THE EFFECTS OF INTERNATIONAL TRADE ON ECONOMIC GROWTH IN SOUTH AFRICA (2000Q1 TO 2017Q1) AND ECONOMETRIC VIEW

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Dissertation submitted for the requirements for the degree of

MASTER OF COMMERCE IN ECONOMICS

in

FACULTY OF MANAGEMENT & LAW

(School of Economics and Management)

at the

UNIVERSITY OF LIMPOPO

SUPERVISOR: Prof IP MONGALE

2019

DECLARATION

I declare that **THE EFFECTS OF INTERNATIONAL TRADE ON ECONOMIC GROWTH IN SOUTH AFRICA (2000Q1 TO 2017Q1) AND ECONOMETRIC VIEW** 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.

Ndivhuho Eunice Ratombo	25 March 2019
Full names	**Date**

ACKNOWLEDGEMENTS

Undertaking a research project of this type is necessarily demanding, nevertheless there are so many important people who supported me in different ways during the development of this dissertation that I would like to thank. Indeed, without their support, guidance, advice and encouragement the completion of my research study would not have been possible.

First I would like to thank the Almighty God for giving me the ability to complete my dissertation. Again I would like to extend a sincere thank you to my supervisor, Prof Itumeleng Mongale; it was such an honour working with him, his guidance, support and encouragement are greatly appreciated. Prof Ncanywa and Prof Mah thank you for the support. Apostle/Senior Pastor M.M and Pastor V.J Ratombo, Pastor Maurice and Nokuthula, and the Ratombo family for being my source of inspiration throughout the duration of the study, especially my mother Mrs NT Ratombo whose prayers propelled me to this point. Mr K Vhengani and my son Akonaho Munangiwa, Mr T and R.J Khumisi, The BBC family, My fellow students Manyaka K, Baloyi L, Mulaudzi MP and all masters of economics students at the University of Limpopo. Thank you all so much for your flexibility, understanding, openness, willingness and support throughout the entire process.

ABSTRACT

International trade has been identified by many economists to be an engine for growth and development. There has been an increase in the number of bilateral and multilateral trade agreements across the globe. Trade has gained significant attention among developed and developing countries and it hugely attributed to the impact of technology and globalisation. The study employs autoregressive distributed lag (ARDL) bounds testing approach to analyse The effects of international trade on economic growth in South Africa from (2000Q1 to 2017Q1) and economic review. The quarterly time series data from 2000Q1 to 2017Q1 is sourced from the South African Reserve Bank (SARB) and Quantec Easy Data. This study is envisaged to provide a better understanding on the relationship between South African economic growth and international trade. The findings brought light on how growth can be improved in South Africa. The unit root tests indicate a mixture of I(0) and I(1) variables which implied the employment of the ARDL approach. The cointegration model emphasizes the long-run equilibrium relationship between the dependant and independent variables. The findings reveal that exchange rate and import are positively related with GDP while one export is negatively related to it. The conclusion from this work is that there is correlation between GDP and its regressors. Since the results show that South African export have negative impact on growth, it is recommended that South African government must promote trading of goods and services internally and not focus much on exporting its primary goods and services abroad because it weakens the economy. It is recommended that South Africa must produce or export according to the need of the industry, so that the country benefit in return. Lastly, it is recommended that South Africa must support local industries and firms to create more employment opportunities and start programmes that will make youth to be active in businesses and reduce over reliance to the government.

KEY CONCEPTS: Economic growth, International trade, ARDL approach, South Africa, GDP

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ACRONYMS

ASGISA- Accelerated and Shared Growth Initiative for South Africa

GDP- Gross Domestic Product

OLS- Ordinary Least Squares

ARDL- Autoregressive Distributed Lag

ADF- Augmented Dickey Fuller

DF- GLS-Dickey Fuller Generalized Least Squares

PP- Phillip-Perron

IT- International Trade

EG- Economic Growth

IS- Import Substitution

EP- Export Promotion

IR- Industrial Revolution

SARB- South African Reserve Bank

OECD- Organisation for Economic Co-operation and Development

R&D- Research and Development

HOS- Heckscher-Ohlin-Samuelson

FDI- Foreign Direct Investment

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

International trade has been identified by many economists to be an engine for growth and development. International trade has experienced mixed results on growth and development. Presently there is no country around the world that does not trade; hence there has been an increase in the number of bilateral and multilateral trade agreements across the globe. International trade among nations has gained significant attention among both developed and developing countries; it is hugely attributed to the impact of technology and globalisation (Nageri, Olodo, Bukulo and Babatunde, 2013).

The issue of international trade and economic growth have gained substantial importance with the introduction of trade liberalization policies in the developing nations across the world. International trade and its impact on economic growth crucially depend on globalization. Impact of international trade on economic growth divided economists of the developed and developing countries into two separate groups. One group of economists believed that international trade has brought unfavourable changes in economic and financial scenarios of the developing countries. Meaning that gains from trade benefited developed nations of the world (Vijayasri 2013).

The other group of economists speak in favour of globalization and international trade with a brighter view of the international trade and its impact on economic growth of the developing nations. According to this group of economists, developing countries which have followed trade liberalization policies have experienced all the favourable effects of globalization and international trade. There is no denying that international trade is beneficial for the countries involved in trade, if practiced properly (Vijayasri 2013).

The importance of international trade stems from the fact that no country can produce all goods and services which people require for their consumption largely owing to resources differences and constraints. As a result, this trade relationship suggests that economies need to export goods and services in order to generate revenue to finance imported goods and services which cannot be produced domestically (Adeleye, Adewuyi and Adeteye, 2015).

The effects of international trade on a nation are neither direct nor indirect. The effects of international trade are both positive and negative, it is a two-way process where the country neither benefit nor lose. The direct effects relate to bilateral trade between countries, whereas the indirect effect involves competing with other countries in a third market. Below, the researcher illustrated some of the effects of international trade on participating countries: - Firstly, international trade affects employment opportunities in both importing and exporting countries. Developing countries have been experiencing loss of “good” manufacturing jobs as a result of import competition; conversely there is an increase in “bad” jobs which hamper exports in developing countries. Job losses results in both political and economic instabilities, which retard economic growth (Jenkins and Sen, 2006).

Secondly, international trade affects commodity prices, but mostly in importing countries. Import competition drives prices down. The impact of the import flow from low-income countries on developed countries’ prices is more pronounced in sectors with an elastic demand. This is due to the fact that it is easier for foreign firms to penetrate a market with elastic demand. The response of prices to a percentage increase in import competition is higher in sectors with inelastic demand. As highlighted by Auer (2008:3), the Import effect on sectors with different elasticity of demand is larger in the short run than in the long run. According to Unite Nation report cited in Auer and Fischer (2008) it has been revealed that the combined effect of higher prices of commodity exports and lower prices of exports of labour-intensive manufacturers is more pronounced in countries exporting primary commodities and this has been noted in Latin American countries (e.g. Brazil and Mexico), as well as in South Africa. Lastly, international trade affects industrial productivity. Compositional theory suggests lower trade cost induces firms to change their product mix so that it can fit in the existing menu of products. This is mostly a result of importing from low-cost countries that reduces a firm’s production costs. Firms will tend to move to producing high-technological commodities if the fall in trade cost occurs with low-wage countries. It is a challenge to developing countries because they cannot read the signs of growth on the international market, they act only after the developed countries has done so.

The participation in international trade and an improvement in export performance as believed by many economists contribute largely to developing countries’ economic growth since the 1960s and 1970s (Ahmend, Cheng and Messinis, 2008). International trade creates economic incentives that boost productivity through two dynamics: - in the short-run trade reduces resource use misallocation while in the long-run it facilitates transfer of technological development. Trade can also force government to commit to reform programs under the pressure of international competition while enhancing economic growth. It is also in the hands of nations or country to see how they pave the way for their economy to grow (Sachs and Warner, 1995; Rajan and Zingales 2003). International trade is one of the leading and trending discussions taken not only in South Africa but worldwide on daily basis. International trade is important because one country can assist the other country to meet its needs, which can help develop the level of economic growth of the assisted country (Mogoe, 2013).

There have been increasing arguments and discussions in favour of export-led strategy development stating that an expansion of international trade will enhance productivity through increased economies of scale in the export sector, productivity will be positively affected through an increase in better allocation of resources which will be driven by specialization and increase in efficiency. In the long-run, this will generate dynamic comparative advantage through reduction in costs for the exporting country. Another advantage in the export-led strategy is through the process of interaction with the international markets, there will be diffusion or exchange of knowledge through learning by-by-doing and a greater efficiency in management through efficient management techniques which will have a net positive effect on the other parts of the economy (Ahmend et al., 2008).

International trade might constitute an effective channel for international transmission of know-how and dissemination of technological progress. In emerging economies, openness to international trade could be a means of overcoming the narrowness of the domestic market and provide an outlet for surplus products in relation to domestic requirements. Extension of the market size due to export orientation can bring economies of scale in the required production processes. Exposure to new products such as import of high technological inputs, new advanced methods and production processes could stimulate technological upgrades and greater development (Deumal and Ozyurt, 2011).

Trade in Africa as a share of Gross Domestic Product (GDP) increased from 38% to 43% between 1988 to 1989 and 1999 to 2000, respectively. African continent has been resisting open trade regimes instead of focusing on growth enhancing policies including promotion of exports of dynamic products. The region’s export share in the global market decline to about 3.1% which was almost half of the original growth rate, but with time, as most African countries began to open up their markets to the rest of the world; the share of exports in GDP has reversed its descent (Ahmend et al., 2008). The adoption of the Accelerated and Shared Growth Initiative for South Africa (ASGISA) in February 2006 signalled the Government intention to pursue a developmental strategy that will promote and accelerate economic growth along a path that generates sustainable and decent jobs. Although the role international trade can play in this endeavour should not be exaggerated because other factors such as commodity prices, investment rates, global and national demand can be more decisive in shaping the economic growth path. With time, between 1994 and 2002, growth in South Africa averaged around 3% annually - this accelerated to an average of over 5% for the five years ending in 2008. This led to a virtuous combination of positive domestic sentiment and a favourable international environment created the basis for eight years of uninterrupted growth (Davies, 2010).

1.2 STATEMENT OF THE PROBLEM

Since the initiation of economic reforms and the adoption of the door policy, international trade and South African economy have experienced dramatic growth in 1994. According to Du Plessis (2014), in the year 1994 democratic transition created turnaround in the South African economic performance. Due to little openness to international trade South Africa is failing to improve its economic growth which lead to inadequate infrastructure, high levels of unemployment, limited growth path and unsustainable growth. These trade barriers promote trade deficit in many African countries, neglect long-term growth and fail to sustain future growth.

The growth performance of the South African economy has been neglected and this has lead the country to face rising interest rates which lead to strong credit growth, widen current account deficit and high inflation which restricted consumer spending on their own produce. South Africa growth is highly resource intensive, specialising in exporting primary agricultural products which are unsustainable and hence, address the needs of the most developing countries without support to promote rapid economic growth. The country has been under pressure with the declining or non-stability in the value of the currency (Rand), which caused export performance to be pressurised.

For South Africa, endowments of natural resources or basic industries are no longer necessary or sufficient for participation in this new global environment. International trade is a substitute for self-sufficiency at all stages in product value chains and if these raw materials are not managed properly there can be hindrance rather than solution to economic growth (Stern and

Flatters, 2007). South Africa must use international trade and capital flows as their main keys to openness and strength to rapid growth in global market to close the gap that was lagged behind. Another study by Mogoe (2013), indicate that export is important on international trade since it can create growth and expansion at the same time

The previous studies did not mention whether the effects of international trade had led to increase or decrease on economic growth in South Africa. Most of the previous studies on international trade and economic growth in South Africa have used ADF unlike this study where ARDL is used. Most studies focus on two or three variables unlike this one which focuses on four variables to bring out change and come up with measures that will strengthen the country's growth. In South Africa economic growth and international trade are not happening at the same time, and if the two are moving in different or parallel directions, it is difficult to enjoy the benefits of international trade. Thus, the current study or methodology sought to investigate the effects of international trade on economic growth in South Africa during the period 2000Q1 to 2017Q1 using quarterly data. The study further seeks to determine whether international trade presents export and imports opportunities for economic growth in South Africa.

1.3 RESEARCH QUESTIONS

- Does international trade promote economic growth?
- Does international trade promote exchange rate in South Africa?
- Does international trade promote export?

1.4 RESEARCH AIM AND OBJECTIVES

1.4.1 Aim

The aim of this study is to analyse the effect of international trade on economic growth in South Africa from 2000Q1 to 2017Q1.

1.4.2 Objectives

The following objectives will be used to reach the main aim:

- To examine the relationship between international trade and economic growth.
- To examine the relationship between international trade and exchange rate.
- To examine the relationship between international trade and export.

The stated objectives will be attained by the use of ARDL framework.

1.5 DEFINITION OF CONCEPTS

1.5.1 Economic growth

According to Lopez (2005) economic growth means the steady process by which the productive capacity of the economy is increased over time to bring about rising levels of national output and income. In contrast, Mankiw (2011) defined economic growth as the increase in the amount of goods and services in an economy over a period of time; it is also caused by rising number of labour force in the market.

1.5.2 International trade

International trade is known as the exchange of goods and services between nations of the world. At least two countries should be involved, that is the aggregate of activities relating to trading between merchants across borders. Traders engage in economic activities for the purpose of the profit maximization engendered from differentials among international economic environment of nations (Adedeji, 2006). According to Krugman, Maurice and Melitjz (2012) International trade focuses on the transactions of international economy.

1.5.3 Foreign trade

According to Vijayasri (2013) trade is essentially an international transformation of commodities, inputs and technology which promote welfare in two ways. Foreign trade is measured by the sum of imports and exports of goods and services with other countries.

1.5.4 Exchange rate

According to Odoemena (2016) exchange rate is the price of the currency of one country expressed in terms of the currency of another. Foreign trade involves payment in foreign currencies such as euro, pound, dollars, pula, naira, yuan, metical and yen. South African importers have to pay in these currencies for the goods they buy and importers are obligated to exchange South African rand for these currencies (Mohr and Fourie, 2008).

1.5.5 Export

Exports are goods and services produced in South Africa by South Africans and purchased by citizens of other countries. South African exports are determined by the factors similar to those concerning imports. The exports decision is taken in another country of the country in need of particular produce (Fourie and Philippe, 2009).

1.5.6 Import

According to Fourie et al., (2009) imports focused on purchasing of foreign products. When South Africa is buying goods from China, we are importing certain commodities. South African importers have to pay in Yuan which is China currency for the goods they received.

1.6 ETHICAL CONSIDERATIONS

The study makes use of secondary data and all the sources are acknowledged. In addition, all the rules of University of Limpopo for conducting research projects for Masters are taken into account. This research will be done without conducting any unlawful act such as misquoting other studies. The research uses different kinds of sources without plagiarism and misquoting other given information with the aim of performing the work without unlawful conducts.

This study will be conducted with the utmost care so as to avoid any international or unintentional harm of any participant or anyone that could be affected by this study, it is also written without any form of plagiarism or misinformation. All sources have been cited and acknowledged.

1.7 SIGNIFICANCE OF THE STUDY

Literature review revealed that there are some levels of contradictions about the impact of international trade on economic growth. These contradictions might be because of the differences in approaches and the compositions of data and also the methodologies applied through the studies. The study is aimed at contributing to the debate because based on Eravwoke and Oyivwi (2012), from the theoretical and empirical literature there will always be losers and those who will benefit from trade, depending on how the country policies has been structured to address openness and growth. Once international trade become fully effective in South Africa trade will be affected in a positive or negative way. This study is therefore envisaged to contribute to the growth policy making process in terms of understanding how to maintain growth and the benefits of international trade liberalization. Furthermore, the findings are expected to raise awareness to international trade policy implementers and encourage participation in promoting economic growth in South Africa.

