EXCHANGE RATE MOVEMENTS AND AGRICULTURAL TRADE IN MALAWI

MASTER OF ARTS (ECONOMICS) THESIS

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MASTER OF ARTS (ECONOMICS) THESIS

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DECLARATION

I hereby declare that this dissertation is my original work and that it has not been presented to any other University for any degree award. Work of others used in this study has been appropriately acknowledged.

Signature ……………………………….

Chimwemwe Ng'ong'ola.

CERTIFICATE OF APPROVAL

We declare that this thesis is from the student's own work and effort and where she has used other sources of information, it has been acknowledged. This thesis is submitted with our approval.

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DEDICATION

To my father, Prof D.H. Ng’ong’ola

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ABSTRACT

Malawi is one of the countries that heavily relies on agriculture which accounted for 27.9% of the country's Gross Domestic Product (GDP) in 2016. About 80% of Malawi's exports are agricultural products with tobacco, sugar, tea and cotton as the main exports while imports are dominated by machinery, fuels, fertilizers and other intermediate inputs. The study aimed at examining the relationship between exchange rate movements and agricultural trade in Malawi specifically to assess the impact of exchange rate movements on agricultural exports and to assess the impact of exchange rate movements on agricultural imports. The study used annual data from 1980 to 2017 and the Autoregressive Distributed Lag was the estimation model used. The study found that there was no relationship between exchange rate movement and agricultural exports as well as agricultural imports in the long run however in the short run there was a negative relationship between exchange rate and agricultural imports.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributed Lag
BOP	Balance of Payments
COMESA	Common Market for Eastern and Southern Africa
DD	Dutch Disease
FISP	Farm Input Subsidy
GDP	Gross Domestic Product
IMF	International Monetary Fund
MGDS	Malawi Government Development Strategy
NSO	National Statistics Office
SADC	Southern African Development Community
SAP	Structural Adjustment Policies
SDR	Special Drawing Rights
RBM	Reserve Bank of Malawi

CHAPTER ONE

INTRODUCTION

1.1 Background

The concept of foreign exchange rises from the movement of goods and services across national frontiers. Movement of goods and services across national frontiers in one direction entails the movement of foreign exchange in the other direction. This creates the need for a rate of exchange between the currencies of the two trading partners to settle indebtedness arising from trade. Exchange rate exerts a significant impact on the movement of other macro-economic aggregates. It is essentially an exogenous variable and determines the movement of most other variables, macro-economic stability and the movement of resources flows, in and out of the country (Odili, 2014).

Maskus (1988) by comparing the effects of exchange rate across major sectors of the economy (agriculture, manufacturing, etc.) found that aggregate bilateral trade (US and its major Western trading partners) to be particularly sensitive to exchange rate. Agricultural products compared to manufactured goods were found to be more sensitive to exchange rate changes because agricultural trade is relatively open when measured by the ratio of exports and imports to domestic agricultural output and exhibit a low level of industrial concentration.

Malawi heavily relies on agriculture which accounts for 27.9 percent of the country's Gross Domestic Product (GDP) (Government of Malawi, 2017). 80 percent of Malawi's exports are agricultural products with tobacco, sugar, tea, cotton and coffee as the main exports. Over the past five years, exports of coffee and pulses have been rising as a result of efforts towards diversifying into non-traditional crops in order to broaden export base and the imports are dominated by machinery, fuels, fertilizers and other intermediate inputs. During years of drought, Malawi's food imports rise significantly. (Ministry of Industry and Trade, 2016).

In recent years, the direction of Malawi's foreign trade has diversified with South Africa emerging as a major trading partner. Zimbabwe is Malawi's largest export market after South Africa. Further, through the Cotonou Convention, agricultural products and virtually all manufactured goods have preferential access to all European Union (EU) member states. Malawi's other trading partners are Britain, the United States, the Netherlands and Ireland (Appendix 1). At regional level, Malawi is a member of both COMESA and SADC. In additional, Malawi has bilateral agreements with Zimbabwe, South Africa and Mozambique, all of which allow duty free entrance of Malawi's products (Simwaka, 2006).

