	58.41128
BRAZIL – 02	17.92619	21.04204	-22.99692	5.981414	55.04738
BRAZIL – 03	16.60478	22.77529	-22.71053	5.905362	56.09072
BRAZIL – 04	17.32019	-22.21297	-19.94118	5.877736	56.42699
BRAZIL – 05	17.05619	21.99877	-21.38936	5.834811	60.41572
BRAZIL – 06	17.21032	-22.81712	23.33163	5.849325	64.57428
BRAZIL – 07	17.99576	20.10619	23.67500	5.978886	69.81078
BRAZIL – 08	19.38531	21.67378	23.92874	5.948035	72.53850
BRAZIL – 09	19.10197	23.60076	22.52054	5.932245	79.01776
BRAZIL – 10	20.53467	24.10397	23.45171	5.921578	79.24772
BRAZIL – 11	20.60899	23.99849	24.60144	5.902633	81.98162
BRAZIL – 12	20.71671	22.32997	24.44649	5.866468	85.99509
BRAZIL – 13	20.91192	-21.56665	24.54438	5.863631	83.52451
BRAZIL – 14	19.87303	-19.78531	24.94063	5.860786	87.73831
BRAZIL – 15	18.08629	-22.41745	24.06118	5.843544	93.62746
BRAZIL – 16	16.38483	-22.76584	23.73190	5.823046	100.2375
RUSSIA – 01	18.88837	21.00166	-20.13300	3.044522	23.90772
RUSSIA – 02	17.92473	22.47166	-19.77389	4.043051	26.43434
RUSSIA – 03	18.41503	20.56288	22.98606	5.583496	29.99708
RUSSIA – 04	18.38530	22.28304	23.72128	6.021023	31.11904
RUSSIA – 05	17.75540	22.14246	24.23292	6.025866	33.41599
RUSSIA – 06	18.50341	23.22606	23.94991	6.289716	37.62204
RUSSIA – 07	20.99526	22.06626	24.68559	6.383507	42.81856
RUSSIA – 08	22.29049	-23.86059	24.54610	6.329721	39.43305
RUSSIA – 09	21.99515	-22.95585	-23.64148	6.309918	49.20685
RUSSIA – 10	21.62540	22.02465	23.87709	6.320768	51.37545
RUSSIA – 11	21.48715	23.49432	24.57304	6.705639	47.25398
RUSSIA – 12	21.54983	23.69367	24.98264	5.676754	47.24745
RUSSIA – 13	21.77595	22.67597	24.49774	5.564520	51.09628
RUSSIA – 14	21.24769	-23.86321	-24.28375	5.537334	54.17902
RUSSIA – 15	20.74451	-22.93753	-24.81802	5.525453	61.71871
RUSSIA – 16	21.05025	23.47114	23.42386	5.488938	59.15986
INDIA – 01	27.07260	-19.81184	-20.76338	8.664751	58.51969
INDIA – 02	25.60968	-20.09354	20.90698	8.639411	63.46613
INDIA – 03	26.52348	-21.98560	22.69984	8.638348	64.03343
INDIA – 04	31.02912	21.97265	19.74103	8.460623	65.50957
INDIA – 05	32.77606	-22.09437	21.75745	8.468633	66.47843
INDIA – 06	33.80966	22.39973	23.33050	8.475538	69.53795
INDIA – 07	35.57031	22.97030	23.75188	8.494334	73.22062
INDIA – 08	34.95170	21.28510	23.06501	8.501267	78.15146
INDIA – 09	34.29207	21.40212	23.08884	8.508152	80.14708
INDIA – 10	33.41392	23.05916	22.90133	8.523970	78.57079
INDIA – 11	34.31342	-19.44216	23.62358	8.539346	78.83731
INDIA – 12	33.43693	22.21954	23.84816	8.554682	76.91319
INDIA – 13	31.29581	-21.26384	24.45654	8.574329	78.18217
INDIA – 14	30.40416	24.03516	23.70599	8.619930	78.04226

INDIA – 15	29.25574	23.09401	23.46019	8.671630	78.52415
INDIA – 16	27.11902	-22.05733	-23.82180	8.669056	75.56013
CHINA – 01	34.33418	20.75829	-22.45516	7.050989	141.0856
CHINA – 02	35.98246	-20.77632	-21.94561	7.109062	145.3901
CHINA – 03	39.26910	20.87540	-21.79899	7.158514	153.5509
CHINA – 04	40.57696	22.02878	22.14610	7.224753	149.7936
CHINA – 05	40.47088	22.31457	21.68838	7.227662	151.0858
CHINA – 06	39.74842	21.25711	22.48024	7.259116	157.4945
CHINA – 07	38.87477	21.51007	23.35167	7.333023	149.2946
CHINA – 08	40.06125	-20.81172	23.37919	7.380256	148.7147
CHINA – 09	44.89913	-17.47396	-23.07247	7.438384	174.8087
CHINA – 10	44.99120	-21.10124	23.90631	7.631917	175.7381
CHINA – 11	44.89489	23.94331	24.07023	7.758761	174.0425
CHINA – 12	45.26563	24.29649	23.49229	7.821643	180.2753
CHINA – 13	45.51477	24.07250	23.66215	7.819636	185.8942
CHINA – 14	45.04111	24.71003	24.53119	7.868254	190.7491
CHINA – 15	43.75620	22.89524	23.70757	7.946971	202.0570
CHINA – 16	42.85713	23.63416	24.77709	8.023552	208.3067
SOUTH AFRICA – 01	15.51001	21.38492	-21.13620	6.234411	57.30775
SOUTH AFRICA – 02	15.15028	21.40788	-21.46651	6.061457	58.25776
SOUTH AFRICA – 03	15.98148	20.26983	-21.49607	5.966147	60.63115
SOUTH AFRICA – 04	16.45999	19.69811	-20.32005	5.910797	61.59694
SOUTH AFRICA – 05	17.24644	-20.81006	20.58044	5.852202	66.97005
SOUTH AFRICA – 06	18.92492	20.00124	-20.13006	5.883322	73.18510
SOUTH AFRICA – 07	20.64696	22.63938	19.35724	5.924256	79.08595
SOUTH AFRICA – 08	23.51128	-21.59929	-20.20716	5.905362	80.79989
SOUTH AFRICA – 09	21.51154	21.37194	-19.98669	5.866468	77.67791
SOUTH AFRICA – 10	19.26599	21.55661	19.69248	5.863631	75.79962
SOUTH AFRICA – 11	19.11638	22.70397	-19.89722	5.849325	74.63563
SOUTH AFRICA – 12	19.22777	21.53907	-20.80876	5.823046	72.94245
SOUTH AFRICA – 13	20.37505	-20.05459	19.34704	5.774552	71.01736
SOUTH AFRICA – 14	20.60096	20.09535	21.96370	5.774552	70.82698
SOUTH AFRICA – 15	20.42899	21.20556	23.02261	5.755742	73.46799
SOUTH AFRICA – 16	19.54277	21.76400	21.36708	5.713733	72.62535