The rest of the dissertation is structured as follows: chapter 2 provides a theoretical framework of the effect of international trade on economic growth in South Africa, targeting classical period, post classical period, the neoclassical paradigm and post classical growth before Solow of international trade and growth theories together with their empirical framework. Chapter 3 outlines the research methodology. Chapter 4 provide analyses of the results based on the method chosen above. Chapter 5 provides conclusion, summary and recommendations of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents several theories on international trade and economic growth. International trade and economic growth have been outlined through "old" and "new" trade and growth theories which explain why countries trade among each other (Bahmani and Nimrod, 1991). This section is sub-divided into theoretical and empirical literature of the effect of international trade on economic growth in South Africa.

2.2 Theoretical Framework

2.2.1 Classical period: international trade and growth

The interaction between International Trade (IT) and Economic Growth (EG) is based on two main ideas (Smith, 1776). International trade made it possible to overcome the reduced dimension of the internal market and on the other hand, it increases the extension of the market. The international trade would therefore constitute a dynamic force capable of intensifying the ability and skills of workers by encouraging technical innovations and accumulating capitals by making it possible to overcome technical indivisibilities and giving participating countries the possibility of enjoying economic growth (Afonso, 2011).

According to Mills (1948), cited in Afonso (2011) international trade is viewed according to the production resulted from labour, capital, land and their productivities. In the same vein as Ricardo, he recognized that underlying the 'progressive state' there was the 'stationary state', and that ultimately the force capable of delaying this state was technical progress. Accordingly, the emphasis that Smith had placed on the extension of the market decreases, even though he also defended free trade among countries. It is believed that this situation was the result of the expectation created by the Industrial Revolution (IR) in regards to technical progress.

2.2.2 Post classical period: international trade and growth

Classical thought gave way to 'marginalism' from the 1870s onwards. This fact led to a 'new theory' (neoclassical) which, for some time, kept the main lines of the evolution of the economy in the long-term away from the studies. This section takes into account the separation that occurred between international trade and economic growth theories and neoclassical theories.

We begin with the neoclassical international trade theory; proceed to the post-classical economic growth and modern neoclassical theory of economic growth.

2.2.2.1 Neoclassical International theory

The Ricardian theory demonstrated the increase of welfare caused by international trade and ignored gains in the rate of economic growth. In the neoclassical general equilibrium context, the model of Heckscher (1919) and Ohlin (1933) appeared and was completed in the late 40's. In a rigid analysis of the model, it was observed that it permits to advocate the opening of the countries to international trade, showing that it is efficient, mutually beneficial and positive for the entire world (Afonso, 2011). Heckscher – Ohlin theory focuses on the differences in relative factors endowments and factors prices between nations as the most determinants of trade. The model identified difference in pre-trade product prices between nations as the basis for trade. The theory assumed two countries, two commodities and two factors. There is perfect competition in both factor and product market. It assumed that factor inputs; labour and capital in the two countries are homogeneous. Production function also exhibits constant return to scale. Production possibility curve is concave to the origin. Meaning that there is increasing opportunity cost, to produce additional unit of one good, more and more unit of other goods need to be satisfied. The model suggests that the less develop countries that are labour abundant should specialize in the production of primary product especially agricultural product because the labour requirement of agricultural is high except in the mechanized form of farming (Usman, 2011).

2.2.2.2 The Neoclassical paradigm

Until the 1980s, the 'Neoclassical Paradigm' dominates the international economic theory and the growth theory. According to neoclassical growth model, without technical progress the macroeconomic capital accumulation is prone to diminishing returns to scale. Meaning that one additional unit of the homogenous input factor capital contributes less to output than the precedent unit. This lead the economy to reach steady-state equilibrium, characterized as equilibrium path where per capita consumption is constant when the marginal product of capital equals the rate of time preference. Through increasing the efficiency of labour by exogenous technological progress the country finds the opportunity of introducing permanent growth rate, which sometimes occur after a decade. While theorists acknowledge the relative restrictiveness of labour mobility, the world has seen more and more liberalisation rounds in international capital flows (Hofman, 2013).

2.2.3 Post-classical growth before Solow

According to Marshall (1890), cited in Afonso (2011) pointed out that "the causes which determine the economic progress of nations belong to the study of international trade". Infact, the expansion of the market that it presented led to the increase of global production and originated the increase of internal and external economies, which resulted in increasing income for the economy. In his concern about economic growth, like Smith, he also considered the dimension of the market limited the labour division and productivity. Therefore, he examined the inter-relation between industries in the process of economic growth, the creation of new industries due to the specialization resulting from the extension of the market, the importance of specialization and standardization in a vast market and the influence of this market on technological progress.

Theories are applicable in todays world because all models point at the benefits of international trade and encourage that a country should specialise in the production of one commodity for a country to realise benefits of international trade. Countries need one another to address the needs of its citizens, and to promote economic growth. According to Angomoko (2017) It is from these theories that different countries tend to realises which commodities they should produce in the international market in order to obtain the more foreign reserves to help them acquire foreign goods and increase their economic growth. Based on the theories, every country can gain from trade, depending on the choice of trading commodities and trading partners. Which country to trade with and how that country trade policies are structured also plays a vital role on the economic growth of that country.

2.3 Empirical literature

The empirical literature on the relationship between economic growths has grown to huge proportions over the past years. The literature demonstrates enormous empirical studies which have been done with regard to the long run relationships and causality between GDP growth, Export, Imports and Exchange rate. However, many of the studies explain relationship between two or three variables. Few have considered four variables (Gross Domestic Product, Exchange rate, Export and Import) like this study attempt to do. After a brief introduction of empirical literature then previous studies are resumed of which others are in favour or against the effects of international trade on economic growth in South Africa.

According to Sun and Heshmati (2010), empirically there appears to be good evidence that international trade affects economic growth positively by facilitating capital accumulation, industrial structure upgrading, technological progress and institutional advancement. Increase in imports of capital and intermediate products, which are not available in the domestic market, may result in the rise in productivity of manufacturing. More active participation in the international market by promoting exports leads to more intense competition and improvement in terms of productivity. Learning-by-doing may be more rapid in export industry thanks to the knowledge and technology spill over effects. In addition, the benefits of international trade are mainly generated from the external environment, appropriate trade strategy and structure of trade patterns.

Sun et al,. (2010) examine the effects of international trade on China's economic growth, applying econometric and non-parametric techniques on six (6) years data of 31 provinces in China from 2002 to 2007, their finding reveals that an increase participation in international trade helps stimulate rapid national economic growth in China. Thus, international trade volume and China's trade structure on technological exports positively affects China's regional production.

Omoju and Adesanya (2012) investigate international trade and growth in developing country using Nigeria as a case study. They make use of secondary data from 1980 – 2010 and applying the Ordinary Least Square (OLS) regression method, they find out that exports, imports and exchange rate have a significant positive impact on economic growth in developing countries. Empirically, there appears to be good evidence that international trade affects economic growth positively by facilitating capital accumulation, industrial structure upgrading, technological progress and institutional advancement. Specifically, increased imports of capital and intermediate products, which are not available in the domestic market, can result in the rise in productivity of manufacturing (Lee 1995).

Similarly, Maizels (1963) discussed the positive relationship between international trade and economic development by rank correlation analysis among 7 developed countries. In the same vein, Kavoussi (1984) after studying 73 middle and low-income developing countries found out that a higher rate of economic growth was strongly correlated with higher rates of export growth. He showed that the positive correlation between exports and growth holds for both middle-and low-income countries, but the effects tend to diminish according to the level of development. In contrast, Sachs and Warner (1995) constructed a policy index to analyse economic growth rate, and found that the average growth rate in the period after trade liberalisation is significantly higher than that in the period before liberalisation.

Coe and Helpman (1995) studied the international Research and Development (R&D) diffusion among 21 Organisation for Economic Co-operation and Development (OECD) countries and Israel over the period of 1971-1990, and found that international trade is an important channel of transfering technology. Most empirical studies support the positive effects of openness on economic growth. From the comprehensive literature, both static and dynamic gains from trade could be found. The static gains from international trade refer to the improvement in output or social welfare with fixed amount of input or resource supply. They are mainly the results from the increase in foregin reserves and national welfare. Firstly, opening up to the global market offers an opportunity to trade at international prices rather than domestic prices. This opportunity provides a gain from exchange, as domestic consumers can buy cheaper imported goods and producers can export goods at higher foreign prices.

Furthermore, there is a gain from specialisation. The new prices established in free trade encourage industries to reallocate production from goods that the closed economy was producing at a relatively high cost (comparative disadvantage) to goods that it was producing at a relatively low cost (comparative advantage). By utilizing its comparative advantage in international trade, a country could increase the total output and social welfare (Coe et al., 1995).

The surveyed analyses indicate the existence of a positive link between international trade and growth, but the validity of the results may be questioned based on (i) the robustness tests perfomed by Rodriquez and Rodrik; (ii) the fact that many of the analyses fail to address the endogeneity problem; and (iii) the “open endedness” of growth theories. Durlauf (2000) describes growth theories, as “open ended” in the sense that if one variable influences growth it does not typically imply that other variables do not. In this case, the error term is the accumulation of omitted growth determinats and a valid instrument is uncorrelated with these variables. Since many growth determinants are extant plausible, acceptance of an instrument variable estimator is based on subjective.

Ezike, Ikepsu and Amah (2012) investigage the macroeconomic impact of trade on Nigerian growth, using the Ordinary Least Squares (OLS) regression technique and appliying a combination of variants and multivariate models from the data covering the period 1970 – 2008 observed that the two predictors used in the study for trade, namely exports and foreign direct investment have a positive and significant impact on Nigeria's growth during the period.

In the same vein, Eravwoke et al., (2012) studies growth persective via trade in Nigeria, employing the OLS method, Augmented Dickey Fuller (ADF) and the Johansen cointegration statistical approach on data covering the period 1970 – 2009. They find that the ADF reveals that the series are integrated of order one I(1), but for total trade the series became stationary after taking the second difference I(2) and concludes that the variables are non-stationary. The Johansen cointegration test shows that there is long run relationship between total trade, exchange rate, export and gross domestic product of Nigeria. The OLS resultt revealed that total trade and export are not statistically significant in explaning economic growth in Nigeria but exchange rate is statistically significant in explaning growth in Nigeria.

Njikam (2003) investigated the relationship between exports and economic growth in 12 Sub-Saharan African countries to test the change of the direction of the causality when these countries switched from Import Substitution (IS) to Export Promotion (EP). Exports were disaggregated into agricultural and manufactured exports. Using Granger causality, during the IS period unidirectional causality was observed between economic growth towards exports in five countries, manufactured exports towards economic growth in one country. Bidirectional causality existed between economic growth and total exports in three countries, economic growth and agricultural exports in one country and economic growth and manufactured exports in three countries. During the EP period, unidirectional causality existed between agricultural exports towards economic growth in nine countries, manufactured exports towards economic growth in these three countries, economic growth and agricultural exports in three countries. This shows that, agricultural exports were very much associated with economic growth during the export promotion period than during the import substitution period. Therefore, export promotion is a better option for countries whose economy is dominated by agricultural production since it is closely related to economic growth.

Anwer and Sampath (1997) examined causality relationship betweeen exports and economic growth for 96 countries for the period of 1960 – 1992 and found out that GDP and exports are integrated of different orders for 35 countries, there were no long run relationship between the two variables for 30 countries, a unidirectional causality from GDP to exports for 12 countries and from exports to GDP for 6 countries. Bidirectional causality was found in 2 countries, and no causality between GDP and exports for 11 countries. Of the 96 countries which were studied, only 6 showed optimistic impact of economic growth on exports conversely to the ordinary thinking that exports promote economic growth.

On the other hand, Melina, Chaido and Antonios (2004) studied the relationship between exports, economic growth and Foreign Direct Investment (FDI) in Greece using annual data for the period 1960 - 2002. They used Johansen cointegration test to test for long-run equilibrium relationship among these variables. The error correction model was applied to estimate the short-run and long-run relationships. The study used Granger causality test and found a bilateral causal relationship between exports and economic growth. There was undirectional causal relationship from FDI to GDP and FDI to exports.

According to Kandil (2004) exchange rate fluctuations influence domestic prices through their effects on aggregate supply and demand. When a currency depreciates it will result in high import prices if the country is an international price taker, while lower import prices result from appreciation. The implication is that overvaluation of exchange rate reduces output growth. Similarly, a study by Adubi (1999) used empirical study to determine the dynamic effects of exchange rate fluctuations on exchange rate risk in agro trade flows. He observed that exchange rate changes have a negative effect on agricultural export. He concluded that, the more volatile the exchange rate changes the low income earnings of farmers which in turn leads to a decline in output production and a reduction in export trade.

Another study by Akpan and Atan (2012) investigated the effect of exchange rate movement on real output growth in Nigeria based on quarterly series for the period 1986 – 2010, the paper examined the possible direct and indirect relationship between exchange rates and GDP growth; the 4 estimation results suggest that there is no evidence of a strong direct relationship between changes in exchange rate and output growth, rather Nigerian's economic growth has been directly affected by monetary variables. Kamin and Klan (1998) used error correction technique to estimate a regression equation linking the ouput to the real exchange rate for a group of twenty seven countries. They did not find that devaluation were contractionary in the long-run.

Empirically, South Africa's international trade is affected by foreign competition, its trade policy and real exchange rate. According to the United States International Trade Commission

2008, cited on Angomoko (2017) South African exporters experienced strong foreign competition. From 2002 to 2006 the competition between South African and Chinese export become stiff. China decreases the export of wood furniture from South Africa to the US and EU market. Rankin (2013) suggested that South Africa must increase the competitiveness of its local firms in foreign markets by keeping its production costs low and improve its domestic business environment. Edwards and Lawrence, (2006) highlited that the South African government must raise its export costs by increasing the prices of intermediate inputs; while reducing the profitability of export promotion

2.3.1 Exchange rate theory

Excahange rate is one of the instrument that governments use to stabilise the macroeconomic policies. Governments have limited ability to pursue one policy independently of others because of their effectiveness, equity and development towards economic growth. For example, under a fixed exchange rate system, the exchange rate chosen by the government might not be sustained, this is true with open capital markets, since monetary or fiscal policy choices can cause capital to leave or enter the country, putting pressure on the fixed exchange rate. When other instruments for stimulating the economy are limited (as they typically are in developing countries), a weak exchange rate can be effective instrument for economic growth and job creation. Weak exchange rates increases the attractiveness of exporting by making the country's product cheaper abroad and help domestic industries that compete with imports (imports substitution industries) by making foreign goods more expensive relative to domestic goods (Spiegel, 2007).

The exchange rate has been used as a tool for regulating flows of trade and capital by many developing economies, which tend to have persistent defecits in the balance of payment because of structural gap between the volumes of exports and imports. In addition, the rate of growth of imports is often higher than the rate of growth of exports resulting in rising imbalances in trade. There have been many discussions in the literature about the determinants of real and nominal exchange rate and how these affect the trade and growth in the economy (Keshab and Armah, 2005).

A competitive exchange is seen today as an esential ingredient of dynamic growth and employment in developing countries. It allows domestic firms to benefit from rapid growth in international trade and attracts international firms searching for the best location for their worldwide sourcing of their goods. This may also have positive spill over's for domestic technological development, and lead to a process of learning how to prodoce with the best technologies available, and with the best marketing tools for the global economy (Spiegel, 2007).

According to Ito (1996) "the real exchange rate is one of the popular key relative prices in an economy". When prices are not constant, problems may arise when trying to explain changes between two currencies. When domestic goods" prices change simultaneously, it would be impossible to know the changes in the relative prices of foreign goods and services just by observing the changes in the nominal bilateral exchange rate except if one takes into account, the new price levels domestically and in the trade partner country". If the price of ZAR appreciates by 10% against the Dollar, we would expect that ceteris paribus, American goods would be more or less, 10% more competitive against South African goods in world markets than was the case before the appreciation.