In the early 1970, there was a breakdown of the Bretton Wood fixed exchange rate system and many countries adopted the flexible exchange system resulting in exchange rate not being stable. Malawi has for the past decades adopted different exchange regimes since independence in 1964 (see Table 1.1). In the period 1965-1973, the Malawi Kwacha was pegged at par to the British Pound Sterling. During the period, Malawi Pound, which later changed to Malawi Kwacha in 1971, operated within the sterling zone. In 1967, the British Pound was devalued by 14% and the Malawi Pound followed suit by the same magnitude. With the collapse of the gold standard per value system, the major currencies, including the British Pound Sterling, became very volatile as these currencies shifted from pegging to a generalized floating system. From 1973 – 1975 the Malawi Kwacha was pegged to a trade weighted basket of the pound and the US dollar (Simwaka, 2007).

Table 0.1: Different exchange rate regimes in Malawi

Period (years)	**Exchange rate regime**
1964-1986	Fixed exchange rate
1987-1993	Pegged to a basket of currencies
1994-2007	Free float
2008-2012	Defacto fixed exchange rate
2012 – date	Free float

There were persistent fluctuations in the two currencies (the Pound and the US dollar) and this led to the authorities seeking to a more permanent peg and the Kwacha was then pegged to the IMF Special Drawing Rights (SDR) in 1975 until 1984. The Kwacha was then stable until the early 1980s when the SDR started appreciating rapidly and this forced the authorities to devalue the local currency by 15% in 1982 and by 12% in 1983 (Simwaka, 2007).

In the period 1984 - 1994, the Kwacha experienced a series of devaluations in order to recover from the worsening balance of payments (BOP) position. The authorities pegged the Kwacha to a trade of weighted basket of the seven currencies and the

Kwacha was then devalued by 15%, 10%, 20%, 15%, 7%, 15% in 1984, 1986,1987,1988,1990 and 1992 respectively (Simwaka, 2007).

In 1994, the authorities later on adopted a managed float exchange rate regime aimed at resolving the foreign exchange crisis that had hit the country due to the suspension of the balance of payment support from donors. During the period 1995 -1997, the exchange rate fluctuated within a narrow fixed band and foreign reserves were used to support the exchange rate. The exchange rate later operated in a more market fashion, i.e. the free floating system in the period 1998 to 2003, but the Kwacha depreciated by 6.5% against the US dollar in 1999 (Simwaka, 2007). From 2003 to 2008, the Kwacha went through the stabilized or the de facto adjustable pegged exchange rate regime and from 2008 to 2012 the Kwacha later on adopted a fixed exchange rate regime (Maehle et al, 2013). From 2012 till date, the authorities adopted the free float exchange rate regimes and the Kwacha has also gone through a series of devaluations since then (RBM, 2015).

The different exchange rate regimes have hence forth caused exchange rate movements (Figure 1.1) and these have an impact on the country's trade. Since most of Malawi's exports are dominated by agricultural products, it therefore means that the exchange rate movements have an impact on agricultural trade.

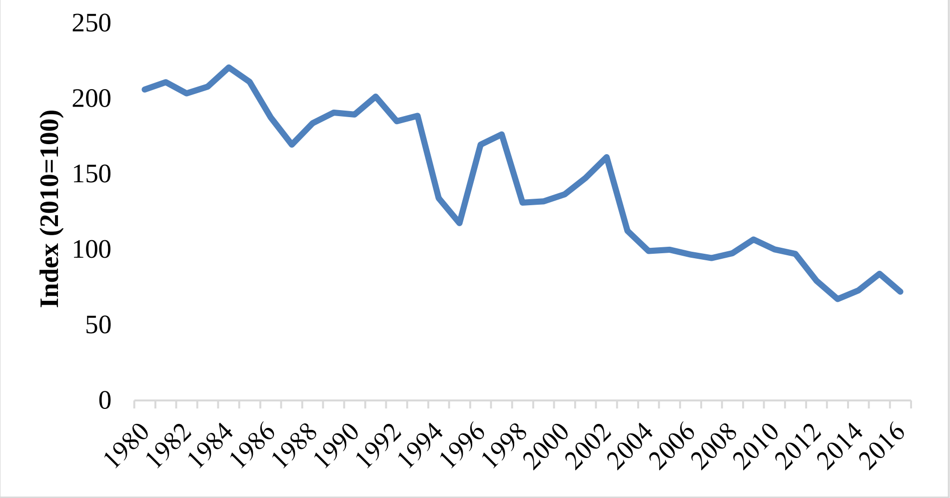

Figure 1.1: Real effective exchange rate index, 1980 – 2016 (2010=100)

Source: World Bank indicators

1.2 Problem Statement

Exchange rate movements bring about uncertainties in world commodity prices and this causes a major problem in estimating the scope and nature of trading behaviours and trade volumes between exporting and importing countries (Orden, 2002). The unpredictable nature of the exchange rate always forces risk-averse traders to reduce their trading activities with foreign countries and this collective risk aversion by traders ultimately impacts negatively on the total trade of the nation by reducing exports and import volumes.

