THE IMPLICATION OF ELECTRICITY SHOCKS AND SELECTED GOVERNANCE INDICATORS ON GROWTH PROSPECTS: A COMPARATIVE ANALYSIS BETWEEN SOUTH AFRICA AND CHINA

by

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DECLARATION

I declare that "**THE IMPLICATION OF ELECTRICITY SHOCKS AND SELECTED GOVERNANCE INDICATORS ON GROWTH PROSPECTS: A COMPARATIVE ANALYSIS BETWEEN SOUTH AFRICA AND CHINA"** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

P. Makgoba 10/09/2025

Signature **Date**

ACKNOWLEDGEMENTS

I would like to give glory to the Almighty God for His Grace, blessing and favour that has been bestowed upon me. I am deeply thankful for the hope and faith that sustained me throughout the completion of this dissertation. His promises are indeed ‘Yes and Amen’.

2 Corinthians 1:20

“For all the promises of God in him are Yes,
and in him Amen, to the glory of God through us”

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My mother and my entire family have been my greatest support system, and I really appreciate their unwavering love and support throughout this journey. Their belief in me and their constant prayers propelled me to reach this far. I’m also incredibly thankful for my siblings, who remind me every day that I cannot afford to give up. Knowing that I am their source of inspiration keeps me motivated to keep going.

ABSTRACT

This study investigated comparatively the implications of electricity shocks and governance indicators on economic growth in South Africa and China for 1995 to 2021 period. The two economies have been facing a slow growth rate for over a decade now, and that is a major concern considering the importance of growth in any country. The key variables investigated were electricity supply, corruption, political instability and economic growth. Subsequently, inflation, debt and money supply were added as control variables in the study to strengthen the models. The study used Autoregressive Distributed Lag (ARDL) to test for the relationship among variables, and Granger causality to test for causality. The preceding techniques used were impulse response function and variance of decomposition to forecast economic growth in relation to the shock in electricity supply. The ARDL long-run results revealed a negative relationship between economic growth and all the key macroeconomic variables in South Africa and China. The results further showed that all the key variables have a dire effect on the economic growth of South Africa, whereas they have little impact on the economic growth of China. The short-run results revealed contradictory results across the two countries. The Granger causality test results found evidence of causality only in political instability and economic growth in South Africa and no causality in China. The impulse response function results exhibited that economic growth responds negatively to shocks from electricity supply in South Africa, whereas it responds positively in China. Due to that, the study consequently recommended that South Africa follow some of China's policies to solve its electricity issues. The study further recommended that the policymakers of both countries focus more on policies that promote accountability and transparency. That will reduce corruption and political instability levels in both economies and ultimately improve economic growth. The study added that the policymakers of South Africa should implement policies to address these challenges urgently as their effects are more pronounced in the country.

Key Concepts: Economic growth, electricity supply, corruption, political instability, ARDL, Causality, impulse response function, variance of decomposition.

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ABBREVIATIONS AND ACRONYMS

GDP	Gross Domestic Product
ELECS	Electricity Supply
CORR	Corruption
POL	Political instability
INF	Inflation
MS	Money Supply
BRICS	Brazil, Russia, India, China and South Africa
SA	South Africa
CPC	Communist Party of China
IMF	International Monetary Fund
ADF	Augmented Dickey-Fuller
PP	Philips perron
ARDL	Autoregressive Distributed Lag
IRF	Impulse Response Function
VAR	Vector Auto Regression
ECT	Error Correction Term
DW	Durbin Watson
SOEs	State Owned Enterprises

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CHAPTER 1
ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

The availability and access to affordable electricity play a vital role in economic growth, as industries and businesses require electricity to operate efficiently (Khobai, Mogano & Le Roux, 2017). Electricity has enabled technological and scientific developments, which have substantially aided the economic development (Stungwa, 2022). A series of research has also shown that electricity is a catalyst for economic growth (Mabugu & Inglesi-Lotz, 2022; Bah & Azam, 2017; Song, Song, Zhao & Wang, 2017). This is what makes it an interesting economic factor to study. When examining the relationship between electricity and economic growth, it is crucial to consider governance. This is because governance plays a key role in managing resources like electricity and promoting economic development. Research suggests that governance structures that emphasize institutional quality, accountability, political stability, and the rule of law are often more effective in managing energy resources, including electricity (Lekana, 2020).

Electricity crises remain an alarming issue to most BRICS countries. South Africa and China have faced electricity supply issues coupled with electricity rationing over the years. World Bank (2021) reported that the power outages in South Africa started in 2007 and became more prominent in 2020. This is because the nation mainly relies on coal to produce electricity, and Eskom has been failing to keep up with demand. The failure was due to, outdated power plants, a white paper on the energy policy of South Africa, and a lack of funding for new infrastructure which led to high electricity costs (Ezesele, 2017). Gasealahwe (2020) added that high electricity costs have also been ascribed to the expense of preserving and modernising South Africa's electricity infrastructure. These high costs lead to high electricity prices. High electricity prices pose a risk to economic growth as industries struggle to remain competitive and consumers face rising living costs (Khobai, et al., 2017). In China, the electricity shortage started earlier than in South Africa and resulted in the worst power outages in 2021 (Fisherman, 2021). The shortage was due to high coal prices, energy dual controls, and underperforming supply (Inman, 2021). To address these electricity crises, China took notable strides which included diversifying its coal supply sources and moving to cleaner energy generation (Mullen, 2021). China's resilience and ability to mitigate the negative effects of electricity supply shocks on the economy made it an interesting country to compare with South Africa. Even though the country faced the worst electricity supply crises, its economy has been remarkable compared to all the other BRICS countries. Hence it is an ideal country to draw lessons from.

Mabugu and Inglesi-Lotz (2022) posit that South African governance problems, such as corruption and poor management, have exacerbated issues in the electrical industry. Corruption scandals have particularly plagued state-owned companies like Eskom, leading to inefficiency and financial burden on the economy. To address these challenges, the government is implementing various initiatives, such as renewable energy programs, diversify the country's electricity mix and reducing dependence on fossil fuels (Gasealahwe, 2020). In contrast, Wang, Zhang and Zhang (2021) outlined that, China has made significant strides in its energy sector, investing heavily in renewable energy and reducing dependence on fossil fuels. They further stated that the government's commitment to green energy has supported sustainable economic growth while addressing environmental challenges. However, governance issues, such as lack of transparency and control of information, have hindered the effectiveness of policies and regulations, creating challenges in the energy sector (D'Amico, 2015).

The governance structure of South Africa and China is different. South Africa is a democratic republic with a president as the head of the state, while China is a one-party socialist state with the Communist Party of China (CPC) as the sole governing party (Hu, 2018; Mc Lennan, 2018). Regardless of the governance structures, both countries' corruption indexes suggest that they are equally corrupt. Transparency International (2021) reveals that South Africa's corruption score is 44 out of 100 whereas China's score is 45 out of 100. Therefore, the study seeks to investigate if electricity supply crises and governance issues contributed to the slow growth rate in these two countries. However, China's economy is still doing extremely well compared to South Africa. It is recognised as the second-largest economy in the world (Mao, Wang, Wu, Wu, Zeng, Song, Yi, & Luo, 2018; Paul & Mas, 2016). The Chinese economy is flourishing, but the growth rate decelerated compared to the last two decades of excessive growth rates (World bank,2021).

The South African economy faces the worst problems as its economic growth has been stagnant. The country's economy was also predicted to have a potential growth rate of only 1.5% per annum, which is less than the population growth rate of 1.6% (IMF, 2021). Hence, it is essential to investigate the relationship between electricity shocks and selected governance indicators in these countries to see if the results cannot help to improve the economic performance of these two economies. This may shed light on why China's economy still manages to thrive under electricity and governance issues and perhaps, relate to the economy of South Africa. This will be an insightful contribution to the body of knowledge for countries that faces electricity and governance challenges.

1.2 STATEMENT OF THE PROBLEM

Economic growth rate is a problem for most countries around the world. South Africa and China are not an exception as they are also facing slow growth rates. This is a major concern as slow growth rate can be an obstacle to a country to take advantage of new economic opportunities arising around the world. The IMF (2021) reported that South Africa has been facing stagnant economic growth with an average annual growth rate of more than 2% only in 2010 and 2021 since 1994. The country had an average annual growth rate of more than the population growth rate only in 2 years in 29 years. The stagnant growth has resulted in economic problems such as rising unemployment and low investments. Furthermore, the South African economy had three technical recessions since 2008, which exacerbated unemployment in the country (Mathe, 2020; Statssa, 2020). In China, the economic growth is prosperous, but the growth rate has been increasing at a decreasing rate or rather declining since 2008. High growth rate is essential for Chinese economy to be able to address its pressing challenges such as high debt level and to keep on responding promptly to economic challenges. Due to that, the study conducts a comparative analysis to determine if electricity supply and governance issues contributed to the slow growth rate in South Africa and China.

The electricity supply issue has received a lot of attention in both countries. The governing leaders actively tried to deal with this crisis even though their efforts are sometimes supressed by issues such as corruption. In South Africa, the president was seen appointing the new ministry in 2023 to address the ongoing power outages

(South African Government News Agency, 2023). The South African Government (2023) outlined that the new minister (Kgosientsho Ramokgopa) is expected to assist in ensuring that, the electricity supply improves in the country so that the overall economy can be advanced. Conversely, China took active actions into transitioning to green economy, where it became a global leader in deploying renewable energy for electricity generation (IMF, 2024). The works of Stungwa (2022), Kaplan and Akçoraoğlu, (2017) and D'Amico (2015) independently outlined how the economic growth rate of a country can be detrimentally affected by issues of electricity and governance. Hence this study seeks to investigate the impact of electricity supply and governance indicators on economic growth in South Africa and China. The outcomes are envisaged to contribute to the improvement of economic growth in both nations.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 Aim

The study aims to compare the impact of electricity supply shocks and specific governance indicators such as the level of corruption and political stability on economic growth in South Africa and China for the period of 1995 to 2021.

1.3.2 Objectives

To achieve the above aim, the study will run two models for South Africa and China. The objectives are as follows for both countries:

- To investigate the effects of electricity supply on economic growth.
- To investigate the impact of corruption level and political instability on economic growth.
- To examine any causality between, electricity supply, corruption, political instability, and economic growth.
- To examine how economic growth respond to electricity supply shocks.

1.4 RESEARCH QUESTIONS

- Does electricity supply affect economic growth?
- How does the level of corruption and political instability impact economic growth?

- Are there any causal effects between electricity supply, corruption, political instability, and economic growth?
- How does economic growth respond to shocks from electricity supply?

1.5 DEFINITION OF CONCEPTS

- **Gross Domestic Product (GDP):** is the market value of goods and services produced in a chosen geographic region or a country over a selected period, usually a year (Ngige, 2020). In the context this study, GDP will be used as a proxy for economic growth.
- **Electricity supply:** is the process of producing and distributing electricity to consumers**.** It involves the generation of electrical power, transmission of power through power lines, and distribution of power to homes, businesses, and industries (Willis, 2018). This definition will apply to this study.
- **Electricity supply shocks:** are the sudden disruptions or changes in the availability of electricity which can affect the overall economy (Ailani, 2024). The shocks typically occur due to disruptions in power generation, transmission, or distribution, and they can be either negative or positive (Rodini, 2022). This definition will be applicable in this study.
- **Governance:** is concerned with the procedures and structures that regulate the management and direction of organizations, institutions, and societies (Mehraj, 2020). Specifically, this study will focus on governance at the national level, looking at management, corruption and political instability in the government and other public institutions.
- **Corruption:** it refers to the fraudulent conduct or dishonesty of those in power, usually involving the misuse of public resources or authority for personal gain. It can take many forms, such as bribery, nepotism, coercion and cronyism (Transparency International, 2021). In this study, corruption means the dishonesty or fraud of government authorities and public officials.
- **Political instability:** is a situation where a government is unable to successfully rule a nation or maintain authority over its territory. Conflicts, economic downturns, societal discontent, and the misuse of power by government officials are a few examples of the many variables that can lead to political instability (Kimemia, 2021). This definition will be applicable in this study.

1.6 ETHICAL CONSIDERATIONS

The study will be performed in accordance with the University of Limpopo's rules and regulations. It will be executed with honesty and integrity, considering the plagiarism policy of the University to maintain and uphold academic standards. This means the study will not include other people's data, graphs, pictures, or other information without acknowledging the source.

1.7 SIGNIFICANCE OF THE STUDY

To the best of the author's knowledge, the current study is the first to examine the implications of electricity supply and governance indicators on economic growth in South Africa and China. Related studies such as Keaser, Kamaiah, Jena and Yadav (2022), Khobai, et al. (2017) and Song, et al. (2017) did not focus on investigating electricity shocks and governance simultaneously. Hence, the uniqueness of this study is on the combination of electricity supply and governance indicators. It was necessary to undertake this study given the electricity crises and the perceived high level of corruption and political instability in South Africa and China. Moreover, studies such as Gasealahwe (2020), Muhammad and Muhammad (2017) and Ezesele (2017) which investigated electricity crises, analysed electricity consumption, while this study focuses on electricity supply. This is linked to the power cuts that South Africa and China continuously experienced. The uniqueness of this study is also on the diverse range of techniques used, the Impulse Response Function and Variance of Decomposition technique.

Literature review proved that research on the link between governance and economic growth is scarce in South Africa and China. Therefore, this study makes a novel contribution to the literature by filling this gap. The study draws a comparative analysis between two BRICS peers with different economies and governance regimes. Hence, the study also adds to the existing literature by providing insights into the critical role of electricity shocks and governance indicators on economic growth for developing countries in the context of South Africa and established emerging countries represented by China. The findings of this study will help policymakers in other developing economies to formulate and implement appropriate policy measures that will improve their economic growth performance.

1.8 STRUCTURE OF THE STUDY

Chapter 1 served as the orientation for the study, encompassing the introduction and background of the topic, along with the study's aims, objectives, problem statement, and significance. Building on this foundation, Chapter 2 offers a comprehensive overview of the trends in the two economies under investigation. This is done by facilitating a deeper understanding of the relationships between key variables prior to conducting the actual analysis. This Chapter also examines the reforms undertaken by both countries to address the economic challenges.

Chapter 3 covers the theoretical frameworks that underpin the study and a review of the relevant empirical literature. Chapter 4 provides a detailed description of the data employed in the research and outlines the modelling techniques utilised. Following this, Chapter 5 presents the study’s findings and analysis derived from the econometric methods discussed in the previous chapter. Finally, Chapter 6 summarises the key findings and offers recommendations.

CHAPTER 2

OVERVIEW AND ANALYSIS OF KEY TRENDS

2.1 Introduction

This chapter aims to examine the behaviour of the variables under investigation and explore potential relationships between them in the respective economies.

2.2 South Africa

The South African economy is shaped by a range of structural and socio-economic challenges. Consequently, the variables examined here include electricity supply, corruption levels, and political instability.

2.2.1 Outlook of the economy

South Africa is known for being rich in natural resources, minerals and diverse industrial base. The country is the most industrialised and diverse in Africa. Although it is more advanced than most African countries, its economic performance is sub-standard. The economy is challenged by considerable issues including energy and infrastructure deficiency, political instability, high unemployment and persistent inequality (Mzangwa, 2016). The growth rate of the economy is illustrated in Figure 2.1 below.

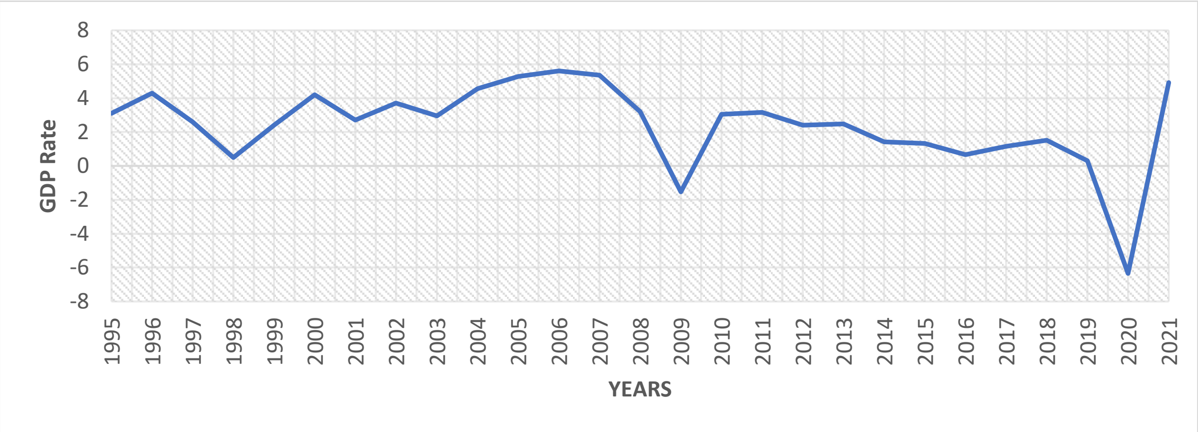

Figure 2.1: GDP Growth Rate in South Africa

Source: Author's compilation from World Bank data

Figure 2.1 shows three sharp declines in growth rate in South Africa. The first one in 1998 was because of the Asian global crisis which resulted in the country entering a recession. In 2008, the economy got caught up in the financial global crisis that resulted in another recession from 2008 to 2009. This is demonstrated by the sharp decline from 2008 to 2009. The third sharp decrease was due to another recession that the country experienced in 2020. The recession was due to the COVID-19 pandemic which led to the disruption of many economic activities in the World. Although the South African growth rate is characterised by most periods of downturns and recessions, there were some periods of sound growth rate. In 2010 and 2021, the economy experienced a GDP growth rate that was more than the population growth rate. Hence the graph demonstrates significant increases in these two years.

2.2.2 Electricity Supply Outlook

Electricity supply shortage in South Africa has been a predicament for several years now. The scheduled power cuts (load-shedding) started in 2007 and became more prominent in recent years. The power cuts were due to the failure to build new power stations and replace ageing ones to keep up with the growing demand. In trying to resolve the issue of electricity shortfall, South Africa began the construction of Medupi and Kusile power stations with a combined installation capacity of 9,564MW in 2007. The country managed to only complete the Medupi power station in 2021 after several delays (Hlongwane & Daw, 2023). Kusile power station was scheduled to be fully operational by 2024. Although the Medupi power station was completed in 2021, it does not really help in solving the issue of load-shedding. This is because even before completion, some of its units were operating, just not optimal (Motha, 2021). The electricity shortfall has disrupted economic activities and increased the cost of doing business (World Bank, 2024).

Sectors such as mining and Information Technology (IT) that are heavily reliant on electricity have been most affected by load-shedding. Figure 2.2 below demonstrates the trend of electricity supply from 1995 to 2021.

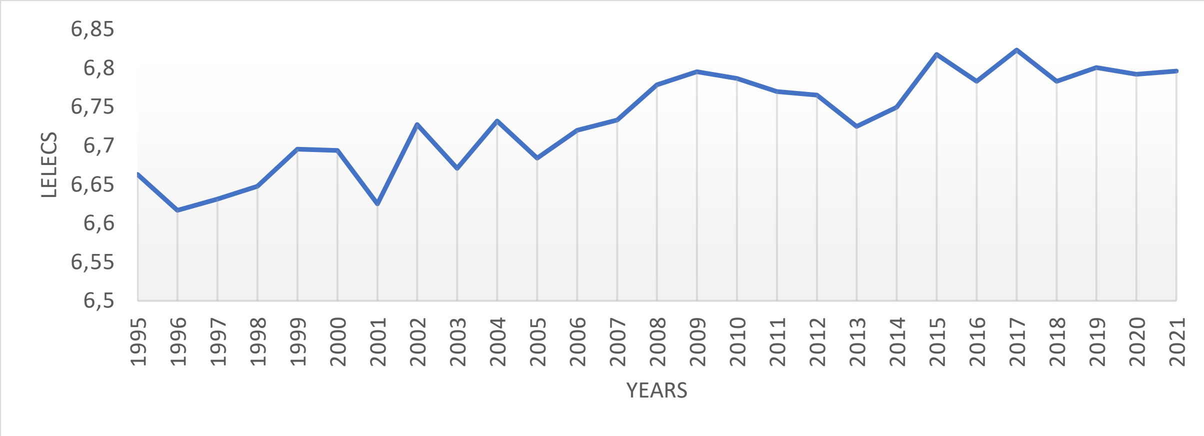

Figure 2.2: Electricity Supply in South Africa

Source: Author's compilation from World Bank data

Even though there are some periods of decline, the line graph presents a picture of electricity supply increasing over time. A proper analysis of Figure 2.2 shows that the change in electricity supply is very little as it is less than 0.5 in all periods. This implies that the country's efforts to build new power stations are not enough as it does not have much effect on the overall electricity supply. The effects of electricity supply on economic growth might not be clear, as the electricity supply is almost stable.

The Figure 2.3 below demonstrates the number of employees in the electricity, gas and water supply industry in 2013 and 2021. For this study, the focus will be on electricity supply employees.

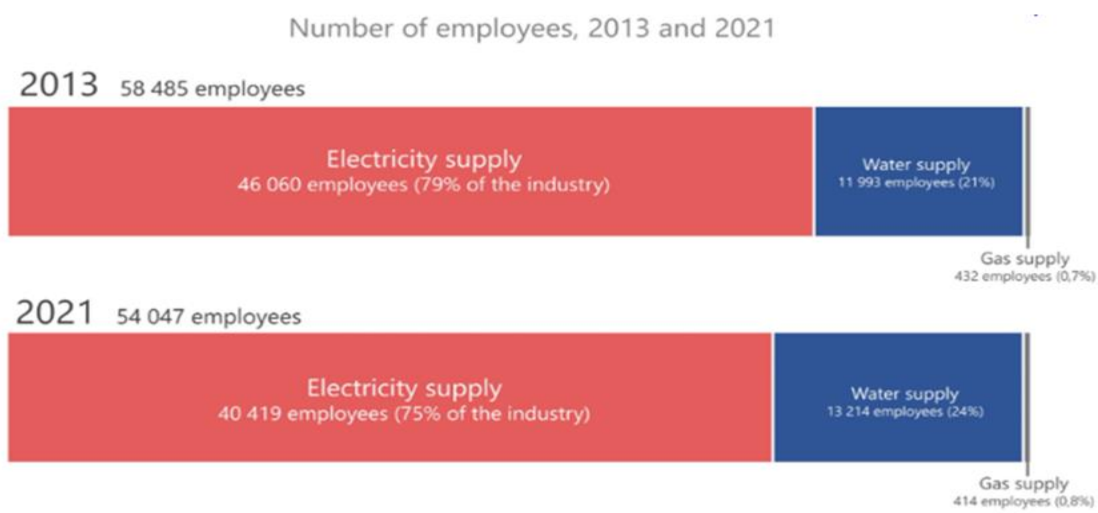

Figure 2.3: Number of employees in the industry, 2013 and 2021

Source: Electricity, gas and water supply industry, Report no. 41 (2021)

Figure 2.3 shows that the employees in the electricity supply sector were fewer by 5641 in 2021, compared to 2013. This shows that the electricity supply issues in the country also affect employment in the industry. Hence it can be presumed that the electricity supply issues may negatively affect the economic growth as it exacerbates the unemployment.

2.2.3 The level of corruption

South Africa has faced the problem of corruption for decades. According to Friedman (2020), the problem of corruption in the country is deeply rooted as it dates to colonisation in 1952 with the last years of apartheid being the most corrupt ones. Corruption weakens democracy and the rule of law because it causes human rights violations, promotes terrorist activities and distorts markets (Budhram and Geldenhuys, 2018). Hence reducing the level of corruption in a country is essential, as that can lead to sustainable economic growth and promote investment. Figure 2.4 below illustrates corruption levels in South Africa.

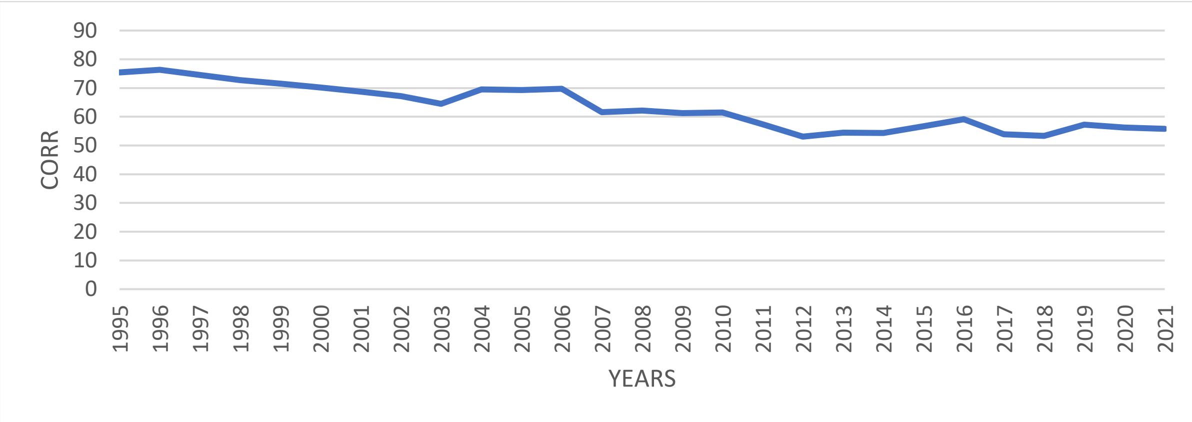

Figure 2.4: Corruption level in South Africa

Source: Author's compilation from World Bank data

The line graph shows that the nation had the worst corruption level in the past compared to recent years. The corruption level was at its highest in 1996, just after democracy. It has been slowing down over the years, with significant improvement in 2012. The improvement might be due to the inception of Corruption Watch, which commenced in 2012 in South Africa.