Theoretical literature has explored the relationship between international trade and growth. Economists viewed international trade as an "engine of growth" since the the 1960s. International trade is expected to bring about both static and dynamic gains. Static gains are linked to conventional trade theory (Ricardo's comparative advantage theory). According to the hypothesis of free movement of production factors across sectors, the international trade theory of Heckscher-Ohlin-Samuelson (HOS) suggested that trade openness might generate substantial gains in two ways: by specialization in production according to country's or region's comparative advantage and by reallocation of resources between traded and non-traded sectors (Deumal, 2011).

Mercantalism to classicism and modern trade theories as stated in the history of economic thought have urgued in favour of global trade. They viewed trade as sinequa-non to the improvement of welfare through the efficient allocation of resources factors across various sectors and countries. The Heckscher Ohlin theory as argued by many international economists, is an improvement of David Ricardo's theory of comparative advantage because trade occurs as a result of differences in comparative cost which is also due to inter-country differences in relative factor endowment. Heckscher Ohlin theory is relevant because it began with the comparative advantage and links the pattern of global trade to the economic structure of trading nations. This provides the model of explaining a change in global trade on the growth of economies (Opukri and Edoumlekomu, 2013).

Kehinde, Adekunjo, Olufemi and Kayode (2012) assert that trade can promote growth from the supply side, but if the balance of payment cost reduce the availability of imported inputs which enter the product of exports, thus forcing exporters to use expensive imports of double quality. They concludes that high level of trade restriction have been an important obstacle to export performance and growth. They contends that the reduction of this restriction can be expected to result in significantly improved trade performance in the region. Countries that are more open to trade are likely to experience higher growth rate and higher per capita income than closd economy, general equilibrium model was used to establish that the greater number of intermediate inputs combination results in productivity gain and higher outputs, whether their using capital and labour input which exhibit increasing return to scale or not.

2.3.2 Some theories on how international trade benefits can be shared among countries are discussed below:-

The current study also looks at what brings about an unequal share of international trade benefits. Countries will not gain equal benefits from trade due to the factors involved. Some of these different factors will be discussed as follows: Firstly, the current measure of benefits from trade is economic growth and development of nations. Benefits from trade with a rapidly growing emerging economy are not static, as claimed by Ricardo. Economic growth changes the relative economic circumstances of trading partners; it alters the relative abundance of economic resources, sources of comparative advantage and relative trade gains.

According to Elwell (2006) trade can still leave a country better off than it would be without trade, but the size of the country's gains from trade could rise or fall, depending on the situation and magnitude of changes in the economic growth of its trading partners. The current study also looks at what brings about an unequal share of international trade benefits. Countries will not gain equal benefits from trade due to the factors involved. Some of these different factors will be discussed as follows: Firstly, the current measure of benefits from trade is economic growth and development of nations. Benefits from trade with a rapidly growing emerging economy are not static, as claimed by Ricardo. Economic growth changes the relative economic circumstances of trading partners; it alters the relative abundance of economic resources, sources of comparative advantage and relative trade gains. According to Elwell (2006) trade can still leave a country better off than it would be without trade, but the size of the country's gains from trade could rise or fall, depending on the situation and magnitude of changes in the economic growth of its trading partners.

Secondly, it is also believed that a country's choice of trading partners affects its benefits from trade. Developing countries may benefit more from trading with developed countries and this could be more technically innovative than trading with their fellow developing countries. Technically innovative countries open access to new goods and technologies necessary for economic development. Developing country that trades with developed countries benefits because it gains access to a larger market. Lastly, according to Dunn (2000) the major focus of benefits from trade has shifted to the measure of terms of trade. Benefits of trade between two trading countries now depend on terms of trade they set. Terms of trade are used as a scale that measure the international exchange ratio that causes the equality of what one country wants to export to the quantity that it imports.

On the other hand, Elwell (2006) argues that terms of trade are a measure of the average export cost of acquiring desired imports. It depends on the prices of the exchanged commodities; the country that trades in higher-valued commodities gains more than others. The problem with terms of trade measurement is that it does not reflect the gains from trade that comes from other bases of trade. Economies of scale are an important element in economic growth; they have greater significance for trade between mature economies that have factors of similar proportions. Nevertheless, movement in terms of trade would remain indicative of changes in the benefits from trade coming from rising trade with low-wage economies that would still have more resource endowments.

Smith pointed out the importance of trade among nations, as this increased productivity, widens markets and motivates firms to increase production in order to satisfy the increasing market. He found that benefits of trade between nations came about in two distinct ways: Firstly, if there is no demand for items, surplus production can be taken to another country where there is a demand and in return something else for which there is a demand at home can be brought back. Secondly, when a commodity is exchanged for something else, that "something" else may satisfy part of the community's wants that cannot be satisfied by its own production (Angomoko, 2017). This view can be applied and yield positive results if the country has lot of resources and produce excess demand or more than its citizen's needs.

Ricardo embrace international trade and compromise gains of economic growth of a country, this will not be good for South Africa since it would not be able to eradicate poverty. This means that the level of unemploymant will keep on rising. While according to Neo classical paragm, it can take a while for a developing country to enjoy the fruits of international trade. The post classical growth before Solow can be good for South African growth, if applied with close observation and it can assist in strengthening and creating new industries that will improve the wellbeing of the citizens and sustain future economic growth. Now unemployment is unmeasurable in SouthAfrica.

The weaknesses and the strength of these theories lies in the fact that international trade can have direct or indirect impact that will make the other countries to enjoy all the benefits of international trade while the other country suffer.

Benefits of international trade

- International trade is important because countries compensate each other due to their different capabilities. It depends on the country ability to produce or what type of commodity is being produced. For example, if country A produces oil, country B, C and D etc. will import oil from country A. meaning that international trade gives raise to the economy of the world.
- Advantage of international trade is that a country can buy from a country which has the lowest price and sell goods and services to a country which has the highest price.
- Buyers and sellers in developed countries use international trade as opportunity to accelerate the economic development. Developed countries are benefiting from international trade because their businesses grow faster and double the profit.
- International trade injects global competitiveness of developing countries to be higher than that of developed countries. The main idea is to make developing countries to be fully engaged in international trade.
- International trade increase protectionism of developing countries to be higher than the developed countries. Developing countries want their economy to grow but have some reservation about how international trade is done.
- International trade has reduced poverty level in some countries. E.g. India has closed economy since 1960s and a970s but since the arrival of international trade in, India employment opportunities increases (Vijayasri G. , 2013).

Weaknesses of international trade

- The weakness of international trade is that the welfare of the people in nations that produce goods and services is sometimes compromised for profits sake. The country can produce goods and services that carter the needs of other countries and ignore the needs of its citizens, sometimes due to affordability.
- Another weakness of international trade is that if a country produces only for its needs, its production and consumption of goods will be limited, hence the country will not taste being economically independence. In other words, economic independence can come as a package that will decline or promote growth.
- In developing countries international trade introduces some growth barriers which are: -
- ✓ Informational and coordination failures that hamper the efficient operation of markets;
- ✓ Limited financial services with lack of access to credit which cause small businesses to holds back their production; and
- ✓ Poverty which restricts growth of internal consumer demand and encourage large informal spheres.
- International trade also results in destruction and exhaustion of natural resources. Some countries become too much profit-driven and allow their natural resources to be over-exploited which lead to temporary solution and serious future problems (Vijayasri G. , 2013).

The researcher used the Sourh Africa's Trade Policy and Strategy Framework (SATP-SF) that states that Trade policy is an instrument of industrial policy that must support industrial development and upgrading, employment growth and increased value-added exports. SATP-FP further outlined that South African Government's broad national development strategy aims to accelerate growth along a path that generates sustainable and decent jobs to address apartheid legacies, while promoting better life and equal opportunities to its citizens (Vickers, 2014).

South African economy was traditionally rooted in primary sector, but since 1990s there has been a structural shift from primary sector to the secondary and tertiary sector. This shows that the South African economy is reaching maturity. The tertiary sector is now the driver of economic growth, now South Africa must focus on what will help to improve the level of export and create lot of employment to young graduates. This is due to the fact that the economy is gradually advancing and the agricultural sector is decreasing. The companies or firms that benefit from international trade are the one's which have higher inelastic demand. If South

Africa reaches inelastic demand the increases or decreases in the product demanded it will not correspond or affect the fall or rise in its price.

2.4 Summary

In this chapter theoretical and empirical theory of the effect of international trade on economic growth was examined. More attention was given to the positive relationship between GDP, exchange rate, export and import and how they affect developing countries which specializes on primary agricultural products as their means of participating to international trade. Most of the studies reveal that there is positive correlation between economic growth and export than the other variables. Import and export makes the country to be open to international trade. Exchange rate is experienced through trading imports and exports of a country.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents methodology of the effects of international trade on economic growth in South Africa. Purposefully, in this current study the Augmented Dickey Fuller (ADF) tests was used to test stationarity and for supporting evidence, the Phillips-Perron (PP) test following Phillips and Perron (1988) and the Dickey-Fuller Generalised Least Squares (DF-GLS) de-trending test proposed by Elliot et al., (1996) were used. The DF (GLS) test is done so that if variables may be integrated of different orders the study will employ ARDL. The ARDL bounds test is based on the assumption that the variables are I(0) or I(1). So, before applying this test, we determine the order of integration of all variables using the unit root tests. The objective is to ensure that the variables are not I (2) so as to avoid spurious results, Phillips (1988), cited in (Persaran et al., 2001). In this section, all the econometric methods, namely, stationarity/unit root, autoregressive distributed lag (ARDL) model, diagnostic and stability testing are explained.

3.2 Data

The study is performed by using a quarterly time series data from 2000Q1 – 2017Q1. The data is sourced from the South African Reserve Bank (SARB) and Quantec. Some of the variables such as exchange rate is measured in millions of rand whereas some variables such as GDP, export and import were transformed into natural logarithmic form as to improve efficiency during estimation or for standardisation. The study employs autoregressive distributed lag (ARDL) bounds testing approach to provide a better understanding on the relationship between economic growth and international trade in South African.

3.3 Model specification

For the better formulation of the study, a simple linear regression model which has four variables was applied. Some of the variables such as exchange rate is measured in millions of rand whereas some variables such as GDP, export and import were transformed into natural logarithmic form as to improve efficiency during estimation or for standardisation. For the better formulation of the model, Belloumi (2014) study that applied Bounds Testing

Approaches to analyse the relationship between trade, FDI and Economic growth in Tunisia will be applied as the basis. Supported by Biru (2014)'s study of Testing Export-led Growth in Bangladesh. The functional form of the model of the current study is expressed as follows:

$$GDP = f(EXCRAT, EXPT, IMPT, \mathrm{E}) \qquad (3.1)$$

where;

GDP	=	Gross Domestic Product
EXCRAT	=	Exchange rate
EXPT	=	Export
IMPT	=	Import
ε	=	Error term

In line with statistical and economic theories, data expressed in terms of logarithms are pruned and definite. Equation 3.1 fulfilled the assumptions of the classical linear model and the parameters will be estimated using Ordinary Least Squares (OLS) (Gujarati, 2014).

Equation (3.1) is transformed to natural logarithm as follows:

$$LogGDP_t = \beta_o + \beta_1 EXCRAT_t + \beta_2 \log EXPT_t + \beta_3 \log IMPT_t + \varepsilon_t \qquad (3.2)$$

Where;

β_0 is a constant intercept, $\beta_1, \beta_2 \, and \, \beta_3$ are the coefficients of the explanatory or associated variables. ε_t is the stochastic or random error term that captures the effect of other variables not included in the model (properties of zero mean and non-serial correlation).

Therefore, based on economic theory, the study expects international trade to have a positive impact on economic growth in South Africa. This is due to the fact that South Africa is open to international trade and in turn it promotes economic growth, therefore, the study prior expectation is expressed as follows:

$LGDP \neq 0$ $EXCRAT \neq 0$ $LEXPT \neq 0$ and $LIMPT \neq 0$

3.4 Estimation techniques

The statistical package; EViews 9.5 will be used to run all the tests.

3.4.1 Stationarity/Unit root test

According to Persaran et al., (2001) in time series, before running the cointegration test the variables must be tested for stationarity. According to Gujarati (2003), cited in Dlamini (2008) if a model is estimated using non-stationary data series, the estimation will generate spurious results. Then, the first step in the process of determining the existence of long-run relationship is to determine the stationarity of the series, known as the order of integration. In order for cointegration to exist, the variables must be stationary at level or first difference. There are many ways of testing stationarity among variables, for example unit root test, autocorrelation function and visual data plotting. The study will employ both the informal testing by means of visual inspection using the line graphs and the formal testing by means of several unit root tests. Stationarity tests have

$H_0 : \gamma_t$ is stationary

$H_1 : \gamma_t$ is non-stationary

3.4.1.1 Visual inspection

Visual data plotting will be done on one of the variables to confirm stationarity and non-stationarity of the model. If a line graph is trending up or down it shows that there is non-stationarity, but if it oscillates around the mean, where a straight line can be drawn across it shows stationarity.

3.4.1.2 Formal unit root tests

The formal testing is done by means the Augmented Dickey Fuller (ADF), the Phillips-Perron (PP) and the Dickey Fuller Generalized Least Squares (DF-GLS) tests.

3.4.1.2.1 Augmented Dickey Fuller (ADF) test

According to Maggiora and Skerman (2009) generally, the ADF and PP tests are consistent with each other; however, we include both as to ensure accuracy regarding the unit root conclusion. Our study will test each time series individually to ensure non-stationarity at the levels of the data, and also run the unit root tests on the first differences to ensure I(1). The equation for the ADF is given below:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-1} + \mathrm{E}_t \quad (3.3)$$

It must be noted that in order to select each model's optimal lag length we maximize the log-likelihood function of the corresponding model. That is done by selecting the model with the lowest SBIC (Schwartz Bayesian Information Criterion). Cross-checking of the results using the AIC (Akaike Information Criterion) ensures accuracy.

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \mu_i \quad (3.4)$$

3.4.1.2.2 Phillips-Perron (PP) test

The Phillips-Perron test is used to test the null hypothesis that a time series is integrated order 1. It builds on the Dickey–Fuller test of the null hypothesis $\mathrm{P} = 1$ in $\Delta\gamma_t \mathrm{P}\gamma_{t-1} + \upsilon_t$, where Δ is the first difference operator. Like the augmented Dickey–Fuller test, the Phillips–Perron test addresses the issue that the process generating data for γ_t might have a higher order of autocorrelation than is admitted in the test equation, making endogenous and thus invalidating the Dickey–Fuller t-test. The Phillips–Perron test makes a non-parametric correction to the t-test statistic. The test is robust with respect to unspecified autocorrelation and heteroskedasticity in the disturbance process of the test equation. Phillips and Perron have developed a more comprehensive theory of unit root non-stationarity. The tests are similar to ADF tests, but they incorporate an automatic correction to the DF procedure to allow for autocorrelated residuals. The advantage to PP test is that it assumes no functional form for the error process of the variable which means that is applicable to a very wide set of problems, although it performs poorly in small sample sizes. The tests usually give the same conclusions as the ADF tests (Davidson and Mackinnon, 2004).

The test regression for the Phillips – Perron tests is given by:

$$\Delta \mathrm{Y}_t = \beta' D_t + \pi \mathrm{Y}_{t-1} + \mu_t \quad (3.5)$$

where μ_t is I(0) and may be heteroskedastic. The PP test corrects for any serial correlation and heteroskedasticity in the errors μ_t of the test regression by modifying the test statistic

$t_{n=0}$ and $T_{\hat{\eta}}$ so that no additional lags of the dependent variable are needed in the presence of serially – correlated errors.