However, it should be noted that exchange rate movements can also affect the economy positively or negatively especially in the agricultural sector. Malawi heavily relies on imported agricultural inputs such as fertilizers mainly because it does not have the capacity to manufacture on its own and with policies such as the Malawi Farm Input Subsidy Program (FISP), imports are dominated by fertilizers hence an appreciation in the Malawi Kwacha makes imported agricultural inputs such as fertilizers cheaper and more accessible to farmers resulting in an increase in output and supply of agricultural commodities for exports. Appreciation also leads to a decrease in the trade balance as exports become expensive which reduces agricultural export volumes, thus making the real direction in which exchange rate movements impacts agricultural trade ambiguous.

Malawi’s currency appreciates when there is a large inflow of foreign currency due to agricultural exports (The Dutch Disease). This is mainly during the tobacco season where the Malawi Kwacha appreciates during the selling season of tobacco and depreciates during the growing season. This affects the farmers negatively as they buy inputs at a higher price and sell their output at a lower price due to Kwacha appreciation. However, different studies conducted in Malawi so far do not explain the impact of exchange rate movements on agricultural trade. Munthali *et al.,* (2010) examined the effects of exchange rate volatilities on economic growth and Mangani (2011) examined the impacts of exchange rate sensitivities on overall trade flows. This information gap makes it difficult for policy maker to explain the impact of foreign exchange rate movements on sector trade flows including the agricultural sector. This study, therefore, sets out to access the impact of exchange rate movements on agricultural sectoral trade.

1.3 Justification of study

Agriculture is still the key for Malawi in terms of driving economic growth and also contributing to development of the country. The sector accounts for around 28 percent of the country’s GDP and contributes over 80 percent of the country’s national export earnings. The largest percentage of the country’s workforce of around 64.1 percent is absorbed by the sector (Government of Malawi, 2017). The sector also contributes significantly to national and household food security and therefore the absence of the needed insights into the extent of the exchange rate movements and its impacts on agricultural trade currently poses serious problems for policy making with important practical implications for the success of the on-going programs and ultimately the health of the entire economy. This study will therefore contribute to providing useful literature and help policymakers in making the various decisions such as to which exchange rate regime is the best since Malawi exports heavily rely on the agricultural sector and most of the agricultural inputs are imported.

1.4 Objectives

1.4.1 Main objective

The main objective of the study is to analyze the relationship between exchange rate movements and agricultural trade in Malawi.

1.4.2 Specific objectives

The specific objectives of the study were:

1. To examine the impact of exchange rate movement on agricultural exports; and
2. To assess the impact of exchange rate movement on agricultural imports.

1.5 Hypotheses

The following null hypotheses were tested for the study:

i. Exchange rate movement does not have any impact on agricultural exports; and

ii. Exchange rate movement does not have any impact on agricultural imports.

1.6 Organization of the Thesis

The rest of thesis has been organised as follows: Chapter Two highlights the overview of the agricultural sector in Malawi and agricultural trade in Malawi; Chapter Three reviews literature for the study whilst Chapter Four describes the methodology adopted in this study; Chapter Five gives estimation results and their empirical interpretation, as well as results of some diagnostic tests and Chapter Six gives a summary conclusion of findings and policy recommendations and limitations of the study.

CHAPTER TWO

OVERVIEW OF THE AGRICULTURAL SECTOR IN MALAWI AND AGRICULTURAL TRADE PERFORMANCE

2.1 Introduction

This chapter gives an overview of the agricultural sector in Malawi, its contribution to the country's economy and trends in agricultural trade of main cash crops and agricultural imports. The purpose of the chapter is to provide an understanding of the agricultural sector and agricultural trade in Malawi.