Although there is some reduction of corruption in the country, it is still ranked high on the Corruption Perception Index with a score of 44/100. It is worth noting that the

Corruption Perception Index does not necessarily measure corruption reported or experienced in the country, so it might be different from actual reality (Singh, 2024). This is why it is important to also observe the Corruption Watch reports to see the actual corruption incidents reported in the country.

Table 2.1shows the sectors reported to have contributed the highest corruption level, and the percentage of overall corruption reported in each province.

Table 2.1 Percentage of corruption reported in sectors and provinces

Sectors	Percentage of total corruption reported	Provinces	Percentage of total corruption reported
Policing	10%	Gauteng	45%
Schools	5.8%	Western Cape	10%
Covid-19 related corruption	3.8%	Kwa-Zulu Natal	10%
Housing	3.1%	Eastern Cape	6%
Traffic	2.7%	Limpopo	6%
Health	2.7%	Mpumalanga	5%
Licensing	2.3%	North-West	5%
Mining	1.2%	Free State	5%
		Northern cape	2%

Source: Corruption Watch report (2021)

Table 2.1 displays policing as the sector with the highest corruption complaints. Based on the report, the government still need to put more stringent measures against corrupt institutions. The rule of law needs to be tightened as corruption might affect economic performance. Looking at the provinces, Gauteng is the most corrupt one with total complaints amounting to 45% of all complaints received by the Corruption Watch.

Despite the sectors listed in the Corruption Watch report, South Africa is facing corruption also in the public sector where State Owned Enterprises are affected the most. Sithomola (2019) highlighted that corruption exacerbated the nation's financial issues in most State-Owned Enterprises (SOEs). The economy is being deterred by corruption in the SOEs where ESKOM and Transnet are the worst contributors (Baum, Hackney, Medas, and Sy, 2019; Mafukata, and Musitha, 2018). The Zondo Commission report revealed that the corruption scandals in ESKOM that ultimately caused problems in the energy sector were due to the worst corruption case-State Capture (Commission of Enquiry into State Capture, 2021). The state capture led to the efforts of transitioning into clean energy to rescue Eskom being slow and ineffective as most government officials cannot cut ties with the coal industry (Donovan, 2023). This shows that reducing corruption in the public sector can improve the management of South African SOEs and ultimately boost economic growth.

2.2.4 Political instability

South Africa is a democratic country, so the political parties play a major role in its political stability. A country characterised by high corruption levels, high unemployment rates, poverty, and high inequality is likely to have high political instability because its people are forever dissatisfied. The graph below illustrates the country's political instability trends.

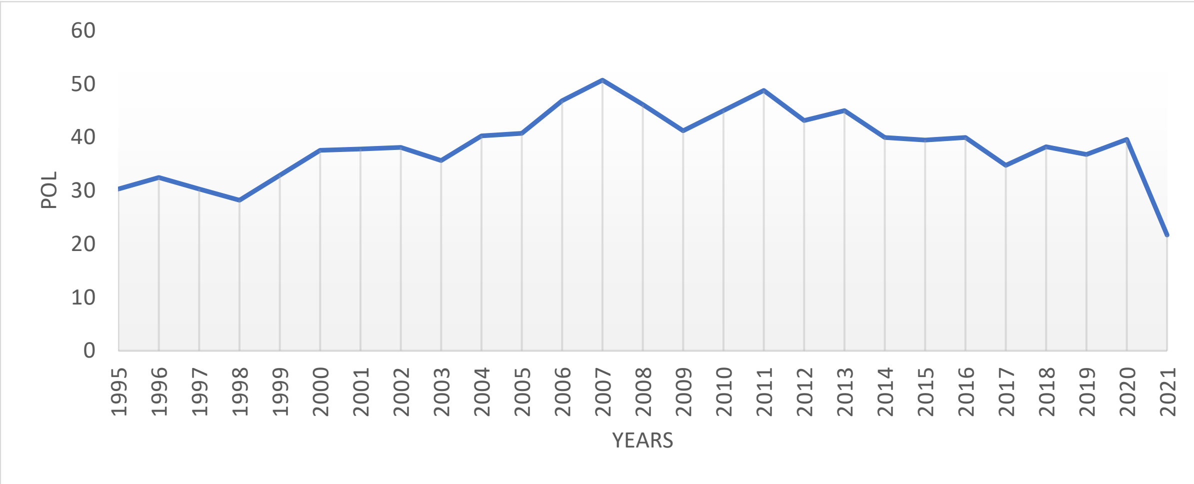

Figure 2.5: Political instability level in South Africa
Source: Author's compilation from World Bank data

Figure 2.5 depicts that the political instability level was lower in 1998 and started increasing in 1999. This might be due to the change of the President, as political party dynamics strongly affect political stability. The effect of political party dynamics on political instability is also reflected by the sharp decline from 2008 to 2009. The graph shows that the political instability started going up in 2010 which concurred with the change of the leadership in the country.

2.3 China

This subsection presents the trend analysis of China's growth, together with the macroeconomic variables under investigation.

2.3.1 Outlook of the economy

China’s economy is the world’s second-largest economy after the United States of America. The economy is characterised by rapid growth, strong global trade and constant transitioning of its economic policies and structures. The growth rate averaged 9% year on year since the country opened and reformed its economy in 1978 (World Bank, 2024). The Chinese economy has been flourishing even though is challenged by several issues such as an ageing population, high debt level, corruption and environmental issues (World Bank, 2021). The country also faced the power cuts that threatened economic growth. However, the government has always been working actively to mitigate this issue (Shen, Hove, Hu, Dupuy, Bregnbæk, Zhang, and Zhang, 2024).

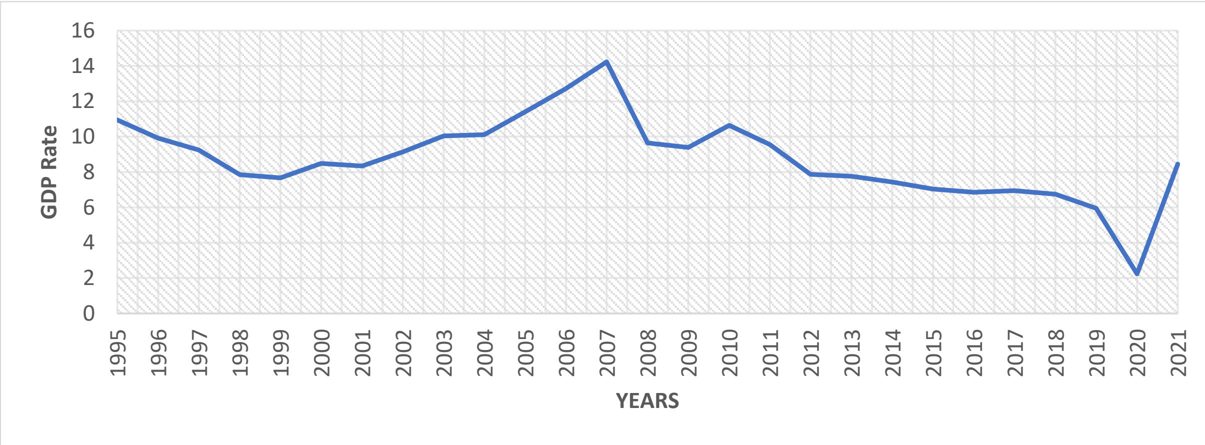

Figure 2.6: GDP Growth Rate in China
Source: Author’s compilation from World Bank data

Wong (2008) reflected that in 2007 the country experienced an unprecedented growth performance of 11% in the world’s history. The growth rate experienced in 2007 is unmatched and difficult to sustain. Therefore, it is prone to be followed by periods of downturns. In 2008 the growth rate was drastically affected by the global financial crisis that originated in the United States (Womack, 2017). Figure 2.6 exhibits that the 2008 global crisis left the Chinese economy in deep trouble as the growth rate has been on a downward trajectory since then. The lowest growth rate was experienced in 2020. That was no surprise as this is the period that the country and the world experienced lockdowns due to the COVID-19 pandemic.

2.3.2 Electricity Supply Outlook

The Chinese infrastructure has been battling with imbalances in the electrical system until mid-2000. The government had to create a highly fragmented grid system to try to enhance the electricity supply (Slotta, 2024). In 1998 the country experienced an electricity growth downturn, related to the Asian financial crisis (Lin, He, and Yuan, 2016; Lin and Liu, 2016). However, the government has carried out a scope of measures to address the difficulties presented by the nation's power area. These actions incorporate prompt activities to addressing blackouts and persistent endeavours to foster long-term solutions. In 2016, efforts were made to check the quick development of coal-terminated power plants due to environmental concerns (Shen, Hove, Hu, Dupuy, Bregnbæk, Zhang, and Zhang, 2024).

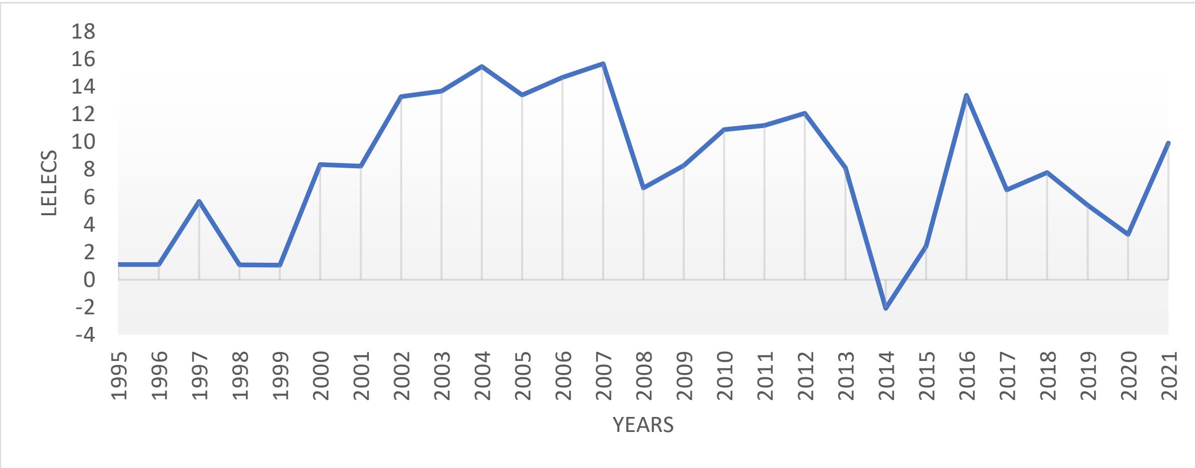

Figure 2.7: Electricity Supply in China
Source: Author’s compilation from World Bank data

The sharp decline depicted in Figure 2.7 in 1998 is associated with the electricity growth downturn that the nation experienced because of the Asian Financial crisis. In 2007 and 2016, the nation experienced a notable increase in electricity generation to meet its ever-growing energy demand. This explains the high electricity supply depicted on the graph in these two years. Bp (2022) reported that the country generated 8.5 petawatt-hours (PWh) of power in 2021, which accounted for almost 30% of global electricity production. Hence the graph shows an improvement in electricity supply during 2021.

2.3.3 The level of corruption

The Chinese economy is characterized by widespread corruption and an explosive economy. The country is known for having a history of high corruption levels, and exceptional economic growth. Although the economy is thriving even at a high corruption level, this does not mean it will be sustainable if corruption continues to increase. The President who used to be the General Secretary of the communist party, Xi Jinping tried to fight this issue by introducing anti-corruption campaigns in the party (McDonell, 2024). Xi wanted to clean up corruption in the party so that the overall Chinese economy could be clean. This is because Xi believed that many people who are likely to partake in corrupt activities are in the communist party. In 2012 Xi Jinping, declared corruption to be a threat to the party (Bakken and Wang, 2021). At that time China scored 39 out of 100 on the Corruption Perception Index.

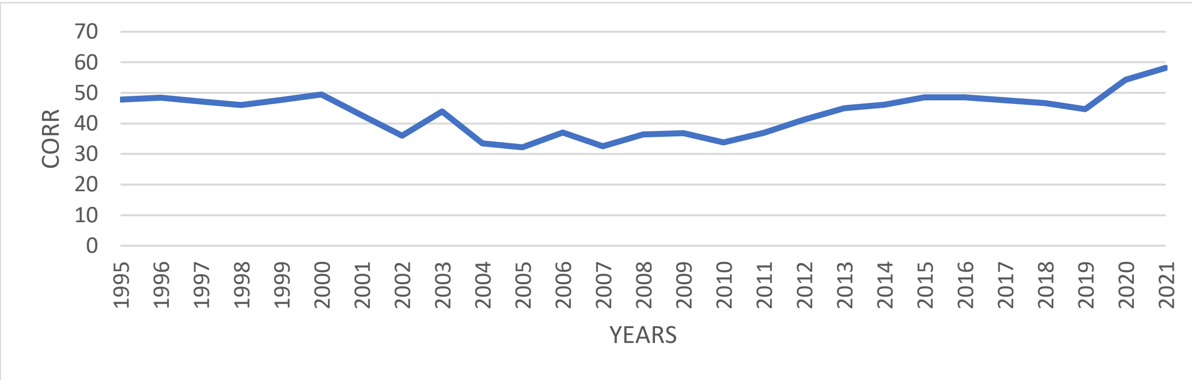

Figure 2.8: Corruption level in China
Source: Author's compilation from World Bank data

Figure 2.8 shows that the corruption level in China continues to increase. Although there are a few years that showed a reduction in corruption level, the corruption level remains high over time. By observing the graph, it seems like Xi's efforts to introduce anti-corruption campaigns in 2012 did not help much. The corruption level continued to increase even after 2012. This means that the country officials must work together to put more effort into suppressing corruption.

2.2.4 Political instability

China's political landscape has been characterized by a high degree of centralisation under the Communist Party of China, which has ruled since 1949 (He, Zhou, and Huang, 2016). However, in recent years, there has been increasing concern about political instability. While the country remains a one-party state with a firm grip on power, there have been internal challenges within the ruling party itself. particularly as the leadership under Xi Jinping has consolidated power to an unprecedented degree (Dickson, 2016). The political instability trend is shown in the figure below.

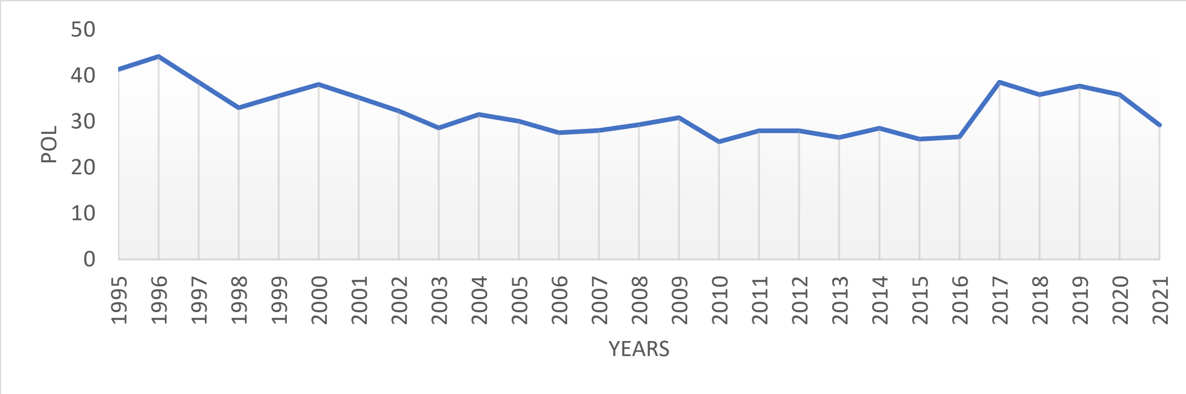

Figure 2.9: Political instability level in China
Source: Author's compilation from World Bank data

Figure 2.9 illustrates the political instability of China from 1995 to 2021. The line graph shows some periods of high political instability as the country has been experiencing some occasional regional unrest. In 2019 for instance, people of Hong Kong were protesting the extradition law. Hence the graph also demonstrates the increase in political instability in 2019. China's foreign policy in 2017, particularly in relation to territorial disputes in the South China Sea and its growing tensions with the United States, added to the political volatility in the nation (Cai, 2022; Lanteigne, 2019). This might be the reason why the country faced a notable political instability level in 2017.

2.4 Comparative analysis of South Africa and China

This subsection provides a comparative analysis of South Africa and China, utilizing all the variables examined in the study. It compares the economic growth trajectories of both countries and contrasts their macroeconomic variables to gain understanding of their behaviour.

2.4.1 Economic growth

Figure 2.10 illustrates the economic growth rates of South Africa and China. By plotting the data for both countries on a single figure, this visualization enhances clarity and facilitates a more straightforward comparison of their respective growth trajectories.

Following this graph, the analysis will delve into the implications of these trends and their significance within the broader context of economic performance.

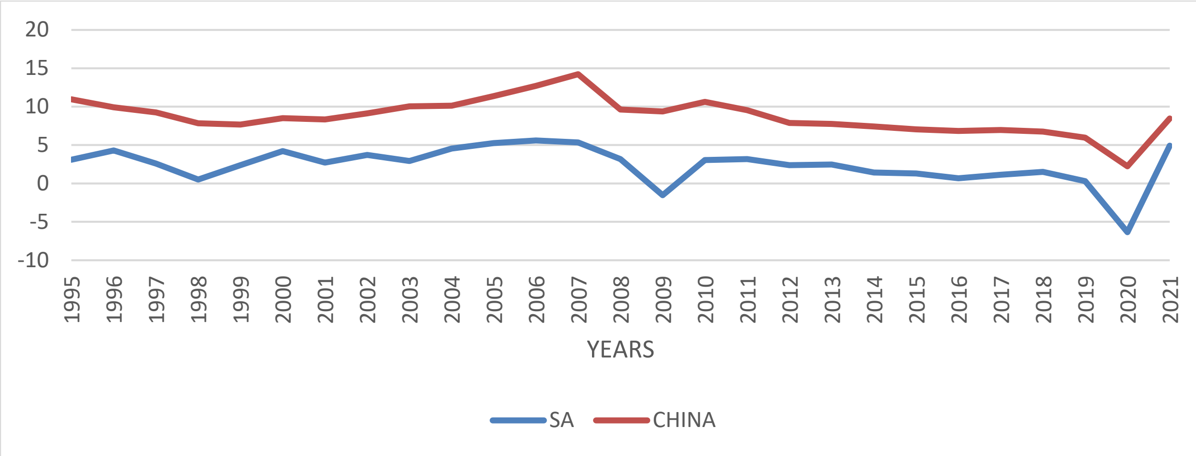

Figure 2.10: GDP growth rate

Source: Author's compilation from World Bank data

The line graphs in Figure 2.10 show that China's growth rate has always been more than South Africa. It is evident that both countries were affected by the same economic issues over time. This is so because both countries' growth rates mirror each other at every period. For instance, in 1998 both countries were affected by the Asian Financial crisis and in 2020 they were both affected by Covid 19 lockdowns. This shows that, even though these two economies differ in size they can still be comparable and yield relevant results.

Below are the sectors or industries that contributed to GDP in both countries.

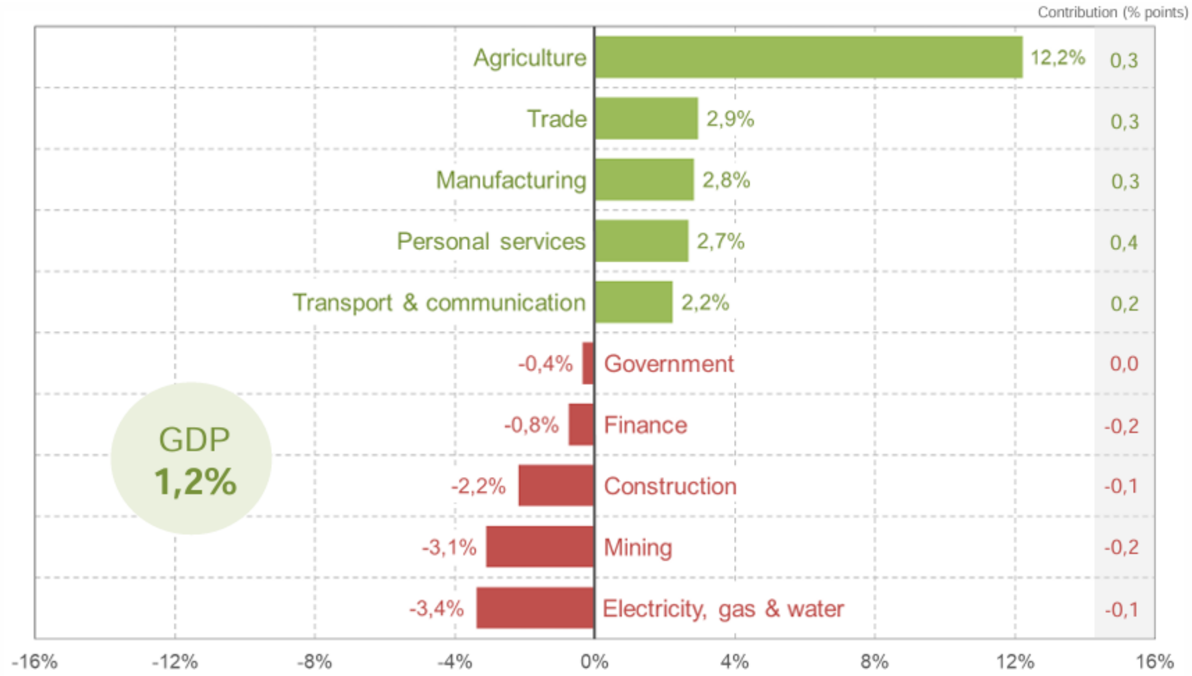

Figure 2.11 South Africa's GDP growth rate by sector

Source: Statistics South Africa 2022

Figure 2.11 illustrates that South Africa realised 1.2% growth in 2021 with Agriculture being the sector that contributed the most to the growth. The higher-than-usual rainfalls that occurred in 2021 boosted agricultural activity but unfortunately disrupted the mining operations at the opencast mines. Hence the mining sector recorded lower production figures. The electricity, gas and water supply industries are the sectors that significantly delayed the GDP growth rate of South Africa. Production was impeded by load shedding and infrastructural issues that affected both electricity and water distribution, resulting in a 3.4% reduction.

Table 2.2 China's Economy by Sector

Sector	2021 Total GDP (Yuan)	2021 Total GDP (USD)	% Share
Industry	¥37.3T	$5.9T	32.6%
Wholesale and Retail Trades	¥10.5T	$1.7T	9.2%
Finance	¥9.1T	$1.4T	8.0%
Farming, Forestry, Animal Husbandry, and Fishery	¥8.7T	$1.4T	7.6%
Construction	¥8.0T	$1.3T	7.0%
Real Estate	¥7.8T	$1.2T	6.9%
Transport, Storage, and Post	¥4.7T	$0.7T	4.1%
Information Transmission, Software and IT Services	¥4.4T	$0.7T	3.9%
Renting & Leasing Activities and Business Services	¥3.5T	$0.6T	3.1%
Accommodation and Restaurants	¥1.8T	$0.3T	1.6%
Others	¥18.1T	$2.8T	15.9%
Total	**¥114T**	**¥18T**	**100.0%**

Source: National Bureau of Statistics of China 2021

Table 2.2 presents the sectors that contributed to China's GDP and their overall contribution amounts and percentage share. Table 2.2. shows that the industrial sector which includes manufacturing and mining contributes more with a percentage share of 32.6%. The sector generated one-third of China's total economic activity, and it is the leading driver of the Chinese economy. Accommodations and Restaurants contributed the least to China's GDP as they were drastically affected by city lockdowns due to the COVID-19 pandemic.

2.4.2 Electricity supply

Figure 2.12 below illustrates the trends in electricity supply for both countries from 1995 to 2021, providing a basis for understanding the differences and similarities in their energy landscapes.

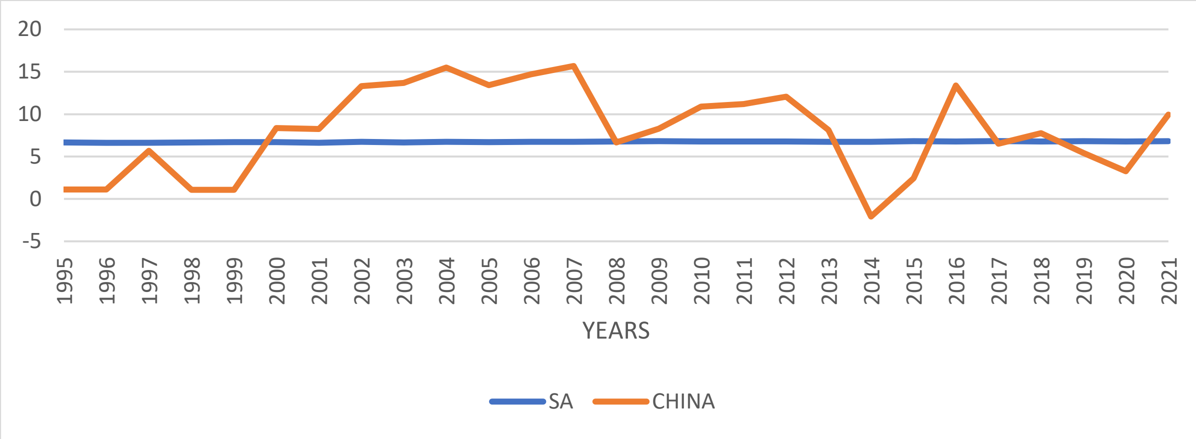

Figure 2.12: Electricity supply

Source: Author's compilation from World Bank data

Figure 2.12 shows that China's electricity supply changes over time whereas the one for South Africa is stable. The electricity supply in South Africa is changing by very small units, hence the changes are not visible on the line graph. This shows that if the electricity demand in South Africa constantly increases, the country will experience a power shortage. Due to this, it is important to also observe the changes in the population that have access to electricity in these two countries. The graph below shows the share of the population who have access to electricity from 1996 to 2021.