Appendix B

PANEL UNIT ROOT TEST

LGFCF

LEVEL

Individual intercept

Panel unit root test: Summary
Series: LGFCF
Date: 10/07/18 Time: 13:49
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-2.49727	0.0063	5	70
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.31394	0.0944	5	70
ADF - Fisher Chi-square	14.5401	0.1498	5	70
PP - Fisher Chi-square	8.11837	0.6173	5	75

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

Individual intercept and trend

Panel unit root test: Summary
Series: LGFCF
Date: 10/07/18 Time: 13:49
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	0.04986	0.5199	5	70
Breitung t-stat	1.33295	0.9087	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.00081	0.8415	5	70
ADF - Fisher Chi-square	5.37454	0.8648	5	70
PP - Fisher Chi-square	1.21709	0.9996	5	75

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

None

Panel unit root test: Summary
Series: LGFCF
Date: 10/07/18 Time: 13:50
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	0.39584	0.6539	5	70
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	3.74500	0.9581	5	70
PP - Fisher Chi-square	3.40417	0.9703	5	75

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

1ST DIFFERENCE
Individual intercept

Panel unit root test: Summary
Series: D(LGFCF)
Date: 10/07/18 Time: 13:51
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-2.96014	0.0015	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.44562	0.0741	5	65
ADF - Fisher Chi-square	17.1942	0.0702	5	65
PP - Fisher Chi-square	15.9911	0.0999	5	70

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

Individual intercept and trend

Panel unit root test: Summary
Series: D(LGFCF)
Date: 10/07/18 Time: 13:51
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-5.29050	0.0000	5	65
Breitung t-stat	-0.54728	0.2921	5	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.14288	0.0161	5	65
ADF - Fisher Chi-square	22.7701	0.0116	5	65
PP - Fisher Chi-square	31.6622	0.0005	5	70

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

None

Panel unit root test: Summary
Series: D(LGFCF)
Date: 10/07/18 Time: 13:52
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-5.32978	0.0000	5	65
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	36.5162	0.0001	5	65
PP - Fisher Chi-square	35.9867	0.0001	5	70

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

LGSB
LEVEL
Individual intercept

Panel unit root test: Summary
Series: LGSB
Date: 10/07/18 Time: 13:52
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-2.31949	0.0102	5	70
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.48822	0.0064	5	70
ADF - Fisher Chi-square	24.5051	0.0064	5	70
PP - Fisher Chi-square	44.9395	0.0000	5	75

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

Individual intercept and trend

Panel unit root test: Summary
Series: LGSB
Date: 10/07/18 Time: 13:53
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-1.50083	0.0667	5	70
Breitung t-stat	-1.39777	0.0811	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.86327	0.1940	5	70
ADF - Fisher Chi-square	14.7628	0.1410	5	70
PP - Fisher Chi-square	33.1487	0.0003	5	75

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

None

Panel unit root test: Summary
Series: LGSB
Date: 10/07/18 Time: 13:53
Sample: 2001 2016

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 common unit root process)				
Levin, Lin & Chu t*	-4.26377	0.0000	5	70
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	29.1522	0.0012	5	70
PP - Fisher Chi-square	46.7044	0.0000	5	75

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

1ST DIFFERENCE
Individual intercept

Panel unit root test: Summary
Series: D(LGSB)
Date: 10/07/18 Time: 13:54
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-2.52222	0.0058	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.66632	0.0000	5	65
ADF - Fisher Chi-square	39.9039	0.0000	5	65
PP - Fisher Chi-square	90.1050	0.0000	5	70

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

Individual intercept and trend

Panel unit root test: Summary
Series: D(LGSB)
Date: 10/07/18 Time: 13:55
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-1.18272	0.1185	5	65
Breitung t-stat	-1.33810	0.0904	5	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.12918	0.0009	5	65
ADF - Fisher Chi-square	28.4391	0.0015	5	65
PP - Fisher Chi-square	64.7483	0.0000	5	70

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

None

Panel unit root test: Summary
Series: D(LGSB)
Date: 10/07/18 Time: 13:55
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-8.21737	0.0000	5	65
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	67.4713	0.0000	5	65
PP - Fisher Chi-square	98.9498	0.0000	5	70

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

LGSMUTUALB
LEVEL
Individual intercept

Panel unit root test: Summary
Series: LGSMUTUALB
Date: 10/07/18 Time: 13:56
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-1.42610	0.0769	5	70
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.13779	0.1276	5	70
ADF - Fisher Chi-square	15.9713	0.1005	5	70
PP - Fisher Chi-square	26.3558	0.0033	5	75

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

Individual intercept and trend

Panel unit root test: Summary
Series: LGSMUTUALB
Date: 10/07/18 Time: 13:57
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-0.90395	0.1830	5	70
Breitung t-stat	1.60780	0.9461	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.48291	0.6854	5	70
ADF - Fisher Chi-square	11.7791	0.3001	5	70
PP - Fisher Chi-square	20.3077	0.0265	5	75