2.2 The role of the agricultural sector in Malawi

The agricultural sector continues to be the most important sector in the Malawian economy. The agricultural sector has two main sub-sectors; the smallholder subsector and the estate/commercial subsector which contribute more than 70% and less than 30% to agricultural GDP respectively (Government of Malawi, 2017).The smallholder agricultural sector in Malawi cultivates mainly maize, the main staple grain cassava and sweet potatoes, to meet subsistence requirements while the estate sector focuses on high value cash crops for export such as tobacco, tea, sugar, coffee and macadamia. Smallholder farmers cultivate small and fragmented land holdings under customary land tenure with yields lower than in the estate sector.

The contribution of the agricultural sector to the Malawian economy has not really changed since independence in 1964. Table 2.1 below presents the trends in the contribution of the agricultural sector to the Malawian economy and it is evident from the table that since 1970, the agricultural sector has contributed largely to increasing output, it is a source of earnings and it remains main source of employment till date.

The agriculture sector performed well in the 1960's with a GDP contribution of 55 percent however during the period of 1979 to 1981 the GDP contribution of the agriculture sector fell almost 40 percent and this caused by drought, low prices and interruptions in input supplies (Khungwa, 2007). The average share of the agricultural sector was 39 percent in the years 1970 to 1979 but later fell to 36 percent in the early 1980s and this was mainly due to the reforms that Malawi adopted but although the reforms were implemented to recover the economy the table shows that there was still a decrease up to 35 percent in the 1990s.There was however an increase in the contribution up to 38 percent in the 2000s and currently the agricultural sector account for about 39 percent of the GDP.

The share to of total employment estimation has always been controversial considering that most agricultural productions are seasonal however agriculture sector itself employs many people ranging from professionals to laborers. The table indicates total employment has been increasing with exceptions of 2000s. The trend of the total earnings is similar to the trend of the total employment mostly depicting the typical relationship between employment and total earnings.

Table 0.2: Contribution of the agricultural sector to Malawi economy

Indicator	1970-1979	1980-1989	1990-1999	2000-2010	2011-2016
Share of agricultural GDP	39.63	36.55	35.98	38.49	39.05
Share of total employment	39.84	47.34	59.56	39.50	45.65
Share of total earnings	14.37	18.35	18.52	22.01	19.30

Source: authors computation from RBM various financial and economic reviews

2.3 Agricultural trade performance

The agricultural sector contributes to more than 90% of the foreign exchange earnings but the export basket is dominated by the traditional exports of tobacco, tea and sugar. The major export commodity from the early 1980s has been tobacco followed by tea and sugar (Government of Malawi, 2017). Figure 2.1 below shows the trends (percentage share) of the selected main export earnings from the main cash crops in Malawi.