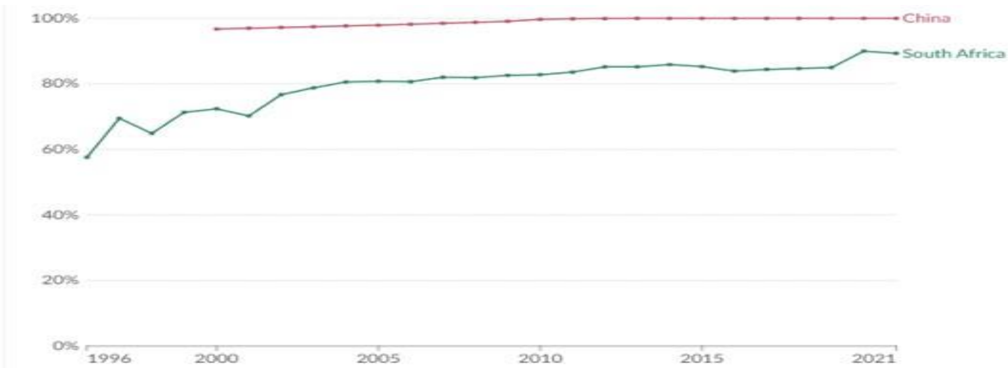

Figure 2.13 Share of the population with access to electricity

Source: Data compiled from multiple sources by the World Bank

Access to electricity means having a source of electricity that can provide basic lighting and charge a phone for at least four hours a day. Figure 2.13 shows that most of the population in China has access to electricity, and the change has been almost stable over the years. The population with access to electricity is gradually increasing in South Africa with over 80% of the population having access to electricity from 2007. It appears that South Africa experienced power shortages because more people are getting electricity connections, but the electricity supply is not increasing. This also shows that China is in a better position as the number of people with access to electricity is not significantly increasing.

2.4.3 The Level of Corruption

South Africa and China are currently characterised by high levels of corruption, which are known to adversely affect economic performance. Figure 2.14 below illustrates the corruption levels in both countries from 1995 to 2021.

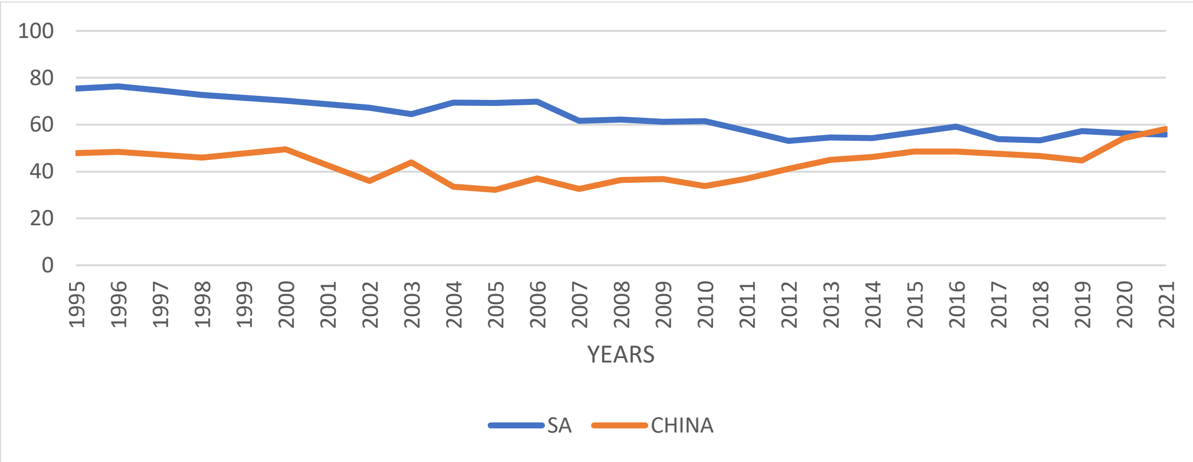

Figure 2.14: Corruption level

Source: Author's compilation from World Bank data

Figure 2.14 shows that South Africa had the worst corruption level in the past compared to China. The figure shows that the corruption level in South Africa is decreasing over time, whereas the corruption level in China is increasing. This trend led to the two countries having equal corruption levels in 2021. This shows that South Africa's efforts to fight corruption might be more effective than those of China. The efforts that South Africa undertook include the inception of the Corruption Watch in 2012, and the development of the National Anti-Corruption Strategy 2020-2030 which aims to uncover wrongdoing, including wide-ranging acts of fraud and corruption across state institutions (Department of Planning, Monitoring and Evaluation, 2021). Conversely, China developed a massive anti-corruption campaign that focused not only on tigers (high-ranking corrupt officials) but also on flies (low-ranking corrupt officials) when trying to sweep corruption in the state, CPC party and enterprises (Yang, Milanovic, and Lin, 2024; McDonnell, 2024).

2.3.4 Political Instability

Figure 2.15 below illustrates the trends in political instability for both countries from 1995 to 2021. Additionally, the analysis incorporates an examination of the government regimes in each country, providing a comprehensive understanding of the factors influencing political stability.

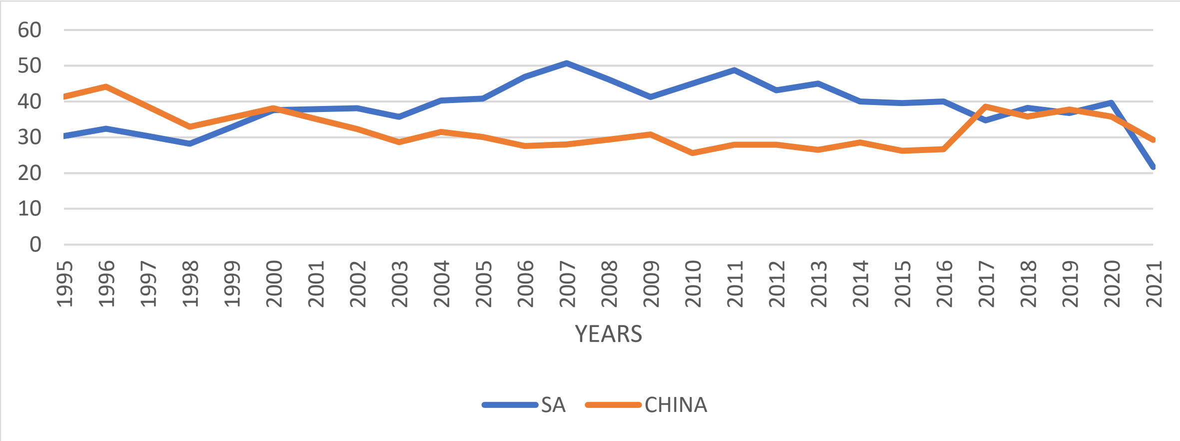

Figure 2.15: Political instability

Source: Author's compilation from World Bank data

Figure 2.15 demonstrates that South Africa had more periods of high political instability than China. This is expected as the nature of the two governments is different. Given that South Africa has many political parties that influence the overall political instability, it is likely to have higher political instability compared to a single-party country. Even though China's political stability has been better than that of South Africa for years, Figure 2.14 shows that both countries had almost the same level of political instability from 2017 to 2021.

It is essential to look at the governing regimes for both countries as they have a significant impact on the political stability of a country. South Africa is governed under a democratic republic while China is under communism with the Communist Party of China as the ruling party (Hu, 2018; Mc Lennan, 2018). The South African Constitution provides a strong emphasis on human rights and democratic principles. Conversely, the Constitution of the People's Republic of China's 1982 emphasises the leadership of the communist party and prioritises the protection of collective rights over individual rights. The constitutions and governments of both countries are different. This may elucidate why China's political stability has been comparatively stronger during most periods.

2.5 Chapter Summary

This chapter presented a brief overview of the economies of South Africa and China, interrogating some key economic fundamentals which affect these two economies as dictated by the study. The focus was more on the trend of electricity supply, corruption level and political instability, as the aim was to observe how these links with growth rate. The of South African electricity supply was seen to be constant over time, which would make it difficult to establish its clear association with growth rate. Nonetheless, the chapter provided that the electricity supply shortage might affect the growth rate indirectly through unemployment. Both countries were also seen to be struggling with corruption and political instability, with China experiencing an increase in these issues in recent years. From the comparative analysis, it is evident that these two economies are comparable and can learn from each other.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

This chapter provides the theoretical framework, and empirical literature related to the study.

3.2 Theoretical framework

The study is based on the new growth model, marginal productivity and rent-seeking theories. These theories are presented below.

3.2.1 New growth model

Romer (1994) contends that new growth theory, also known as endogenous growth theory, holds that economic growth is driven largely by internal factors and not external factors. The theory suggests that investment in information, innovation, and human capital plays a significant role in promoting economic growth. The new growth theory mostly holds that the long-run growth rate of an economy depends on policy measures (Milanzi, 2021). The theory suggests that it is essential for government to intervene in the economy. That means political decisions can significantly affect the long-term growth rate of an economy.

This theory also suggests a reliable and steady connection between the amount of capital stock and output. It also states that investing immediately alters the existing capital stock to the intended level. Ledwaba (2022) asserts that the new growth theory can assist policymakers in advising the government that increased investment in inputs is necessary for the economy to grow. Therefore, policymakers can advise the government to invest in productivity inputs which are electricity and management as they can improve economic growth. South Africa and China face varying levels of energy insecurity. South Africa has experienced significant electricity supply shocks due to ageing infrastructure and financial difficulties in Eskom. Electricity shocks, such as power outages or supply disruptions, reduce firms' ability to operate efficiently, lower productivity, and hinder innovation. In this sense, electricity disruptions directly affect the endogenous drivers of growth by limiting access to critical resources for firms. So, both countries need to foster good governance to create a conducive environment for investment in human capital and productivity infrastructure such as electricity. Furthermore, the government should better manage debt levels and money supply to stimulate growth as the theory suggests that government intervention is important in the economy. High debt levels and excessive money supply may constrain the capacity of governments to invest in key growth areas like electricity infrastructure, human capital, and technological innovation.

3.2.2 Marginal productivity theory

The Marginal productivity theory is a mathematical function that depicts the relationship between the physical inputs utilised by a firm and the physical output generated during the production of goods. It highlights the need for all four factors of production - land, labour, capital, and enterprise to be present for maximum production. In simpler terms, it outlines a method for efficiently combining these factors at a given time using a specific technology to produce the most goods possible. The function evolves with changes in technology. In the 1840s, J.H. Von Thünen developed the proportions of the first variable in this function.

In 1988, John Bates Clack received credit for being the first to develop the marginal productivity theory (Gordon, 2011). The theory addresses some of the most vital economic ideas. The ideas include the link between commodity prices and the prices (or wages or rents) of the productive factors used to produce them, as well as the link between commodity prices and productive factors, on the one hand, and the quantities of commodities and productive factors produced or used, on the other (Reder, 1947). In the context of this study, the theory suggests that higher electricity prices can reduce productivity or electricity supply and economic growth since electricity is a critical input in many industries. This theory also highlights that inflation can negatively impact productivity and ultimately decrease growth.

In South Africa and China, electricity supply is a critical factor in the productivity of industries and services. When the electricity supply is stable and abundant, the marginal product of capital is higher, meaning that additional machinery, labour, and technology investments can generate higher outputs. Conversely, electricity shocks, such as supply disruptions or insufficient energy infrastructure, decrease the marginal productivity of capital by reducing the capacity of industries to function efficiently. For instance, in industries like manufacturing or mining, where South Africa and China have large sectors, power outages can cause severe disruptions, leading to underutilisation of productive capacity, lower output, and ultimately slower economic growth.

3.2.3 Rent-seeking theory

The concept of rent-seeking was originally introduced by Tullock (1967) and later popularised by Krueger (1974). This notion stemmed from the investigations of Adam Smith, widely recognised as the founder of economics. The concept uses an economic interpretation of "rent," which refers to financial wealth acquired by astute or potentially cunning exploitation of resources. According to Smith (1776), there are three ways for entities to generate income: through wages, profit, and rent. Making a profit typically involves taking a risk by investing capital to obtain a return. Earning wages achieved through employment. On the other hand, generating rent is the least risky of the three income sources and may require minimal investment. Over time, the concept of economic rent has come to refer to receiving payment greater than the costs incurred to a particular resource. As a result, entities may engage in rent-seeking behaviour to acquire economic rent without reciprocally contributing to production (Lambsdorff, 2002).

One type of rent-seeking activity is corruption, which involves private individuals seeking to further their interests by gaining preferential treatment. Corruption, like other forms of rent-seeking, is a method of circumventing market forces or the invisible hand and influence over policies for personal gain (Aidt, 2016). Widespread corruption can reduce public confidence in the government, threaten the rule of law, and foster an atmosphere of impunity where individuals in positions of authority can act unlawfully. Due to their potential to deter investment, stifle entrepreneurship, and worsen income inequality, these consequences can further slow economic growth (Murphy, Shleifer and Vishny, 1993). In countries like South Africa and China where electricity supply is already a critical input for economic development, rent-seeking behaviour could undermine the provision of reliable energy infrastructure, by diverting public funds or by creating an environment where electricity provision becomes the subject of political favouritism and manipulation. Political instability also exacerbates rent-seeking behaviour as the unstable political systems create opportunities for firms to engage in short-term, opportunistic behaviour aimed at capturing resources before the political environment shifts again. So, to encourage enduring economic growth in South Africa and China, it is critical to lessen the opportunities for rent-seeking behaviour. The two economies should strengthen the institutions that support accountability and transparency and ensure that economic policies are founded on sound economic policies. By taking such actions, the two countries economic growth is anticipated to improve.

3.3 EMPIRICAL LITERATURE

This section provides an overview of the relevant literature. The review of empirical studies is structured to align with the specific objectives of the research, ensuring it is both relevant and consistent.

3.3.1 The effects of electricity supply on economic growth

Relevant to the work at hand, Stungwa (2022) used the ARDL technique when conducting a study on the supply and consumption of electricity in South African growth prospects from 1971 to 2014. The independent variables used in the study were electric consumption, electricity production from renewable sources and non-renewable electricity. Their results discovered that electricity consumption has a positive significant impact on economic growth in the short run, whereas electricity production from both renewable and non-renewable electricity output revealed a significant negative impact on economic growth in the short run. In the long run, electricity generation from renewable sources revealed a positive influence on growth. Whereas electric consumption and electricity generation from non-renewable were insignificant. According to these results, the study suggests that South Africa must promote policies that will increase renewable electricity generation in the long term to stimulate economic growth.

Khobai, Mogano and Le Roux (2017) examined the association between electricity supply and economic growth using annual data from 1984 to 2014. They used the ARDL technique to test for the relationship in South Africa. The short-run and long-run results both indicated that electricity supply has a positive impact on economic growth while electricity prices have a negative impact on economic growth. The long-run results were the only significant result. The ECM showed that 82,06% of the disequilibrium is corrected in the next period. Noteworthy, to the knowledge of authors, when looking at related studies theirs was the first in South Africa to incorporate electricity supply. Mazambani (2015) investigated the effects of electricity prices on economic growth from 1986 to 2013. The country investigated was South Africa using a VECM technique. Their results revealed a long-run negative relationship between electricity prices and economic growth.

In Pakistan, Arshad, Zakaria and Junyang (2016) investigated the link between economic growth and energy prices utilising quarterly data from 1991 to 2011. The GMM technique was used, and their results revealed that energy prices positively affect economic growth through their impact on government consumption and real interest rate, while it adversely affects growth through investment, stock prices, unemployment and real exchange rate. In addition, the results further revealed that stock prices, real exchange rates, government consumption, and unemployment account for most of the effect of energy prices on economic growth. Therefore, the study suggests that policymakers in Pakistan should put in place adequate policies to manage energy prices to improve growth.

3.3.2 The impact of governance on economic growth

Zeeshan, Rehman, Ullah, Hussain and Afridi (2022) examined the nexus between corruption, political instability, natural resources and economic growth in Pakistan for 1996 to 2018 period. The technique used was the ARDL approach and the findings revealed that political instability and corruption adversely affect economic growth in the long run while corruption increases economic growth in the short run. Based on the findings, the study recommended policies to prevent rent-seeking and patronage acts, intending to produce a more transparent atmosphere in the country, which will resultantly limit the visible issues of political instability. The suggested policies are projected to enhance Pakistan's economic growth.

Kaplan and Akçoraoğlu (2017) used the panel data system, GMM to investigate the relationship between economic growth and a group of political instability factors which include corruption, bureaucracy quality, internal and external conflicts, government instability, ethnic tensions and religious, and democratic accountability. The countries investigated were OCED countries for the period spanning from 1984 to 2012. The results revealed that internal and external conflicts, corruption, and government stability deter economic growth while other variables have no significant statistical impact on economic growth. Overall, these results strongly suggest that political instability affects economic growth negatively therefore strong reforms must be taken to deal with political instability.

D'Amico (2015) undertook a study to investigate the effects of the level of corruption at the provincial level in China from 1998 to 2003. The findings strongly suggest that corruption has a negative impact on economic growth and the provinces of China can benefit by capping down corruption. The study used a model developed by Robert Barro (1998) to arrive at these results.

3.3.3 Causality among electricity, governance indicators and economic growth

Stungwa (2022) tested for causality among electricity production, electricity consumption and economic growth in South Africa using the Granger causality from 1971 to 2014. The results revealed no causality between electricity production and economic growth, between electricity consumption and economic growth. In China, Song, Song, Zhao, and Wang (2017) added to the body of literature when they were studying coal prices, power supply, and economic growth in China for the period 1996 to 2011. They tested for causality among variables using a bootstrapped Granger causality test. They found unidirectional causality resulting from coal price to power supply and from power supply to economic growth, and bidirectional causality between economic growth and coal price.

Zeeshan, et al., (2022) tested for causality using block Exogeneity and Granger causality tests to investigate the relationship between corruption, political instability and economic growth. They examined the country of Pakistan over period spanning 1996 to 2018. The results for Granger causality revealed bidirectional causality between political instability and economic growth and unidirectional causality between corruption and economic growth resulting from corruption.

Azam, Rafiq, Shafique, Ateeq, and Yuan (2020) explored the causality relationship between electricity supply and economic growth in Pakistan for the period spanning from 1990 to 2015. The study also added gross capital formation, export and investment as supporting variables which enabled to prove unidirectional causality between electricity supply and economic growth resulting from economic growth.

Therefore, these results infer that economic growth in Pakistan is culpable to an increasing electricity supply.

Dalyop (2019) also explored the causal relationship between political instability and economic growth in their study “Political instability and economic growth in Africa”. The writing explored 52 African countries for the period spanning from 1980 to 2013. The findings revealed a strong bi-directional causality between political instability and the level of growth in interrogated countries. Bass (2018) was interested in proving that electricity supply is a catalyst for economic growth, so they explored the causal relationship between electricity supply and economic growth in Russia from 1990 to 2017. They found a unidirectional causality from electricity supply to economic growth and concluded that electricity supply is essential for boosting economic growth in Russia in the long run.

The paper of Bah and Azam (2017) contributed to the literature of causal relationship between electricity and economic growth. The work investigated the causal relationship between electricity consumption and economic growth in South Africa for the period spanning from 1971 to 2012. The variables used were electricity consumption, financial development, CO_2 emissions, and economic growth. The results revealed no evidence of causal relationship between electricity consumption and economic growth. The study additionally found a unidirectional causality resulting from CO_2 emissions to electricity consumption and a unidirectional causality from financial development to CO_2 emissions. Consequently, the study recommended that policymakers establish strong plans to improve investment in the electricity sector to ensure reliability of electricity supply. It was further recommended that policymakers address persisting environmental issues by moving towards a renewable energy generation. This is expected to improve the economic growth of South Africa significantly.

3.3.4 The response of economic growth to electricity shocks

Dakpogan and Smit (2018) investigated the effects of electricity shocks on economic growth in Benin from 1971 to 2014. The study was motivated by electricity shortages that Benin experienced in the 1980s, 1990s, and 2000s. The study used electricity consumption and economic growth as the main variables in the study. The asymmetric approach was used to test the data, and the findings revealed that negative electricity shocks affect economic growth negatively. The study concluded by emphasising the importance of policies of electricity that improve electricity supply. Consequently, the study recommended that the country reduce its dependence on imported electricity to improve electricity supply and economic growth.

Aytaç and Güran (2011) explored the response of economic growth to shocks from electricity consumption and electricity prices in their investigation of the association between electricity prices, electricity consumption, and economic growth in Turkey. They employed two analytical tools, namely, impulse response function and variance of decomposition using data from 1984 to 2007. The findings from the impulse response analysis indicated that economic growth responded positively to its shock. Furthermore, the results indicated that in response to shocks from electricity prices, economic growth initially exhibited a negative response, followed by a period of stability, before finally reverting to a negative response. Based on variance of decomposition results, economic growth in both short and long terms, is mostly affected by its shocks, and electricity prices have little influence.

3.4 Literature Assessment

The literature reviewed shows areas of agreement with the proposed theories. The New growth theory suggests that investing more in input products such as electricity will improve economic growth. This theory infers that electricity supply is positively related to economic growth. The empirical findings from the literature are in concur with this theory. The study of Stungwa (2022) and Khobai, Mogano and Le Roux (2017) established that the increase in electricity supply improves economic growth. The Marginal Production theory highlighted that; high electricity prices can affect electricity production which will ultimately slow economic growth. The findings of Arshad, Zakaria and Junyang (2016) and Mazambani (2015) agree with this theory. The Rent-seeking theory was supported by the study of Zeeshan, Rehman, Ullah, Hussain and Afridi (2022), Kaplan and Akçoraoğlu (2017), and D'Amico (2015). The theory suggested that corruption and political instability are detrimental to the growth of the economy. The supporting studies also found a negative relationship between corruption, political instability and economic growth.

The gaps that were noted from the literature review is that the topic at hand was seldomly explored. There is a need for more studies on this topic. The reviewed studies also did not explore diverse econometric techniques in their investigation. There are very few studies that included the Impulse Response Function and Variance of decomposition techniques in their research. In addition, the studies which included these techniques focused only on electricity consumption and electricity prices and not electricity supply. This study uses diverse econometric techniques and focus more on electricity supply and governance indicators.

3.5 Chapter Summary

This chapter started by providing three theories underpinning the study, namely, New Growth Model, Marginal Productivity theory, and Rent-seeking theory. The choice of theories was guided by the main macroeconomic variables used in the study. The theories shed light on the expected relationship between economic growth and dependent variables which are electricity supply, corruption and political instability. After outlining the theories, the chapter reviewed the empirical literature related to the topic to observe the findings of previous scholars. The reviewed literature suggested that electricity supply is positively related to economic growth, whereas corruption and political instability are negatively related to economic growth in the long run. The causality results from different researchers revealed different findings. An essential gap in the literature that reflects the response of economic growth to electricity shocks was seldom explored and the reviewed literature focused on electricity consumption and electricity prices. The chapter concluded by assessing the literature reviewed against proposed theories.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This study employed econometric techniques to empirically analyse the effects of electricity shocks and governance indicators on the growth prospects of South Africa and China. As such, this chapter presents the procedures used to achieve the study aims and objectives. Moreover, this chapter provides insight into the data sources, model specification and estimation techniques.

4.2 Data

The study used secondary annual time series data from 1995 to 2021 for South Africa and China. The chosen data period was influenced by the availability of data in both countries. The GDP, corruption, political instability, debt and money supply data of both countries was sourced from the World Bank website. The South African electricity supply data was collected from Quantec Easy Data and that of China is from Federal Reserve Bank-St Louis. Inflation data of both countries was sourced from the Federal Reserve Bank-St Louis. The variables in the study were chosen based on data availability for the two countries.

4.3 Model specification

This study conducts a comparative analysis between South Africa and China, employing two proposed multivariate linear regression models. These models are derived from a combination of the primary framework established by Khobai et al. (2017) and the model utilised by Zeeshan et al. (2022). Notably, the current study omits electricity prices from the Khobai et al. (2017) model due to limitations in data availability and excludes natural resources from the Zeeshan et al. (2022) model, as this variable is not relevant to the objectives of the current investigation. The functional forms of the models are presented as follows:

$$GDP_{SA} = f(ELECS, CORR, POL) \quad (4.1)$$

$$GDP_{CHN} = f(ELECS,\ CORR, POL) \quad (4.2)$$

Whereby in both functional models,

- GDP, represents Gross Domestic Product in real terms (the GDP of SA is collected in percentages and the GDP of China is collected in monetary values).
- $ELECS$, represents electricity supply (total percentage of electricity production from coal sources).
- $CORR$, represents the level of corruption (Corruption is measured as an index from 0 to 1, with 1 reflecting absolute corruption).
- POL, denotes the level of political instability (measured in percentage of absence of violence and political stability ranking from 0 to 100 with 0 corresponding to the lowest rank and 100 corresponding to the highest rank).
- The subscript 'SA' (4.1) represents South Africa while 'CHN' (4.2) represents China to differentiate the two countries' models.