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

None

Panel unit root test: Summary
Series: LGSMUTUALB
Date: 10/07/18 Time: 13:57
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-2.75066	0.0030	5	70
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	22.2694	0.0138	5	70
PP - Fisher Chi-square	32.2470	0.0004	5	75

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

1ST DIFFERENCE
Individual intercept

Panel unit root test: Summary
Series: D(LGSMUTUALB)
Date: 10/07/18 Time: 13:58
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-2.95405	0.0016	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.90421	0.0018	5	65
ADF - Fisher Chi-square	30.0407	0.0008	5	65
PP - Fisher Chi-square	60.6859	0.0000	5	70

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

Individual intercept and trend

Panel unit root test: Summary
Series: D(LGSMUTUALB)
Date: 10/07/18 Time: 13:58
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-1.58817	0.0561	5	65

Breitung t-stat	1.67981	0.9535	5	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.45439	0.0729	5	65
ADF - Fisher Chi-square	20.5726	0.0243	5	65
PP - Fisher Chi-square	56.8929	0.0000	5	70

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

None

Panel unit root test: Summary
Series: D(LGSMUTUALB)
Date: 10/07/18 Time: 13:59
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-6.85843	0.0000	5	65
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	49.3771	0.0000	5	65
PP - Fisher Chi-square	85.9498	0.0000	5	70

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

LGSCORP
LEVEL
Individual intercept

Panel unit root test: Summary
Series: LGSCORP
Date: 10/07/18 Time: 13:59
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	0.13756	0.5547	5	70
Null: Unit root (assumes individual unit root process)				

Im, Pesaran and Shin W-stat	-0.31977	0.3746	5	70
ADF - Fisher Chi-square	13.8243	0.1812	5	70
PP - Fisher Chi-square	25.2624	0.0049	5	75

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

Individual intercept and trend

Panel unit root test: Summary
Series: LGSCORP
Date: 10/07/18 Time: 14:00
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-2.93446	0.0017	5	70
Breitung t-stat	-0.82296	0.2053	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.70122	0.0445	5	70
ADF - Fisher Chi-square	18.3853	0.0488	5	70
PP - Fisher Chi-square	38.6774	0.0000	5	75

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

None

Panel unit root test: Summary
Series: LGSCORP
Date: 10/07/18 Time: 14:00
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-0.22401	0.4114	5	70
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	6.43077	0.7779	5	70
PP - Fisher Chi-square	12.0270	0.2833	5	75

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

-square distribution. All other tests assume asymptotic normality.

1ST DIFFERENCE
Individual intercept

Panel unit root test: Summary
Series: D(LGSCORP)
Date: 10/07/18   Time: 14:01
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-4.89502	0.0000	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.80632	0.0025	5	65
ADF - Fisher Chi-square	25.4135	0.0046	5	65
PP - Fisher Chi-square	39.6088	0.0000	5	70

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

Individual intercept and trend

Panel unit root test: Summary
Series: D(LGSCORP)
Date: 10/07/18   Time: 14:01
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-4.49802	0.0000	5	65
Breitung t-stat	-1.53780	0.0620	5	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.46068	0.0721	5	65
ADF - Fisher Chi-square	16.3251	0.0907	5	65
PP - Fisher Chi-square	29.6206	0.0010	5	70

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

-square distribution. All other tests assume asymptotic normality.

None

Panel unit root test: Summary
Series: D(LGSCORP)
Date: 10/07/18 Time: 14:01
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-5.58712	0.0000	5	65
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	42.3957	0.0000	5	65
PP - Fisher Chi-square	50.1645	0.0000	5	70

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

LGSLA
LEVEL
Individual intercept

Panel unit root test: Summary
Series: LGSLA
Date: 10/07/18 Time: 14:02
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-0.48879	0.3125	5	70
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.47697	0.9302	5	70
ADF - Fisher Chi-square	6.57999	0.7644	5	70
PP - Fisher Chi-square	6.98921	0.7265	5	75

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

Individual intercept and trend

Panel unit root test: Summary
Series: LGSLA
Date: 10/07/18 Time: 14:03
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-0.59304	0.2766	5	70
Breitung t-stat	0.93061	0.8240	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.64253	0.7397	5	70
ADF - Fisher Chi-square	7.24497	0.7021	5	70
PP - Fisher Chi-square	8.33209	0.5964	5	75

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

None

Panel unit root test: Summary
Series: LGSLA
Date: 10/07/18 Time: 14:04
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	2.52934	0.9943	5	70
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	1.23509	0.9996	5	70
PP - Fisher Chi-square	0.42863	1.0000	5	75

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

1ST DIFFERENCE
Individual intercept

Panel unit root test: Summary
Series: D(LGSLA)
Date: 10/07/18   Time: 14:05
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-1.67761	0.0467	5	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.28342	0.0112	5	65
ADF - Fisher Chi-square	23.3435	0.0095	5	65
PP - Fisher Chi-square	49.2573	0.0000	5	70

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

Individual intercept and trend

Panel unit root test: Summary
Series: D(LGSLA)
Date: 10/07/18   Time: 14:05
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-1.82779	0.0338	5	65
Breitung t-stat	-2.01720	0.0218	5	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.81165	0.0350	5	65
ADF - Fisher Chi-square	19.9463	0.0298	5	65
PP - Fisher Chi-square	46.2297	0.0000	5	70

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

None

Panel unit root test: Summary
Series: D(LGSLA)
Date: 10/07/18 Time: 14:05
Sample: 2001 2016
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 common unit root process)				
Levin, Lin & Chu t*	-3.42160	0.0003	5	65
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	25.5965	0.0043	5	65
PP - Fisher Chi-square	39.5939	0.0000	5	70