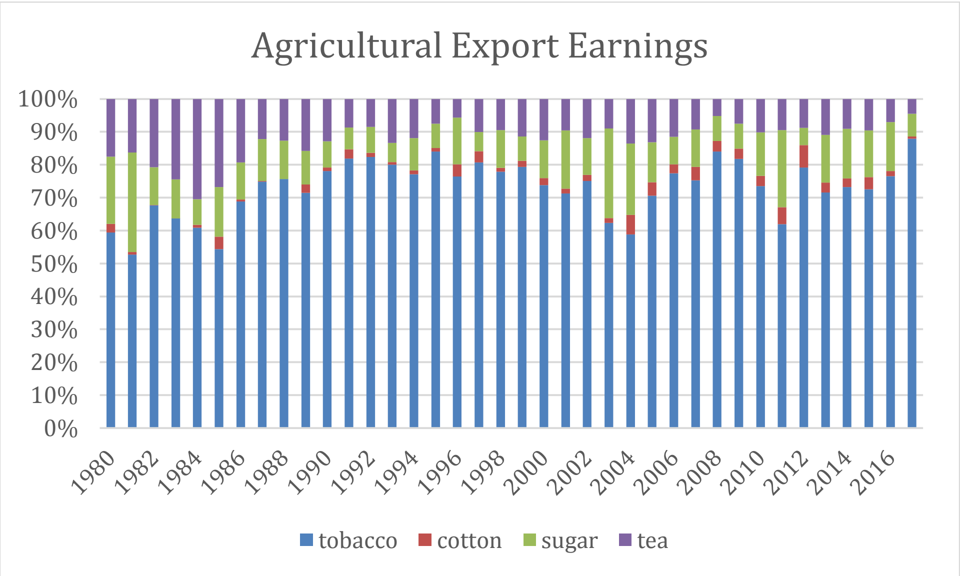

Figure 0.2: percentage share of main agricultural export earnings

Source; authors computation from NSO estimates

However in terms of both the agricultural exports and imports which include fertilizers there have been fluctuations over the years as shown in figure 2.2. It can be noticed that during the late 1980s to early 1990s there was a rise in exports this was as a result of the Malawi Government reviewed its role from that of being both a policy formulator and implementer to that of policy regulator under the Structural Adjustment Programmes (SAPs). Through this, all restrictions on production of some commodities like burley tobacco by smallholder farmers were removed to accord them with opportunities to enhance their incomes. The other important policy reforms are the removal of agricultural input and output marketing controls, price decontrols, and the commercialization of parastatals, amongst others. In the early 2000s there was a sharp decline in both exports and imports, in terms of imports the sharp decline could be due to devaluation of the Kwacha after government had adopted the free floating system that happened in the late 1999 as such imports became more expensive whilst the sharp decline in the exports was the result of the major drought that Malawi had faced in 2000. Another noticeable trend is that from the year 2006 imports have had an increasing trend till now and this could be as a result of the FISP programme that was implemented in 2005.

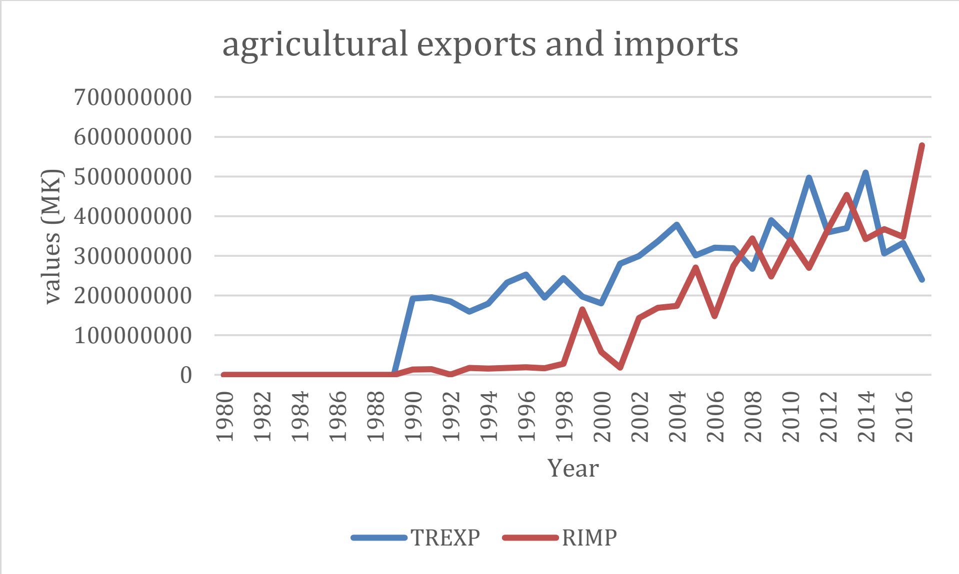

Figure 0.3: Agricultural exports and imports

Source; authors computation from various NSO estimates

In summary the agricultural sector has remained the mainstay of Malawi's economy as it has a role of increasing output, creating employment, a main source of foreign earnings and contributes significantly to national and household food security. Tobacco is the major item of export for Malawi as it accounts for more that 50 percent of the total export volume whilst Malawi's major agricultural import is fertilizer and cereals. Having reviewed the agricultural sector in Malawi we then look at the relationship between exchange rate movements and agricultural trade which are discussed in the next chapter.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

The purpose of this chapter is to provide literature on the Dutch disease, secondly it gives literature on theoretical analyses of the relationship between exchange rate movements and international trade (theoretical literature) and lastly this chapter will provide empirical studies on the impact of exchange rate movements on trade flows from different parts of the world (empirical literature) as well as empirical studies on the impact of specialization on natural based exports on the exchange rate movements.

3.2 The Dutch disease

The term Dutch disease refers to adverse effects of a natural resource manufacturing or the discoveries of a natural resource. Specifically when a country experiences a resource boom due to a tradable resource discovery or an increase in a resource price, it normally undergoes a real appreciation of its exchange rate. A real appreciation reduces the international competitiveness of the other tradable sectors because the resource based exports crowd out commodity exports produced by those sectors (Krugman 1987). Relative-price changes induce a reallocation of factors of production away from the resource-based sector (the resource-movement effect) and an increase in the demand for non-traded goods (the spending effect), favoring an appreciation of the real exchange rate. In Malawi agricultural exports are considered as a natural resource as we experience an appreciation of the Kwacha during the selling season of our agricultural products especially during selling season of Tobacco which is our main export product.