To improve estimate and standardisation, the variables that were not collected in percentages were transformed into natural logarithms. Therefore, the linear equation for this model is presented as:

$$\mathrm{GDP_{SAt}} = \beta_0 + \beta_1 \mathrm{LELEC\ S_t} + \beta_2 \mathrm{CORR_t} + \beta_3 \mathrm{POL_t} + \varepsilon_t \quad (4.3)$$

$$L\mathrm{GDP_{CHNt}} = \beta_0 + \beta_1 \mathrm{LELEC\ S_t} + \beta_2 \mathrm{CORR_t} + \beta_3 \mathrm{POL_t} + \varepsilon_t \quad (4.4)$$

The study also adds the control variables to enhance the validity and reliability of the model. A control variable is a variable that is not of interest to the study's objectives but is controlled as it could affect the outcomes (Bhandari, 2022). Inflation, debt, and money supply are selected as control variables due to their crucial role in shaping macroeconomic conditions and influencing economic growth. Inflation is controlled for because it directly affects the real value of key economic variables, such as wages, capital, and output. According to the Marginal Productivity Theory, inflation can distort the real returns to labour and capital by altering the cost structure of production inputs. Failure to account for inflation may lead to the erroneous attribution of changes in economic growth to factors such as electricity supply shocks or governance issues, when, in fact, inflationary pressures may be the primary driver affecting the marginal productivity of capital and labour. By incorporating inflation as a control variable, this study ensures that the observed effects on economic growth are not confounded by the distortions caused by price instability.

Debt is also included as a control variable because it directly affects a country's fiscal policy and ability to respond to economic shocks. The elevated debt levels can limit government spending on essential areas such as infrastructure development and public services, including energy supply (Budget Review, 2024). From the standpoint of the New Growth Theory, sustainable economic growth depends on sufficient investment, which can be undermined by fiscal constraints caused by high debt (Baldacci, Gupta, and Mulas-Granados, 2015; Ayadi and Ayadi, 2008). Furthermore, the Rent-Seeking Theory suggests that excessive debt may be exacerbated by poor governance, leading to inefficient allocation of resources and a decline in overall economic performance (Stephane, 2024). By controlling for debt, the study isolates the impact of electricity supply and governance from potential fiscal distortions that could affect growth.

The money supply is another important control variable, as fluctuations in the money supply can serve as a policy response to economic shocks, such as those induced by disruptions in the electricity supply. Additionally, the money supply can be influenced by governance factors, including the effectiveness of government management of monetary policy. From the perspective of the New Growth Theory, monetary policy plays a crucial role in shaping economic growth by influencing investment in innovation and human capital. By controlling for the money supply, this study mitigates the potential influence of policy responses to economic shocks and governance-related factors that could misrepresent the relationship between electricity supply, governance, and economic growth.

After adding the control variables, the standard model then becomes:

$$\mathrm{GDP_{SAt}} = \beta_0 - \beta_1 \mathrm{LELEC\ S_t} - \beta_3 \mathrm{CORR_t} - \beta_3 \mathrm{POL_t} + \beta_4 \mathrm{INF_t} + \beta_5 \mathrm{DEBT_t} + \beta_6 MS_t + \varepsilon_t \quad (4.5)$$

$$L\mathrm{GDP_{CHNt}} = \beta_0 - \beta_1 \mathrm{LELEC\ S_t} - \beta_3 \mathrm{CORR_t} - \beta_3 \mathrm{POL_t} + \beta_4 \mathrm{INF_t} + \beta_5 \mathrm{DEBT_t} + \beta_6 MS_t + \varepsilon_t \quad (4.6)$$

Whereby:

β_0 is a constant intercept, β_1, β_2, β_3, β_4, β_5, and β_6 are the coefficients of the estimated model. ε_t is the error term that intends to capture unaccounted variables that affect GDP.

4.4 Estimation techniques

The study uses the time series economic technique called the Autoregressive Distributed Lag (ARDL) to investigate the effects of electricity shocks, corruption and political instability on economic growth. The following techniques, Unit root test (informal and formal), ARDL cointegration test, Granger causality test, diagnostic test, stability test, Variance of decomposition and impulse response function were employed to achieve the objectives. The statistical package; EViews 12 is used to run all the tests.

4.4.1 Stationarity/Unit Root Test

Unit root tests are tests for stationarity in a time series. A time series is stationary if a shift in time does not cause a change in the shape of the distribution (Everitt & Skrondal, 2010). When dealing with time series data, the first step is to test for the unit root of the series to avoid having spurious issues which are listed by Stepanie (2016) as:

- Spurious regression: You might get high r-squared values even if the data is uncorrelated.
- Errant behaviour: There might be errant behaviour due to assumptions for analysis being invalid. For example, t-ratios will not follow a t-distribution.

According to Pesaran, Shin and Smith (2001), Variables should be tested for statonarity before running cointegration. For cointegration to exist, the variables must be stationary at level or first difference. Stationarity can be tested informally through visual inspection or formally through several unit root test techniques. The study uses both the informal and formal unit root tests to test for stationarity. For the formal unit root test, the study uses the Augmented Dickey-Fuller and Philips-Perron tests.

4.4.1.1 Visual inspection

Visual inspection is the method of testing stationarity through graphs or correlograms. Data plotting will be done on variables to check the stationarity of the model. If a line graph is hovering around the mean of zero (where the straight line can be drawn), covariance is constant and variance is constant, then we can conclude that the model appears stationary. According to Mah (2013), this approach gives an initial indication of the nature of the time series. Shrestha and Bhatta (2018) added that graphs are the preliminary tools used to get a rough idea of the stationarity of the variables, so statistical tests are still needed to verify the visual inspection results.

4.4.1.2 ADF unit root test

The original Dickey-Fuller test presumed that all the error terms are uncorrelated. Dickey and Fuller (1976) formulated an enhanced version of the Augmented Dickey-Fuller (ADF) test to cope with the possibility of the error term correlation. This new test is applied to models that include lagged values of dependent variables to control the serial correlation in the error term.

The ADF test is based on the null hypothesis that a series is not stationary (that is has a unit root) against the alternative that it is stationary. If the null hypothesis is rejected, then the study can conclude that the time series is stationary. A time series is stationary if the mean and auto-covariance do not depend on time. A series that achieves stationarity after first differencing is said to have a unit root, and to be integrated of order one. The ADF approach tests for a unit root, and controls for higher-order serial correlation in a series (Shafuda, 2015).

The first-difference terms, a constant, and a linear time trend are included in the ADF test specification. The ADF requires a determination of the order of integration of the variables of interest and is given by the following equation:

$$\Delta X_t = \alpha + bX_{t-1} + \sum cj\Delta X_{t-1} + e_t \quad (4.7)$$

Where, X_t, Denotes the respective variables of interest, Δ is the difference operator, while a, b and c are parameters to be estimated. The tests are based on the null hypothesis (H_0) : X_t, contains a unit root. If the calculated ADF statistics are less than their test critical values (1%, 5% and 10%) then the null hypothesis (H_0) is rejected and the series is stationary. Dickey and Fuller (1979, 1989) devised this procedure of formally testing for non-stationarity (unit root). The key insight of their argument is that testing for non-stationarity is equivalent to testing for the existence of a unit root (Shafuda, 2015).

4.4.1.3 Philips-Perron test

The Phillips-Perron (PP) unit root test is a different approach for testing unit roots in models that have weakly dependent errors. The test was formulated by Phillips (1987) and Phillips and Perron (1988) as a substitute for the ADF test, in the analysis of time series data. Unlike the ADF technique, which utilises a parametric auto-regression to approximate the ARMA structure of errors in the test regression, the PP unit root test adjusts the test statistic to handle serial correlation and heteroscedasticity issues. This allows the test to be conducted even in the presence of serially correlated errors without requiring additional lags of the dependent variable (Phillips & Perron, 1988). The test regression for the PP tests is:

$$\Delta_{yt} = \acute{\beta} D_t + \pi y_{t-1} + u_t. \quad (4.8)$$

where u_t is I (0) and may be heteroskedastic. The PP tests correct for any serial correlation and heteroskedasticity in the errors u_t of the test regression by directly modifying the test statistics $t_{\pi=0}$ and $T_{\hat{\pi}}$ (Philips & Perron, 1988). The advantage of the PP test is that it assumes no functional form for the error process of the variable which means that it applies to range of problems, although it can perform poorly in small sample sizes (Davidson & Mackinnon, 2004).

The null hypothesis tested by the PP is the same as that in the ADF test, which is the presence of a unit root in the time series.

4.4.2 Autoregressive Distributed Lag Modelling Approach

The study chose to utilise the ARDL model due to its flexibility in handling mixed integration order variables and its robustness when modelling small sample sizes. Unlike other cointegration techniques, which may require larger datasets to produce reliable results, the ARDL approach provides efficient and consistent estimators even with a limited number of observations (Menegaki, 2019; Nkoro and Uko, 2016). This is particularly advantageous in this study because the data employed span from 1995 to 2021.

When applying the ARDL model in the study, the first step is to test for cointegration among the variables. Granger (1981) and Engle and Granger (1987) developed the first tests and estimation procedures of cointegration to formalise the concept of cointegration. The tests were used to assess the presence of long-run relationships between a group of variables inside a dynamic specification framework. To achieve the analysis's stated goal, the bounds test advocated by Pesaran, Shin and Smith (2001) are used in this study to determine if the set of variables is co-moved in the long run. The bounds test for co-integration is chosen over other techniques supported by Johansen and Juselius (1990), Engle and Granger (1987), and others because just like ARDL, it is effective when utilising a small sample size series and different orders of integrated variables.

The bounds test provides crucial values for the lower and upper boundaries. To determine the long-run connection among variables, critical values are compared to the estimated F-statistics. According to Pesaran et al (2001), if the estimated F-statistics are more than the upper critical boundaries test, then the null hypothesis of no co-integration should be rejected, showing that co-integration exists. Co-integration demonstrates that the variables have a long-run connection. If the estimated F-statistic falls between the two bound conditions, the co-integration is inconclusive (Pesaran et al, 2001). After the cointegration is established, the study will estimate the long run and short run error correction model (ECM) relationship.

The equation of ARDL (m, n) is presented by Chetty (2018) as follows:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \cdots + \beta P Y_{t-m} + a_0 X_t + a_1 X_{t-1} + a_2 X_{t-2} + \cdots + a_q X_{t-n} + \varepsilon_t \qquad (4.8)$$

Whereby, *m* and *n* represent the number of years for the lag, ε_t is the error term and βi's denotes coefficients for short-run relationship and αi's are coefficients for the long-run relationship.

The ECM analysis, the last step when using the ARDL modelling approach is used to determine the models' dynamics around short-term and long-term trends. It captures how the variables adjust to deviations from their long-term equilibrium, indicating the speed and direction of these adjustments (Silvia, Sihotang and Sihotang, 2023; Hadi, Zainuddin, Hussain and Rehan, 2019). It also models the temporary or short-term fluctuations and how past errors or shocks influence current changes in the variables (Martinez-Martin, 2016). The ECM equation can be represented as follows:

$$\varDelta Yt = \sum_{i=1}^{n} \beta oi\varDelta Y_{t-i} \ + \sum_{i=1}^{n} \beta_{1i}\varDelta X_{t-i} \ + \sum_{i=1}^{n} \beta_{2i}\varDelta X_{t-i} \ + \sum_{i=1}^{n} \beta_{ji}\varDelta X_{t-i} \ + SECM_{t-1} + u_t$$

(4.9)

Therefore, for both models,

$$\varDelta GDPt = \sum_{i=1}^{n} \beta oi\varDelta GDP_{t-i} \ + \sum_{i=1}^{n} \beta_{1i}\varDelta ELECS_{t-i} \ + \sum_{i=1}^{n} \beta_{2i}\varDelta CORR_{t-i} \ + \sum_{i=1}^{n} \beta_{ji}\varDelta POL_{t-i} \ + \cdots + SECM_{t-1} + u_t \quad (4.10)$$

Where ECM_{t-1} denotes the lagged error correction term. In this study, ARDL is used to address the first and second objectives which are to investigate the long and short-term relationship between variables in the two set models of SA and China.

4.4.3 Granger causality analysis

Granger causality is a quantifiable notion of causality or directed impact in time series data determined based on predictability and temporal order. It represents the degree of effective connectivity. Additionally, Granger causality can be described as the logarithmic ratio of error variance in a simplified model that forecasts a time series exclusively based on its past values, and error variance in the complete model, which incorporates past values of another time series as well (Roebroeck, 2015). The model can provide one of four outcomes: unidirectional Granger causality from Y-variable to X-variable, unidirectional Granger causation from X-variables to Y-variable, bi-directional causality between the variables, or no causality between the variables. The equations of the Granger causality are presented as follows:

$$Y_t = \sum_{i=1}^{P} \beta_i X_{t-i} + \sum_{j=1}^{P} \delta_j Y_{t-j} + \varepsilon_{1t} \quad (4.8)$$

$$X_t = \sum_{i=1}^{P} \vartheta_i X_{t-i} + \sum_{j=1}^{P} \omega_j Y_{t-j} + \varepsilon_{2t} \quad (4.9)$$

Where, $\beta_i \, \delta_j \vartheta_i \omega_j$ are coefficients of the lagged variables, ε_t is the error term, Y_t symbolise dependent variables and X_t represent independent variables.

4.4.4 Diagnostic testing

The diagnostic tests are conducted to ensure the validity and reliability of the regression models and to determine the assumptions of the Classical Linear

Regression Model (CLRM) violations. The diagnostic tests include normality test, serial or Autocorrelation test and heteroscedasticity test.

4.4.4.1 Normality test

The study employed normality tests to ascertain whether a dataset conforms to a normal distribution and to estimate the likelihood of the random variable underlying the dataset conforming to a normal distribution. In this study, Jacque-Bera was utilised to evaluate normality. The Jarque-Bera normality test (JB) relies on classical skewness and kurtosis coefficients to assess normality (Shukla, 2020). The null hypothesis is that the variables conform to a normal distribution, while the alternative hypothesis is that they do not. The study accepts the null hypothesis if the probability value of the Jacque-Bera test is more than a 5% significance level.

4.4.4.2 Serial correlation

Serial correlation, often known as autocorrelation, violates the premise that regression errors are uncorrelated across all observations. Autocorrelation is observed in time series data when the errors in one period are associated with the errors in subsequent periods (Abdulhafedh, 2017). To identify the presence of serial correlation in the model, this study utilised the Ljung-Box Q test, proposed by Box and Pierce (1970), and the Breusch-Godfrey LM test, proposed by Breusch and Godfrey (1980). The null hypothesis for both tests is that there is no serial correlation, while the alternative hypothesis states that there is a correlation. The study rejects the null hypothesis if the probability value tested is less than a 5% significance level.

4.4.4.3 Heteroskedasticity

Heteroskedasticity occurs when the variance of a regression model's residual term, or error term, varies significantly or unequally across a range of observed values. Heteroskedasticity is problematic with OLS regressions because they assume that residuals are generated from a population with constant variance. The scattering of residuals indicates an unequal variance in the population utilised in the regression, which could invalidate the results (Klein, Gerhard, Büchner, Diestel, & Schermelleh-Engel, 2016). To test for heteroskedasticity, the Breusch-Pagan, Harvey, Autoregressive Conditional Heteroscedasticity (ARCH), and Glejser test methods were employed. Utilising multiple heteroscedasticity tests is important to ensure accurate model diagnosis and enhance the reliability of heteroscedasticity detection as each test has its strengths and assumptions. The tests may perform differently depending on the specific characteristics of the data. For instance:

- **Breusch-Pegan Test**: Primarily tests for heteroscedasticity related to the regression model's explanatory variables. It is based on the idea that the variance of the error terms is a function of the independent variables (Sanghro, 2024).
- **Harvey Test**: This test is a variant of the Breusch-Pagan test and is designed to detect heteroscedasticity where the variance of the errors changes nonlinearly with the regressors (Muhammad, 2018).
- **ARCH Test**: Specifically designed to detect time-varying volatility in time series data and tests for heteroscedasticity that changes over time in a predictable manner (Kenton, 2024).
- **Glejser Test**: This test focuses on identifying heteroscedasticity by looking for a relationship between the absolute values of residuals and the independent variables (Obabire, Agboola, Ajao and Adegbilero-Iwari, 2020). It can capture cases where the variance increases or decreases as a function of the regressors (Wiedermann, Artner and von Eye, 2017).

The study concludes that the models are homoscedastic if all the tests cannot reject the null hypothesis. The null hypothesis suggests no heteroscedasticity, and the alternative hypothesis indicates heteroscedasticity of some unknown form. The null hypothesis is rejected if the probability value is less than the 5% significance level.

4.4.5 Stability testing

The stability of the model is tested using the CUSUM to check for structural breaks. The key principle of carrying out this test is to determine whether the model is stable. Ploberger, Kramer and Alt (1988) defined the CUSUM test as a test that is essentially used to detect instability in the intercept. A CUSUM test uses the cumulative sum of some quantity to investigate whether a sequence of values can be modelled as random (Wicklin, 2019).

$$W_t = \sum_{j=k+1}^{T} \frac{w_t}{\hat{\sigma}} \tag{4.10}$$

With

$$\sigma^2 = \frac{\sum_j^T k+1(W_t - W)^2}{T-k-1} \tag{4.11}$$

And

$$\overline{W} = \frac{\sum_j^T k+1^{W_t}}{T-k} \tag{4.12}$$

Where K is the minimal sample size required to fit the model. The CUSUM test involves graphing W_t versus t. According to the null hypothesis, W_t, cumulative sum with constant parameters is expected to have a mean of zero and variance must be equal to the sum of residuals. The study concludes that the models are stable when the cumulative sum of residuals is within the 5% boundary.

Establishing model stability is vital, as it underpins the reliability of forecasts, and the soundness of policy recommendations derived from these models. Unstable models can lead to shifting relationships that compromise predictive accuracy and may result in misguided decision-making. Thus, the stability assessment not only enhances the robustness of the modelling framework but also informs stakeholders if they can rely on the model for future projections.

4.4.6 Impulse Response Function

The Impulse Response Function (IRF) describes how one variable responds to a shock in another variable. The shocks and impulses are measured in Standard Deviations for changes in variables (Saeed, 2017). Alam and Ahme (2010) explained that the IRF makes it possible to trace the temporal responses of variables to their shocks and as shocks in other variables. The IRF also allows for the observation of the time the variables take to return to equilibrium after a shock in one of them (Nazeer & Masih, 2017). Modern macroeconomics relies heavily on the IRF using Vector Auto

Regressions (Ivanov & Kilian, 2005). The present study uses the IRF to check how the GDP in South Africa and China respond to shocks from itself and shocks from the electricity supply.

4.4.7 Variance of Decomposition

Variance decomposition refers to a set of approaches for breaking down the variation of a dependent variable into multiple sources or classes of effects (Shedden, 2021). The variance of decomposition is used to check which variables are most exogenous and endogenous. The degree of variance determines its relative exogeneity or endogeneity (Naleef & Masih, 2018). The variance of Decomposition implies computing the relative importance of different variables and understanding which ones drive the main variable the most (Zaefarian, Iurkov & Koval, 2022). The study uses this technique to test how the GDP in the investigated economies respond to shocks from itself and shocks from the electricity supply.

4.5 Chapter Summary

This chapter provided an overview of the research methods employed to achieve the aim and objectives. It started by detailing the data used in the analysis, including its sources. The chapter then outlined the model specifications, and the econometric techniques applied in the study, all of which were guided by the research objectives. The first technique discussed was the ARDL model, which is used to examine the relationships between the study's variables, addressing the first and second objectives of the study. Before applying the ARDL model, it was necessary to test the stationarity of the variables to avoid spurious results, followed by a cointegration test to assess whether a long-term relationship could be established. Hence, the stationarity and cointegration tests were introduced before the ARDL analysis.

The next technique outlined was the Granger causality test, which was used to explore the potential causal relationships between the variables. The final techniques presented in this chapter were the IRF and variance of decomposition technique which are employed to assess how GDP responds to shocks from electricity supply in SA and China. Additionally, the chapter outlined the diagnostic and stability tests used to ensure the validity and reliability of the models. The results derived from these techniques will be presented in the subsequent chapter.

CHAPTER 5

DISCUSSION / PRESENTATION / INTERPRETATION OF FINDINGS

5.1 INTRODUCTION

This chapter presents the results of the techniques outlined in Chapter 4.

5.2 Empirical test results

This section presents the results of all the tests performed in the study to understand the effects of electricity supply, corruption and political instability on economic growth.

5.2.1 Stationarity/Unit root tests results

The informal and formal stationarity tests are presented in this section. The informal unit root tests use the line graph inspection to assess the stationarity of the variables, whereas the formal unit root tests use various types of tests. This study uses ADF and PP tests to confirm informal unit root test results.

5.2.1.1 Informal unit root test results

An informal unit root test or visual inspection is used to identify the nature of the variables in the study. Figure 5.1 to 5.15 present the results for both South Africa and China.

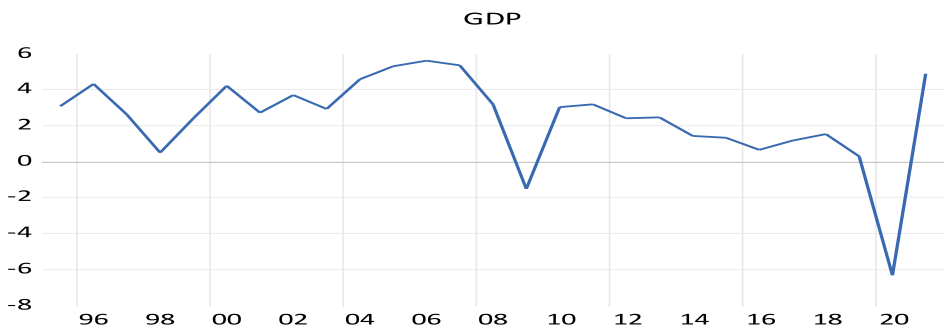

Figure 5.1: South Africa Gross Domestic Product GDP
Source: Author's computation

Figure 5.1 above shows that the GDP of South Africa may be stationary at level as the variable does not appear to be drifting away from the mean of zero. The graph is hovering along the mean of zero, which is expected since this is GDP percentage change.

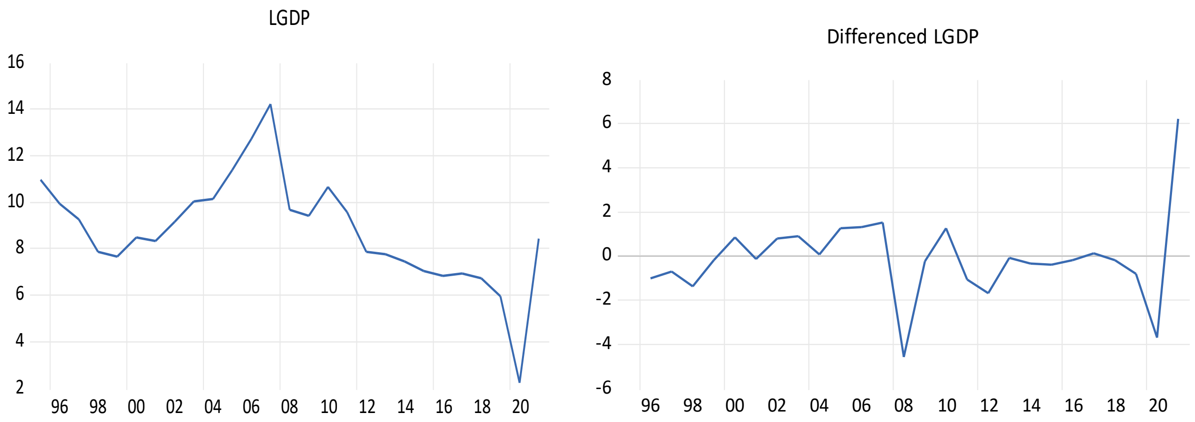

Figure 5.2: China Log of Gross Domestic Product (LGDP)

Source: Author's computation

Figure 5.2 depicts the log of GDP of China at level and at first difference. At level, the LGDP appears to be non-stationary as the graph is drifting away from zero mean. After first differencing, however, the LGDP seems to be stationary.

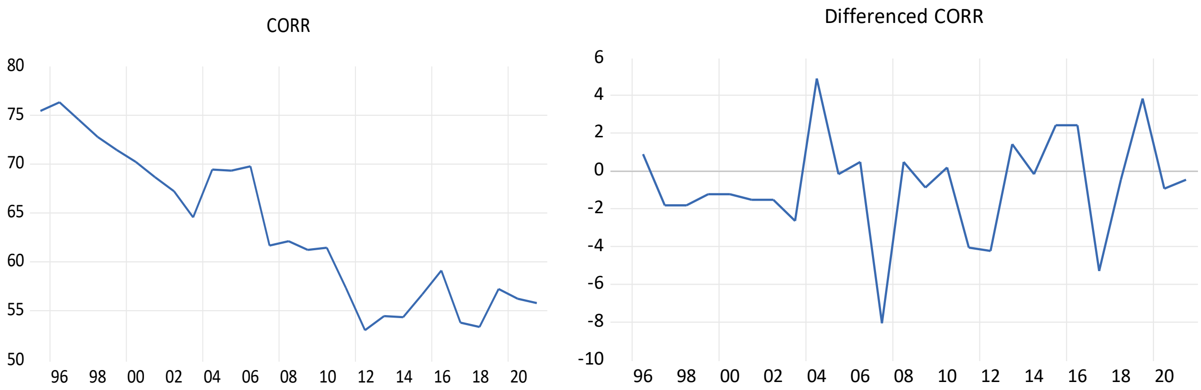

Figure 5.3: South Africa Corruption (CORR)

Source: Author's computation

Figure 5.3 depicts corruption of South Africa at level and at first difference. At level, the CORR appears to be non-stationary as it constitutes a random walk. The CORR was subjected to first differencing to induce stationarity, and it appears to be stationary at I (1). This is so because at first difference the graph is hovering around the zero mean.