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

Appendix C

LAG LENGTH CRITERIA

VAR Lag Order Selection Criteria
Endogenous variables: LGFCF LGSB LGSMUTUALB LGSCORP LGSLA
Exogenous variables: C
Date: 10/07/18 Time: 12:57
Sample: 2001 2016
Included observations: 50

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-890.8577	NA	2.51e+09	35.83431	36.02551	35.90712
1	-632.8265	454.1350	226269.9*	26.51306*	27.66027*	26.94992*
2	-608.4323	38.05491*	239059.5	26.53729	28.64052	27.33821
3	-583.0783	34.48146	255305.8	26.52313	29.58237	27.68811
4	-559.9353	26.84587	322851.2	26.59741	30.61266	28.12644
5	-541.0934	18.08827	550040.0	26.84373	31.81499	28.73682
6	-516.5242	18.67258	910393.8	26.86097	32.78824	29.11811

* 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

PANEL COINTEGRATION TESTS

PANEL JOHANSEN COINTEGRATION TEST REULTS

Date: 10/07/18 Time: 12:58
Sample (adjusted): 2003 2016
Included observations: 70 after adjustments
Trend assumption: Linear deterministic trend
Series: LGFCF LGSB LGSMUTUALB LGSCORP LGSLA
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 *	0.404194	80.31828	69.81889	0.0057
At most 1	0.277380	44.06946	47.85613	0.1085
At most 2	0.204173	21.32846	29.79707	0.3375
At most 3	0.072227	5.342303	15.49471	0.7714
At most 4	0.001350	0.094551	3.841466	0.7585

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 *	0.404194	36.24883	33.87687	0.0256
At most 1	0.277380	22.74099	27.58434	0.1848
At most 2	0.204173	15.98616	21.13162	0.2257
At most 3	0.072227	5.247752	14.26460	0.7103
At most 4	0.001350	0.094551	3.841466	0.7585

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):

LGFCF	LGSB	LGSMUTUALB	LGSCORP	LGSLA
-0.160132	0.035657	0.041321	0.705065	0.019152
0.022748	0.058941	-0.036854	0.069213	-0.012042
-0.304220	-0.007858	-0.021749	1.618115	0.035842
0.139888	-0.008773	0.002123	0.072765	-0.041827
-0.063191	-0.017627	0.025347	-0.524822	0.000405

Unrestricted Adjustment Coefficients (alpha):

D(LGFCF)	-0.028899	0.051851	0.216293	-0.006149	0.041583
D(LGSB)	-8.316141	-8.830116	2.205564	2.102175	-0.054579
D(LGSMUTUALB)	-10.02912	2.574338	2.282792	-1.132904	-0.142442
D(LGSCORP)	-0.063605	0.026662	-0.070806	0.012278	0.002355
D(LGSLA)	0.280359	-1.061495	-0.595612	-0.750541	0.087025

1 Cointegrating Equation(s): Log likelihood -898.3861

Normalized cointegrating coefficients (standard error in parentheses)

LGFCF	LGSB	LGSMUTUALB	LGSCORP	LGSLA
1.000000	-0.222671	-0.258041	-4.403021	-0.119602
	(0.06864)	(0.06156)	(1.04411)	(0.02528)

Adjustment coefficients (standard error in parentheses)

D(LGFCF)	0.004628
	(0.02489)
D(LGSB)	1.331681
	(0.43750)
D(LGSMUTUALB)	1.605983
	(0.30629)
D(LGSCORP)	0.010185
	(0.00400)
D(LGSLA)	-0.044894
	(0.08869)

2 Cointegrating Equation(s): Log likelihood -887.0156

Normalized cointegrating coefficients (standard error in parentheses)

LGFCF	LGSB	LGSMUTUALB	LGSCORP	LGSLA
1.000000	0.000000	-0.365830	-3.813800	-0.152031
		(0.07094)	(1.20501)	(0.02963)
0.000000	1.000000	-0.484075	2.646154	-0.145637
		(0.20081)	(3.41080)	(0.08385)

Adjustment coefficients (standard error in parentheses)

D(LGFCF)	0.005807	0.002026
	(0.02511)	(0.01070)
D(LGSB)	1.130815	-0.816986
	(0.40360)	(0.17190)
D(LGSMUTUALB)	1.664544	-0.205870
	(0.30488)	(0.12985)
D(LGSCORP)	0.010792	-0.000696
	(0.00400)	(0.00170)
D(LGSLA)	-0.069041	-0.052569
	(0.08693)	(0.03702)

3 Cointegrating Equation(s): Log likelihood -879.0226

Normalized cointegrating coefficients (standard error in parentheses)

LGFCF	LGSB	LGSMUTUALB	LGSCORP	LGSLA
1.000000	0.000000	0.000000	-5.093441	-0.121147
			(0.67482)	(0.01810)

0.000000	1.000000	0.000000	0.952905	-0.104770
			(2.73593)	(0.07339)
0.000000	0.000000	1.000000	-3.497908	0.084422
			(3.11408)	(0.08353)

Adjustment coefficients (standard error in parentheses)

D(LGFCF)	-0.059993	0.000326	-0.007809
	(0.05267)	(0.01060)	(0.00909)
D(LGSB)	0.459839	-0.834316	-0.066173
	(0.85441)	(0.17194)	(0.14752)
D(LGSMUTUALB)	0.970073	-0.223807	-0.558933
	(0.64186)	(0.12917)	(0.11082)
D(LGSCORP)	0.032332	-0.000140	-0.002071
	(0.00795)	(0.00160)	(0.00137)
D(LGSLA)	0.112156	-0.047889	0.063659
	(0.18337)	(0.03690)	(0.03166)

4 Cointegrating Equation(s): Log likelihood -876.3987

Normalized cointegrating coefficients (standard error in parentheses)