3.3 Theoretical Literature

This section gives the theories that focus on the effect of exchange rate movement on the trade balance both in the short run and long run. Generally, ever since the failure of the automatic adjustment of the balance of payments, three approaches have been developed in investigating the impact of exchange rate changes on balance of payments. These are the Elasticity approach, the Absorption approach and the Monetary approach.

3.3.1 The Elasticity approach

In the elasticity approach, trade balance adjustment path is viewed on the basis of elasticities of demand for imports and exports. The analysis was developed by Alfred Marshall, Abba-Lerner and later extended by Joan Robinson (1937) and Machlup (1955).

The central idea of the elasticity approach is that a change in relative prices of goods brings about a change in the demands for the various goods by both domestic and foreign consumers thus inducing changes in the flows of exports and imports. The model makes some simplifying assumptions. It is an analysis –holding constant everything else that may affect the supply of and demand for foreign or domestic currency, except the change in the relative price of foreign and domestic goods arising from the change in the exchange rate itself. The approach focuses on demand conditions and assumes the supply elasticities for the domestic export goods and foreign import goods are infinite, i.e. perfectly elastic so that changes in demand volumes have no effect on prices (the domestic price of exports, the foreign price of imports and prices of import and export substitutes are constant). In effect these assumptions mean that domestic and foreign prices are fixed so that changes in relative prices are caused by changes in the nominal exchange rate.

Under these assumptions, the condition for a devaluation to improve the trade balance which directly contributes to the improvement of the balance of payments (starting from equilibrium) is known as the Marshall-Lerner condition. It states that devaluation will improve the balance of payments on trade balance if the sum of the foreign price elasticity of demand for exports (ηx) and domestic price elasticity of demand for imports (ηm) exceeds unity as specified below;

$$\eta_x + \eta_m > 1 \qquad [3.1]$$

There is a general consensus by most economists that elasticity are lower in the short-run than in the long -run, in which case Marshal -Lerner condition may only hold in the medium to long run. The possibility that in the short run, Marshal-Lerner may not be fulfilled although it generally holds over the long run leads to the phenomenon of what is popularly known as the J-curve effect. The idea underlying the J-curve effect is that in the short run export volumes and import volumes do not change much, so that the price effect outweighs the volume effect leading to deterioration in trade balance. Three of the most important reasons advanced in explaining the J-curve effect are time lag both in producers and consumers response and imperfect competition.

The elasticity approach has some shortcomings some of which is that it ignores capital flows, the approach is applicable to BOP on current account or balance of trade but BOP deficit of a country is mainly the result of the outflow of capital, it thus ignores BOP on capital account.

3.3.2 The Absorption approach

The Absorption approach due to Alexander (1952 and popularized by Miles (1979) was developed to overcome some of the shortcomings of the elasticity approach. The absorption approach merges the elasticity approach with Keynesian macroeconomics (Marrewijk, 2005).

The approach starts with the assumption that a nations expenditure fall into four categories: consumption (c), investment (i), government expenditures (g) and imports (m). All variables are measurements in real terms since this approach treats prices as constant. The sum of these four categories is also referred to as domestic absorption (a);

$$a = c + i + g + m \qquad [3.2]$$

On the other hand, a nation's real income (y) equals its total expenditures on output, where x is real exports; real income is expressed as;

$$y = c + i + g + x \qquad [3.3]$$

A nation's current account balance equals the difference between real income (y) and absorption (a) which can be written as;

$$y - a = (c + i + g + x) - (c + i + g + m) = x - m \qquad [3.4]$$

Therefore a change in the current account equals the change in real income minus the change in the sum of consumption, investment and government expenditures;

$$\Delta(x - m) = \Delta y - \Delta(c + i + g) \qquad [3.5]$$

Therefore a trade account improves only if the domestic output growth exceeds domestic absorption. A currency devaluation improves a trade balance if the substitution towards domestic goods in response to the relative price change boosts output more than absorption.

The criticisms that the absorption approach has received are that it neglects price effects of devaluation which are very important and that it is not operative in a fixed exchange rate system, this approach fails as a corrective measure of BOP deficit under a fixed a fixed exchange rate system. When prices rise with devaluation, people reduce their consumption expenditure. With money supply remaining constant, interest rates rises which brings a fall in output along with absorption. Thus devaluation will have little effect on BOP deficit.