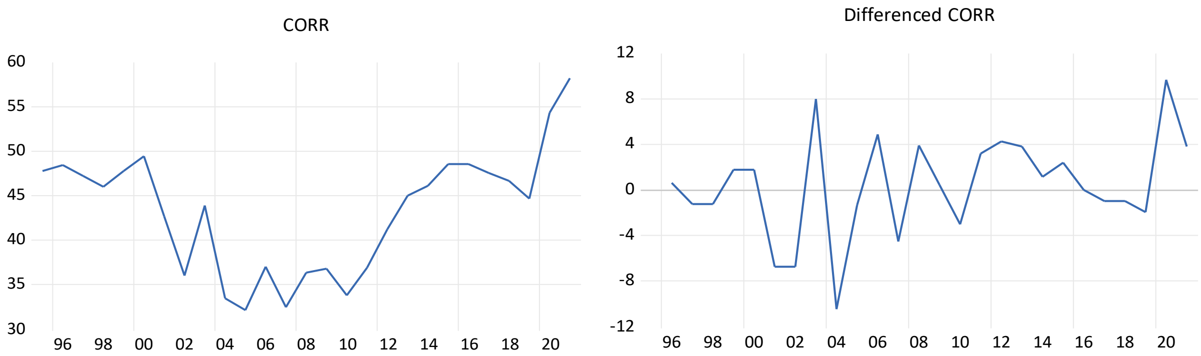

Figure 5.4: China Corruption (CORR)

Source: Author's computation

Figure 5.4 depicts the corruption of China at level and at first difference. At level, the CORR appears to be non-stationary as it is not hovering around the mean of zero. CORR was subjected to first differencing to induce stationarity, and it appears to be stationary at I (1). This is so because at first difference the line graph is hovering around the zero mean.

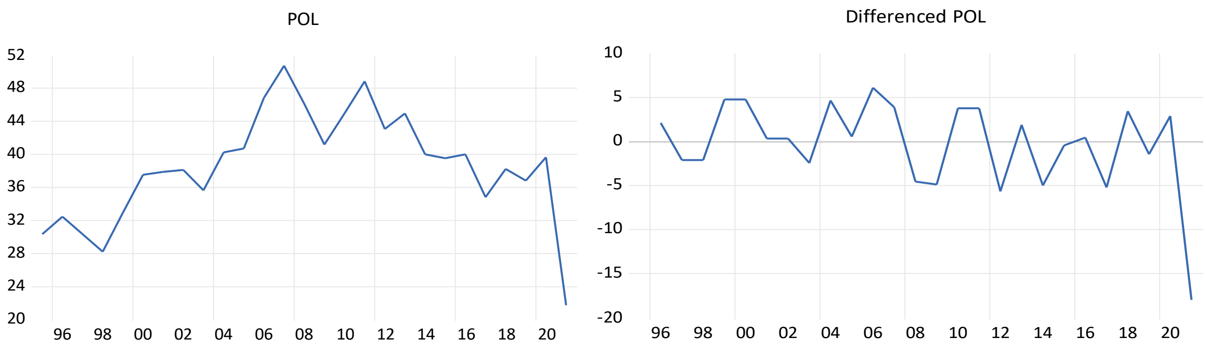

Figure 5.5 South Africa Political Instability (POL)

Source: Author's computation

Figure 5.5 depicts the Political instability of South Africa at the level and first difference. At level, the POL appears to be non-stationary as it is not hovering around the mean of zero. POL was subjected to first differencing to induce stationarity, and it appears to be stationary at I (1). This is so because at first difference the graph is hovering around the zero mean.

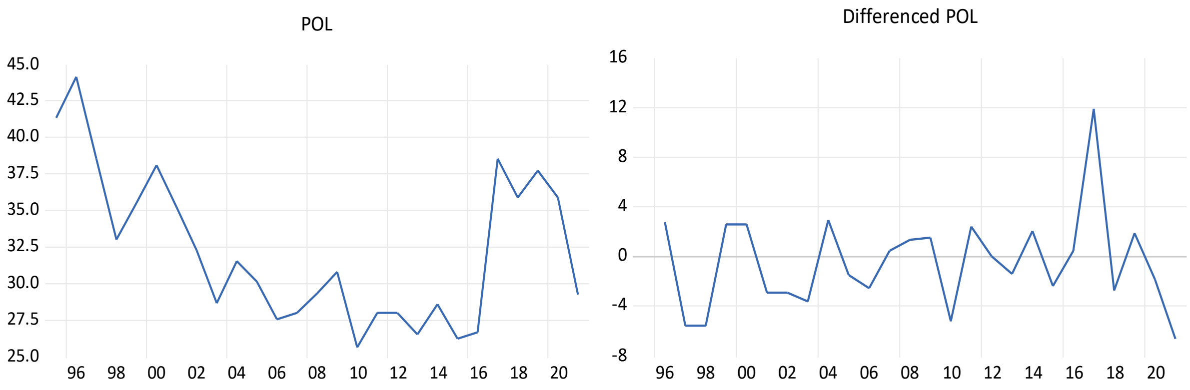

Figure 5.6 China Political Instability (POL)

Source: Author's computation

Figure 5.6 shows the Political instability of China at level and at first difference. At level, the political instability is moving away from the mean of zero, so it was subjected to differencing. At first difference political instability seems to be stationary at I (1), as the line graph is hovering around the zero mean.

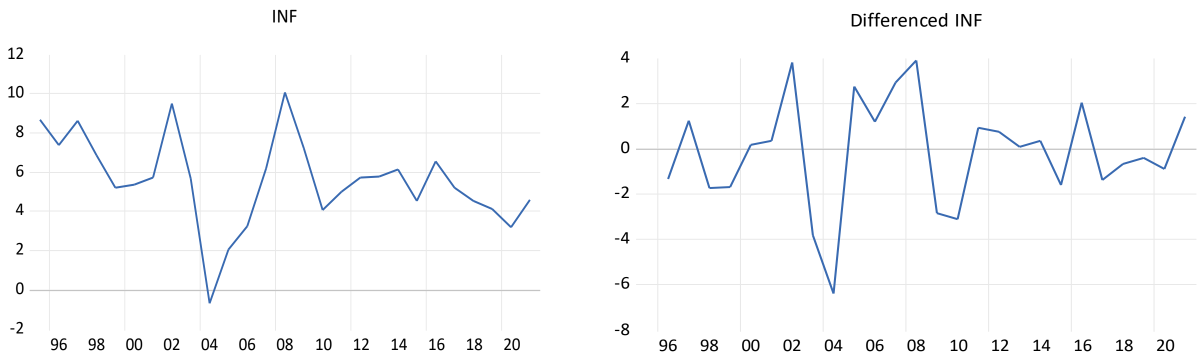

Figure 5.7 South Africa Inflation (INF)

Source: Author's computation

Figure 5.7 illustrates the inflation of South Africa at level and at first difference. Inflation in South Africa seems to be non-stationary at level. Hence, it was subjected to differencing. At first difference, it appears to be stationary as the line graph is hovering along the mean of zero.

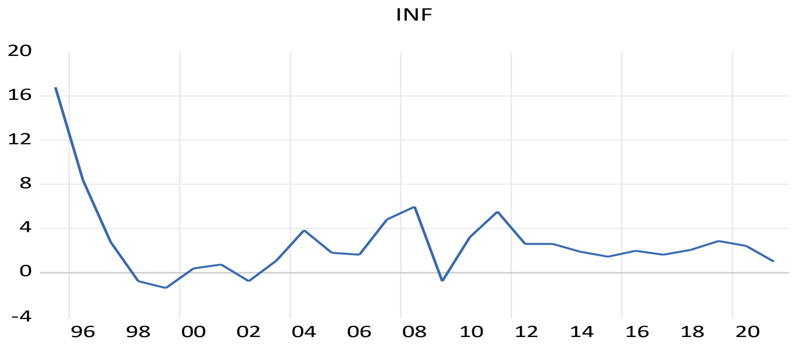

Figure 5.8 China Inflation (INF)

Source: Author's computation

Figure 5.8 above shows that the INF of China may be stationary at level as the variable does not appear to be drifting away from the mean of zero. The line graph is hovering along the mean of zero,

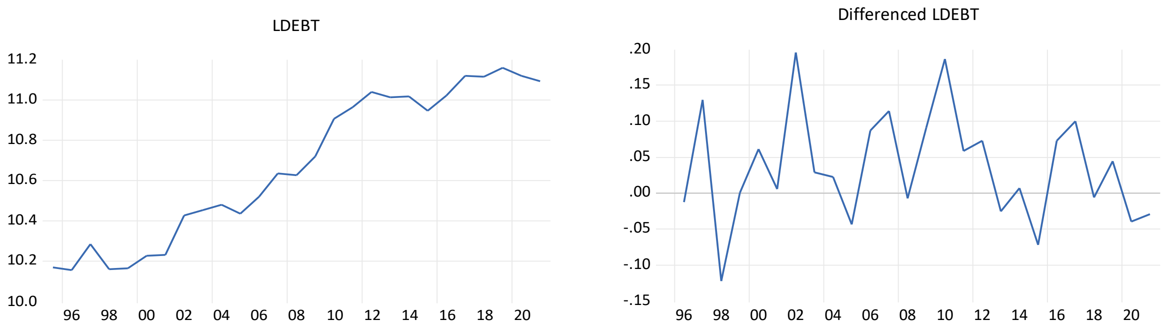

Figure 5.9 South Africa log of debt (LDEBT), 1995 to 2021

Source: Author's computation

Figure 5.9 above demonstrates the log of debt of South Africa at level and at first difference. At level, LDEBT appears to be non-stationary as it is trending over time. At first difference, however, LDEBT seems to be stationary.

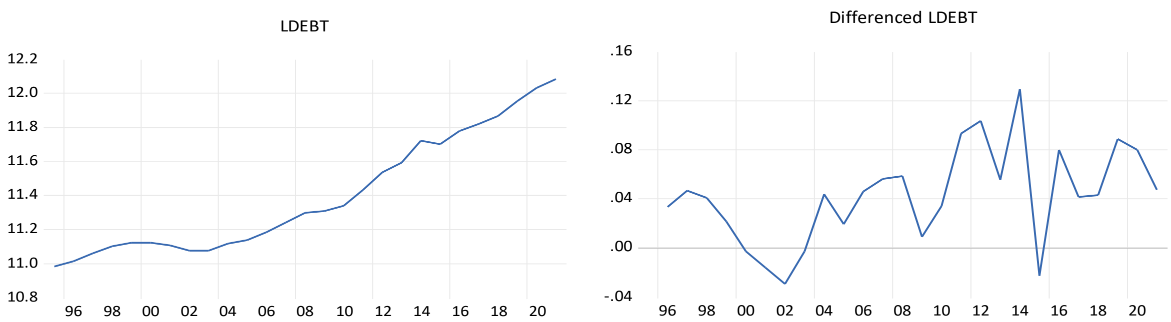

Figure 5.10 China log of debt (LDEBT)

Source: Author's computation

Figure 5.10 is the log of debt of debt of China at level and at first difference. The LDEBT seems to be non-stationary at level, hence it was subjected to differencing. After first difference, LDEBT seems to be stationery.

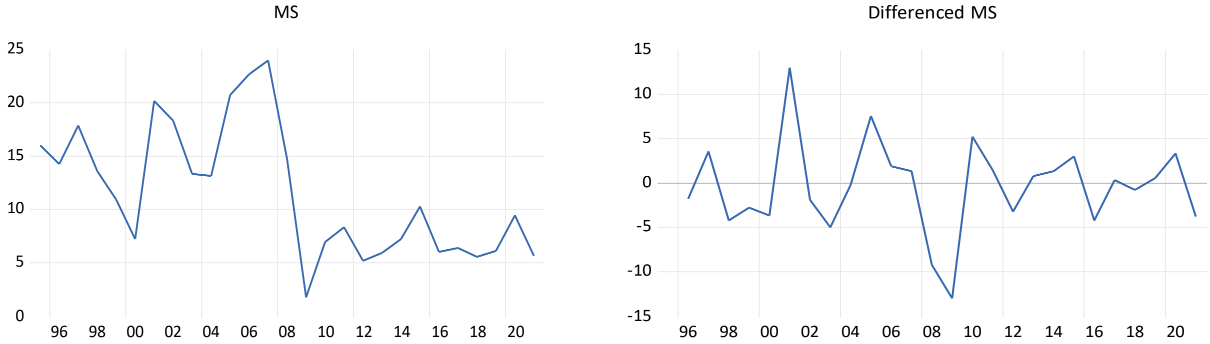

Figure 5.11 South Africa Money Supply (MS)

Source: Author's computation

Figure 5.11 illustrates the Money supply of South Africa at the level and first difference. At level, the MS seems to be non-stationary as it is not hovering around the mean of zero. MS was subjected to first differencing to induce stationarity, and it appears to be stationary at I (1). This is so because at first difference the graph is hovering around the zero mean.

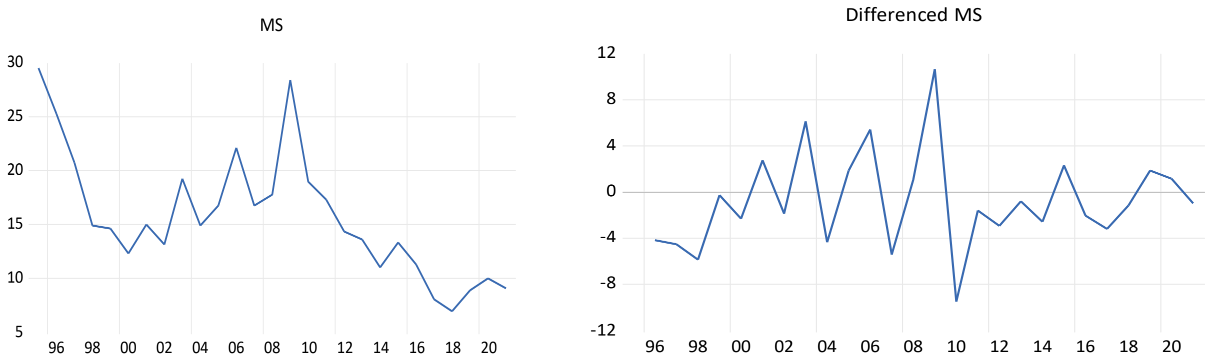

Figure 5.12 China Money Supply (MS)

Source: Author's computation

Figure 5.12 above demonstrates the money supply of China at level and at first difference. At level, MS appears to be non-stationary as it is trending over time. At first difference, however, MS seem to be stationary as it hovers around the mean of zero.

According to informal unit root test results presented in Figures 5.7 to 5.12, the variables are integrated at both I (0) and I (1). However, to make conclusions on stationarity, we must verify the visual inspection results by performing formal unit root tests which will result in more efficient results.

5.2.1.2 Formal unit root test results

This section presents the formal unit root test results that confirm the visual inspection results. The study uses two techniques which is ADF test and PP test to validate the results. Table 5.1 presents the results of unit root at level and table 5.2 present the results of the unit root at first difference for the variables which stationarity could not be established at level.

Table 5.1 Formal unit root test at level

SOUTH AFRICA MODEL				
Variables	Model Specification	ADF test	PP test	Conclusion
GDP	Intercept	-3.906580***	-3.906580***	Stationery
	Trend and intercept	-4.559448***	-4.559448***	Stationery
	None	-1.649296*	-2.195902**	Non-Stationery
LELECS	Intercept	-1.472110	-1.557332	Non-Stationery
	Trend and intercept	-4.583252**	-4.640590***	Stationery
	None	1.423294	0.923043	Non-Stationery
CORR	Intercept	-1.388940	-1.335777	Non-Stationery
	Trend and intercept	-2.375699	-2.375699	Non-Stationery
	None	-1.559477	-2.274172**	Non-stationery
POL	Intercept	-1.450554	-1.450554	Non-Stationery
	Trend and intercept	-0.722695	0.169307	Non-Stationery
	None	-0.535318	-0.527775	Non-Stationery
INF	Intercept	-3.852290***	-2.999857**	Stationery
	Trend and intercept	-4.005004**	-2.961873	Non-Stationery
	None	-0.988823	-1.286835	Non-Stationery
LDEBT	Intercept	-0.819888	-0.819888	Non-Stationery
	Trend and intercept	-1.874580	-1.955289	Non-Stationery
	None	2.354728	2.451247	Non-Stationery
MS	Intercept	-2.205826	-2.091749	Non-Stationery
	Trend and intercept	-3.2799119*	-2.893064	Non-Stationery
	None	-1.321624	-1.201192	Non-Stationery
CHINA MODEL				
Variables	Model Specification	ADF test	PP test	Conclusion
LGDP	Intercept	-2.317962	-2.293508	Non-Stationery
	Trend and intercept	-2.511817	-2.511817	Non-Stationery
	None	-0.801473	-2.451247	Non-Stationery
LELECS	Intercept	-2.838749**	-2.760970	Non-Stationery
	Trend and intercept	-2.657524	-2.658614	Non-Stationery
	None	-1.071970	-0.896049	Non-Stationery
CORR	Intercept	-1.039208	-0.827300	Non-Stationery
	Trend and intercept	-1.254603	-0.794711	Non-Stationery
	None	0.301520	0.414083	Non-Stationery
	Intercept	-2.450250	-2.322320	Non-Stationery

POL	Trend and intercept	-2.354054	-2.245618	Non-Stationery
	None	-0.965746	-1.183683	Non-Stationery
INF	Intercept	-3.752884***	-6.167169***	Stationery
	Trend and intercept	-4.100767**	-8.269571***	Stationery
	None	-2.272560**	-5.395688***	Stationery
LDEBT	Intercept	-2.159731	1.944440	Non-Stationery
	Trend and intercept	-0.819869	-0.888689	Non-Stationery
	None	-5.614139***	4.260778***	Stationery
MS	Intercept	-2.530809	-2.048732	Non-Stationery
	Trend and intercept	1.687723	1.348510	Non-Stationery
	None	1.774754*	6.181716***	

Note: ***, **, * Stationary at 1%, 5% and 10% level of significance respectively

Source: Author computation

The study concludes that the variable is stationary when the t-stat is significant at a 5% level of significance. The ADF and PP tests were both used to determine the order of integration since the ADF is not that strong alone (Ledwaba, 2022). The results in Table 5.1 show that in the South African model, GDP is the only variable that is stationary at level, while China has inflation as the only stationery variable at the same level. Although GDP is non-stationary at none, it is still concluded to be stationary at level because of the majority outcome, and due to the 'none' parameter being deemed weak. Overall, the results in Table 5.1 confirm the informal test results as they are consistent.

Since most of the variables are non-stationary at level, stationarity was tested at first difference. The results are presented in Table 5.2 below.

Table 5.2 Formal unit root test at first difference

SOUTH AFRICA MODEL				
Variables	Model Specification	ADF test	PP test	Conclusion
∆LELECS	Intercept	-9.459259***	-10.79263***	Stationery
	Trend and intercept	-9.347551***	-12.42866***	Stationery
	None	-9.153285***	-9.153285***	Stationery
∆CORR	Intercept	-5.488450***	-5.936982***	Stationery
	Trend and intercept	-5.538129***	-6.468934***	Stationery
	None	-5.110566***	-5.110341***	Stationery
∆POL	Intercept	-4.386239***	-4.378054***	Stationery
	Trend and intercept	-4.913979***	-4.708235***	Stationery
	None	-4.528847***	-4.519896***	Stationery
∆INF	Intercept	-5.414041***	-7.034865***	Stationery
	Trend and intercept	-5.280939***	-6.816430***	Stationery
	None	-5.461932***	-7.033082***	Stationery
∆LDEBT	Intercept	-5.172284***	-5.170583***	Stationery
	Trend and intercept	-5.123696***	-5.121872***	Stationery
	None	-4.254430***	-4.250149***	Stationery
∆ MS	Intercept	-4.886703***	-6.659852***	Stationery
	Trend and intercept	-4.768357***	-7.054001***	Stationery

	None	-4.916795***	-6.284085***	Stationery
CHINA MODEL				
Variables	Model Specification	ADF test	PP test	Conclusion
ΔLGDP	Intercept	-5.188863***	-5.068925***	Stationery
	Trend and intercept	-4.979082***	-4.795815***	Stationery
	None	-5.303946***	-5.225281***	Stationery
ΔLELECS	Intercept	-5.121598***	-6.342880***	Stationery
	Trend and intercept	-5.038153***	-8.146037***	Stationery
	None	-5.225606***	-6.391721***	Stationery
ΔCORR	Intercept	-5.672279***	-5.724979***	Stationery
	Trend and intercept	-6.361520***	-7.576594***	Stationery
	None	-5.747350***	-5.802181***	Stationery
ΔPOL	Intercept	-5.277428***	-5.304479***	Stationery
	Trend and intercept	-3.773682**	-5.848335***	Stationery
	None	-5.280057***	-5.301661***	Stationery
ΔLDEBT	Intercept	-3.753133***	-3.809808***	Stationery
	Trend and intercept	-4.646764***	-4.64123***	Stationery
	None	-1.031552	-2.03023**	Non-Stationery
ΔMS	Intercept	-6.351625***	-6.459954***	Stationery
	Trend and intercept	-4.289397**	-6.412524***	Stationery
	None	-6.27322***	-6.417016***	Stationery

Note: ***, **, * Stationary at 1%, 5% and 10% level of significance respectively

Source: Author computation

All the variables that were not stationary at level were subjected to differencing and they all became stationary at first difference. The null hypothesis of no stationary was rejected at intercept and trend and intercept; hence the study concludes that the rest of the variables are stationary at first difference. From Tables 5.1 and 5.2 results, it is confirmed that the variables for both countries are cointegrated at I(0) and I(1). Since stationarity is proven, the next step was to test for cointegration among variables in the study.

5.2.2 ARDL Bounds test results

The ARDL Cointegration technique is preferred when dealing with variables of different orders, or when the study have a combination of variables that integrate at I(0) and (1). This study comprises of I (0) and I (1) variables as already discussed above. Therefore, the ARDL bounds test to cointegration technique is adopted.

Table 5.3: ARDL bounds test results

SOUTH AFRICA MODEL		
Test-Statistic	Value	k
F-Statistic	12,39	6
Critical Value bounds		

Significance level	Lower bound I (0)	Upper bound I (1)
10%	1.99	2.94
5%	2.27	3.28
1%	2.88	3.99
CHINA MODEL		
Test-Statistic	Value	k
F-Statistic	10.13138	6
Critical Value bounds		
Significance level	Lower bound I (0)	Upper bound I (1)
10%	1.99	2.94
5%	2.27	3.28
1%	2.88	3.61

Source: Author's computation

Table 5.3 presents ARDL bounds test results for South Africa and China. For both countries k=6, the number of independent variables for both models are 6. The calculated F-Statistic for South Africa is 12.39. It is greater than the lower and upper bound critical values at 1%. For China, the F-Statistic is 10.13138 which is also greater than the lower and upper bound critical values at a 1% significance level. The results thus show evidence of the long-run relationship between variables, meaning there is cointegration in both models.

Since the results for both South Africa and China revealed the presence of a long-run relationship, the study then proceeds to estimate the long-run coefficients and equation. The long-run results are presented in Table 5.4 below.

Table 5.4: ARDL Long Run Model

SOUTH AFRICA MODEL				
Variables	Coefficients	Std.Error	t-Statistic	P-value
LELECS	-24.30394	4.405113	-5.517212	0.0015
CORR	-0.172044	0.033563	-5.126032	0.0022
POL	-0.080960	-0.024649	-3.284514	0.0167
INF	-0.451092	0.077916	-5.789450	0.0012
LDEBT	-7.22119	1.110906	-6.500205	0.0006
MS	15.82492	2.633093	6.010012	0.0010
C	177.2116	25.69812	6.895897	0.0005
CHINA MODEL				

Variables	Coefficients	Std.Error	t-Statistic	P-value
LELECS	-0.000926	0.000332	-2.786545	0.0317
CORR	-0.002903	0.0000753	-3.856378	0.0084
POL	-0.002024	0.0000410	-4.934482	0.0026
INF	0.003455	0.000911	3.791673	0.0091
LDEBT	0.044992	0.37986	1.184445	0.2810
MS	0.611732	0.032982	18.54743	0.0000
C	2.421754	0.198975	12.17118	0.0000

Source: Author's computation

Electricity supply has a negative significant long-run relationship with economic growth in both South Africa and China. Table 5.4 shows that a 1% increase in the electricity supply of South Africa will worsen economic growth by 24.3039%, and a percentage increase in the electricity supply of China will worsen economic growth by 0.0009%. These results are contrary to Khobai, et al., (2017), as they found a positive relationship between electricity supply and economic growth in South Africa. The results for both South Africa and China are contrary to priori expectations and the New Growth Model theory as it suggests that an increase in production leads to a rise in economic growth.

These results suggest that electricity supply negatively impact economic growth in both countries, but the scale of the effect is significantly larger in South Africa. The large negative coefficient indicates that power shortages or inefficiencies in the energy sector have a substantial and detrimental impact on economic activity, likely due to chronic electricity supply issues such as load shedding, outdated infrastructure, and governance challenges within state-owned enterprises like Eskom. These disruptions hinder industrial production, increase costs, and reduce business confidence, thus limiting overall economic growth. In contrast, the smaller negative effect in China suggests that although electricity supply may still impact economic growth, the effect is much weaker. This could be attributed to the country's more diversified and robust energy infrastructure, including investments in renewable energy and a more reliable grid system. Additionally, China's centralised governance structure allows for more coordinated and effective responses to electricity shortages, thus mitigating the negative impact on growth. Despite facing occasional energy challenges, China's broader economic resilience, driven by a diversified economy and greater investment in energy resources, likely mitigates the adverse effects of electricity disruptions. The inconsistency between theory and empirical findings highlights the complex relationship between electricity supply and economic growth. Thus, indicates that in countries facing continuous electricity and governance challenges, the potential benefits of infrastructure improvements are overshadowed by deeper structural issues. This argument is supported by the study of Mawere and Andtshamano (2024) who established that persistent governance issues in South Africa's electricity infrastructure have overshadowed the benefits of infrastructure development.