3.4.1.2.3 Dickey Fuller Generalized Least Squares (DF-GLS) test

The DF-GLS test is a de-trending test proposed by Elliot, Rothenberg and Stock (1996) which is deemed suitable for the ARDL bounds test and it is based on the assumption that the variables are I(0) or I(1). Therefore, before applying ARDL test, the study determines the order of integration of all variables using unit root tests by testing for null hypothesis H_0 : β =0 (i.e. β has a unit root), alternative hypothesis is H_1 : β <0. The objective is to ensure that there is no I(2) variable so as to avoid spurious results. The reason is that, in the presence of variables integrated of order two the study cannot interpret the values of F-statistics.

3.4.2 ARDL Bounds Testing Procedure

In order to empirically analyse the long-run relationships and short-run dynamic interactions among the variables of interest in the study employs the autoregressive distributed lag (ARDL). The ARDL cointegration approach that was developed by Persaran and Shin (1999) and Persaran et al., (2001) will be employed in this study. This approach enjoys several advantages over the traditional cointegration technique documented by (Johansen and Juseline, 1990). Firstly, it requires small sample size, two set of critical values are provided, low and upper value bounds for all classification of explanatory variables into pure I(1), purely I(0) or mutually cointegrated. Indeed, these critical values are generated for various sample sizes. However, Narayan (2005) argues that existing critical values of large samples sizes cannot be employed for small sample sizes. Secondly, Johansen's procedure requires that the variables should be integrated of the same order, whereas ARDL approach does not require variables to be of the same order. Thirdly, ARDL approach provides unbiased long-run estimates with valid t' statistics if some of the model repressors are endogenous (Narayan, 2005 and Odhiambo, 2009). Lastly, this approach provides a method of assessing the short-run and long-run effects of one variable on the other and as well separate both once an appropriate choice of order of the ARDL model is made (Bentzen and Engsted, 2001). Once variables have been classified as integration of order I(0), I(10) or both it is possible to set up models that lead to stationary relations among the variables, and where standard inference is possible. The necessary criterion for stationarity among non-stationary variables is called cointegration.

Testing for cointegration is a necessary step to check if one is modelling an empirically meaningful relationship.

Cointegration is done to determine whether there exists a long-run equilibrium relationship and interactions among all the variables of interest. If there is one or more cointegration vector in the model, we say that there exists a long-run relationship among the variables (Hossain, 2008). On the basis of the theory that integrated variables, of order one, I(1), it may have a cointegration relationship, which is crucial to test for the existence of such a relationship. If a group of variables are individually integrated of the same order and there is at least one linear combination of these variables that is stationary, then the variables are said to be cointegrated. The cointegrated variables will never move far apart, and will be attracted to their long-run relationship. Testing for cointegration implies testing for the existence of such a long-run relationship between economic variables (Sekuma, 2011).

According to Asterious and Hall (2007) to maintain cointegration is when two variables are related in a sense that they move together and the stochastic trend tend to be similar to each other. When the related variables are combined, it becomes difficult to eliminate the non-stationarity. This symbolise the presence of cointegration. Basically, according Persaran et al., (2001) the ARDL approach to cointegration involves estimating the conditional error correction (EC) version of the ARDL model for international trade and its determinants:

$$\Delta LGDP_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta LGDP_{t-i} + \sum_{i=1}^{p} \Delta\beta_2 EXCRAT_{t-i} + \sum_{i=1}^{p} \Delta\beta_3 LEXPT_{t-i} + \sum_{i=1}^{p} \Delta\beta_4 LIMPT_{t-i} + \beta_5 LGDP_{t-1}$$
$$+ \beta_6 EXCRAT_{t-1} + \beta_7 LEXPT_{t-1} + \beta_8 LIMP_{t-1} + \mu_t \quad (3.6)$$

where L(GDP), EXCRAT, L(EXPT) and L(IMPT) are gross domestic product, exchange rate, exports and imports respectively. GDP, export and imports are transferred to natural logarithm, Δ is first difference operator, P is the optimal lag length and β indicate long-run coefficients and short-run coefficients are represented as follows:

The null hypothesis of no cointegration is shown by $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ and H_1 : $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$ is the alternative hypothesis of cointegration. The next step is to compare the F-statistic with the critical values from Narayan (2005) which were generated for small sample sizes of between 30 and 80 observations. One set assumes that all variables in the model are I(0) and the other set assumes they are all I(1). If the calculated F-statistics exceeds the upper critical bounds value, then H_0 is rejected. If the F-statistic falls within the bounds, then the test is inclusive. If the F-statistic falls below the lower critical bounds value, it implies that there is no co-integration.

Should the above persist, then there is cointegration among the variables.

3.4.3 Diagnostic testing

To ensure the goodness fit of the model the diagnostic tests are conducted to examine the model for serial correlation/autocorrelation, normality (Jarque Bera) and heteroskedasticity. Diagnostic check will be used to extract information about the structure of data, particularly in the Breuch-Godfrey test.

3.4.3.1 Serial correlation

Serial correlation occurs when error term from time periods, usually from adjacent periods is correlated. If we ignore the serial correlation in error, the impacts on the OLS estimates are unbiased and consistent even if the error terms are serially correlated. The problem is with the efficiency of the estimates (Gou, Cheng and Dong, 2013).

3.4.3.2 Heteroskedasticity

The classical linear regression assumes that the variance of the error term is constant over time, that is, the error term is homoskedastic. If the variance of the error term is changing over time, then the assumption of homoskedastic is violated leading to heteroskedasticity. Ordinary least squares estimates are consistent in the presence of heteroskedasticity, but the conventional computed standard errors are no longer valid (Green, 2000). In this study heteroskedasticity test is conducted using the Breusch-Pagan-Godfrey, Harvey, Glejser and Arch test method where the null hypothesis is that the variance of the error term is constant. If existence of heteroskedasticity is found, ARDL model using the robust standard errors is used to account for the problem of heteroskedasticity.

3.4.3.3 Normality test

Normal distribution test is a nonstop probability distribution that occurs between two real numbers. Normal distributions are regularly used in the natural and social sciences for real-valued random variables whose distributions are not known. The normal distribution is also just about zero once the value x lies more than a few standard deviations away from the mean (Gou et al., 2013).

3.4.3.4 Autocorrelation

According to Hamilton (1994), cited in Kingori (2015) a common problem in using time series regressions is that the estimated residuals tend to be correlated across time. For example, the residuals at time ***t*** could be correlated with the residuals in time *t-1*. The presence of serial correlation in OLS regressions leads to estimates that have small standard errors, inefficient, biased and inconsistent especially when lagged dependent variables are included on the right hand side of the test equation.

There are several causes which gives rise to autocorrelation. Sources of autocorrelation are; Firstly, the omitted explanatory variables: It is generally known that one variable is affected by so many variables. The error term represents the influence of omitted variables and because of that an error term in one period many have a relation with the error terms in successive periods. Thus the problem of autocorrelation arises. Secondly, misspecification of the mathematical form of the model: If the study has adopted a mathematical form which differs from the true form of the relationship, then the disturbance term must be shown as serial correlation. Thirdly, interpolation in the statistical observation: Most of the published time series data involve some of the interpolation and smoothing process, which do average the true disturbance over successive time periods. As a consequence, the successive values of the series are auto-correlated. Lastly, misspecification of the true error μ : Disturbance term may be auto-correlated because it contains errors, of measurement. If the explanatory variable is measured wrongly the serial disturbance will be auto-correlated (Hamilton, 1994).

The consequences of autocorrelation are, firstly, when the disturbance term is or are seriously correlated then the least square (OLS) estimation are unbiased but optimist property (minimum variance property) is not satisfied. Secondly, if the disturbance term is or are auto-correlated then, the OLS variance is greater than the variances of estimate calculated by other method therefore the use of ***t*** and ***f*** of significance are no longer valid. Thirdly, the variance of random term μ may be seriously underestimated if the μ `s are auto-correlated. Lastly, if the disturbance terms are auto-correlated then the OLS estimates are not asymptotic (Hamilton, 1994).

This study tests for the presence of autocorrelation/serial correlation using the Breusch-Godfrey test. The Breusch-Godfrey serial correlation test is used to test for autocorrelation among the errors and is applicable whether or not there are lagged dependent variables (Green, 2000). The null hypothesis is that there is no serial correlation up to a pre-specified lag order against the alternative of the presence of serial correlation. If autocorrelation is present, ARDL model is estimated using the robust standard errors to account for the presence of autocorrelation. The Breusch-Godfrey (GB) test is more general and test for higher order serial correlation, AR(q):

$$\mu_t = \rho_1 \mu_{t-1} + \rho_2 \mu_{t-2} + \cdots + \rho_\sigma = 0 \quad (3.7)$$

then, null hypothesis is

$$\mathrm{H}_0 : \rho_1 = \cdots = \rho_\sigma = 0$$

3.4.4 Stability testing

Ramsey Reset test will be conducted to check the stability of estimates of the model in the long-run. Ramsey Reset test of missspecification is intended to provide a simple indicator since is similar in purpose to White's test for functional form. The RESET test is based on the notion that if the functional form of the model is incorrect, then the correct specification might be approximated by the inclusion of powers of the variables in the original model. The original set of independent variable is augmented by powers of these variables. If the coefficients associated with the added variables are statistically significant, misspecification from sources such as incorrect functional form or the exclusion of relevant variables is suggested. This test is done by running regression of the original form and then saves the fitted values of the dependent variable, which denote $\hat{\gamma}$.

$$\hat{\gamma} = \mathrm{b} b_1 + \sum_{i=2}^{k} b_i \chi_i \; 1 \quad (3.8)$$

$\hat{\gamma}^2$ is a linear combination of the squares of X variables and their interactions. If $\hat{\gamma}^2$ is added to the regression specification, it should pick up quadratic and interactive nonlinearity, if present, without being correlated with the X variables and consuming only one degree of freedom. If the t statistic for the coefficient of $\hat{\gamma}^2$ is significant, this symbolise that nonlinerity maybe present, so to obtain linear relationship, the predicted value of y must be calculated from the data on x, using the values of the parameters (Dougherty, 2011)

3.4.5 Error Correction Model (ECM)

An ECM has two important points: the study starts by estimating short-run coefficients and then provide feedback or the speed of adjustment whereby short-run dynamics converge to the long-run equilibrium path in the model. This study also develops the error correction model (ECM) in order to test for the speed of adjustment and how the variables in the data set converge towards equilibrium in the long run. Therefore, the ARDL version of the ECM for international trade on economic growth is presented so as to check the speed of the error term towards equilibrium. The sign of the error correction (EC) coefficient must be negative and significant to ensure convergence of the dynamics of the long-run equilibrium. According to Dougherty (2011) the model of the error correction model can be obtained as follows:

$$\Delta Y_t = (\beta_2 - 1)\left(Y_{t-} - \frac{\beta_1}{1-\beta_2} - \frac{\beta_3 + \beta_4}{1-\beta_1} X_{t-1} - \right) + \beta_3 \Delta X_t + \varepsilon_t \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_} \quad (3.9)$$

The model states that the change in Y in any period will be governed by the change in X.

3.5 Summary

A quarterly time series data was collected from 2000Q1 to 2017Q1 to help the researcher to determine the relationship between international trade and economic growth in South Africa. ADF, PP and DF-GLS were used to test if the variables are stationary or non-stationary. After running stationarity test some variables were I(0) and others I(1) which lead to the adoption of ARDL bounds test.

CHAPTER 4

DISCUSSION / PRESENTATION / INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents the empirical results of all the tests outlined in previous chapter. There are some levels of contradictions about the impact of international trade on economic growth. These contradictions might be because of the differences in approaches and the compositions of data and also the methodologies applied through the studies. Once international trade become fully effective in South Africa trade will be affected in a positive or negative way. This study is therefore envisaged to contribute to the growth policy making process in terms of understanding how to maintain growth and the benefits of international trade liberalization. The findings of data collected in previous chapter will clarify South Africa level on international trade and economic growth.

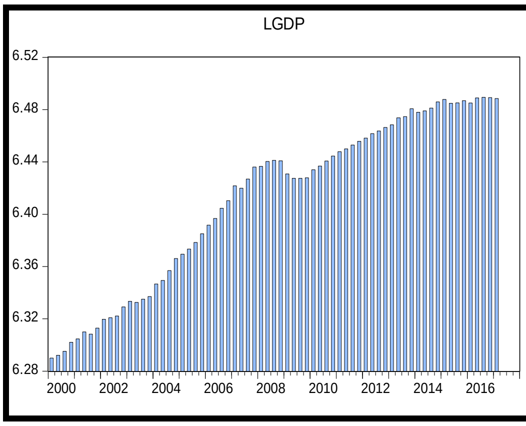
4.2 Empirical tests results

This section presents the results of unit root tests the ARDL bounds test, the diagnostic and stability tests.

4.2.1 Stationarity/Unit root tests results

4.2.1.1 Visual inspection

According to graphical presentation in figure 4.1, GDP seems to be non-stationary at level because of the upwards trending movement over time. It gives the impression that economic growth movement is controlled by time over the years (2000 – 2016). On the other hand, figure 4.2 indicates that GDP seems to be stationary at first difference between the years 2000 to 2016. This is based on the oscillation around the mean of zero.



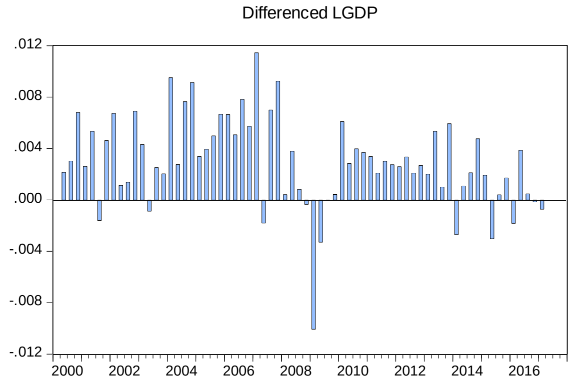


Figure 4.1 GDP at level difference

Figure 4.2 GDP at 1st difference

Source: Authors estimations

4.2.1.2 Formal unit root tests results

The unit root tests were performed at intercept, trend and intercept models to determine stationarity. The results are presented in Tables 4.1 to 4.12

Table 4.1: ADF test results at level

Variables	Model specification	T-statistics	Critical values			Conclusion
			1%	5%	10%	
LGDP	Intercept	-1,905437	-3,530030	-2,904848	-2,589907	Non-stationarity I(0)
	Trend & intercept	-0,282102	-4,098741	-3,477275	-3,166190	Non-stationarity I(0)
EXCH	Intercept	-7,282589***	-3,530030	-2,904848	-2,589907	Stationarity I(0)
	Trend & intercept	-7,226035***	-4,098742	-3,477275	-3,166190	Stationarity I(0)
LEXP	Intercept	-1,469571	-3,536587	-2,907660	-2,591396	Non-stationarity I(0)
	Trend & intercept	-2,836769	-4,107947	-3,481595	-3,168695	Non-stationarity I(0)
LIMP	Intercept	-1,336194	-1,530030	-2,904848	-2,589907	Non-stationarity I(0)
	Trend & intercept	-2,393541	-4,098741	-3,477275	-3,166190	Non-stationarity I(0)

***0.01, **0.05, *0.10 significant level

Note: I (1) indicates unit root at first difference being stationary
I (0) indicates unit root in level being stationary
L indicates the logged variables
** indicates critical value at 5% level of significance

Source: Authors estimations

In table 4.1 exchange rate is stationary at level I(0) and some variables are non-stationary at level and stationary at 1st different I(1).