3.3.3 The Monetary approach

The monetary approach to devaluation analysis was pioneered by Whitman, Frekel and Johnson (Carbaugh, 1995). The fundamental basis of the monetary approach to the balance of payments is that the balance of payments is a monetary phenomenon and not a real phenomenon. Three key assumptions that underline the monetary model are the stable money demand function, vertical aggregate supply schedule and purchasing power parity (Pilbeam, 1998).

The elasticity and absorption approaches apply to the trade account of the balance of payments, neglecting the capital movements. Thus, the essence of the monetary approach to the balance of payments is that it takes the balance of payments as a whole (the current and capital account) and assumes that changes in international reserves (as the measure of payments imbalance) are a function of disequilibrium between the supply of, and demand for, money. An excess supply of money leads to a loss of international reserves (a deficit), and an excess demand for money leads to a gain in international reserves (a surplus); and changes in the level of reserves are the mechanism by which the balance between the supply and demand for money is restored.

The monetary approach argues that currency depreciation can only be successful if it increases the nominal demand for money relative to the supply, as the price level rises, or by reducing the real supply of money in relation to the real demand (Thirlwall, 2004). The theme of the monetary approach is that exchange rate changes are viewed as incapable of bringing about a lasting change in the balance of payments. As already mentioned, exchange rate change operates strictly by causing disequilibrium in the money market, causing a deficit or surplus in the balance of payments which continues only until equilibrium is restored in the money market via reserve changes.

The criticisms of the monetary approach are that the assumption of stable demand does not hold, the demand for money is stable in the long run but not in the short run and also there are market imperfections which prevent the law of one price from working properly in many markets for traded goods. There may be price differentials due to the lack of information about overseas prices and trade regulations faced by traders.

The study therefore adopted the elasticity approach to balance of payments because of its assumptions which leads to the theory between exchange rate movements and agricultural trade whereby when devaluation occurs the domestic prices of its imports are raised and the foreign prices of its exports are reduced thus devaluation helps to improve BOP deficit of a country by increasing its exports and reducing its imports and the reverse is true.

3.4 Empirical Literature

Several studies have so far been conducted on the impact of exchange rate movements on both trade flows and agricultural trade and the findings of these are mixed and not conclusive. This section therefore discusses some of the findings of the effect of exchange rate movements around the world.

3.4.1 Exchange rate movement and trade

From an earlier empirical study, it was evident that exchange rate movements have a negative impact on exports (Akhter and Hilton, 1984). Akhter and Hilton, 1984 used a polynomial distributed lag method in their OLS estimate of the effects of exchange rate movements on trade flows. Results from the study confirms the theoretical assertion that exchange rate movements (decrease in exchange rate) reduce international trade. According to the model used export volume is a function of foreign income, foreign capacity utilization and relative prices; and import volume is a function of domestic income, the ratio of foreign to domestic capacity utilization, and relative prices. The study used USA and Germany data and estimated the models using quarterly data over the period 1974-1981, and they found that exchange rate had a significantly negative effect on US imports, German exports and imports but no effect on US exports.

Gotur (1985) later challenged Akhter and Hilton, 1984 by using the same methodology but with a little modification. Gotur (1985) included France, UK and Japan in the model, applied the Cochrane-Orcutt procedure to control for autocorrelation only when the Durbin-Watson statistic calls for autocorrelation, (Akhter and Hilton (1984) used it even in the cases in which the problem was not even present), changed the sample period under investigation to account for lag structure and incorporated the rate of change, rather than the level of the exchange rate. After these modifications the study found that German exports and imports have been negatively impacted by a decrease in the exchange rate, and Japanese exports are positively affected but for the other trade flows they were not affected.

A number of recent studies also found a negative relationship between exchange rate movements (an appreciation of exchange rate) and trade flows. For example, significant negative relationship between real exchange rate and export volume in short run and long run was found for eight South American countries (Arize and Slottje, 2008) and the study employed the Johansen cointegration test to analyze the long run relationship. Short term effects are explored by estimating an error correction model and by assessing impulse-response functions.

By using Error Correction Model, Chou (2000) found significantly negative relationship between export volume and volatility of real effective exchange rate (REER) for trade flows of industrial materials, mineral and fuels; and manufactured good. However, the relation was not significant for foodstuffs. Significant negative relationship was also found between exchange rate volatilities and export supply for all the G7 countries and their partners for twenty one industries (Peridy, 2003).