Corruption and economic growth also have a significant inverse relationship in South Africa and China. A 1% decrease in the level of corruption will improve the economic growth of South Africa by 0.1720%, and a 1% decrease in the level of corruption in China will improve the economic growth by 0.0029%. The results for these two economies align with the contribution of Murphy, et al., (1993) on why rent-seeking is costly to growth. The work implied that the reduction of rent-seeking behaviour will improve economic growth. The results are also consistent with the results of (Kaplan & Akçoraoğlu, 2017; d'Agostino, et al., 2016; D'Amico, 2015). The magnitude of this negative impact varies considerably between the two nations, with South Africa experiencing a notably stronger effect than to China. The more pronounced effect of corruption on economic growth in South Africa likely stems from the country's significant governance challenges, including weak institutional frameworks, inefficiencies in public service delivery, and the detrimental impact of corruption on investor confidence. Corruption can lead to the misallocation of resources, a reduction in public investment, and the inefficient use of government funds, all of which impede economic growth. Additionally, corruption may exacerbate issues of economic inequality and high unemployment in South Africa, further hindering economic development and growth prospects.

The significant negative relationship between political instability and gross domestic product was also evident in both countries. The South African results show that a 1% rise in political instability, leads to a 0.08096% decline in economic growth. In China, a 1% increase in political instability results in a 0.0002% decrease in economic growth. The two countries results are consistent with the results of Zeeshan, et al. (2022) and Kaplan and Akçoraoğlu (2017). The results also uphold the work of D'Amico (2015) where it was alluded that political instability in China adversely affects economic growth. Although political instability has a negative effect in both countries, the impact on growth is minimal in China compared to South Africa. This can be attributed to China's political system, which, despite being authoritarian, has demonstrated a high degree of political continuity and centralised control. The Communist Party's dominant role in governance ensures stability and long-term planning that has allowed China to continue its rapid economic growth, even in the face of periodic political challenges. The government's ability to implement policies effectively and maintain social order helps mitigate the economic consequences of political instability, making the Chinese economy more resilient to such disruptions. Conversely, South Africa's political environment marked by frequent leadership changes and public dissatisfaction with governance, contributes to uncertainty, which discourages investment and causes a dire effect on economic growth.

Inflation and debt were found to have a negative relationship with economic growth in South Africa, whereas they have a positive relationship with economic growth in China. These findings are suggesting that while inflation and debt limit economic growth in South Africa, they are strategically utilised to promote economic development in China. This can likely be attributed to more robust governance structures in China, which enable effective management of inflation and debt to support long-term growth. Noteworthy, the relationship between debt and economic growth is insignificant in China, which might reflect the long-term sustainability of debt-driven growth is uncertain, as excessive debt could eventually lead to diminishing returns if not properly managed. Moreover, money supply was found to have a significant positive relationship with economic growth in both countries. The positive relationship between money supply and economic growth indicates that both economies benefit from increased liquidity. The effectiveness of this policy may depend on how well it is managed as inflation can be triggered. So, in the case of South Africa where inflationary pressures distort the prices of inputs such as electricity and harm growth, this policy should be implemented with caution.

Table 5.5 Error Correction Model and Short run

SOUTH AFRICA MODEL			
Variables	Coefficient	t-statistic	Probability value
∆GDP (-1)	0.916671	3.046528	0.0159
∆LELECS	-0.633838	-0.072407	0.9441
∆CORR	0.057245	0.494588	0.6342
∆POL	-0.257392	-3.097785	0.0147
CointEq(-1)	-1.9212108	-8.409256	0.0000
R-squared	0.853562		
Adjusted R-squared	0.793264		
CHINA MODEL			
Variables	Coefficient	t-statistic	Probability value
∆LGDP (-1)	0.496263	8.020042	0.0002
∆LELECS	-0.001500	-8.021225	0.0002
∆CORR	-0.001450	-7.173639	0.0004
∆POL	-0.000292	-1.554603	0.1710
CointEq(-1)	-1.091517	-13.25182	0.0000
R-squared	0.894484		
Adjusted R-squared	0.841725		

Notes: ∆ Indicate changes in at first difference
CointEq equals the size of the error correction model
L indicates the logged variables
Source: Author's computation

Table 5.5 presents the Error Correction Model (ECM) estimates and short-run results of South Africa and China. The short-run results show that only a few variables in the study are important predictors of growth in the short run, as most variables are insignificant. In South Africa, only political instability maintained a dominant effect on growth in the short run, as it is the only one that is significant at 1%. The same results of a negative relationship between political instability and economic growth are maintained in the short run, with a coefficient of -0.25. This means a 1% increase in political instability worsens the economic growth of South Africa by 0.25%. Political instability is a major deterrent factor in South Africa even in the short run due to policy uncertainties and frequent leadership changes that cause immediate effects on the economy. Constant shifts in government policies notably in land reform, mining laws, and economic reforms, can cause uncertainty for investors, influencing their decisions. In China, electricity supply and corruption are the only variables with a significant negative relationship with economic growth. The results establish that a 1% increase in electricity supply, reduces economic growth by -0.0015% and a 1% increase in the level of corruption worsens economic growth by 0.0014 in China. The electricity supply and corruption effect on economic growth is, however, negligible as the coefficients are very small.

The estimated Error Correction Term (ECT) is represented by (CointEq) in Table 5.5 above. The ECT of the model should be negative and significant to show that the model converges in the long run (Türsoy, 2017; Dogan, 2016). A positive value indicates that the model moves away from equilibrium in the long run. If the ECT is equal to -1, the whole adjustment takes place within the same period and if it equals -0.5, only half of the adjustment will occur per period (Lebo and Kraft, 2017). The South African and Chinese ECTs show convergence as their coefficients of -1.92 and -1.09 respectively are negative and significant at a 1% significance level. This confirms that all the economic imbalances will be corrected within the same period in both countries.

The study also calculated the r-squared and adjusted r-squared values to check the fitness of the linear regression model. To conclude if the model is of good fit, the r squared and adjusted r squared values must be closer to 100% (Frost, 2018). The study observes both the r-squared and adjusted r-squared values, as r-squared alone cannot be trusted because the more the study adds more variables the more it increases, even if the variables are unrelated to the study (Bobbit, 2022). So, to ensure accuracy adjusted r squared is used for interpretation as its value reduces the more unrelated variables are added to the model. Thus, it is concluded that the regression models of both countries are of good fit as the adjusted r-squared of South Africa is 79% and the one for China is 84% which are both closer to 100%.

5.2.3 Diagnostic tests results

The diagnostic tests are conducted to determine the reliability and specification of the model. The results are presented in Figures 5.13 and 5.14, and Tables 4.8 and 4.9 below.

5.2.3.1 Normality test results

The purpose of the normality test was to determine if data is normally distributed, as misspecification of the normal distribution can produce misleading inferences. The study uses the Jacque-Bera probability value and kurtosis to confirm if the residuals are normally distributed. The Kurtosis should not be more than 3 and the Jacque-Bera probability value should be more than the significance level not to reject the null hypothesis of normal distribution.

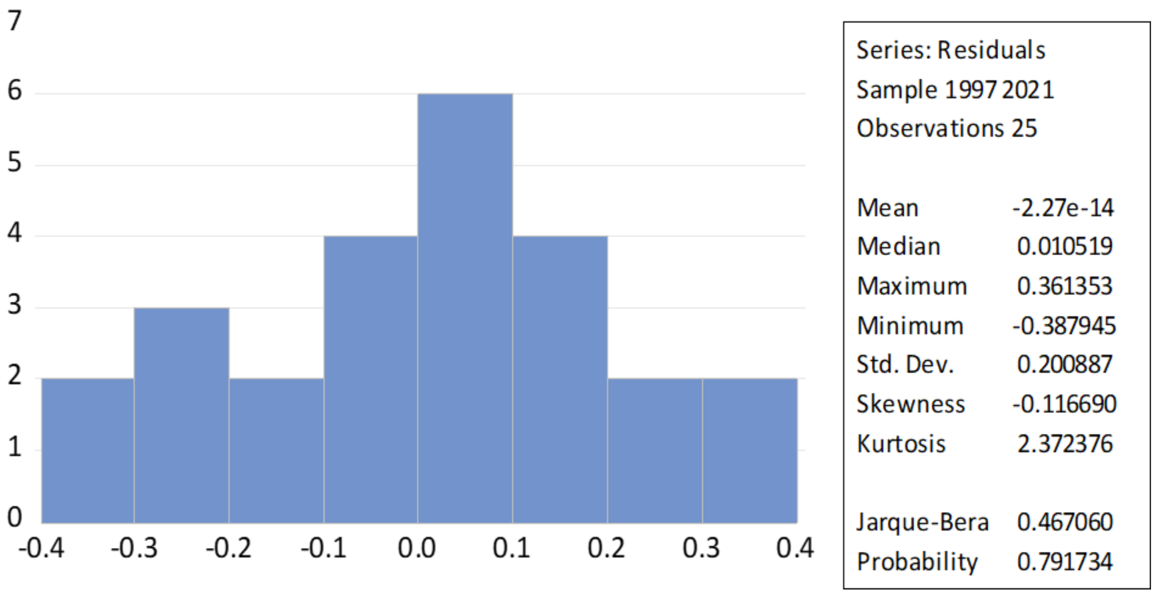

Figure 5.13 South Africa Normality tests results

Source: Author's computation

The residuals seem to be normally distributed as the kurtosis of 2.37 is less than 3, the graph is bell-shaped, and most notably, the probability value of the Jacque-Bera is more than 5% level of significance. Due to these results, the study cannot reject the null hypothesis that the South African residuals are normally distributed.

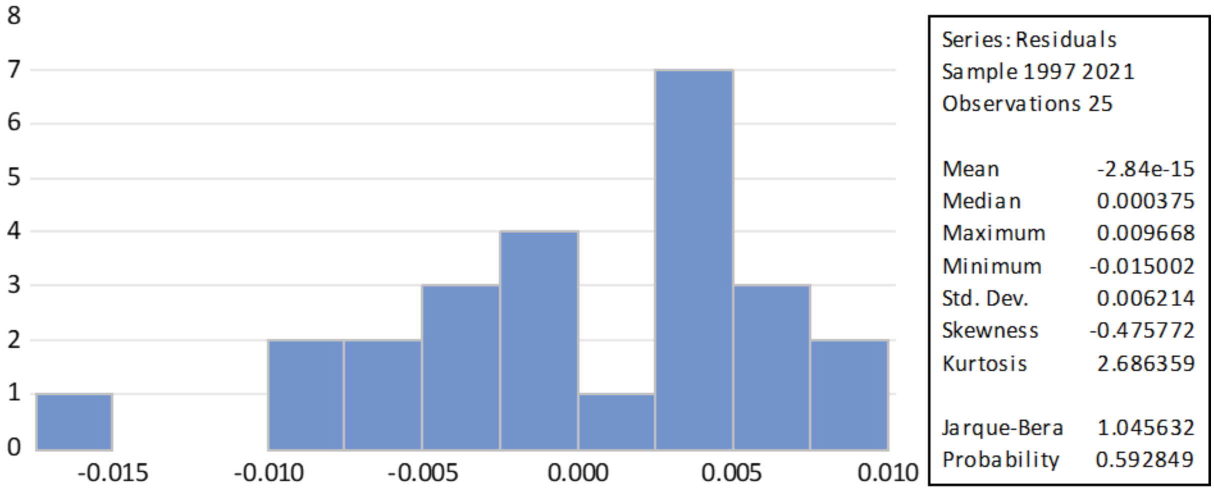

Figure 5.14 China Normality test results

Source: Author's computation

Based on the results in Figure 5.13 the study cannot reject the null hypothesis that the China model is normally distributed as the probability value of the Jacque-Bera is more than a 5% level of significance. The kurtosis value 2,68 confirms the Jacque-Bera results as it should be less than 3 to conclude that the residuals are normally distributed. Therefore, we conclude without doubt that China residuals are normally distributed.

5.2.3.2 Autocorrelation test results

Autocorrelation violates ordinary least squares (OLS) regression assumptions, resulting in inefficient estimates and unreliable hypothesis tests. Consequently, this study employs the Ljung-Box test to assess autocorrelation in the models, thereby ensuring the estimates reliability. The results of the autocorrelation tests are presented in Table 5.6 below.

Table 5.6: Autocorrelation test results

SOUTH AFRICA MODEL				
Test	Null Hypothesis	Test statistic	P-Value	Conclusion
L Jung	No autocorrelation up to order p	6.8190	0.869	Do not reject the null hypothesis
CHINA MODEL				
Test	Null Hypothesis	Test statistic	P-Value	Conclusion

L Jung	No autocorrelation up to order p	8.3987	0.753	Do not reject the null hypothesis

Source: Author's computation

The study used the L Jung test to assess autocorrelation in both models. According to the results presented, the study cannot reject the null hypothesis but rather accept the null hypothesis of no autocorrelation up to order p. This is because the probability values of 0.869 and 0.753 are both more than a 5% significance level.

5.2.4.3 Heteroscedasticity test results

Heteroscedasticity can result in inefficient estimates and biased statistical inferences, making it essential to test for its presence to ensure the validity of model estimates. This study employs several tests, namely, the Breusch-Pagan-Godfrey test, the ARCH test, the Harvey test, and the Glejser test to assess heteroscedasticity in the two models. Utilising a range of tests facilitates a comprehensive evaluation of the data and enhances the robustness of the findings. The results are presented in Table 5.7 below.

Table 5.7: Heteroscedasticity test results

SOUTH AFRICA MODEL				
Test	Null Hypothesis	Test statistic	P-Value	Conclusion
Breusch-pegan-Godfrey	Homoscedasticity	0.519473	0.6918	Do not reject the null hypothesis
Harvey	Homoscedasticity	1.402317	0.2994	Do not reject the null hypothesis
Arch	Homoscedasticity	0.252858	0.6015	Do not reject the null hypothesis
Glejser	Homoscedasticity	0.854803	0.4689	Do not reject the null hypothesis
CHINA MODEL				
Test	Null Hypothesis	Test statistic	P-Value	Conclusion
Breusch-pegan-Godfrey	Homoscedasticity	0.462438	0.6941	Do not reject the null hypothesis
Harvey	Homoscedasticity	0.592838	0.5924	Do not reject the null hypothesis

Arch	Homoscedasticity	0.638327	0.4107	Do not reject the null hypothesis
Glejser	Homoscedasticity	0.442808	0.7118	Do not reject the null hypothesis

Source: Author's computation

The Breusch-Pegan-Godfrey test and the Harvey test results revealed no heteroskedasticity problem in the South African model since their p-values of 69.18% and 29.94% respectively are greater than a 5% significance level. This outcome of the nonexistence of heteroscedasticity in the model was also confirmed by ARCH and Glejser tests since their respective p-values of 60.15% and 46.89% also outweigh the 5% significance level. The study still could not reject the null hypothesis of homoscedasticity in the China model as the probability of the Breusch-Pegan-Godfrey test and the Harvey test results is 69.41% and 59.21% respectively. The results were further confirmed by ARCH and Glejser tests as their p-values of 41.07% and 71.18% respectively are greater than a 5% significance level. Therefore, according to the results in Table 5.7, both models do not suffer from the problem of heteroscedasticity.

5.2.4 Stability test results

The present study evaluated the stability of the models to ascertain that the relationships and patterns identified in the data remain consistent over time. The results of the stability test are illustrated in the CUSUM test diagrams presented in Figure 5.15 below, providing a visual representation of the cumulative sum of residuals and facilitating the identification of any structural breaks within the model.

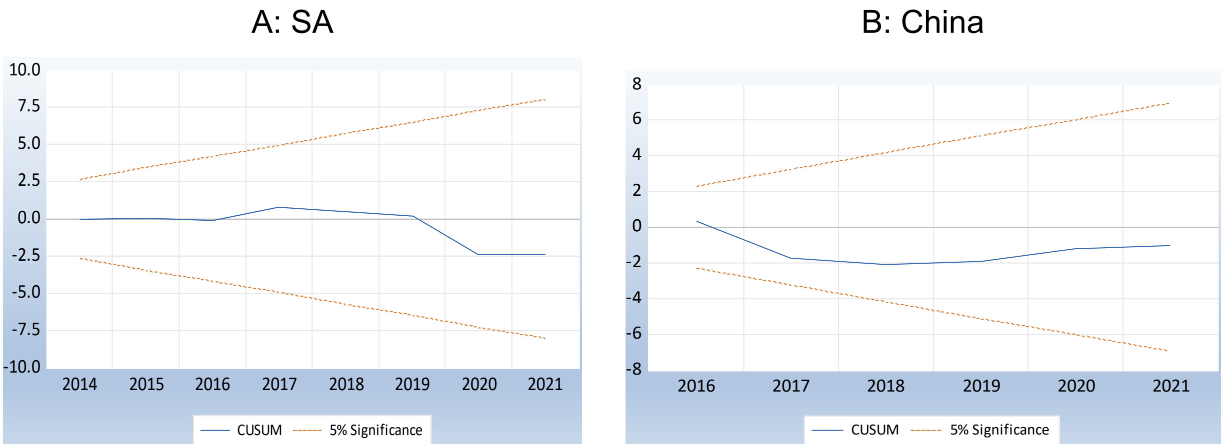

Figure 5.15 South Africa and China Cusum test results
Source: Author's computation

Figure 5.15 shows that both models are stable over time, as their cumulative sum of errors collected is within 5% critical lines. The sum of recursive errors remained within two critical boundary lines throughout the observation period in both models. This confirms the accuracy of long and short-run parameters which affect economic growth in South and China. This means the policymakers of the two economies can rely on the results derived from models when formulating economic policies.

5.2.5 Granger Causality Test Results

This study uses the Granger causality test to detect the direct influence of the independent variables on economic growth. This analysis seeks to determine whether the independent variables have a causal effect on economic growth. The Granger causality results are presented in Table 5.8 below.

Table 5.8: Granger Causality test results

SOUTH AFRICA MODEL				
Null Hypothesis	Obs	F-Statistic	Prob.	Conclusion
LELECS does not Granger Cause GDP	25	1.05549	0.3666	Accept the null hypothesis
GDP does not Granger Cause LELECS		2.23158	0.1334	Accept the null hypothesis
CORR does not Granger Cause GDP	25	3.27850	0.1141	Accept the null hypothesis
GDP does not Granger Cause CORR		0.11865	0.8136	Accept the null hypothesis
POL does not Granger Cause GDP	25	2.28345	0.1983	Accept the null hypothesis
GDP does not Granger Cause POL		0.21371	0.0025	Reject the null hypothesis
CHINA MODEL				
LELECS does not Granger Cause LGDP	25	0.40418	0.2297	Accept the null hypothesis
LGDP does not Granger Cause LELECS		0.77778	0.4682	Accept the null hypothesis
CORR does not Granger Cause LGDP	25	0.00191	0.0761	Accept the null hypothesis
LGDP does not Granger Cause CORR		0.06017	0.1178	Accept the null hypothesis
POL does not Granger Cause LGDP	25	3.60488	0.3026	Accept the null hypothesis
LGDP does not Granger Cause POL		0.20446	0.0645	Accept the null hypothesis

Source: Author’s computation

The findings in Table 5.8 reveal no evidence of causality between electricity supply and economic growth in South Africa, so the study accepts the null hypothesis. The study also found no causality between corruption and economic growth in South Africa. The only variable that has a causal relationship with economic growth in South Africa is political instability. A unidirectional causal relationship was found from economic growth to political instability in South Africa. This means that the level of growth or perhaps lack thereof influences political instability in South Africa. The work of Nazeer and Masih (2017) found the same results and recommended that the policymakers in Malaysia need to implement a strategy that would ensure that the benefits of economic growth are translated into a reduction in the level of political instability. They further informed that government policies should target the GDP growth rate as other variables such as political instability are likely to follow it.

In China, the study could not find any evidence of a causal relationship between electricity supply, corruption, political instability, and economic growth. The absence of clear causality in China could be explained by the country's resilient and diversified economy. The government's ability to intervene and stabilise the economy when challenges arise, likely contributes to the lack of causal relationship.

5.2.6 Impulse Response Function

One of the objectives of the study was to forecast the response of economic growth to shocks from the electricity supply in both South Africa and China. Hence the graphs extracted in Figures 5.15 and 5.16 only illustrate the GDP responses to shocks from electricity supply and the response of GDP to shocks from itself. However, detailed results are available in Appendix H.

The graphs in Figures 5.17 and 5.18 below are based on the output of the unrestricted VAR with analytic response standard error over 10 periods and Cholesky degrees of freedom adjusted, which show the response to Cholesky's one standard deviation innovation. The dotted lines on the graphs represent the 95% error bounds and the solid lines represent the variable percentage change in response to a standard deviation of 1 in the variables. The response can either be positive or negative. The positive response is indicated by the fluctuation of variables above 0.0 and the negative effect is indicated by the fluctuation of variables below 0.0.

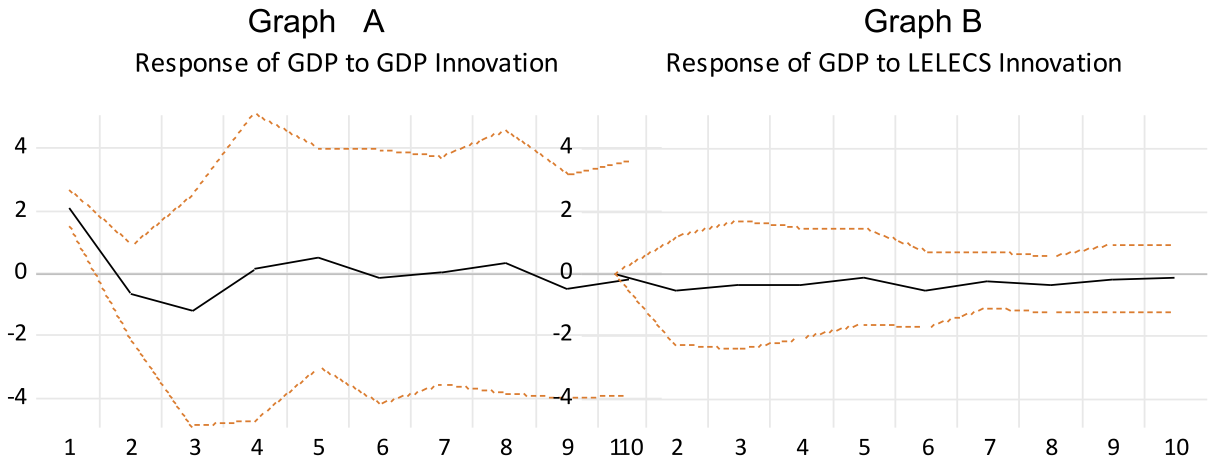

Figure 5.17 South Africa Impulse Response Function results

Source: Author's computation

From Graph A, it appears like GDP in South Africa respond immediately to its shocks, and the responsiveness of GDP to itself changes over time. The response was positive in the 1st period, then it became negative in the 2nd period until the 4th period then came back to negative in the 9th period. Graph B depicts that the response of GDP to shocks in electricity supply is negative throughout the whole period with change being constant in most periods. The country has been battling insufficient electricity supply for over 13 years with constant power cuts. The electricity supply has been constant with minor increases insufficient to meet the increased electricity demand in the country (Hlongwane & Daw, 2023). There were also some of the South African mines grounded to a halt due to the mining industry being more energy-intensive (du Venage, 2020). Perhaps the negative response of GDP to electricity shocks is induced by these overwhelming electricity crises faced by South Africa.

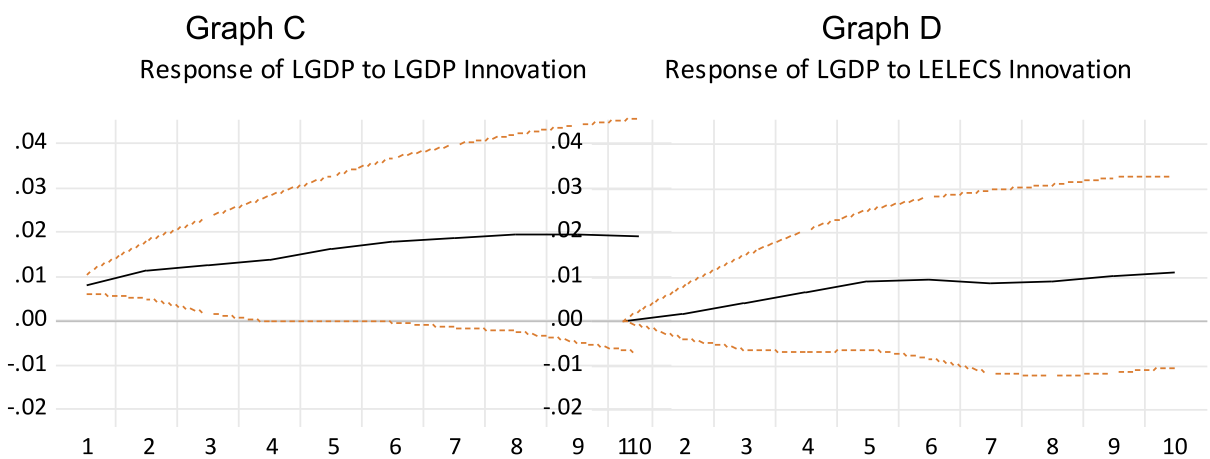

Figure 5.18 South Africa Impulse Response Function results

Source: Author's computation

Graph C shows that LGDP responds positively and immediately to shocks from itself in China. The response is positive throughout the period, though it remained constant from period 8 to the last. In Graph D, it can also be seen that LGD respond positively to shocks from electricity supply. China has been taking measures that include immediate actions to address power outages and continuous efforts to develop long-term solutions (Shen, Hove, Hu, Dupuy, Bregnbæk, Zhang, and Zhang, 2024). China increased its electricity generation significantly over the years and took action to curb the rapid construction of coal-fired power to address environmental concerns. This might be the reason for the explosive positive response of LGDP to electricity supply in China.