Table 4.2: ADF test results at 1st difference

Variables	Model specification	T-statistics	Critical values			Conclusion
			1%	5%	10%	
Δ LGDP	Intercept	-6,453890***	-3,531592	-2,905519	-2,590262	Stationarity I(1)
	Trend & intercept	-6,750389***	-4,100935	-3,478305	-3,166788	Stationarity I(1)
Δ LEXP	Intercept	-3,730950***	-3,536587	-2,907660	-2,591396	Stationarity I(1)
	Trend & intercept	-3,703980**	-4,107947	-3,481595	-3,168695	Stationarity I(1)
Δ LIMP	Intercept	-3,222882***	-3,536587	-2,907660	-2,591396	Stationarity I(1)
	Trend & intercept	-3,293051***	-4,107947	-3,481595	-3,168695	Stationarity I(1)

***0.01, **0.05, *0.10 significant level

Note: I (1) indicates unit root at first difference being stationary

I (0) indicates unit root in level being stationary

Δ Indicate changes in first difference

L indicates the logged variables

** indicates critical value at 5% level of significance

Source: Authors estimations

In table 4.2: GDP, export and import are stationary at I(1) after first difference.

Table 4.3: Phillips - Perron test results at level

Variables	Model specification	T-statistics	Critical values			Conclusion
			1%	**5%**	**10%**	
LGDP	Intercept	-1,586992	-3,530030	-2,904848	-2,58990	Non-stationarity I(0)
	Trend & intercept	-0,843730*	-4,098741	-3,477275	-3,166190	Non-stationarity I(0)
EXCH	Intercept	-7,255711***	-3,530030	-2,904848	-2,589907	Stationarity I(0)
	Trend & intercept	-7,196922***	-4,098741	-3,477275	-3,166190	Stationarity I(0)
LEXP	Intercept	-1,888582	-3,530030	-2,904848	-2,589907	Non-stationarity I(0)
	Trend & intercept	-3,878191	-4,098741	-3,477275	-3,166190	Stationarity I(0)
LIMP	Intercept	-1,288125	-3,530030	-2,904848	-2,599907	Non-stationarity I(0)
	Trend & intercept	-2,501771	-4,098741	-3,477275	-3,166190	Non-stationarity I(0)

***0.01, **0.05, *0.10 significant level

Note: I (1) indicates unit root at first difference being stationary

I (0) indicates unit root in level being stationary

L indicates the logged variables

** indicates critical value at 5% level of significance

Source: Authors estimations

In table 4.3 exchange rate and log export under trend and intercept are stationary at level I (0) at 5%.

Table 4.4: Phillips - Perron test results at 1st difference

Variables	Model specification	T-statistics	Critical values			Conclusion
			1%	5%	10%	
Δ LGDP	Intercept	-6,695452***	-3,531592	-2,905519	-2,590262	Stationarity I(1)
	Trend & intercept	-6,932077***	-4,100935	-3,478305	-3,166788	Stationarity I(1)
Δ LEXP	Intercept	-16,68729***	-3,531592	-2,905519	-2,590262	Stationarity I(1)
	Trend & intercept	-18,77689***	-4,100935	-3,478305	-3,166788	Stationarity I(1)
Δ LIMP	Intercept	-9,190217***	-3,531592	-2,905519	-2,590262	Stationarity I(1)
	Trend & intercept	-10,19689***	-4,100935	-3,478305	-3,166788	Stationarity I(1)

***0.01, **0.05, *0.10 significant level
Note: I (1) indicates unit root at first difference being stationary
I (0) indicates unit root in level being stationary
Δ Indicate changes in first difference
L indicates the logged variables
** indicates critical value at 5% level of significance

Source: Authors estimations

Table 4.4: Shows that GDP, export and import are stationary at I(1) after first differencing. PP tests support the ADF tests that all the logged variables are stationary at first difference I(1).

Table 4.5: DF-GLS test results at level

Variables	Model specification	T-statistics	Critical values			Conclusion
			1%	5%	10%	
LGDP	Intercept	0,337636	-2,600471	-1,945823	-1,613589	Non-stationarity I(0)
	Trend & intercept	-0,947632	-3,709200	-3,138800	-2,842000	Non-stationarity I(0)
EXCH	Intercept	-6,466432***	-2,599413	-1,945669	-1,613677	Stationarity I(0)
	Trend & intercept	-7,067557***	-3,701600	-3,132400	-2,836000	Stationarity I(0)
LEXP	Intercept	-0,422211	-2,601596	-1,945987	-1,613496	Non-stationarity I(0)
	Trend & intercept	-2,745379	-3,716800	-3,145200	-2,848000	Non-stationarity I(0)
LIMP	Intercept	-0,100778	-2,599413	-1,945669	-1,613677	Non-stationarity I(0)

	Trend & intercept	-1,845598	-3,701600	-3,132400	-2,836000	Non-stationarity I(0)

***0.01, **0.05, *0.10 significant level
Note: I (1) indicates unit root at first difference being stationary
I (0) indicates unit root in level being stationary
L indicates the logged variables
** indicates critical value at 5% level of significance
Source: Authors estimations

Table 4.5: emphasis that the test on ADF, PP are correct because even in DF-GLS test exchange rate is stationary at unit root level at 5% I(0).

Table 4.6: DF-GLS test results at 1st difference

Variables	Model specification	T-statistics	Critical values			Conclusion
			1%	5%	10%	
Δ LGDP	Intercept	-3,761202***	-2,600471	-1,945823	-1,613589	Stationarity I(1)
	Trend & intercept	-6,683496***	-3,705400	-3,135600	-2,839000	Stationarity I(1)
Δ LEXP	Intercept	-2,657457***	-2,601596	-1,945987	-1,613496	Stationarity I(1)
	Trend & intercept	-3,406301***	-3,716800	-3,145200	-2,848000	Stationarity I(1)
Δ LIMP	Intercept	-3,053658***	-2,601596	-1,945987	-1,613496	Stationarity I(1)
	Trend & intercept	-3,225863***	-3,716800	-3,145200	-2,848000	Stationarity I(1)

***0.01, **0.05, *0.10 significant level
Note: I (1) indicates unit root at first difference being stationary
I (0) indicates unit root in level being stationary
Δ Indicate changes in first difference
L indicates the logged variables
** indicates critical value at 5% level of significance
Source: Authors estimations

Table 4.6: back-up the results of unit root done by ADF, PP that symbolises that indeed GDP, export and import are stationary at first difference I(1). In detail the results for the unit root test are presented in appendix A. The results of the three tests indicate that some of the series are found to be non-stationary; however, the first differences of these series lead to stationarity.

4.2.2 Bounds test results

Table 4.7 and Table 4.8 present results of the bounds testing approach. In detail the results for the Bounds test are presented in appendix B. E-views 9 automatically selects the optimal lag length of our model using the Akaike Information Criterion (AIC) and for this study a lag length of 6 was selected to accommodate the variables in question.

Table 4.7 Bounds test results

Equation	F-statistic	Lower bound I(0) @ 5%	Upper bound I(1) @ 5%	Results/ Outcome
Economic growth	5.02	2.79	3.67	Cointegrated

Source: Authors estimations

According to Persaran et al., (2001) significant levels for lower bound and upper bound are shown as follows hereafter:

Table 4.8: Significant levels for lower bound and upper bound

Significant level	I(0) or Lower bound	I(1) or Upper bound
10%	3.65	4.66
5%	2.79	3.67
1%	2.37	3.20

Persaran et al., (2001)

The number of independent variables in this model is 3, hence k=3. All the lower bound and upper bound critical values are obtained from (Pesaran et al., 2001). The calculated F-statistic = 5.02 and is greater than the lower bound critical value of 2.79 and the upper bound critical value of 3.67 at 5% level of significance, therefore this symbolise the presence of cointegration among the variables.

The bound testing approach has provided enough evidence of a long-run relationship between all the variables on economic growth model, the study then proceeds to estimate the long-run coefficients of the model. The calculated results show that F statistics exceeds the upper bound; the null hypothesis of no cointegration can be rejected. Estimating the long-run coefficients and the ECM along with the short-run parameters become necessary.

4.2.3 ARDL long-run coefficients model

Table 4.9: ARDL long-run coefficients

Variables	Coefficients
EXCR	0.000014
LEXP	-0.391893
LIMP	0.578821
C	5.315750

Source: Authors estimations

Table 4.9 presents the summary of the results of the long-run ARDL model for the international trade equation and all the details are in appendix C. All the variables in the model exert significant long-term influences on the economic growth. EXCH with a coefficient of 0.00% indicates a positive long-run relationship between the EXCH and economic growth. This suggests that a 1% appreciation of the exchange rate will lead to 0.00% improvement or increase on economic growth. South Africa exchange rate is significant. This result is also consistent with economic theory. A competitive exchange rate is seen as an esential ingredient of dynamic growth and employment in developing countries. It allows domestic firms to benefit from rapid growth in international trade and attracts international firms searching for the best location for sourcing of their goods. This may also have positive spill over’s for domestic technological development, which might lead to a process of learning how to produce with the best technologies available, and with the best marketing tools for the global economy (Spiegel, 2007).

Export stands at -0.361, suggesting a negative relationship between LEXP and LGDP in the long-run. Export has no significant effect output in the long-run. A 10% increase in export will lead to 3.61% deterioration in the level of the economic growth. The coefficient of LEXP is negative and statistically not significant at 5 per cent level of confidence with a value of -0.361. This implies that at 1% increase in the degree of export would lead to about 0.361 decreases in economic growth (GDP) of South Africa. Export does not lead to economic growth in South Africa. If the country exports more, economic growth will decrease since South Africa like other developing countries relies much on homogeneous agricultural products, which some are harvested seasonally and also depend on climate change. No rains-no crops, results will be poor production on farms, livestock dies of drought and increase in food prices of home produce. Although South Africa also exports some commodities such as minerals, iron, steel, vessels, wood, plastic and rubber still the economic growth is unstable.

In this study, export impact growth negatively because South Africa is importing much from its bilateral countries and export little. The other reason is that for South Africa, endowments of natural resources or basic industries are no longer necessary or sufficient for participation in this new global environment. South Africa focus on producing lot of agricultural commodities that fail to compete in the global market. On the other hand, South Africa export is weak because as the country is advancing or reaching maturity its agricultural sector demand decreases and the focus shift to other performing sector. Another reason is that South Africa prices are not stable and its trading partners always search for better trading partners.

The results presented in this study are similar to Flattrs and Stern (2007), that highlighted that rising exports of resources in South Africa have led to appreciation of the rand. A stronger rand against major currencies could contribute to the declining competiveness of South Africa's exports. Meaning that some countries can withdraw exporting from South African and while South Africa do the same our economic growth remain on the same level and did not grow. In the same vein, Kehinde et.al, (2012) concluded that higher level of trade restrictions has been a huge obstacle to export and growth performance in developing countries like South Africa.

The results are also consistent with the Heckscher – Ohlin theory which focuses on the differences in relative factors endowments and factors prices between nations as the most determinants of trade. The model identified difference in pre-trade product prices between nations as the basis for trade. The theory assumed two countries, two commodities and two factors. There is perfect competition in both factor and product market. It assumed that factor inputs; labour and capital in the two countries are homogeneous. Production function also exhibits constant return to scale because the production situation increases exactly in the same proportion which factor production increases. Production possibility curve is concave to the origin. The model suggests that the less develop countries that are labour abundant should specialize in the production of primary products especially agricultural product because the labour requirement of agricultural is high except in the mechanized form of farming (Usman, 2011).

Import stands at 0.578, suggesting a positive relationship between LIMP and LGDP in the long-run. A 10% increase in import will lead to 5.78% improvement in the level of economic growth. The coefficients of import are 0.57 and highly significant suggesting that GDP rises by 57 per cent of the increase in the long-run. South Africa imports have impact on economic growth is sustained by higher level of import and little export. Omoju and Adesanya (2012) find out that exports, imports and exchange rate have a significant positive impact on economic growth in developing countries. Empirically, there appears to be good evidence that international trade affects economic growth positively by facilitating capital accumulation, industrial structure upgrading, technological progress and institutional advancement. The result is also consistent with economic theory and more specifically, increased imports of capital and intermediate products, which are not available in the domestic market, can result in the rise in productivity of manufacturing (Lee 1995).

Table 4.10: Error Correction Model

Variables	Coefficients	Standard error	T-statistic
EXCH	0.000002	0.000062	0.021681
Δ LEXP(-1)	0.084169	0.021041	4.000230
Δ LIMP(-1)	-0.023217	0.023491	-0.408162
CointEq(-1)	-0.125246	0.038971	-3.213864

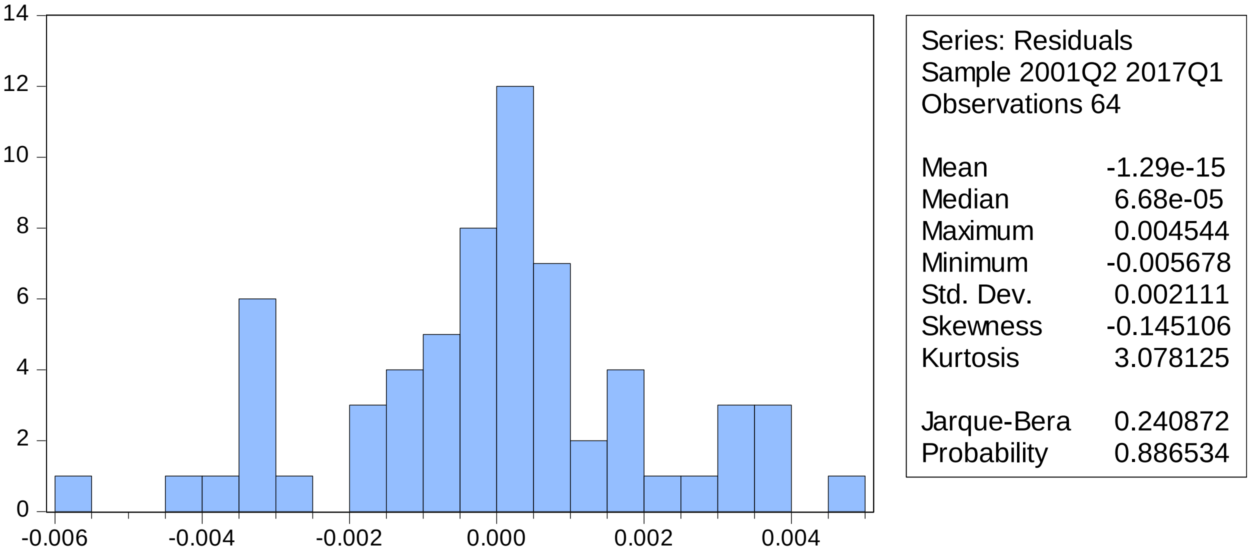
Δ Indicate changes in first difference
CointEq equals to the size of the error correction model
L indicates the logged variables
Source: Authors estimations

The results of the error-correction model are quite consistent between long-run and short-run. The short-run impact of EXCH on GDP is positive and significant at 5 per cent level of significance. Exchange rate and Import foster GDP growth in South Africa both in the short-run and long-run. The role of export in the error-correction model remains as insignificant as before or in short-run and long-run. The error-correction model is negative as expected but it is significant at 10 per cent level of significant instead of the conventional 5 per cent level.

The negative sign before the error-correction term, -0.125 suggests that the long-run equilibrium relation comes back to the speed of adjustment. The value of the coefficient however is very low, which suggests that it will take long time to restore steady-state or speed of adjustment if the system is distributed. The estimated model shows a fair level of goodness of fit.

4.2.4 Diagnostic tests results

Figure 4.3: Normality test results



The residuals are normally distributed in the model as shown by not rejecting the null hypothesis of the Jarque-Bera test. The p-value is greater than 5 per cent; therefore the study cannot reject the null hypothesis because at 8.86% probability is normally distributed. If P value is less than 5 per cent the study cannot accept the null hypothesis and accept the alternative, meaning that the x value is not normal. The skewness and the kurtosis rely on the probability value. The bell shape of the histogram shows that the residuals are normally distributed.