LGFCF	LGSB	LGSMUTUALB	LGSCORP	LGSLA
1.000000	0.000000	0.000000	0.000000	-0.286323
				(0.06843)
0.000000	1.000000	0.000000	0.000000	-0.073868
				(0.06782)
0.000000	0.000000	1.000000	0.000000	-0.029012
				(0.08599)
0.000000	0.000000	0.000000	1.000000	-0.032429
				(0.01370)

Adjustment coefficients (standard error in parentheses)

D(LGFCF)	-0.060854	0.000380	-0.007822	0.332752
	(0.05684)	(0.01068)	(0.00910)	(0.27024)
D(LGSB)	0.753909	-0.852757	-0.061710	-2.752754
	(0.91687)	(0.17232)	(0.14677)	(4.35904)
D(LGSMUTUALB)	0.811593	-0.213869	-0.561338	-3.281616
	(0.69071)	(0.12981)	(0.11056)	(3.28382)
D(LGSCORP)	0.034050	-0.000248	-0.002045	-0.156680
	(0.00856)	(0.00161)	(0.00137)	(0.04071)
D(LGSLA)	0.007164	-0.041305	0.062065	-0.894179
	(0.19475)	(0.03660)	(0.03117)	(0.92591)

PEDRONI PANEL COINTEGRATION RESULTS

Individual intercept

Pedroni Residual Cointegration Test
Series: LGFCF LGSB LGSMUTUALB LGSCORP LGSLA
Date: 10/07/18 Time: 13:03
Sample: 2001 2016

Included observations: 80
Cross-sections included: 5
Null Hypothesis: No cointegration
Trend assumption: No deterministic 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	-0.192804	0.5764	-0.895738	0.8148
Panel rho-Statistic	1.548076	0.9392	1.639371	0.9494
Panel PP-Statistic	0.931466	0.8242	1.003356	0.8422
Panel ADF-Statistic	0.933944	0.8248	0.633434	0.7368

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

	Statistic	Prob.
Group rho-Statistic	2.597258	0.9953
Group PP-Statistic	1.656261	0.9512
Group ADF-Statistic	1.790747	0.9633

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
BRAZIL	0.567	1.050372	1.184376	1.00	15
RUSSIA	0.637	0.525529	0.656561	1.00	15
INDIA	-0.014	0.999462	0.999462	0.00	15
CHINA	0.393	2.762385	2.762385	0.00	15
SOUTH AFRICA	0.374	0.531049	0.575824	2.00	15

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
BRAZIL	0.404	1.046365	1	--	14
RUSSIA	0.508	0.470907	1	--	14
INDIA	0.071	0.984327	1	--	14
CHINA	0.093	2.551905	1	--	14
SOUTH AFRICA	0.128	0.444595	1	--	14

Individual intercept and individual trend

Pedroni Residual Cointegration Test
Series: LGFCF LGSB LGSMUTUALB LGSCORP LGSLA
Date: 10/07/18   Time: 13:04
Sample: 2001 2016
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	-1.279632	0.8997	-1.770260	0.9617
Panel rho-Statistic	2.445249	0.9928	2.772797	0.9972
Panel PP-Statistic	1.746147	0.9596	2.050694	0.9799
Panel ADF-Statistic	1.394310	0.9184	0.821971	0.7945

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

	Statistic	Prob.
Group rho-Statistic	3.362210	0.9996
Group PP-Statistic	2.207191	0.9863
Group ADF-Statistic	1.814715	0.9652

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
BRAZIL	0.302	0.765535	0.812505	1.00	15
RUSSIA	0.630	0.535588	0.657867	1.00	15
INDIA	-0.023	0.969090	1.089193	1.00	15
CHINA	0.454	2.605620	2.605620	0.00	15
SOUTH AFRICA	0.307	0.407017	0.123024	4.00	15

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
BRAZIL	0.296	0.798502	1	--	14
RUSSIA	0.500	0.492522	1	--	14
INDIA	-0.042	0.882530	1	--	14
CHINA	0.138	2.327137	1	--	14
SOUTH AFRICA	-0.092	0.291365	1	--	14

No intercept or trend

Pedroni Residual Cointegration Test
Series: LGFCF LGSB LGSMUTUALB LGSCORP LGSLA
Date: 10/07/18 Time: 13:05
Sample: 2001 2016
Included observations: 80
Cross-sections included: 5
Null Hypothesis: No cointegration
Trend assumption: No deterministic intercept or 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	-1.061321	0.8557	-1.436099	0.9245
Panel rho-Statistic	1.138889	0.8726	0.983063	0.8372
Panel PP-Statistic	-0.349323	0.3634	-1.715314	0.0431
Panel ADF-Statistic	-0.420966	0.3369	-1.125470	0.1302

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

	Statistic	Prob.
Group rho-Statistic	2.265186	0.9882
Group PP-Statistic	-1.272930	0.1015
Group ADF-Statistic	0.144461	0.5574

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
BRAZIL	0.551	1.063169	1.184603	1.00	15
RUSSIA	0.056	2.803953	0.534884	9.00	15
INDIA	0.525	4.211087	4.211087	0.00	15
CHINA	0.420	2.760184	2.760184	0.00	15
SOUTH AFRICA	0.369	0.552247	0.583510	2.00	15

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
BRAZIL	0.400	1.072365	1	--	14
RUSSIA	-0.193	2.762797	1	--	14
INDIA	0.431	2.871652	1	--	14
CHINA	0.168	2.637300	1	--	14
SOUTH AFRICA	0.142	0.497207	1	--	14

KAO PANEL COINTEGRATION TEST RESULTS

Individual intercept

Kao Residual Cointegration Test
Series: LGFCF LGSB LGSMUTUALB LGSCORP LGSLA
Date: 10/07/18 Time: 13:06
Sample: 2001 2016
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	-2.526282	0.0058

Residual variance	1.673299
HAC variance	1.736239

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 10/07/18 Time: 13:06
Sample (adjusted): 2003 2016
Included observations: 70 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.431752	0.092274	-4.679011	0.0000
D(RESID(-1))	0.447336	0.111527	4.011026	0.0002