5.2.7 Variance of decomposition

The variance of decomposition is another technique used to assess GDP responses to shocks from the electricity supply and from itself. The results will assist in determining how much the variance of forecast error in economic growth is attributable to its own shock and to shocks from the electricity supply. The results for both South Africa and China are presented in Table 5.9 below. Detailed results on variance of decomposition are presented in Appendix I.

Table 5.9: Variance of decomposition results

SOUTH AFRICA MODEL				
Variance of decomposition	Period	SE	GDP	LELECS
GDP	1	2.109776	100.0000	0.000000
	3	3.346138	55.25323	3.923973
	10	3.856625	46.34388	7.047560
CHINA MODEL				
Variance of decomposition	Period	SE	LGDP	LELECS
LGDP	1	0.008412	100.0000	0.000000
	3	0.022611	71.20608	3.920590
	10	0.064008	64.95392	15.38021

Source: Author’s computation

To simplify the analysis, period 3 on Table 5.9 represents the short run and period 10 represents the long run. In the first period, economic growth in both countries explain

100% innovation variance. This is in line with the results that were stated in the Impulse Response Function, that economic growth responds immediately and significantly to its shock. In the short run, a shock in South Africa's economic growth causes 55.25% fluctuation on itself whereas a shock in China's economic growth causes 71.20% on itself. In the long run, the response of economic growth to shocks from itself is relatively smaller for both countries, as the economic growth of South Africa only responds by 46.34% and the economic growth of China responds by 64.95%.

In the short run, a shock in electricity supply causes a 3.92 fluctuation in economic growth in both South Africa and China. The economic growth responsiveness to shocks from electricity supply, in the long run, is larger than in the short run for both countries. The economic growth of South Africa responds by 7.04 to electricity supply shocks whereas the economic growth of China responds by 15.38 to electricity supply shocks. The magnitude of economic growth’s response to electricity supply shocks is lower in South Africa than to China in the long run. This means that the electricity supply in China drives economic growth more than in SA.

5.3 Chapter Summary

This chapter summarises results of the study based on the methodology discussed in Chapter 4. EViews 12 was used to perform and present the estimated results. The chapter began by reporting the informal unit root test results which insinuated that the variables are integrated at order I (0) and order I (1). The informal test results were confirmed by the formal unit root test using ADF and PP techniques. Since the unit root test results found the variables to be integrating at different orders, the study then proceeded to test the presence of cointegration and the long-run and short-run relationship using ARDL techniques. The long-run results revealed that economic growth in both South Africa and China have an inverse relationship with electricity supply, corruption and political instability. The subsequent results that the chapter presented are the Granger causality test results that revealed a unidirectional causality between political instability and GDP in South Africa and no causality in China. The chapter concluded with the impulse response function and variance of decomposition test to examine the response of GDP to shocks from the electricity supply. The results of the Impulse Response Function illustrated that GDP responds negatively to shocks from electricity supply shocks in SA and positively to electricity supply shocks in China.

The variance of decomposition revealed that the GDP in both SA and China responded by 3.93% to shocks from the electricity supply in the short run. In the long run, the economic growth of South Africa responds by 7.04 to electricity supply shocks whereas the economic growth of China responds by 15.38 to electricity supply shocks. The results displayed that the Chinese economic growth responds more to fluctuations in electricity supply than South Africa in the long run.

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary and interpretation of findings, followed by recommendations for clarity and policy decision-making in South Africa and China. It concludes by providing the study limitations and area for future research.

6.2 Summary and interpretation of findings

This study aimed to investigate comparatively the impact of electricity supply and subsequent shocks, the level of corruption, and political instability on the economic growth of South Africa and China for the period of 1995 to 2021. To achieve this aim, the study used four objectives for guidance. The first objective was to investigate the short and long-run relationship between electricity supply and economic growth. The second objective was investigated the short and long-run relationship between economic growth and the two governance indicators: level of corruption and political instability. The third objective was to determine if there is a causal relationship between electricity supply, the level of corruption and political instability. The final objective was to forecast the response of economic growth to shocks from electricity supply shocks.

To address the study objectives, the study first tested for stationarity of the variables to determine the suitable cointegration technique and to ensure that the variables were not explosive. The results therefore permitted the study to test the short and long-run relationship using the ARDL technique and to test for causal relationships using the Granger causality test. The Variance of decomposition and Impulse Response Function techniques were employed to forecast economic growth response to electricity supply shocks.

The empirical findings revealed that more variables were significant in both countries in the long run than in the short run. The long-run results indicated that economic growth in China and South Africa has a significant inverse relationship with electricity supply, corruption, and political instability. However, the magnitude of the impact of all variables was found to be more pronounced in South Africa. The Chinese economy was found to be more resilient to the effects of these issues in the long run. China took significant strikes to mitigate the negative electricity effects on growth and the results of this study show that the policies that the country implemented in dealing with energy issues were effective. South Africa on the other hand still has a long way to go as the effect of electricity shocks still has a dire impact on the economy. The policymakers of South Africa can learn from China and implement more responsive policies that will limit this negative impact on growth.

The South African economy was also found to be more impacted by corruption and political instability than China. The study established that this might be due to the differences in governing structures in the two countries as the South African government is deemed to attract instability because of frequent leadership changes, amongst others. South Africa should strengthen its governance and public institutions to reduce corruption and political instability to boost economic growth. In the short run, only political instability was found to have a substantial negative association with economic growth in South Africa, and electricity supply and corruption were found to have a significant negative relationship with growth in China. The Granger causality test found evidence of causality only in South Africa. A unidirectional causality was found between political instability and economic growth resulting from economic growth. The Impulse response function results revealed that the economic growth of South Africa responds negatively to shocks from electricity, whereas China responds positively to shocks from electricity supply. The study highlighted that China might be having favourable results because immediate measures or actions were taken to address power outages and made continuous efforts to develop long-term power solutions.

6.3 Conclusion and recommendation

Based on the study's findings, it can be inferred that China outperforms South Africa in terms of mitigating the impact of electricity supply shocks, corruption and political instability on economic growth. Although all these variables have a negative impact on economic growth in both countries, China has proven to be managing the effects far better than South Africa. All the variables have a direct effect on the economic growth of South Africa whereas they only affect the Chinese economic growth by a very small percentage. The impulse response function also established that China responds positively to electricity supply shocks whereas SA responds negatively. Therefore, the study established that South Africa might be more vulnerable to these challenges due to slow policy responses, weak political institutions, fragmented governance, and recurring political crises. Conversely, China has a more stable government that can better implement responsive long-term economic policies that help to limit the effects of these underlying energy and governance challenges.

The study recommends that South Africa follow some of the policies that China undertook when trying to solve electricity issues. This means South Africa must also take immediate actions and continual efforts to improve aged electrical power stations and renewable electricity generation. This might help to improve the economic growth of South Africa as the shocks from electricity supply deter economic growth. The study further recommends that both countries focus more on developing policies that can strengthen the rule of law, promote accountability and transparency, and promote a country that is free from riots and rent-seeking behaviour. This will result in reduced corruption level and political instability, which will in turn improve economic growth in these two countries. Although China’s economy demonstrates greater resilience to issues of corruption and political instability compared to South Africa, it remains crucial for China to persist in addressing these challenges, strengthening political stability, and improving governance to sustain long-term growth. In contrast, for South Africa, addressing these issues is an immediate priority, as they currently pose a more significant threat to its economic development. Strengthening governance in both countries will foster more favourable environments for investment, innovation, and broader economic prosperity.

6.4 Limitations of the study

The study limited its focus to South Africa and China for the period spanning from 1995 to 2021 due to data availability. The impact of only three major macroeconomic variables on economic growth was investigated whereas growth can be affected by numerous variables. Data availability also limited the study to use only electricity supply to represent electricity shocks, whereas variables such as electricity prices could have been added. The study also used the percentage growth to represent GDP in South Africa and the real value growth in China. When the data improves, upcoming researchers can consider using the same GDP when conducting comparative studies. The study used time series data for both models.

6.5 Area for further research

Despite the limited data and literature related to this study, this phenomenon can still be explored further. The study demonstrated that industrialised and developing countries might be influenced by comparable economic concerns, hence there is a need for more studies that can investigate them together. Future research can include electricity prices and electricity deficit when interrogating electricity shocks, and more governance indicators such as the rule of law can also be added when interrogating governance indicators on economic growth. Continued studies can carry out more comprehensive research that interrogates all the BRICS countries when investigating the topic. Moreover, they can also consider using different econometric techniques to explore different outcomes.

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APPENDICES

Appendix A: Data

Appendix A1: South African Data

YEARS	GDP	LELECS	CORR	POL	INF	LDEBT	MS
1995	3,1	0,491362	75,43988	30,31915	8,680444	10,16943	16,03137
1996	4,3	0,6	76,34409	32,44681	7,354113	10,15638	14,27894
1997	2,6	0,414973	74,53568	30,31915	8,597783	10,28536	17,81321
1998	0,5	-0,3	72,72727	28,19149	6,880546	10,16348	13,65295
1999	2,4	0,380211	71,47002	32,87881	5,181493	10,16442	10,90725
2000	4,2	0,6	70,21277	37,56614	5,338951	10,22606	7,215057
2001	2,7	0,431364	68,70427	37,83069	5,7019	10,23176	20,18988
2002	3,700374	0,6	67,19577	38,09524	9,494711	10,42723	18,28619
2003	2,949075	0,469686	64,55026	35,67839	5,679418	10,45603	13,3506
2004	4,55456	0,7	69,45813	40,29126	-0,69203	10,4786	13,153
2005	5,277052	0,722391	69,2683	40,7767	2,062846	10,43465	20,69745
2006	5,603806	0,7	69,7561	46,85991	3,243908	10,5211	22,62301
2007	5,360474	0,729203	61,65049	50,72464	6,177807	10,63557	23,93114
2008	3,191044	0,5	62,13592	46,15385	10,07458	10,62848	14,73821
2009	-1,53809	6,795176	61,24402	41,23223	7,215314	10,71906	1,761086
2010	3,039733	0,5	61,42857	45,0237	4,08973	10,90569	6,93403
2011	3,168556	0,500861	57,34597	48,81517	4,999267	10,96408	8,341285
2012	2,396232	0,4	53,08057	43,12796	5,724658	11,0363	5,17173
2013	2,485468	0,395408	54,50237	45,0237	5,784469	11,01127	5,916591
2014	1,413826	0,2	54,32692	40	6,129838	11,01817	7,279488
2015	1,321862	0,121186	56,73077	39,52381	4,540642	10,94567	10,32365
2016	0,664552	-0,2	59,13462	40	6,571396	11,0189	6,079449
2017	1,157947	0,063689	53,84615	34,76191	5,184247	11,11919	6,425536
2018	1,522329	0,2	53,36538	38,20755	4,517165	11,11337	5,599616
2019	0,303453	-0,51791	57,21154	36,79245	4,120246	11,15767	6,110245
2020	-6,34247	6,8	56,25	39,62264	3,210036	11,11849	9,427326
2021	4,913097	0,691355	55,76923	21,69811	4,611672	11,08941	5,709985

Appendix A2: Chinese Data

YEARS	LGDP	LELECS	CORR	POL	INF	LDEBT	MS
1995	10,95395	1,1	47,78765	41,35638	16,79123	10,98222	29,46102
1996	9,922557	1,101088	48,3871	44,14894	8,31316	11,01549	25,27316
1997	9,23678	5,695797	47,1882	38,56383	2,786465	11,06236	20,72731
1998	7,845952	1,077363	45,9893	32,97872	-0,77319	11,10337	14,90435
1999	7,661652	1,065879	47,72869	35,53698	-1,40147	11,1249	14,66648
2000	8,490093	8,365311	49,46809	38,09524	0,347811	11,12227	12,32478
2001	8,335733	8,238143	42,72346	35,18518	0,719126	11,10625	15,04241

2002	9,133631	13,30153	35,97884	32,27513	-0,73197	11,07724	13,14044
2003	10,03803	13,67983	43,91534	28,64322	1,127603	11,07458	19,23977
2004	10,11362	15,47769	33,49754	31,5534	3,824637	11,118	14,88692
2005	11,39459	13,40271	32,19512	30,09709	1,776414	11,13752	16,74165
2006	12,72096	14,6843	37,07317	27,53623	1,649431	11,1838	22,11612
2007	14,23086	15,6807	32,52427	28,01932	4,816768	11,23974	16,73553
2008	9,650679	6,657381	36,40777	29,32692	5,925251	11,29857	17,77811
2009	9,398726	8,278654	36,84211	30,80569	-0,72817	11,30756	28,42328
2010	10,63587	10,88727	33,80952	25,59242	3,175325	11,34173	18,94831
2011	9,550832	11,18683	36,96682	27,96209	5,553899	11,43476	17,32297
2012	7,863736	12,07078	41,23223	27,96209	2,619524	11,53821	14,39165
2013	7,76615	8,122234	45,0237	26,54029	2,62105	11,59404	13,5889
2014	7,425764	-2,07727	46,15385	28,57143	1,921642	11,72329	11,01194
2015	7,041329	2,438909	48,55769	26,19048	1,437024	11,70056	13,3431
2016	6,848762	13,38583	48,55769	26,66667	2,000002	11,7804	11,33312
2017	6,947201	6,513454	47,59615	38,57143	1,593136	11,82217	8,109778
2018	6,749774	7,772688	46,63462	35,84906	2,07479	11,86507	6,991062
2019	5,950501	5,409223	44,71154	37,73585	2,899234	11,95385	8,882279
2020	2,238638	3,279545	54,32692	35,84906	2,419422	12,0336	10,01356
2021	8,447478	9,928123	58,17308	29,24528	0,981015	12,08121	9,075746

Appendix B: Unit root/stationary test results

Appendix B1: Unit root test for South Africa model

- Augmented Dickey-Fuller: GDP @ level

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.906580	0.0063
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.559448	0.0064
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: GDP has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.649296	0.0926
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philips perron: GDP @ level

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.906580	0.0063
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.559448	0.0064
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: GDP has a unit root
Exogenous: None
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.195902	0.0296
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: LELEC @ level

Null Hypothesis: LELECS has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.472110	0.5308
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

Null Hypothesis: LELECS has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.423294	0.9573
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philps-perron: LELEC @ level

Null Hypothesis: LELECS has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.557332	0.4894
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LELECS has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.640590	0.0053
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LELECS has a unit root
Exogenous: None
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.923043	0.9000
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey-Fuller: LELEC @ 1st difference

Null Hypothesis: D(LELECS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.459259	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LELECS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.347551	0.0000
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LELECS) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.153285	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: ELECS @ 1st difference

Null Hypothesis: D(LELECS) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.79263	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LELECS) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-12.42866	0.0000
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LELECS) has a unit root
Exogenous: None
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.153285	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: CORR @ level

Null Hypothesis: CORR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.388940	0.5720
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CORR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.375699	0.3824
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CORR has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.559477	0.1098
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: CORR @ level

Null Hypothesis: CORR has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.335777	0.5973
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CORR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.375699	0.3824
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CORR has a unit root
Exogenous: None
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.274172	0.0248
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: CORR @ 1st difference

Null Hypothesis: D(CORR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.488450	0.0001
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CORR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.538129	0.0007
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CORR) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.110566	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: CORR @ 1st difference

Null Hypothesis: D(CORR) has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.936982	0.0001
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CORR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.468934	0.0001
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CORR) has a unit root
Exogenous: None
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.110341	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: POL @ level

Null Hypothesis: POL has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.450554	0.5421
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: POL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.722695	0.9604
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: POL has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.535318	0.4752
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: POL @ level

Null Hypothesis: POL has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.450554	0.5421
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: POL has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.169307	0.9963
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: POL has a unit root
Exogenous: None
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.527775	0.4783
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: POL @ 1st difference

Null Hypothesis: D(POL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.386239	0.0021
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(POL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.913979	0.0030
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(POL) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.528847	0.0001
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: POL @ 1st difference

Null Hypothesis: D(POL) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.378054	0.0022
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(POL) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.708235	0.0048
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(POL) has a unit root
Exogenous: None
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.519896	0.0001
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: INF @ level

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.852290	0.0074
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.005004	0.0220
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: None
Lag Length: 4 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.988823	0.2791
Test critical values:	1% level	-2.674290	
	5% level	-1.957204	
	10% level	-1.608175	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: INF @ level

Null Hypothesis: INF has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.999857	0.0481
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.961873	0.1611
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: None
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.286835	0.1776
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: INF@ 1st difference

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.414041	0.0002
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.280939	0.0017
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INF) has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.461932	0.0000
Test critical values:	1% level	-2.674290	
	5% level	-1.957204	
	10% level	-1.608175	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: INF @ 1st difference

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.034865	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.816430	0.0000
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INF) has a unit root
Exogenous: None
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.033082	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: LDEBT @ level

Null Hypothesis: LDEBT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.819888	0.7966
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDEBT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.874680	0.6385
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDEBT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.354728	0.9939
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: LDEBT @ level

Null Hypothesis: LDEBT has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.819888	0.7966
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDEBT has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.955289	0.5974
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDEBT has a unit root
Exogenous: None
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		2.451247	0.9951
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: LDEBT @ 1st difference

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.172284	0.0003
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.123696	0.0019
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.254430	0.0002
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: LDEBT @ 1st difference

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.170583	0.0003
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.121872	0.0019
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: None
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.250149	0.0002
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: MS @ level

Null Hypothesis: MS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.205826	0.2090
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: MS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.279919	0.0926
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: MS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.321624	0.1676
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: MS @ level

Null Hypothesis: MS has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.091749	0.2493
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: MS has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.893064	0.1806
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: MS has a unit root
Exogenous: None
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.201192	0.2041
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: MS @ 1st difference

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.886703	0.0007
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.768357	0.0045
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MS) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.916795	0.0000
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: MS @ 1st difference

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.659852	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.054001	0.0000
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MS) has a unit root
Exogenous: None
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.284085	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

Appendix B2: Unit root test for China model

- Augmented Dickey Fuller: LGDP @ level

Null Hypothesis: LGDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.188056	0.2153
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.639165	0.2678
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LGDP has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.582805	0.4542
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: LGDP @ level

Null Hypothesis: LGDP has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.152973	0.2273
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LGDP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.531434	0.3115
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LGDP has a unit root
Exogenous: None
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.455169	0.5071
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: LGDP @ 1st difference

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.998289	0.0006
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.921141	0.0037
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LGDP) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.162850	0.0000
Test critical values:	1% level	-2.674290	
	5% level	-1.957204	
	10% level	-1.608175	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: LGDP @ 1st difference

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.919067	0.0008
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.685204	0.0060
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LGDP) has a unit root
Exogenous: None
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.112193	0.0000
Test critical values:	1% level	-2.674290	
	5% level	-1.957204	
	10% level	-1.608175	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: LELECS @ level

Null Hypothesis: LELECS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.838749	0.0667
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LELECS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.657524	0.2606
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LELECS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.071970	0.2490
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: LELECS @ level

Null Hypothesis: LELECS has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.760970	0.0778
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LELECS has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.658614	0.2600
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LELECS has a unit root
Exogenous: None
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.896049	0.3185
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: LELECS @ 1st difference

Null Hypothesis: D(LELECS) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.121598	0.0004
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LELECS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.038153	0.0025
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LELECS) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.225606	0.0000
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: LELECS @ 1st difference

Null Hypothesis: D(LELECS) has a unit root
Exogenous: Constant
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.342880	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LELECS) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 17 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.146037	0.0000
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LELECS) has a unit root
Exogenous: None
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.391721	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: CORR @ level

Null Hypothesis: CORR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.039208	0.7235
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CORR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.254603	0.8768
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CORR has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.301520	0.7654
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: CORR @ level

Null Hypothesis: CORR has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.827300	0.7944
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CORR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.794711	0.9533
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CORR has a unit root
Exogenous: None
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.414083	0.7954
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: CORR @ 1st difference

Null Hypothesis: D(CORR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.672279	0.0001
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CORR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.361520	0.0001
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CORR) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.747350	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: CORR @ 1st difference

Null Hypothesis: D(CORR) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.724979	0.0001
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CORR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.576594	0.0000
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CORR) has a unit root
Exogenous: None
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.802181	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: POL @ level

Null Hypothesis: POL has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.450250	0.1387
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: POL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.354054	0.3928
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: POL has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.965746	0.2899
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: POL @ level

Null Hypothesis: POL has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.322320	0.1728
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: POL has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.245618	0.4466
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: POL has a unit root
Exogenous: None
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.183683	0.2099
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: POL @ 1st difference

Null Hypothesis: D(POL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.277428	0.0002
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(POL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 6 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.773682	0.0417
Test critical values:	1% level	-4.532598	
	5% level	-3.673616	
	10% level	-3.277364	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(POL) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.280057	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: POL@ 1st difference

Null Hypothesis: D(POL) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.304479	0.0002
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(POL) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.848335	0.0004
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(POL) has a unit root
Exogenous: None
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.301661	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: INF @ level

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.752884	0.0097
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.100767	0.0186
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.272560	0.0251
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: INF@ level

Null Hypothesis: INF has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.167169	0.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.269571	0.0000
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: None
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.395688	0.0000
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: INF @ 1st difference

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.129732	0.0004
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.848274	0.0037
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INF) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.254812	0.0000
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: INF@ 1st difference

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.771817	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 14 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.296174	0.0001
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INF) has a unit root
Exogenous: None
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.169998	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: LDEBT @ level

Null Hypothesis: LDEBT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.159731	0.9998
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDEBT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.819869	0.9505
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDEBT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		5.614139	1.0000
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: LDEBT @ level

Null Hypothesis: LDEBT has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		1.944440	0.9997
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDEBT has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.888689	0.9424
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDEBT has a unit root
Exogenous: None
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		4.260778	0.9999
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: LDEBT @ 1st difference

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.753133	0.0094
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.646764	0.0055
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.031552	0.2634
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: LDEBT @ 1st difference

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.809808	0.0082
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.641523	0.0056
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDEBT) has a unit root
Exogenous: None
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.037023	0.0420
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: MS @ level

Null Hypothesis: MS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.750720	0.0794
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: MS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.028504	0.1439
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: MS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.787136	0.0706
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: MS @ level

Null Hypothesis: MS has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.750720	0.0794
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: MS has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.028504	0.1439
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: MS has a unit root
Exogenous: None
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.898835	0.0562
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

- Augmented Dickey Fuller: MS @ 1st difference

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.351625	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.289397	0.0125
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MS) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.272322	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

- Philips-perron: MS @ 1st difference

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.459954	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.412524	0.0001
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MS) has a unit root
Exogenous: None
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.417016	0.0000
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

Appendix C: Bounds test

South Africa model

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	12.38939	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99
Actual Sample Size	25	Finite Sample: n=30		
		10%	2.334	3.515
		5%	2.794	4.148
		1%	3.976	5.691

China model

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	10.13138	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99
Actual Sample Size	25	Finite Sample: n=30		
		10%	2.334	3.515
		5%	2.794	4.148
		1%	3.976	5.691

Appendix D: Long run relationship

South Africa model

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LELECS	-24.30394	4.405113	-5.517212	0.0015
CORR	-0.172044	0.033563	-5.126032	0.0022
POL	-0.080960	0.024649	-3.284514	0.0167
INF	-0.451092	0.077916	-5.789450	0.0012
LDEBT	-7.221119	1.110906	-6.500205	0.0006
MS	15.82492	2.633093	6.010012	0.0010
C	177.2116	25.69812	6.895897	0.0005

EC = GDP - (-24.3039*LELECS -0.1720*CORR -0.0810*POL -0.4511*INF
-7.2211*LDEBT + 15.8249*MS + 177.2116)

China Model

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LELECS	-0.000926	0.000332	-2.786545	0.0317
CORR	-0.002903	0.000753	-3.856378	0.0084
POL	-0.002024	0.000410	-4.934482	0.0026
INF	0.003455	0.000911	3.791673	0.0091
LDEBT	0.044992	0.037986	1.184445	0.2810
MS	0.611732	0.032982	18.54743	0.0000
C	2.421754	0.198975	12.17118	0.0000

EC = LGDP - (-0.0009*LELECS -0.0029*CORR -0.0020*POL + 0.0035*INF + 0.0450*LDEBT + 0.6117*MS + 2.4218)

Appendix E: Short run Model

South Africa Model

ARDL Error Correction Regression
Dependent Variable: D(GDP)
Selected Model: ARDL(2, 2, 2, 2, 1, 1, 0)
Case 2: Restricted Constant and No Trend
Date: 03/27/24 Time: 08:48
Sample: 1995 2021
Included observations: 25

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	0.916671	0.300890	3.046528	0.0159
D(LELECS)	-0.633838	8.753850	-0.072407	0.9441
D(LELECS(-1))	33.54623	9.618757	3.487585	0.0082
D(CORR)	0.057245	0.115743	0.494588	0.6342
D(CORR(-1))	-0.528850	0.107027	-4.941274	0.0011
D(POL)	-0.257392	0.083089	-3.097785	0.0147
D(POL(-1))	-0.282769	0.138843	-2.036615	0.0761
D(INF)	-0.523574	0.150558	-3.477552	0.0083
D(LDEBT)	21.18503	4.494410	4.713639	0.0015
CointEq(-1)*	-1.912108	0.227381	-8.409256	0.0000