Table 4.11: Diagnostic checks on the error term

Test	Null Hypothesis	Test Statistic	P-Value	Conclusion
Jarque-Bera	Residuals are normally distributed	0.240872	0.886534	Do not reject H_0 as P-value is greater than level of significance at 5%, therefore the residuals of the model are normally distributed.
Breusch-Pagan-Godfrey	No Serial correlation	1.851886	0.3962	Do not reject H_0 as P-value is greater than level of significance at 5%, therefore there is no serial correlation.
Breusch-Pagan-Godfrey	No heteroskedasticity	9.139524	0.6090	Do not reject H_0 as P-value is greater than level of significance at 5%, therefore, no heteroskedasticity in the model, but there is homoscedasticity which is desirable.

Harvey	No heteroskedasticity	10.02451	0.5282	Do not reject H_0 as P-value is greater than level of significance at 5%, therefore, no heteroskedasticity in the model, but there is homoscedasticity which is desirable.
Glejser	No heteroskedasticity	9.495565	0.5762	Do not reject H_0 as P-value is greater than level of significance at 5%, therefore, no heteroskedasticity in the model, but there is homoscedasticity which is desirable.
Arch	No heteroskedasticity	0.219560	0.6394	Do not reject H_0 as P-value is greater than L.O.S at 5%, therefore, no heteroskedasticity in the model, but there is homoscedasticity which is desirable.

Null hypothesis: Homoskedacicity Alternative hypothesis: Heteroskedasticity

Source: Authors estimations

If the model has heteroskedasticity, we reject the null (homoskedacicity) and accept the alternative. Table 4.11 presents the residual diagnostic of the economic growth model. Detailed results for all the diagnostic tests are presented in Appendix D. The study tested for serial correlation using the Breusch-Godfrey test. The test reports the F-statistic with a value of 1.85 and a P-value of 0.39 implying that the study fails to reject the null hypothesis of no serial correlation at all conventional level of significance. Breusch-Pagan-Godfrey test for heteroskedasticity has LM statistic with a value of 9.13 and a P-value of 0.60 implying that the LM statistic is insignificant at 5% level of significant. Therefore, failing to reject the null hypothesis of constant variance and concluding that heteroskedasticity is not present in the data. The study also tested for Arch effects using the Arch test. The test reports an LM statistic with a value of 0.21 and a P-value of 0.63 implying that the null hypothesis of no Arch effects in the data is rejected. Last0ly, according to Harvey and Glejser the model has no heteroskedasticity as all their P-values are greater than level of significant at 5%. From the results of diagnostic tests, this study estimated model is free of serial correlations, misspecification errors, and heteroskedasticity at the 5 per cent level of significance.

4.2.5 Stability tests results

Table 4.12: Ramsey Reset tests results

Test	H_0	T-statistic	P-value	Conclusion
Ramsey Reset	The model is correctly specified	0.133163	0.8946	Do not reject H_0 because the P-value is greater than the level of significant at 5%.

Source: Authors estimations

Table 4.12 reports the results from the Ramsey Reset test. Detailed results for the Ramsey Reset test are presented in Appendix E. Null hypothesis states that the model is correctly specified. The P-value is greater than the level of significant at 5%, the null hypothesis is not rejected, and therefore, the model of economic growth is correctly specified.

4.3 Summary

This chapter sum-up the results of the study based on the methodology discussed in chapter 3. Firstly, the time series quarterly data were discussed to visually check the stationarity of the variables with ADF; in addition, PP and DF-GLS unit root test were used as supporting evidence. Secondly, the ARDL bounds test was adopted to check short-run and long-run cointegration in the model. Lastly, the diagnostic and stability test conclude the chapter.

CHAPTER 5

SUMMARY, RECOMMENDATIONS, CONCLUSION

5.1 Introduction

This chapter presents the summary and interpretation of the findings of the study, conclusions, and contributions of the study and limitations of the study.

5.2 Summary and Interpretation of Findings

The study analysed the effect of international trade on economic growth in South Africa with the aim of addressing three objectives. The first objective was to examine the relationship between international trade and economic growth. The second one was to examine the relationship between international trade and exchange rate and the last one examined the relationship between international trade and export.

The ARDL bounds test was employed to analyse the effects of international trade on economic growth in South Africa and Belloumi (2014)'s model was used as the basis for the formulation of the model and The data was sourced from South African Reserve Bank (SARB) and Quantec. The ADF, PP and DF-GLS analytic technique were performed to test stationarity and the ARDL model was employed in data analysis to help address the objectives that the study intended to address. The study found that exchange rate and import were the main determinants of economic growth in the long-run in South Africa. Furthermore, the study found out that the coefficient of export had negative relationship to economic growth it is not significant in the long-run.

5.3 Conclusions

The study found out that gross domestic product, exchange rate and export were the important variables in explaining variations in economic growth in South Africa. The other factors like exports that were sought to be determinants of growth in South Africa turned out not to be contrary to what most empirical studies suggested. This means that South African economic growth is unique in its activities domestically and abroad. The study makes it clear that there is over reliability to other countries done by South African economy. The study examines the effect of international trade on economic growth in South Africa. The results show that exchange rate and import are positively related to GDP, while export has a negative influence on GDP. These results are in line with Zahonongo (2017) who concluded that sub-saharan African countries must productively control trade opennesss, particularly the import of consumption goods, boosting their economic growth through international trade. At the same time this result is in contrast with Eravwoke and Onokero (2012) who found out that export is highly significant in South African economy. According to Biru (2014) testing export-led growth in Bangladesh, imports donot have any significant relationship with GDP. The study findings add a new dimension to the existing literature on the examines the effect of international trade on economic growth in South Africa, also due to the fact that the findings contradict the conclusions reached by the majority of the past studies.

5.4 Limitations of the study

There were some limitations experienced in relation to the availability of some data. Although most of the quarterly data was readily available, some of the data did not cover second quarter of 2017. The data had to be adjusted to Q1 2017 for the purpose of the study. There was no delimitation experienced in this study.

5.5 Policy recommendations

The study empirical findings have a certain implication for policy discussions. Since the results show that South African export have negative impact on growth, it is recommended that South African government must promote trading of goods and services internally and not focus much on exporting its primary goods and services abroad because it weakens the economy. Since we have noticed that South African economic growth is unique in its activities domestically and abroad this must help us reduce over reliability to other countries and boost our economy by implementing or pursuing policy that promote growth such as focusing on the other sectors or promoting the use of technology gadgets as most developed countries relies on that. It is recommended that South African government must rely on the strength it have in order to strengthen its currency and reduce importing poor quality product "fongkong" that is weakening the economy. It is recommended that South Africa must produce or export according to the need of the industry, so that the country benefit in return. Lastly, it is recommended that South Africa must support local industries and firms to create more employment opportunities and start programmes that will make youth to be active in businesses and reduce over reliance to the government.

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APPENDICES

APPENDIX A: ADF TEST UNIT ROOT TESTS

LGDP

INTERCEPT @ LEVEL

Null Hypothesis: LGDP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.717934	0.0762
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LGDP)

Method: Least Squares

Sample (adjusted): 2000Q2 2017Q1

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-0.017443	0.006418	-2.717934	0.0084
C	0.114729	0.041140	2.788747	0.0069

R-squared	0.100660	Mean dependent var	0.002919
Adjusted R-squared	0.087034	S.D. dependent var	0.003534
S.E. of regression	0.003377	Akaike info criterion	-8.514932
Sum squared resid	0.000752	Schwarz criterion	-8.449652
Log likelihood	291.5077	Hannan-Quinn criter.	-8.489066

F-statistic	7.387164	Durbin-Watson stat	1.650875
Prob(F-statistic)	0.008383		

TREND AND INTERCEPT @ LEVEL

Null Hypothesis: LGDP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.108585	0.9938
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LGDP)

Method: Least Squares

Sample (adjusted): 2000Q2 2017Q1

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-0.003103	0.028576	-0.108585	0.9139
C	0.024460	0.180056	0.135845	0.8924
@TREND("2000Q1")	-4.79E-05	9.29E-05	-0.515124	0.6082

R-squared	0.104317	Mean dependent var	0.002919
Adjusted R-squared	0.076757	S.D. dependent var	0.003534
S.E. of regression	0.003396	Akaike info criterion	-8.489594
Sum squared resid	0.000749	Schwarz criterion	-8.391675

Log likelihood	291.6462	Hannan-Quinn criter.	-8.450796
F-statistic	3.785145	Durbin-Watson stat	1.681238
Prob(F-statistic)	0.027863		

INTERCEPT @ 1^{ST} DIFFFERENCE

Null Hypothesis: D(LGDP) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.258682	0.0000
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LGDP,2)

Method: Least Squares

Sample (adjusted): 2000Q3 2017Q1

Included observations: 67 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	-0.759781	0.121396	-6.258682	0.0000
C	0.002216	0.000558	3.971704	0.0002

R-squared	0.376027	Mean dependent var	-4.28E-05
Adjusted R-squared	0.366427	S.D. dependent var	0.004376
S.E. of regression	0.003483	Akaike info criterion	-8.452371
Sum squared resid	0.000789	Schwarz criterion	-8.386559

Log likelihood	285.1544	Hannan-Quinn criter.	-8.426329
F-statistic	39.17111	Durbin-Watson stat	2.092460
Prob(F-statistic)	0.000000		

TREND AND INTERCEPT @ 1ST DIFFERENCE

Null Hypothesis: D(LGDP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.893463	0.0000
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LGDP,2)

Method: Least Squares

Sample (adjusted): 2000Q3 2017Q1

Included observations: 67 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	-0.849077	0.123171	-6.893463	0.0000
C	0.004337	0.001043	4.156524	0.0001
@TREND("2000Q1")	-5.30E-05	2.23E-05	-2.373823	0.0206

R-squared	0.426520	Mean dependent var	-4.28E-05
Adjusted R-squared	0.408599	S.D. dependent var	0.004376
S.E. of regression	0.003365	Akaike info criterion	-8.506905
Sum squared resid	0.000725	Schwarz criterion	-8.408188

Log likelihood	287.9813	Hannan-Quinn criter.	-8.467842
F-statistic	23.79968	Durbin-Watson stat	2.054506
Prob(F-statistic)	0.000000		

EXCHANGE RATE

INTERCEPT @ LEVEL

Null Hypothesis: EXCH has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.282589	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXCH)

Method: Least Squares

Sample (adjusted): 2000Q2 2017Q1

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCH(-1)	-0.887362	0.121847	-7.282589	0.0000
C	0.108060	0.622012	0.173727	0.8626

R-squared	0.445546	Mean dependent var	0.044118
Adjusted R-squared	0.437146	S.D. dependent var	6.836150
S.E. of regression	5.128728	Akaike info criterion	6.136563

Sum squared resid	1736.054	Schwarz criterion	6.201843
Log likelihood	-206.6431	Hannan-Quinn criter.	6.162429
F-statistic	53.03610	Durbin-Watson stat	1.967446
Prob(F-statistic)	0.000000		

TREND & INTERCEPT @ LEVEL

Null Hypothesis: EXCH has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.226035	0.0000
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXCH)

Method: Least Squares

Sample (adjusted): 2000Q2 2017Q1

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCH(-1)	-0.887227	0.122782	-7.226035	0.0000
C	0.208085	1.267312	0.164194	0.8701
@TREND("2000Q1")	-0.002900	0.031930	-0.090809	0.9279

R-squared	0.445617	Mean dependent var	0.044118
Adjusted R-squared	0.428559	S.D. dependent var	6.836150

S.E. of regression	5.167701	Akaike info criterion	6.165848
Sum squared resid	1735.834	Schwarz criterion	6.263767
Log likelihood	-206.6388	Hannan-Quinn criter.	6.204647
F-statistic	26.12370	Durbin-Watson stat	1.967927
Prob(F-statistic)	0.000000		

LEXPORT

INTERCEPT @ LEVEL

Null Hypothesis: LEXP has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.486596	0.5340
Test critical values:	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LEXP)

Method: Least Squares

Sample (adjusted): 2001Q2 2017Q1

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXP(-1)	-0.080737	0.054310	-1.486596	0.1425
D(LEXP(-1))	-0.135778	0.127367	-1.066034	0.2908
D(LEXP(-2))	-0.207133	0.123700	-1.674478	0.0994
D(LEXP(-3))	-0.180715	0.120940	-1.494253	0.1405

D(LEXP(-4))	0.365619	0.121276	3.014773	0.0038
C	0.429889	0.287330	1.496148	0.1400

R-squared	0.337696	Mean dependent var	0.001986
Adjusted R-squared	0.280601	S.D. dependent var	0.024403
S.E. of regression	0.020698	Akaike info criterion	-4.828526
Sum squared resid	0.024847	Schwarz criterion	-4.626131
Log likelihood	160.5128	Hannan-Quinn criter.	-4.748792
F-statistic	5.914608	Durbin-Watson stat	1.799905
Prob(F-statistic)	0.000175		

TREND AND INTERCEPT @ LEVEL

Null Hypothesis: LEXP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.744876	0.2229
Test critical values:	1% level	-4.107947	
	5% level	-3.481595	
	10% level	-3.168695	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LEXP)

Method: Least Squares

Sample (adjusted): 2001Q2 2017Q1

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

LEXP(-1)	-0.306303	0.111591	-2.744876	0.0081
D(LEXP(-1))	0.034932	0.143786	0.242944	0.8089
D(LEXP(-2))	-0.066387	0.134301	-0.494314	0.6230
D(LEXP(-3))	-0.088688	0.123469	-0.718301	0.4755
D(LEXP(-4))	0.428558	0.120253	3.563813	0.0007
C	1.598938	0.581023	2.751936	0.0079
@TREND("2000Q1")	0.000660	0.000288	2.289802	0.0258

R-squared	0.393486	Mean dependent var	0.001986
Adjusted R-squared	0.329643	S.D. dependent var	0.024403
S.E. of regression	0.019980	Akaike info criterion	-4.885274
Sum squared resid	0.022754	Schwarz criterion	-4.649146
Log likelihood	163.3288	Hannan-Quinn criter.	-4.792251
F-statistic	6.163293	Durbin-Watson stat	1.833775
Prob(F-statistic)	0.000050		

INTERCEPT @ 1ST DIFFERENCE

Null Hypothesis: D(LEXP) has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.762010	0.0053
Test critical values:	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LEXP,2)

Method: Least Squares

Sample (adjusted): 2001Q2 2017Q1

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEXP(-1))	-1.296905	0.344737	-3.762010	0.0004
D(LEXP(-1),2)	0.102397	0.271995	0.376467	0.7079
D(LEXP(-2),2)	-0.146376	0.194983	-0.750712	0.4558
D(LEXP(-3),2)	-0.353404	0.122232	-2.891265	0.0054
C	0.002764	0.002734	1.010810	0.3162

R-squared	0.697301	Mean dependent var	-2.63E-05
Adjusted R-squared	0.676779	S.D. dependent var	0.036777
S.E. of regression	0.020909	Akaike info criterion	-4.822381
Sum squared resid	0.025794	Schwarz criterion	-4.653718
Log likelihood	159.3162	Hannan-Quinn criter.	-4.755936
F-statistic	33.97827	Durbin-Watson stat	1.781889
Prob(F-statistic)	0.000000		

TREND & INTERCEPT @ 1ST DIFFERENCE

Null Hypothesis: D(LEXP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.740993	0.0266
Test critical values:	1% level	-4.107947	
	5% level	-3.481595	
	10% level	-3.168695	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LEXP,2)

Method: Least Squares

Sample (adjusted): 2001Q2 2017Q1

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEXP(-1))	-1.301467	0.347893	-3.740993	0.0004
D(LEXP(-1),2)	0.106573	0.274598	0.388106	0.6994
D(LEXP(-2),2)	-0.143621	0.196800	-0.729779	0.4685
D(LEXP(-3),2)	-0.351727	0.123362	-2.851184	0.0060
C	0.004177	0.005933	0.703980	0.4843
@TREND("2000Q1")	-3.84E-05	0.000143	-0.268975	0.7889