R-squared	0.281939	Mean dependent var	-0.101120
Adjusted R-squared	0.271379	S.D. dependent var	1.415836
S.E. of regression	1.208548	Akaike info criterion	3.244871
Sum squared resid	99.31998	Schwarz criterion	3.309114
Log likelihood	-111.5705	Hannan-Quinn criter.	3.270389
Durbin-Watson stat	2.031628		

JOHANSEN-FISHER PANEL COINTEGRATION TEST RESULTS

Johansen Fisher Panel Cointegration Test
Series: LGFCF LGSB LGSMUTUALB LGSCORP LGSLA
Date: 10/07/18 Time: 13:06
Sample: 2001 2016
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	23.97	0.0077	23.97	0.0077
At most 1	75.07	0.0000	75.07	0.0000
At most 2	85.00	0.0000	69.66	0.0000
At most 3	31.73	0.0004	24.78	0.0058
At most 4	22.09	0.0147	22.09	0.0147

* 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				
BRAZIL	NA	0.5000	NA	0.5000
RUSSIA	NA	0.5000	NA	0.5000
INDIA	1009.3756	0.0001	494.9071	0.0001
CHINA	NA	0.5000	NA	0.5000
SOUTH AFRICA	NA	0.5000	NA	0.5000
Hypothesis of at most 1 cointegration relationship				
BRAZIL	516.8459	0.0001	480.7447	0.0001
RUSSIA	524.7243	0.0001	485.2030	0.0001
INDIA	514.4685	0.0001	479.5265	0.0001
CHINA	NA	0.5000	NA	0.5000
SOUTH AFRICA	538.9155	0.0001	476.4025	0.0001
Hypothesis of at most 2 cointegration relationship				
BRAZIL	36.1013	0.0082	28.5294	0.0038
RUSSIA	39.5213	0.0028	30.7124	0.0017
INDIA	34.9420	0.0117	20.1624	0.0679
CHINA	64.1446	0.0000	38.5011	0.0001
SOUTH AFRICA	62.5130	0.0000	42.4574	0.0000
Hypothesis of at most 3 cointegration relationship				
BRAZIL	7.5719	0.5123	7.5655	0.4246
RUSSIA	8.8089	0.3834	7.4766	0.4344
INDIA	14.7796	0.0639	14.1617	0.0519
CHINA	25.6435	0.0011	17.7566	0.0135
SOUTH AFRICA	20.0556	0.0096	15.4559	0.0323
Hypothesis of at most 4 cointegration relationship				
BRAZIL	0.0064	0.9358	0.0064	0.9358
RUSSIA	1.3322	0.2484	1.3322	0.2484
INDIA	0.6178	0.4319	0.6178	0.4319
CHINA	7.8869	0.0050	7.8869	0.0050
SOUTH AFRICA	4.5997	0.0320	4.5997	0.0320

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

Appendix E

PARDL MODEL RESULTS

Dependent Variable: D(LGFCF)
Method: ARDL
Date: 10/07/18 Time: 13:18
Sample: 2003 2016
Included observations: 70
Dependent lags: 2 (Fixed)
Dynamic regressors (2 lags, fixed): LGSB LGSMUTUALB LGSCORP LGSLA

Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
		Long Run Equation		
LGSB	-0.033838	0.000601	-56.26196	0.0000
LGSMUTUALB	0.029584	0.000596	49.66621	0.0000
LGSCORP	-0.464305	0.095756	-4.848814	0.0001
LGSLA	0.276565	0.001372	201.6024	0.0000
		Short Run Equation		
COINTEQ01	-0.543092	0.405851	-1.338155	0.1952
D(LGFCF(-1))	0.893118	0.357515	2.498128	0.0209
D(LGSB)	0.015469	0.012353	1.252261	0.2242
D(LGSB(-1))	0.021558	0.014797	1.456903	0.1599
D(LGSMUTUALB)	-0.024016	0.023926	-1.003733	0.3269
D(LGSMUTUALB(-1))	-0.019302	0.019979	-0.966137	0.3450
D(LGSCORP)	-3.658543	6.371233	-0.574228	0.5719
D(LGSCORP(-1))	-2.076369	4.379305	-0.474132	0.6403
D(LGSLA)	-0.064621	0.163979	-0.394083	0.6975
D(LGSLA(-1))	-0.099138	0.088902	-1.115141	0.2774
C	2.236627	1.116606	2.003058	0.0582

Mean dependent var	0.205152	S.D. dependent var	1.385269
S.E. of regression	0.851801	Akaike info criterion	-2.763306
Sum squared resid	15.23685	Schwarz criterion	-1.006562
Log likelihood	169.5322	Hannan-Quinn criter.	-2.058977

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

Appendix F

ENGEL-GRANGER CAUSALTY TEST RESULTS

Pairwise Granger Causality Tests
Date: 10/07/18 Time: 13:10
Sample: 2001 2016
Lags: 1