China model

ARDL Error Correction Regression
Dependent Variable: D(LGDP)
Selected Model: ARDL(2, 1, 2, 1, 2, 2, 2)
Case 2: Restricted Constant and No Trend
Date: 03/27/24 Time: 07:40
Sample: 1995 2021
Included observations: 25

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	0.496263	0.061878	8.020042	0.0002
D(LELECS)	-0.001500	0.000187	-8.021225	0.0002
D(CORR)	-0.001450	0.000202	-7.173639	0.0004
D(CORR(-1))	0.001798	0.000189	9.500634	0.0001
D(POL)	-0.000292	0.000188	-1.554603	0.1710
D(INF)	-0.000256	0.000307	-0.834334	0.4360
D(INF(-1))	-0.002833	0.000373	-7.594247	0.0003
D(LDEBT)	-0.281328	0.024224	-11.61344	0.0000
D(LDEBT(-1))	-0.313766	0.027763	-11.30175	0.0000
D(MS)	-0.267008	0.045316	-5.892125	0.0011
D(MS(-1))	-0.557769	0.089912	-6.203491	0.0008
CointEq(-1)*	-1.091517	0.082367	-13.25182	0.0000

Appendix F: Granger Causality

South Africa Model

Pairwise Granger Causality Tests
Date: 04/02/24 Time: 06:35
Sample: 1995 2021
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LELECS does not Granger Cause GDP	25	1.05549	0.3666
GDP does not Granger Cause LELECS		2.23158	0.1334
CORR does not Granger Cause GDP	25	2.42424	0.1141
GDP does not Granger Cause CORR		0.20841	0.8136
POL does not Granger Cause GDP	25	1.75606	0.1983
GDP does not Granger Cause POL		8.17345	0.0025
INF does not Granger Cause GDP	25	2.02496	0.1582
GDP does not Granger Cause INF		0.26214	0.7720
LDEBT does not Granger Cause GDP	25	1.68827	0.2101
GDP does not Granger Cause LDEBT		0.03195	0.9686
MS does not Granger Cause GDP	25	1.47551	0.2525
GDP does not Granger Cause MS		1.87580	0.1792
CORR does not Granger Cause LELECS	25	0.96342	0.3986
LELECS does not Granger Cause CORR		1.93890	0.1700
POL does not Granger Cause LELECS	25	1.45940	0.2561
LELECS does not Granger Cause POL		0.37907	0.6893
INF does not Granger Cause LELECS	25	0.65660	0.5294
LELECS does not Granger Cause INF		0.50665	0.6100
LDEBT does not Granger Cause LELECS	25	1.22051	0.3161
LELECS does not Granger Cause LDEBT		8.01576	0.0028
MS does not Granger Cause LELECS	25	1.81927	0.1880
LELECS does not Granger Cause MS		2.34911	0.1212
POL does not Granger Cause CORR	25	2.59266	0.0997
CORR does not Granger Cause POL		1.00320	0.3844
INF does not Granger Cause CORR	25	1.69137	0.2096
CORR does not Granger Cause INF		0.70948	0.5039
LDEBT does not Granger Cause CORR	25	5.72995	0.0108
CORR does not Granger Cause LDEBT		0.42651	0.6586
MS does not Granger Cause CORR	25	0.13115	0.8778
CORR does not Granger Cause MS		4.77968	0.0201
INF does not Granger Cause POL	25	1.01739	0.3795
POL does not Granger Cause INF		2.09019	0.1499
LDEBT does not Granger Cause POL	25	1.31912	0.2896
POL does not Granger Cause LDEBT		1.47760	0.2521
MS does not Granger Cause POL	25	0.12806	0.8805
POL does not Granger Cause MS		1.79936	0.1912
LDEBT does not Granger Cause INF	25	0.50702	0.6098
INF does not Granger Cause LDEBT		0.08197	0.9216
MS does not Granger Cause INF	25	2.70126	0.0915
INF does not Granger Cause MS		3.40821	0.0532
MS does not Granger Cause LDEBT	25	0.04144	0.9595
LDEBT does not Granger Cause MS		3.28407	0.0584

China

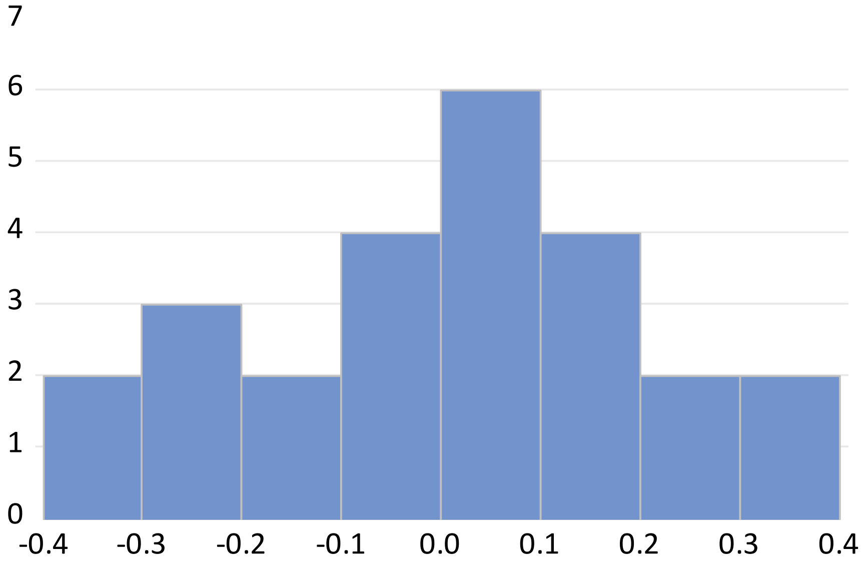
Pairwise Granger Causality Tests
Date: 04/04/24 Time: 18:46
Sample: 1995 2021
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LELECS does not Granger Cause LGDP	25	1.58470	0.2297
LGDP does not Granger Cause LELECS		0.78848	0.4682
CORR does not Granger Cause LGDP	25	2.93762	0.0761
LGDP does not Granger Cause CORR		2.38465	0.1178
POL does not Granger Cause LGDP	25	1.26981	0.3026
LGDP does not Granger Cause POL		3.15303	0.0645
INF does not Granger Cause LGDP	25	1.12116	0.3455
LGDP does not Granger Cause INF		5.76095	0.0106
LDEBT does not Granger Cause LGDP	25	2.86778	0.0803
LGDP does not Granger Cause LDEBT		2.31818	0.1243
MS does not Granger Cause LGDP	25	8.48975	0.0021
LGDP does not Granger Cause MS		3.67780	0.0436
CORR does not Granger Cause LELECS	25	1.20648	0.3201
LELECS does not Granger Cause CORR		1.18008	0.3278
POL does not Granger Cause LELECS	25	0.05471	0.9469
LELECS does not Granger Cause POL		0.94264	0.4062
INF does not Granger Cause LELECS	25	0.37249	0.6937
LELECS does not Granger Cause INF		2.17975	0.1392
LDEBT does not Granger Cause LELECS	25	3.35045	0.0556
LELECS does not Granger Cause LDEBT		1.33153	0.2865
MS does not Granger Cause LELECS	25	0.30225	0.7425
LELECS does not Granger Cause MS		1.89709	0.1760
POL does not Granger Cause CORR	25	0.04935	0.9520
CORR does not Granger Cause POL		2.14013	0.1438
INF does not Granger Cause CORR	25	0.19467	0.8246
CORR does not Granger Cause INF		2.10044	0.1486
LDEBT does not Granger Cause CORR	25	4.61198	0.0225
CORR does not Granger Cause LDEBT		2.19818	0.1371
MS does not Granger Cause CORR	25	6.42375	0.0070
CORR does not Granger Cause MS		2.71361	0.0906
INF does not Granger Cause POL	25	0.95488	0.4017
POL does not Granger Cause INF		1.28054	0.2997
LDEBT does not Granger Cause POL	25	0.08231	0.9213
POL does not Granger Cause LDEBT		1.33774	0.2849
MS does not Granger Cause POL	25	0.24595	0.7843
POL does not Granger Cause MS		1.86689	0.1806
LDEBT does not Granger Cause INF	25	0.10455	0.9012
INF does not Granger Cause LDEBT		2.10871	0.1476
MS does not Granger Cause INF	25	3.87286	0.0379
INF does not Granger Cause MS		1.00383	0.3842
MS does not Granger Cause LDEBT	25	2.28204	0.1280
LDEBT does not Granger Cause MS		4.60784	0.0226

Appendix G: Diagnostic tests results

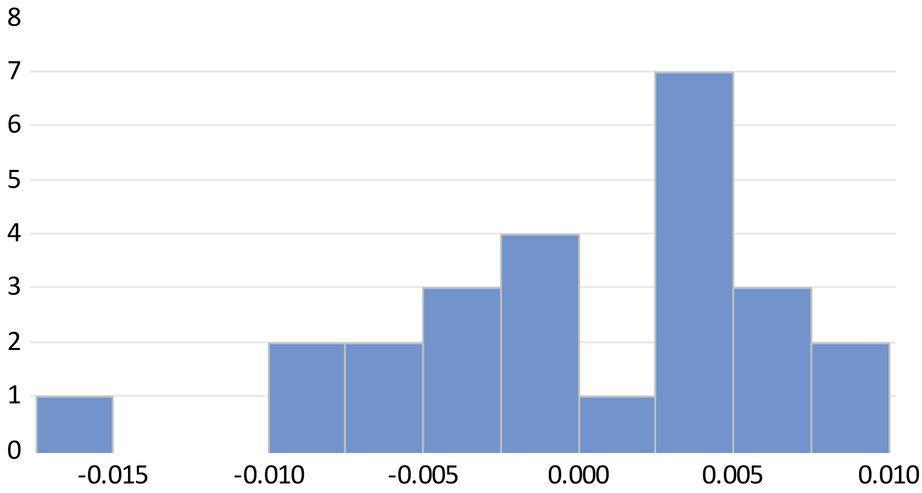
Normality

South Africa Model



Series: Residuals	
Sample 1997 2021	
Observations 25	
Mean	-2.27e-14
Median	0.010519
Maximum	0.361353
Minimum	-0.387945
Std. Dev.	0.200887
Skewness	-0.116690
Kurtosis	2.372376
Jarque-Bera	0.467060
Probability	0.791734

China Model



Series: Residuals	
Sample 1997 2021	
Observations 25	
Mean	-2.84e-15
Median	0.000375
Maximum	0.009668
Minimum	-0.015002
Std. Dev.	0.006214
Skewness	-0.475772
Kurtosis	2.686359
Jarque-Bera	1.045632
Probability	0.592849

Autocorrelation

South Africa Model

Date: 03/27/24 Time: 08:52
Sample (adjusted): 1997 2021
Q-statistic probabilities adjusted for 2 dynamic regressors

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.050	-0.050	0.0699	0.791
		2	-0.011	-0.014	0.0735	0.964
		3	-0.127	-0.128	0.5664	0.904
		4	-0.127	-0.143	1.0843	0.897
		5	-0.286	-0.319	3.8535	0.571
		6	-0.034	-0.129	3.8942	0.691
		7	-0.086	-0.199	4.1690	0.760
		8	0.220	0.074	6.0912	0.637
		9	0.121	0.031	6.7082	0.667
		10	0.034	-0.086	6.7598	0.748
		11	0.001	-0.040	6.7598	0.818
		12	0.034	0.018	6.8190	0.869

*Probabilities may not be valid for this equation specification.

China Model

Date: 03/27/24 Time: 08:12
Sample (adjusted): 1997 2021
Q-statistic probabilities adjusted for 2 dynamic regressors

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.323	-0.323	2.9400	0.086
		2	0.163	0.065	3.7178	0.156
		3	-0.192	-0.137	4.8508	0.183
		4	-0.224	-0.375	6.4617	0.167
		5	0.063	-0.118	6.5959	0.252
		6	-0.079	-0.095	6.8150	0.338
		7	0.085	-0.121	7.0846	0.420
		8	-0.079	-0.242	7.3330	0.501
		9	-0.048	-0.285	7.4317	0.592
		10	0.039	-0.201	7.4989	0.678
		11	0.136	0.007	8.3903	0.678
		12	0.013	-0.124	8.3987	0.753

*Probabilities may not be valid for this equation specification.

Heteros

South Africa Model

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.519473	Prob. F(16,8)	0.8739
Obs*R-squared	12.73876	Prob. Chi-Square(16)	0.6918
Scaled explained SS	3.158831	Prob. Chi-Square(16)	0.9998

Heteroskedasticity Test: Harvey
Null hypothesis: Homoskedasticity

F-statistic	1.402317	Prob. F(16,8)	0.3226
Obs*R-squared	18.42907	Prob. Chi-Square(16)	0.2994
Scaled explained SS	22.81304	Prob. Chi-Square(16)	0.1188

Heteroskedasticity Test: ARCH

F-statistic	0.252858	Prob. F(1,22)	0.6201
Obs*R-squared	0.272710	Prob. Chi-Square(1)	0.6015

Heteroskedasticity Test: Glejser
Null hypothesis: Homoskedasticity

F-statistic	0.854803	Prob. F(16,8)	0.6261
Obs*R-squared	15.77357	Prob. Chi-Square(16)	0.4689
Scaled explained SS	7.257201	Prob. Chi-Square(16)	0.9680

China Model

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.462438	Prob. F(18,6)	0.9043
Obs*R-squared	14.52798	Prob. Chi-Square(18)	0.6941
Scaled explained SS	1.735106	Prob. Chi-Square(18)	1.0000

Heteroskedasticity Test: Harvey
Null hypothesis: Homoskedasticity

F-statistic	0.592838	Prob. F(18,6)	0.8184
Obs*R-squared	16.00238	Prob. Chi-Square(18)	0.5924
Scaled explained SS	21.45424	Prob. Chi-Square(18)	0.2571

Heteroskedasticity Test: ARCH

F-statistic	0.638327	Prob. F(1,22)	0.4329
Obs*R-squared	0.676722	Prob. Chi-Square(1)	0.4107

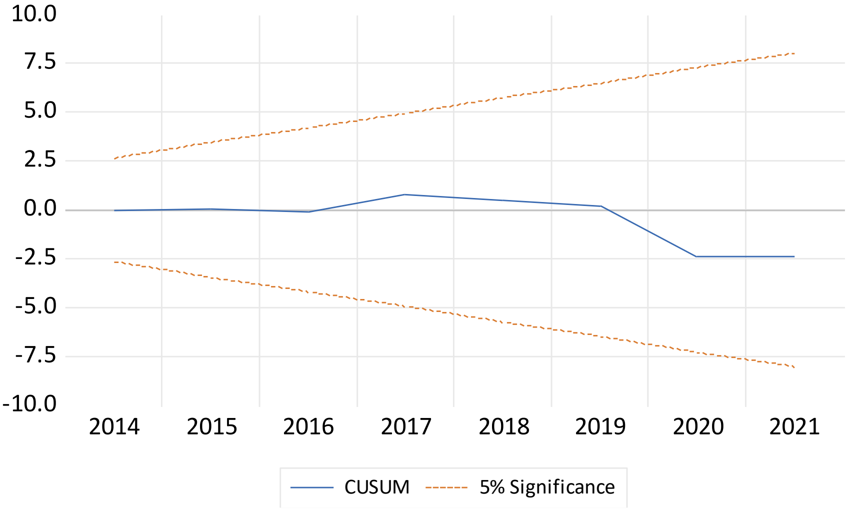
Heteroskedasticity Test: Glejser
Null hypothesis: Homoskedasticity

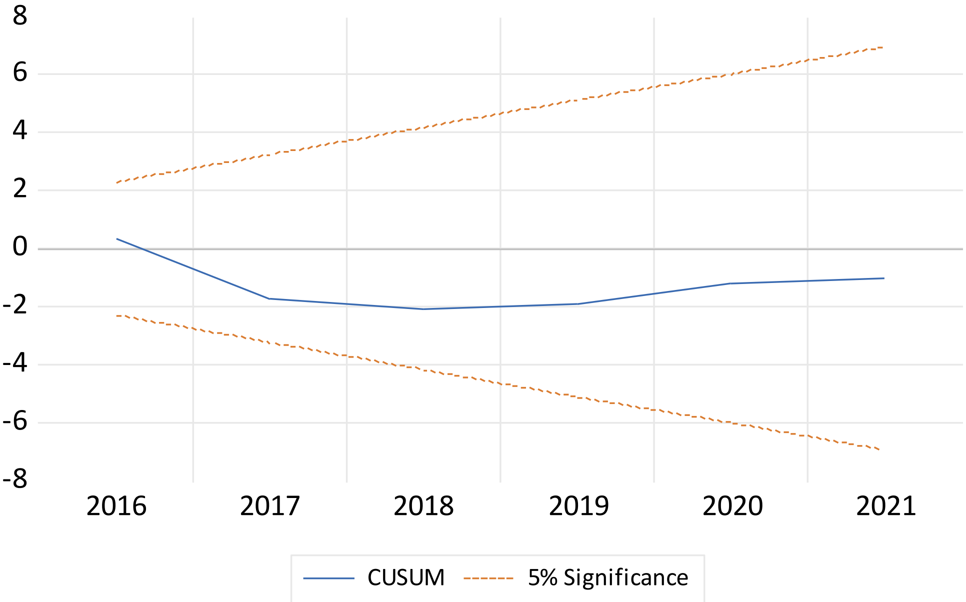
F-statistic	0.442808	Prob. F(18,6)	0.9157
Obs*R-squared	14.26312	Prob. Chi-Square(18)	0.7118
Scaled explained SS	4.353609	Prob. Chi-Square(18)	0.9996

Appendix H: Stability Test

Cusum test

South Africa

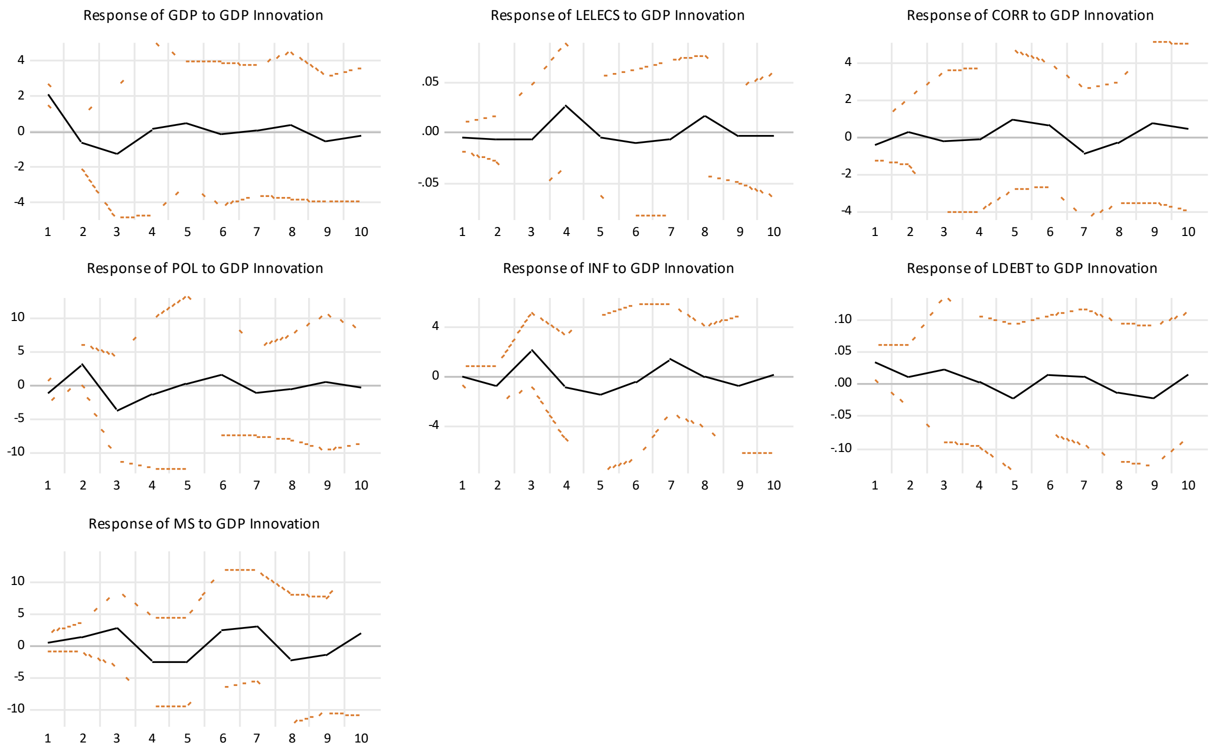




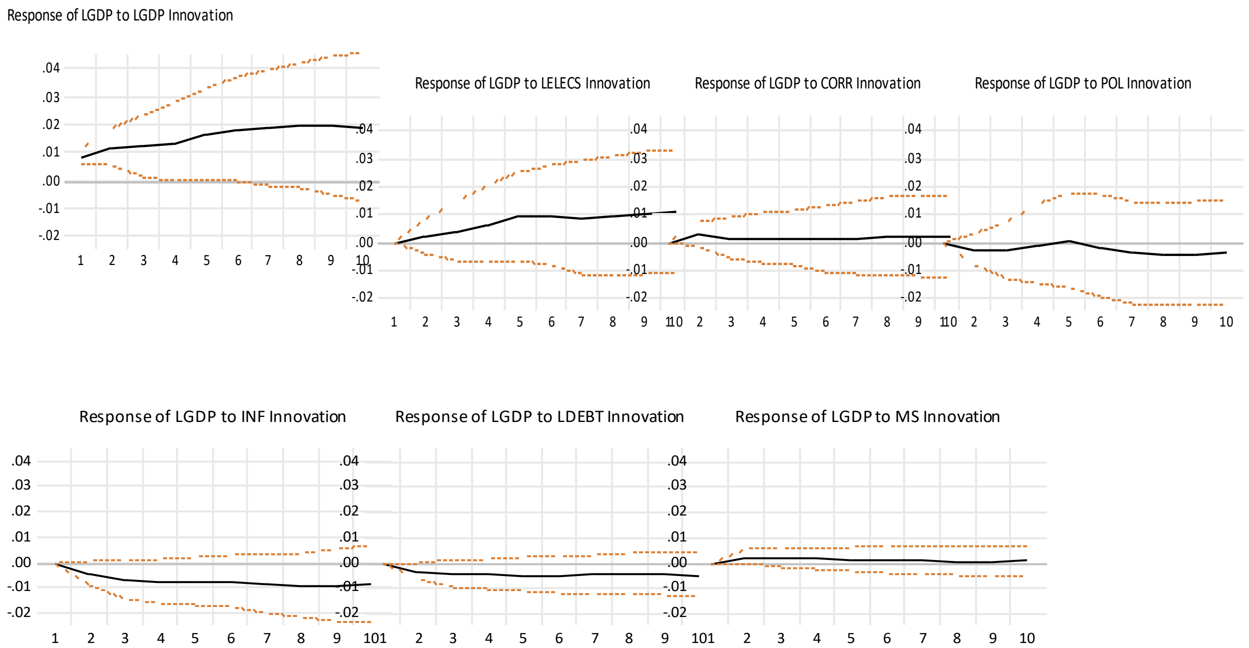
Appendix I: Impulse Response

South Africa

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



China



Appendix J: Variance of decomposition

South Africa

Variance Decomposition of GDP:

Period	S.E.	GDP	LELECS	CORR	POL	INF	LDEBT	MS
1	2.109776	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.875381	58.43276	3.608617	4.321436	4.935040	28.68815	0.010161	0.003843
3	3.346138	55.25323	3.923973	4.250626	3.995953	29.21144	1.424908	1.939863
4	3.513033	50.44843	4.420345	6.961120	6.795890	26.53255	1.824894	3.016771
5	3.610720	49.81896	4.253103	8.506555	7.278536	25.35631	1.728857	3.057677
6	3.670539	48.34096	6.136977	8.955743	7.152969	24.59612	1.769055	3.048174
7	3.695522	47.74236	6.360561	8.973896	7.274151	24.45656	1.848906	3.343571
8	3.768503	46.89038	7.059805	8.737843	8.437996	23.63298	1.826392	3.414611
9	3.808907	47.32836	7.099935	8.998642	8.260366	23.14241	1.790635	3.379654
10	3.856625	46.34388	7.047560	9.021188	8.130867	24.37783	1.773435	3.305244

China

Variance Decomposition of LGDP:

Period	S.E.	LGDP	LELECS	CORR	POL	INF	LDEBT	MS
1	0.008412	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.016180	78.89735	1.305210	2.624744	2.632003	7.334615	5.270052	1.936031
3	0.022611	71.20608	3.920590	1.612014	3.179824	11.97665	6.080850	2.023994
4	0.028725	67.54843	7.763633	1.184583	2.025763	13.57010	6.219367	1.688126
5	0.035595	65.69886	11.81131	0.909430	1.342659	13.18408	5.810314	1.243345
6	0.042033	65.77136	13.63099	0.704297	1.104864	12.43673	5.360566	0.991190
7	0.048005	65.97700	13.83162	0.633186	1.496616	12.30468	4.930716	0.826185
8	0.053817	65.95302	13.92156	0.622964	1.784095	12.51112	4.525616	0.681624
9	0.059162	65.57622	14.53671	0.608078	1.919669	12.49247	4.281486	0.585376
10	0.064008	64.95392	15.38021	0.602368	2.001294	12.36698	4.170113	0.525115