R-squared	0.697678	Mean dependent var	-2.63E-05
Adjusted R-squared	0.671616	S.D. dependent var	0.036777
S.E. of regression	0.021075	Akaike info criterion	-4.792378
Sum squared resid	0.025762	Schwarz criterion	-4.589982
Log likelihood	159.3561	Hannan-Quinn criter.	-4.712644
F-statistic	26.76970	Durbin-Watson stat	1.783842
Prob(F-statistic)	0.000000		

LIMPORT

INTERCEPT @ LEVEL

Null Hypothesis: LIMP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.594370	0.4800

Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LIMP)

Method: Least Squares

Sample (adjusted): 2000Q2 2017Q1

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIMP(-1)	-0.035910	0.022523	-1.594370	0.1156
C	0.193370	0.117989	1.638884	0.1060

R-squared	0.037087	Mean dependent var	0.005306
Adjusted R-squared	0.022497	S.D. dependent var	0.023473
S.E. of regression	0.023208	Akaike info criterion	-4.659678
Sum squared resid	0.035548	Schwarz criterion	-4.594399
Log likelihood	160.4291	Hannan-Quinn criter.	-4.633812
F-statistic	2.542017	Durbin-Watson stat	2.045722
Prob(F-statistic)	0.115631		

TREND & INTERCEPT @ LEVEL

Null Hypothesis: LIMP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.855959	0.6662

Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LIMP)

Method: Least Squares

Sample (adjusted): 2000Q2 2017Q1

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIMP(-1)	-0.113265	0.061027	-1.855959	0.0680
C	0.580229	0.307193	1.888809	0.0634
@TREND("2000Q1")	0.000529	0.000389	1.362445	0.1778

R-squared	0.063822	Mean dependent var	0.005306
Adjusted R-squared	0.035017	S.D. dependent var	0.023473
S.E. of regression	0.023059	Akaike info criterion	-4.658424
Sum squared resid	0.034561	Schwarz criterion	-4.560505
Log likelihood	161.3864	Hannan-Quinn criter.	-4.619625
F-statistic	2.215627	Durbin-Watson stat	1.947935
Prob(F-statistic)	0.117259		

INTERCEPT @ 1ST DIFFERENCE

Null Hypothesis: D(LIMP) has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic - based on SIC, maxlag=10)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-3.034913	0.0370
Test critical values:	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LIMP,2)

Method: Least Squares

Sample (adjusted): 2001Q2 2017Q1

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LIMP(-1))	-0.829748	0.273401	-3.034913	0.0036
D(LIMP(-1),2)	-0.178351	0.222973	-0.799880	0.4270
D(LIMP(-2),2)	-0.296238	0.168345	-1.759708	0.0836
D(LIMP(-3),2)	-0.394169	0.116635	-3.379498	0.0013
C	0.004569	0.003050	1.498220	0.1394

R-squared	0.622757	Mean dependent var	0.000408
Adjusted R-squared	0.597182	S.D. dependent var	0.033756
S.E. of regression	0.021425	Akaike info criterion	-4.773656
Sum squared resid	0.027082	Schwarz criterion	-4.604993
Log likelihood	157.7570	Hannan-Quinn criter.	-4.707211
F-statistic	24.34951	Durbin-Watson stat	1.841809
Prob(F-statistic)	0.000000		

TREND & INTERCEPT @ 1ST DIFFERENCE

Null Hypothesis: D(LIMP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.244214	0.0852
Test critical values:	1% level	-4.107947	
	5% level	-3.481595	
	10% level	-3.168695	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LIMP,2)

Method: Least Squares

Sample (adjusted): 2001Q2 2017Q1

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LIMP(-1))	-0.911331	0.280910	-3.244214	0.0020
D(LIMP(-1),2)	-0.118661	0.227764	-0.520984	0.6044
D(LIMP(-2),2)	-0.252321	0.171753	-1.469089	0.1472
D(LIMP(-3),2)	-0.372774	0.117602	-3.169783	0.0024
C	0.011487	0.006554	1.752696	0.0849
@TREND("2000Q1")	-0.000178	0.000149	-1.191331	0.2384

R-squared	0.631768	Mean dependent var	0.000408
Adjusted R-squared	0.600024	S.D. dependent var	0.033756
S.E. of regression	0.021349	Akaike info criterion	-4.766581
Sum squared resid	0.026435	Schwarz criterion	-4.564186
Log likelihood	158.5306	Hannan-Quinn criter.	-4.686847
F-statistic	19.90189	Durbin-Watson stat	1.849053
Prob(F-statistic)	0.000000		

APPENDIX B: PHILLIPS-PERRON UNIT ROOT TESTS

Null Hypothesis: GDP has a unit root

Exogenous: None

Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		4.149622	1.0000
Test critical values:	1% level	-2.599413	
	5% level	-1.945669	
	10% level	-1.613677	

Null Hypothesis: GDP has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.586992	0.4837
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

Null Hypothesis: GDP has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.843730	0.9559
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

Null Hypothesis: D(GDP) has a unit root

Exogenous: None

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.679389	0.0000
Test critical values:	1% level	-2.599934	
	5% level	-1.945745	
	10% level	-1.613633	

Null Hypothesis: D(GDP) has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.695452	0.0000
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

Null Hypothesis: D(GDP) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.932077	0.0000
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

Null Hypothesis: EXCH has a unit root

Exogenous: None

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.309246	0.0000
Test critical values:	1% level	-2.599413	
	5% level	-1.945669	
	10% level	-1.613677	

Null Hypothesis: EXCH has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.255711	0.0000
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

Null Hypothesis: EXCH has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.196922	0.0000
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	

	10% level	-3.166190	

Null Hypothesis: EXPORT has a unit root

Exogenous: None

Bandwidth: 23 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		1.545969	0.9690
Test critical values:	1% level	-2.599413	
	5% level	-1.945669	
	10% level	-1.613677	

Null Hypothesis: EXPORT has a unit root

Exogenous: Constant

Bandwidth: 26 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.888582	0.3357
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

Null Hypothesis: EXPORT has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.878191	0.0183
Test critical values:	1% level	-4.098741	

	5% level	-3.477275	
	10% level	-3.166190	

Null Hypothesis: D(EXPORT) has a unit root

Exogenous: None

Bandwidth: 57 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.10323	0.0000
Test critical values:	1% level	-2.599934	
	5% level	-1.945745	
	10% level	-1.613633	

Null Hypothesis: D(EXPORT) has a unit root

Exogenous: Constant

Bandwidth: 34 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-16.68729	0.0000
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

Null Hypothesis: D(EXPORT) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 34 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-18.77689	0.0001

Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

Null Hypothesis: IMPORT has a unit root

Exogenous: None

Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		1.734336	0.9791
Test critical values:	1% level	-2.599413	
	5% level	-1.945669	
	10% level	-1.613677	

Null Hypothesis: IMPORT has a unit root

Exogenous: Constant

Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.288125	0.6306
Test critical values:	1% level	-3.530030	
	5% level	-2.904848	
	10% level	-2.589907	

Null Hypothesis: IMPORT has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*

Phillips-Perron test statistic		-2.501771	0.3265
Test critical values:	1% level	-4.098741	
	5% level	-3.477275	
	10% level	-3.166190	

Null Hypothesis: D(IMPORT) has a unit root

Exogenous: None

Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.981299	0.0000
Test critical values:	1% level	-2.599934	
	5% level	-1.945745	
	10% level	-1.613633	

Null Hypothesis: D(IMPORT) has a unit root

Exogenous: Constant

Bandwidth: 18 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.190217	0.0000
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

Null Hypothesis: D(IMPORT) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 20 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*

Phillips-Perron test statistic		-10.19689	0.0000
Test critical values:	1% level	-4.100935	
	5% level	-3.478305	
	10% level	-3.166788	

APPENDIX C: DF-GLS UNIT ROOT TESTS

INTERCEPT@ LEVEL

Null Hypothesis: LGDP has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		0.337636
Test critical values:	1% level	-2.600471
	5% level	-1.945823
	10% level	-1.613589

*MacKinnon (1996)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 4 69

Included observations: 66 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	0.001869	0.005534	0.337636	0.7368
D(GLSRESID(-1))	0.334334	0.117974	2.833953	0.0062

D(GLSRESID(-2))	0.367886	0.118873	3.094787	0.0029

R-squared	0.000289	Mean dependent var	0.002929
Adjusted R-squared	-0.031448	S.D. dependent var	0.003586
S.E. of regression	0.003642	Akaike info criterion	-8.347930
Sum squared resid	0.000836	Schwarz criterion	-8.248401
Log likelihood	278.4817	Hannan-Quinn criter.	-8.308601
Durbin-Watson stat	2.163278		

TREND & INTERCEPT @LEVEL

Null Hypothesis: LGDP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 2 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-0.947632
Test critical values:	1% level	-3.709200
	5% level	-3.138800
	10% level	-2.842000

*Elliott-Rothenberg-Stock (1996, Table 1)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 4 69

Included observations: 66 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.027059	0.028554	-0.947632	0.3469
D(GLSRESID(-1))	0.209166	0.123938	1.687666	0.0964
D(GLSRESID(-2))	0.244416	0.125604	1.945919	0.0561

R-squared	0.111847	Mean dependent var	-0.000265
Adjusted R-squared	0.083652	S.D. dependent var	0.003586
S.E. of regression	0.003433	Akaike info criterion	-8.466253
Sum squared resid	0.000743	Schwarz criterion	-8.366723
Log likelihood	282.3863	Hannan-Quinn criter.	-8.426924
Durbin-Watson stat	2.053137		

INTERCEPT @1ST DIFFERENCE

Null Hypothesis: D(LGDP) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-3.761202
Test critical values:	1% level	-2.600471
	5% level	-1.945823
	10% level	-1.613589

*MacKinnon (1996)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 4 69

Included observations: 66 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.560395	0.148994	-3.761202	0.0004
D(GLSRESID(-1))	-0.235688	0.122359	-1.926193	0.0585

R-squared	0.400112	Mean dependent var	-5.68E-05
Adjusted R-squared	0.390739	S.D. dependent var	0.004408
S.E. of regression	0.003441	Akaike info criterion	-8.476482
Sum squared resid	0.000758	Schwarz criterion	-8.410129
Log likelihood	281.7239	Hannan-Quinn criter.	-8.450263
Durbin-Watson stat	2.051903		

TREND & INTERCEPT @1ST DIFFERE

Null Hypothesis: D(LGDP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-6.683496
Test critical values:	1% level	-3.705400
	5% level	-3.135600
	10% level	-2.839000

*Elliott-Rothenberg-Stock (1996, Table 1)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Date: 10/06/17 Time: 16:00

Sample (adjusted): 3 69

Included observations: 67 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.808645	0.120991	-6.683496	0.0000

R-squared	0.403625	Mean dependent var	-9.63E-06
Adjusted R-squared	0.403625	S.D. dependent var	0.004376
S.E. of regression	0.003379	Akaike info criterion	-8.527459
Sum squared resid	0.000754	Schwarz criterion	-8.494554
Log likelihood	286.6699	Hannan-Quinn criter.	-8.514439
Durbin-Watson stat	2.069016		

EXCHANGE RATE DF(GLS)

INTERCEPT @ LEVEL

Null Hypothesis: EXCH has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-6.466432
Test critical values:	1% level	-2.599413
	5% level	-1.945669

	10% level	-1.613677

*MacKinnon (1996)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 2 69

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.768268	0.118809	-6.466432	0.0000

R-squared	0.384249	Mean dependent var	0.044118
Adjusted R-squared	0.384249	S.D. dependent var	6.836150
S.E. of regression	5.364315	Akaike info criterion	6.212011
Sum squared resid	1927.984	Schwarz criterion	6.244651
Log likelihood	-210.2084	Hannan-Quinn criter.	6.224944
Durbin-Watson stat	1.984598		

TREND & INTERCEPT @ LEVEL

Null Hypothesis: EXCH has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-7.067557
Test critical values:	1% level	-3.701600

	5% level	-3.132400
	10% level	-2.836000

*Elliott-Rothenberg-Stock (1996, Table 1)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 2 69

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.853963	0.120829	-7.067557	0.0000

R-squared	0.427107	Mean dependent var	0.004360
Adjusted R-squared	0.427107	S.D. dependent var	6.836150
S.E. of regression	5.174261	Akaike info criterion	6.139867
Sum squared resid	1793.789	Schwarz criterion	6.172506
Log likelihood	-207.7555	Hannan-Quinn criter.	6.152800
Durbin-Watson stat	1.963532		

INTERCEPT @ 1ST DIFFERE

Null Hypothesis: D(EXCH) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-10.44462

Test critical values:	1% level	-2.599934
	5% level	-1.945745
	10% level	-1.613633

*MacKinnon (1996)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 3 69

Included observations: 67 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-1.253267	0.119992	-10.44462	0.0000

R-squared	0.622986	Mean dependent var	-0.149254
Adjusted R-squared	0.622986	S.D. dependent var	11.40859
S.E. of regression	7.005042	Akaike info criterion	6.745950
Sum squared resid	3238.661	Schwarz criterion	6.778856
Log likelihood	-224.9893	Hannan-Quinn criter.	6.758971
Durbin-Watson stat	2.071322		

EXPORT @LEVEL DF(GLS)

Null Hypothesis: LEXP has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic - based on SIC, maxlag=10)

	t-Statistic

Elliott-Rothenberg-Stock DF-GLS test statistic		-0.422211
Test critical values:	1% level	-2.601596
	5% level	-1.945987
	10% level	-1.613496

*MacKinnon (1996)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 6 69

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.017408	0.041231	-0.422211	0.6744
D(GLSRESID(-1))	-0.150156	0.129311	-1.161200	0.2502
D(GLSRESID(-2))	-0.206918	0.125850	-1.644166	0.1055
D(GLSRESID(-3))	-0.167372	0.122797	-1.362989	0.1781
D(GLSRESID(-4))	0.388115	0.122689	3.163397	0.0025

R-squared	0.302660	Mean dependent var	0.001986
Adjusted R-squared	0.255383	S.D. dependent var	0.024403
S.E. of regression	0.021057	Akaike info criterion	-4.808228
Sum squared resid	0.026161	Schwarz criterion	-4.639566
Log likelihood	158.8633	Hannan-Quinn criter.	-4.741784
Durbin-Watson stat	1.796151		

TREND & INTERCEPT

Null Hypothesis: LEXP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-2.745379
Test critical values:	1% level	-3.716800
	5% level	-3.145200
	10% level	-2.848000

*Elliott-Rothenberg-Stock (1996, Table 1)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 6 69

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.296603	0.108037	-2.745379	0.0080
D(GLSRESID(-1))	0.027801	0.140785	0.197468	0.8441
D(GLSRESID(-2))	-0.070339	0.131770	-0.533801	0.5955
D(GLSRESID(-3))	-0.090481	0.121485	-0.744789	0.4594
D(GLSRESID(-4))	0.428100	0.118276	3.619508	0.0006

R-squared	0.390252	Mean dependent var	-0.000333
Adjusted R-squared	0.348913	S.D. dependent var	0.024403
S.E. of regression	0.019691	Akaike info criterion	-4.942455
Sum squared resid	0.022875	Schwarz criterion	-4.773793

Log likelihood	163.1586	Hannan-Quinn criter.	-4.876010
Durbin-Watson stat	1.829487		

INTERCEPT @ 1ST D

Null Hypothesis: D(LEXP) has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-2.657457
Test critical values:	1% level	-2.601596
	5% level	-1.945987
	10% level	-1.613496

*MacKinnon (1996)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 6 69

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.689229	0.259357	-2.657457	0.0101
D(GLSRESID(-1))	-0.354089	0.213319	-1.659902	0.1022
D(GLSRESID(-2))	-0.450014	0.160934	-2.796257	0.0069
D(GLSRESID(-3))	-0.504852	0.111465	-4.529250	0.0000