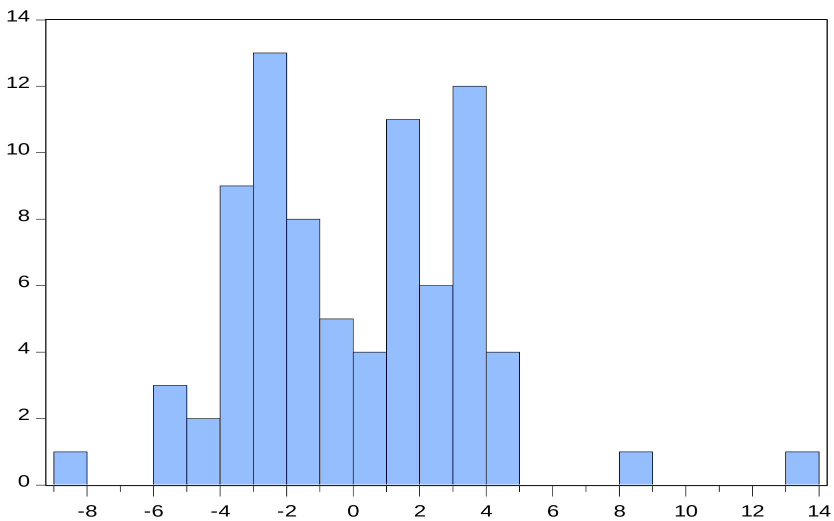
Null Hypothesis:	Obs	F-Statistic	Prob.
LGSB does not Granger Cause LGFCF	75	0.26512	0.6082
LGFCF does not Granger Cause LGSB		0.22179	0.6391
LGSMUTUALB does not Granger Cause LGFCF	75	0.00026	0.9871
LGFCF does not Granger Cause LGSMUTUALB		2.00399	0.1612
LGSCORP does not Granger Cause LGFCF	75	0.07249	0.7885
LGFCF does not Granger Cause LGSCORP		9.23321	0.0033
LGSLA does not Granger Cause LGFCF	75	0.12097	0.7290
LGFCF does not Granger Cause LGSLA		0.09872	0.7543
LGSMUTUALB does not Granger Cause LGSB	75	0.13693	0.7124

LGSB does not Granger Cause LGSMUTUALB		0.24418	0.6227
LGSCORP does not Granger Cause LGSB	75	0.14457	0.7049
LGSB does not Granger Cause LGSCORP		0.07720	0.7819
LGSLA does not Granger Cause LGSB	75	0.15926	0.6910
LGSB does not Granger Cause LGSLA		4.18056	0.0445
LGSCORP does not Granger Cause LGSMUTUALB	75	1.59769	0.2103
LGSMUTUALB does not Granger Cause LGSCORP		0.06865	0.7941
LGSLA does not Granger Cause LGSMUTUALB	75	0.78727	0.3779
LGSMUTUALB does not Granger Cause LGSLA		0.48060	0.4904
LGSLA does not Granger Cause LGSCORP	75	0.37822	0.5405
LGSCORP does not Granger Cause LGSLA		0.56495	0.4547

Appendix G

DIAGNOSTIC TESTS

JARQUE-BERA NORMALITY TEST RESULTS



Series: Standardized Residuals
Sample 2001 2016
Observations 80

Mean	-1.27e-14
Median	-0.147618
Maximum	13.48063
Minimum	-8.229118
Std. Dev.	3.499028
Skewness	0.671302
Kurtosis	4.518771
Jarque-Bera	13.69751
Probability	0.001061

AUTOCORRELATION LM TEST RESULTS

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 10/07/18 Time: 21:59

Sample: 2001 2016
Included observations: 70

Lags	LM-Stat	Prob
1	36.54905	0.0637
2	28.19414	0.2990
3	22.64276	0.5984
4	17.42594	0.8658
5	20.50802	0.7197

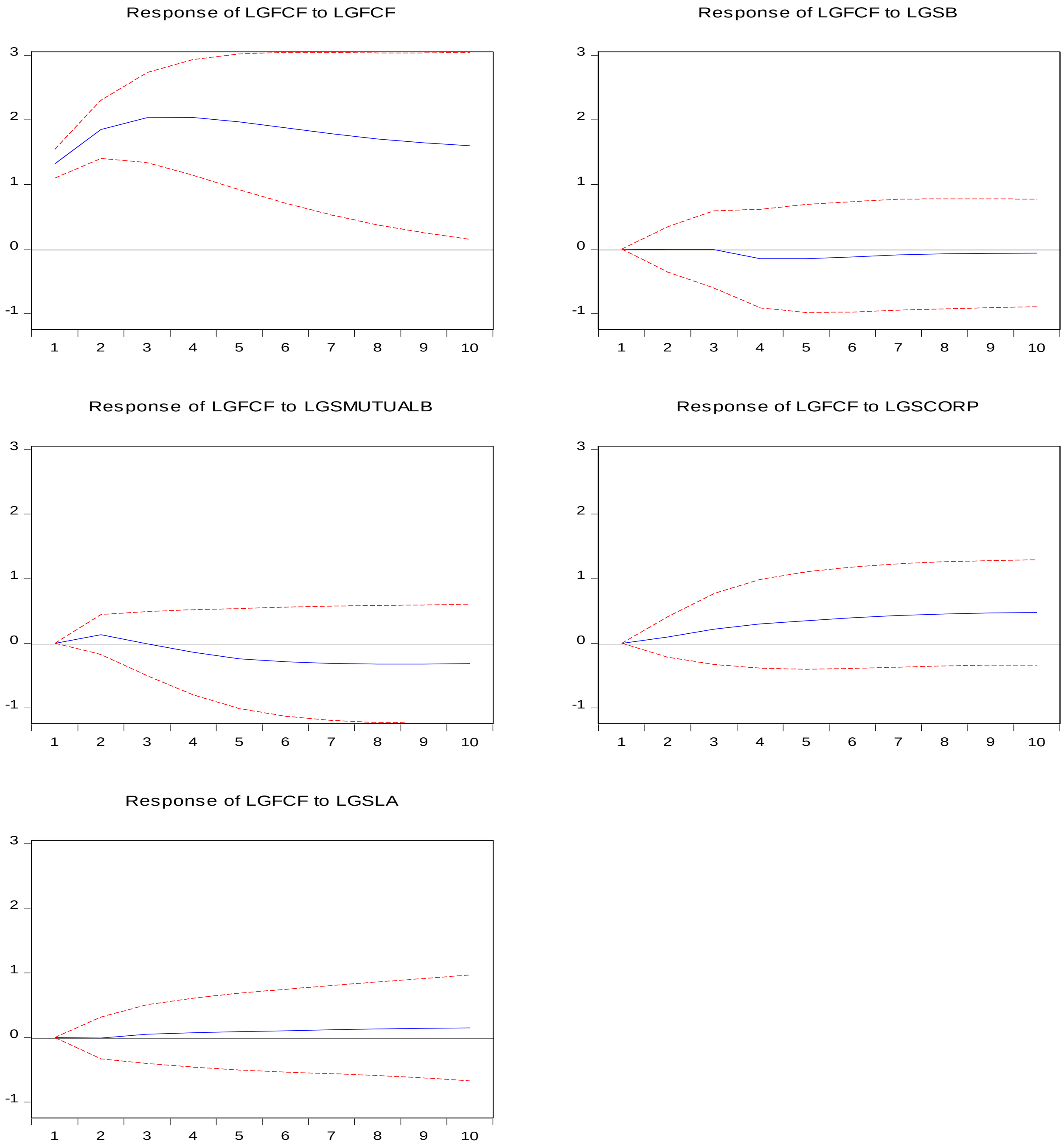
Probs from chi-square with 25 df.

Appendix H

IMPULSE RESPONSE FUNCTION AND VARIANCE DECOMPOSITION RESULTS

IMPULSE RESPONSE FUNCTION RESULTS

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.



VARIANCE DECOMPOSITION RESULTS

Variance Decompositi on of

LGFCF:

Period	S.E.	LGFCF	LGSB	LGSMUTUAL B	LGSCORP	LGSLA
1	1.320795	100.0000	0.000000	0.000000	0.000000	0.000000
2	2.280902	99.47338	0.000981	0.347337	0.177161	0.001145
3	3.063456	99.16725	0.000959	0.193124	0.608439	0.030229
4	3.696811	98.42718	0.163273	0.275626	1.071810	0.062115
5	4.213196	97.60772	0.248154	0.534300	1.516748	0.093073
6	4.640195	96.80969	0.273226	0.819083	1.971190	0.126814
7	5.001792	96.03809	0.266591	1.092120	2.435651	0.167550
8	5.315837	95.31074	0.255561	1.331704	2.889633	0.212359
9	5.595226	94.65244	0.244479	1.532763	3.312663	0.257655
10	5.849068	94.07620	0.234883	1.694534	3.693841	0.300540

Variance Decomposition of LGSB:

Period	S.E.	LGFCF	LGSB	LGSMUTUAL B	LGSCORP	LGSLA
1	21.31683	0.120639	99.87936	0.000000	0.000000	0.000000
2	21.47991	0.120160	99.62671	0.181652	0.056085	0.015389
3	21.58153	0.338474	98.90240	0.652899	0.090951	0.015280
4	21.66659	0.768064	98.21152	0.693477	0.232366	0.094571
5	21.74961	1.248220	97.59083	0.716698	0.308855	0.135396
6	21.79553	1.598743	97.20399	0.722980	0.323047	0.151240
7	21.82479	1.821530	96.95649	0.744134	0.323140	0.154710
8	21.84193	1.952028	96.80526	0.763967	0.322923	0.155819
9	21.85303	2.029828	96.70861	0.781048	0.324588	0.155929
10	21.86041	2.078988	96.64437	0.792562	0.328248	0.155833

Variance Decomposition of LGSMUTUALB:

Period	S.E.	LGFCF	LGSB	LGSMUTUAL B	LGSCORP	LGSLA
1	16.05806	0.794285	3.992396	95.21332	0.000000	0.000000
2	17.64366	0.679025	9.460956	87.68445	0.462753	1.712817
3	19.11102	0.956802	19.30462	77.80828	0.401137	1.529159
4	19.45922	2.036015	20.10343	75.63240	0.738367	1.489782
5	19.73685	3.200725	20.15659	74.10689	1.014341	1.521460
6	19.87001	4.147813	19.92110	73.27572	1.123425	1.531939
7	19.94784	4.737707	19.82975	72.74002	1.155157	1.537366
8	19.98691	5.066888	19.77306	72.45616	1.163407	1.540488
9	20.00613	5.230989	19.74328	72.31901	1.163781	1.542940
10	20.01508	5.307297	19.72610	72.25981	1.162773	1.544019

Variance Decomposition of LGSCORP:

Period	S.E.	LGFCF	LGSB	LGSMUTUAL B	LGSCORP	LGSLA
1	0.199055	0.666725	0.299876	0.179323	98.85408	0.000000

2	0.298983	1.405109	0.205641	0.169370	96.85799	1.361889
3	0.361541	4.840212	0.932535	0.488575	92.56083	1.177852
4	0.411060	12.75518	1.465827	0.709166	84.09161	0.978222
5	0.463666	24.05308	1.212318	0.853938	72.66029	1.220377
6	0.523835	35.40723	0.950797	0.994911	60.94663	1.700427
7	0.588904	44.77403	0.756234	1.239894	51.00589	2.223946
8	0.655333	51.76328	0.621459	1.574276	43.31537	2.725609
9	0.720741	56.74321	0.538289	1.965701	37.56978	3.183012
10	0.783869	60.22170	0.495310	2.378611	33.30649	3.597887

Variance Decomposition of LGSLA:

Period	S.E.	LGFCF	LGSB	LGSMUTUALB	LGSCORP	LGSLA
1	4.526965	17.02018	0.690381	3.727091	0.980619	77.58173
2	6.430496	18.41713	6.766513	2.763771	0.731237	71.32135
3	7.837458	19.48017	6.360249	1.913388	0.528548	71.71765
4	9.127340	19.63427	5.870657	1.713841	0.402694	72.37854
5	10.36189	19.27529	6.197301	1.745499	0.312478	72.46943
6	11.53577	18.73585	6.716985	1.866598	0.270703	72.40986
7	12.65890	18.07007	7.204202	2.056655	0.281050	72.38802
8	13.74342	17.28257	7.602027	2.277488	0.333170	72.50474
9	14.80195	16.37896	7.950285	2.508844	0.417537	72.74437
10	15.84367	15.38519	8.257948	2.742337	0.528720	73.08581

Cholesky Ordering: LGFCF LGSB LGSMUTUALB LGSCORP LGSLA