R-squared	0.664172	Mean dependent var	-2.63E-05
Adjusted R-squared	0.647380	S.D. dependent var	0.036777
S.E. of regression	0.021839	Akaike info criterion	-4.749770
Sum squared resid	0.028617	Schwarz criterion	-4.614839
Log likelihood	155.9926	Hannan-Quinn criter.	-4.696614
Durbin-Watson stat	1.847381		

TREND & INTERCEPT @1ST DIFF

Null Hypothesis: D(LEXP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-3.406301
Test critical values:	1% level	-3.716800
	5% level	-3.145200
	10% level	-2.848000

*Elliott-Rothenberg-Stock (1996, Table 1)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 6 69

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

GLSRESID(-1)	-1.071284	0.314501	-3.406301	0.0012
D(GLSRESID(-1))	-0.068382	0.250387	-0.273107	0.7857
D(GLSRESID(-2))	-0.260241	0.181967	-1.430159	0.1579
D(GLSRESID(-3))	-0.409785	0.117736	-3.480553	0.0009

R-squared	0.685441	Mean dependent var	-4.94E-05
Adjusted R-squared	0.669713	S.D. dependent var	0.036777
S.E. of regression	0.021136	Akaike info criterion	-4.815198
Sum squared resid	0.026804	Schwarz criterion	-4.680267
Log likelihood	158.0863	Hannan-Quinn criter.	-4.762042
Durbin-Watson stat	1.800408		

LIMPORT DF GLS

INTERCEPT @ LEVEL

Null Hypothesis: LIMP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		0.100778
Test critical values:	1% level	-2.599413
	5% level	-1.945669
	10% level	-1.613677

*MacKinnon (1996)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 2 69

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	0.001732	0.017183	0.100778	0.9200

R-squared	-0.051691	Mean dependent var	0.005306
Adjusted R-squared	-0.051691	S.D. dependent var	0.023473
S.E. of regression	0.024072	Akaike info criterion	-4.600899
Sum squared resid	0.038825	Schwarz criterion	-4.568259
Log likelihood	157.4306	Hannan-Quinn criter.	-4.587966
Durbin-Watson stat	1.944839		

TREND & INTERCEPT @ LEVEL

Null Hypothesis: LIMP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-1.845598
Test critical values:	1% level	-3.701600
	5% level	-3.132400
	10% level	-2.836000

*Elliott-Rothenberg-Stock (1996, Table 1)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 2 69

Included observations: 68 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.108595	0.058840	-1.845598	0.0694

R-squared	0.047569	Mean dependent var	-0.000680
Adjusted R-squared	0.047569	S.D. dependent var	0.023473
S.E. of regression	0.022908	Akaike info criterion	-4.700035
Sum squared resid	0.035161	Schwarz criterion	-4.667396
Log likelihood	160.8012	Hannan-Quinn criter.	-4.687102
Durbin-Watson stat	1.923680		

INTERCEPT @ 1^{ST} DIFF

Null Hypothesis: D(LIMP) has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-3.053658
Test critical values:	1% level	-2.601596
	5% level	-1.945987
	10% level	-1.613496

*MacKinnon (1996)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 6 69

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.827241	0.270902	-3.053658	0.0034
D(GLSRESID(-1))	-0.180316	0.220953	-0.816080	0.4177
D(GLSRESID(-2))	-0.297727	0.166819	-1.784728	0.0794
D(GLSRESID(-3))	-0.395010	0.115618	-3.416514	0.0011

R-squared	0.622513	Mean dependent var	0.000408
Adjusted R-squared	0.603639	S.D. dependent var	0.033756
S.E. of regression	0.021252	Akaike info criterion	-4.804259
Sum squared resid	0.027099	Schwarz criterion	-4.669329
Log likelihood	157.7363	Hannan-Quinn criter.	-4.751103
Durbin-Watson stat	1.841470		

TREND & INTERCEPT @ 1^{ST} DIFF

Null Hypothesis: D(LIMP) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 3 (Automatic - based on SIC, maxlag=10)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-3.225863

Test critical values:	1% level	-3.716800
	5% level	-3.145200
	10% level	-2.848000

*Elliott-Rothenberg-Stock (1996, Table 1)

DF-GLS Test Equation on GLS Detrended Residuals

Dependent Variable: D(GLSRESID)

Method: Least Squares

Sample (adjusted): 6 69

Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GLSRESID(-1)	-0.889629	0.275780	-3.225863	0.0020
D(GLSRESID(-1))	-0.134349	0.223877	-0.600101	0.5507
D(GLSRESID(-2))	-0.264928	0.168816	-1.569330	0.1218
D(GLSRESID(-3))	-0.378704	0.115883	-3.267996	0.0018

R-squared	0.628157	Mean dependent var	0.000514
Adjusted R-squared	0.609564	S.D. dependent var	0.033756
S.E. of regression	0.021093	Akaike info criterion	-4.819321
Sum squared resid	0.026694	Schwarz criterion	-4.684391
Log likelihood	158.2183	Hannan-Quinn criter.	-4.766165
Durbin-Watson stat	1.841291		

APPENDIX C: ARDL BOUNDS TEST

Sample: 2001Q2 2017Q1

Included observations: 64
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	5.028621	3

APPENDIX D: ARDL COINTEGRATING AND LONG RUN FORM

ARDL Cointegrating And Long Run Form
Dependent Variable: LGDP
Selected Model: ARDL(1, 0, 2, 5)

Sample: 2000Q1 2017Q4
Included observations: 64

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXCH)	0.000002	0.000064	0.027681	0.9780
D(LEXP)	0.084169	0.021041	4.000232	0.0002
D(LEXP(-1))	0.038482	0.022294	1.726094	0.0903
D(LIMP)	-0.008497	0.020818	-0.408162	0.6848
D(LIMP(-1))	-0.023217	0.023491	-0.988345	0.3276
D(LIMP(-2))	-0.000738	0.018623	-0.039621	0.9685
D(LIMP(-3))	0.057382	0.019903	2.883074	0.0057
D(LIMP(-4))	-0.037806	0.016339	-2.313895	0.0247
CointEq(-1)	-0.125246	0.038971	-3.213864	0.0023

Cointeq = LGDP - (0.0000*EXCH -0.3619*LEXP + 0.5788*LIMP + 5.3157)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCH	0.000014	0.000513	0.027701	0.9780
LEXP	-0.361893	0.179090	-2.020737	0.0485
LIMP	0.578821	0.069079	8.379106	0.0000
C	5.315750	0.635277	8.367611	0.0000

Serial correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.744949	Prob. F(2,50)	0.4800
Obs*R-squared	1.851886	Prob. Chi-Square(2)	0.3962

Test Equation:
Dependent Variable: RESID
Method: ARDL

Sample: 2001Q2 2017Q1
Included observations: 64
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	0.005391	0.040426	0.133365	0.8944
EXCH	-9.58E-06	6.54E-05	-0.146482	0.8841
LEXP	0.000298	0.021204	0.014045	0.9888
LEXP(-1)	-0.000206	0.021339	-0.009644	0.9923
LEXP(-2)	0.002325	0.023131	0.100497	0.9204
LIMP	0.004449	0.022192	0.200469	0.8419
LIMP(-1)	-0.007117	0.023109	-0.307976	0.7594
LIMP(-2)	0.000956	0.024838	0.038470	0.9695
LIMP(-3)	-0.001082	0.018737	-0.057738	0.9542
LIMP(-4)	-0.002779	0.020610	-0.134857	0.8933
LIMP(-5)	0.002054	0.016569	0.123957	0.9018
C	-0.028935	0.195119	-0.148294	0.8827
RESID(-1)	-0.157431	0.164823	-0.955152	0.3441
RESID(-2)	0.069034	0.162814	0.424005	0.6734

R-squared	0.028936	Mean dependent var	-1.29E-15
Adjusted R-squared	-0.223541	S.D. dependent var	0.002111
S.E. of regression	0.002335	Akaike info criterion	-9.090581
Sum squared resid	0.000273	Schwarz criterion	-8.618326
Log likelihood	304.8986	Hannan-Quinn criter.	-8.904536
F-statistic	0.114607	Durbin-Watson stat	1.982829
Prob(F-statistic)	0.999931		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.787544	Prob. F(11,52)	0.6510
Obs*R-squared	9.139524	Prob. Chi-Square(11)	0.6090
Scaled explained SS	6.269197	Prob. Chi-Square(11)	0.8548

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2001Q2 2017Q1
Included observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000145	0.000511	-0.282962	0.7783
LGDP(-1)	-1.45E-05	0.000109	-0.133016	0.8947
EXCH	-8.53E-09	1.80E-07	-0.047490	0.9623
LEXP	-1.37E-05	5.88E-05	-0.232084	0.8174
LEXP(-1)	5.39E-05	5.93E-05	0.907795	0.3682
LEXP(-2)	6.60E-06	6.23E-05	0.105871	0.9161
LIMP	-3.45E-05	5.82E-05	-0.592679	0.5560
LIMP(-1)	4.52E-05	6.18E-05	0.730570	0.4683
LIMP(-2)	8.00E-08	6.57E-05	0.001219	0.9990
LIMP(-3)	2.08E-05	5.21E-05	0.399258	0.6913
LIMP(-4)	-2.69E-05	5.56E-05	-0.483573	0.6307
LIMP(-5)	-5.75E-06	4.57E-05	-0.125842	0.9003

R-squared	0.142805	Mean dependent var	4.39E-06

Adjusted R-squared	-0.038525	S.D. dependent var	6.38E-06
S.E. of regression	6.50E-06	Akaike info criterion	-20.88294
Sum squared resid	2.20E-09	Schwarz criterion	-20.47815
Log likelihood	680.2540	Hannan-Quinn criter.	-20.72347
F-statistic	0.787544	Durbin-Watson stat	1.994210
Prob(F-statistic)	0.651048		

Heteroskedasticity Test: Harvey

F-statistic	0.877965	Prob. F(11,52)	0.5667
Obs*R-squared	10.02451	Prob. Chi-Square(11)	0.5282
Scaled explained SS	28.99235	Prob. Chi-Square(11)	0.0023

Test Equation:
Dependent Variable: LRESID2
Method: Least Squares

Sample: 2001Q2 2017Q1
Included observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	134.8509	302.7358	0.445441	0.6579
LGDP(-1)	-45.82349	64.54299	-0.709968	0.4809
EXCH	0.117496	0.106456	1.103708	0.2748
LEXP	-23.53494	34.84807	-0.675359	0.5024
LEXP(-1)	39.27533	35.15412	1.117232	0.2690
LEXP(-2)	-10.29535	36.92357	-0.278829	0.7815
LIMP	8.518754	34.47928	0.247069	0.8058
LIMP(-1)	-2.766179	36.60925	-0.075560	0.9401
LIMP(-2)	18.27458	38.90595	0.469712	0.6405
LIMP(-3)	6.634958	30.84378	0.215115	0.8305
LIMP(-4)	-35.75827	32.96327	-1.084791	0.2830
LIMP(-5)	27.17692	27.06008	1.004318	0.3199

R-squared	0.156633	Mean dependent var	-14.58728
Adjusted R-squared	-0.021772	S.D. dependent var	3.807717
S.E. of regression	3.848944	Akaike info criterion	5.700835
Sum squared resid	770.3472	Schwarz criterion	6.105626
Log likelihood	-170.4267	Hannan-Quinn criter.	5.860303
F-statistic	0.877965	Durbin-Watson stat	1.981971
Prob(F-statistic)	0.566745		

Heteroskedasticity Test: Glejser

F-statistic	0.823568	Prob. F(11,52)	0.6172
Obs*R-squared	9.495565	Prob. Chi-Square(11)	0.5762
Scaled explained SS	9.676761	Prob. Chi-Square(11)	0.5597

Test Equation:
Dependent Variable: ARESID
Method: Least Squares

Included observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.047972	0.113881	0.421250	0.6753
LGDP(-1)	-0.019830	0.024279	-0.816757	0.4178
EXCH	1.59E-05	4.00E-05	0.396669	0.6932
LEXP	-0.007818	0.013109	-0.596364	0.5535
LEXP(-1)	0.016589	0.013224	1.254483	0.2153
LEXP(-2)	-0.003208	0.013890	-0.230994	0.8182
LIMP	-2.88E-05	0.012970	-0.002219	0.9982
LIMP(-1)	0.003016	0.013771	0.219012	0.8275
LIMP(-2)	0.006381	0.014635	0.436016	0.6646
LIMP(-3)	0.004674	0.011603	0.402876	0.6887
LIMP(-4)	-0.007067	0.012400	-0.569891	0.5712
LIMP(-5)	0.002816	0.010179	0.276605	0.7832

R-squared	0.148368	Mean dependent var	0.001545
Adjusted R-squared	-0.031785	S.D. dependent var	0.001425
S.E. of regression	0.001448	Akaike info criterion	-10.07008
Sum squared resid	0.000109	Schwarz criterion	-9.665293
Log likelihood	334.2427	Hannan-Quinn criter.	-9.910616
F-statistic	0.823568	Durbin-Watson stat	1.906979
Prob(F-statistic)	0.617240		

Heteroskedasticity Test: ARCH

F-statistic	0.213333	Prob. F(1,61)	0.6458
Obs*R-squared	0.219560	Prob. Chi-Square(1)	0.6394

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Sample (adjusted): 2001Q3 2017Q1
Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.17E-06	9.94E-07	4.201641	0.0001
RESID^2(-1)	0.059138	0.128039	0.461880	0.6458

R-squared	0.003485	Mean dependent var	4.44E-06
Adjusted R-squared	-0.012851	S.D. dependent var	6.41E-06
S.E. of regression	6.46E-06	Akaike info criterion	-21.03203
Sum squared resid	2.54E-09	Schwarz criterion	-20.96399
Log likelihood	664.5089	Hannan-Quinn criter.	-21.00527
F-statistic	0.213333	Durbin-Watson stat	1.975048
Prob(F-statistic)	0.645811		

APPENDIX E: RAMSEY RESET

Ramsey RESET Test
Equation: UNTITLED
Specification: LGDP LGDP(-1) EXCH LEXP LEXP(-1) LEXP(-2) LIMP LIMP(
-1) LIMP(-2) LIMP(-3) LIMP(-4) LIMP(-5) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.133163	51	0.8946
F-statistic	0.017732	(1, 51)	0.8946

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	9.76E-08	1	9.76E-08
Restricted SSR	0.000281	52	5.40E-06
Unrestricted SSR	0.000281	51	5.50E-06

Unrestricted Test Equation:
Dependent Variable: LGDP
Method: ARDL
Sample: 2001Q2 2017Q1
Included observations: 64
Maximum dependent lags: 6 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (6 lags, automatic):
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LGDP(-1)	0.649772	1.689981	0.384485	0.7022
EXCH	2.93E-06	6.55E-05	0.044807	0.9644
LEXP	0.062026	0.167635	0.370009	0.7129
LEXP(-1)	-0.068388	0.171252	-0.399339	0.6913
LEXP(-2)	-0.029351	0.072169	-0.406699	0.6859
LIMP	-0.005365	0.031546	-0.170064	0.8656
LIMP(-1)	0.057719	0.143628	0.401868	0.6895
LIMP(-2)	0.018076	0.045309	0.398960	0.6916
LIMP(-3)	0.000719	0.018802	0.038238	0.9696
LIMP(-4)	-0.042756	0.111654	-0.382936	0.7034
LIMP(-5)	0.028481	0.071947	0.395858	0.6939
C	1.327151	4.970058	0.267029	0.7905
FITTED^2	0.019737	0.148213	0.133163	0.8946

R-squared	0.998677	Mean dependent var	6.420104
Adjusted R-squared	0.998366	S.D. dependent var	0.058040
S.E. of regression	0.002346	Akaike info criterion	-9.092816
Sum squared resid	0.000281	Schwarz criterion	-8.654293
Log likelihood	303.9701	Hannan-Quinn criter.	-8.920060
F-statistic	3208.422	Durbin-Watson stat	2.279092
Prob(F-statistic)	0.000000		

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