In Africa there have also been a number of studies that have been done to find out the impact of exchange rate movement on international trade. For example in Ghana, Bhattarai and Armah (2005) confirmed that there is a stable long-run relationship and that there is a positive relationship between exports and exchange rate movement by using annual time series data from 1990 -2000 and they made use of the cointegration analysis and in the short run the exchange rate does not affect both the export and import demand functions.

In Malawi, a study done by Mangani (2011) examined the effects of the exchange rate on foreign trade in Malawi. Separate export value and import value models were estimated using the single equation error correction modelling. Apart from the real effective exchange rate, the aggregate GDP of Malawi's key trading partners was included in the export value function, while Malawi's own GDP was allowed to explain the value of imports. The findings showed that foreign trade in Malawi was not responsive to the real effective exchange rate, both in the long-run and in the short-run. Thus, there was no compelling support for either the Marshall-Lerner condition or the J curve effect.

All the above studies did not consider the agricultural sector specifically which is the main focus for this study but considered overall exports and imports for their respective countries.

3.4.2 Exchange rate movements and agricultural trade

Despite an extensive literature on effect of exchange rate movement on overall trade, very few studies (Cho *et al*., 2002; Kandilov, 2008; Zhang et al, 2010) explored the impact of exchange rate movements on agricultural trade. Compared to the other sectors, agricultural trade was found to be more sensitive to exchange rate uncertainties in developed countries.

Using a sample of bilateral trade flows across ten developed countries (G 10 countries) Cho *et al*., (2002) shows that the real exchange rate uncertainty has had a significant negative effect on agricultural trade and the negative impact on agricultural trade was more significant compared to the other sectors.

Fabiosa (2002), in his working paper, examined the impacts of the exchange rate movement on pork and live swine exports and a model of a representative Canadian pork exporter was developed. The pork export supply equation was expressed as a function of the expected level of real exchange rate and a time-varying variance of real exchange rate. The same model was used to examine the sensitivity of pork exports to Japan from Canada, the United States and Denmark. The parameters of all pork and live swine in export equations were theoretically consistent and many were significant and it was found that decrease in exchange rate negatively affects exports.

Examining the impact of exchange rate movements on South African export flows, Todani and Munyama (2005) and Takaendesa, Tsheole and Aziakpono (2005), came to more or less same conclusion in respect to the differential impacts on agricultural and non-agricultural exports. It was found that exchange rate volatility had a more impact on the agricultural exports than on the non-agricultural exports and the relation was also found to be negative; they established this relationship by using the ARDL econometric technique.

Agricultural exports from developing countries are much more vulnerable to exchange rate volatilities compared to the exports from developed countries. Kandilov (2008) found that the effect of exchange rate movement is largest for developing country exporters and smallest for developed exporters and in his paper he found that exchange rate has a negative impact on agricultural trade compared to others.

Villanueva and Sarker (2009) conducted a study to examine the effects of exchange rate on fresh tomato imports into the United States from Mexico. They showed, using cointegration analysis, that while changes in exchange rate have a positive effect on trade flows, movement of the exchange rate has a significant negative effect on trade flows. In a study that examined the effect of an increase in exchange rate movements on the United States and the OECD Countries, Kafle and Kennedy (2012) found that exchange rate movement has a greater impact on the agricultural sector, while the real exchange rate has a greater impact on the non-agricultural sector. And in his study he used panel data and made use of the gravity model and that the effects of the exchange rate movements and the real exchange rate on agricultural, non-agricultural and total exports, imports and trade flows were to be statistically significant and negative. Ajuruchukwu *et al.,* (2013) assessed the impact of exchange rate movements on South Africa's exports by using the ARIMA and ARCH models and found that a decrease in exchange rate had a positive impact on South Africa's exports.

In summary, from the empirical literature, therefore, we note that different studies have come up with different results on how exchange rate movements has impacted both agricultural trade as well as trade flows as others have found a negative impact and others have found a positive impact. Thus, the effect of exchange rate movements on trade and/or agricultural trade is ambiguous and the existing empirical literature on the relationship between exchange rate and trade flows concerning Malawi is very limited and none on the agricultural sector. This study therefore sets out to fill the gap in academic literature and guided by literature the study uses the most used variables and adopts the ARDL model as an estimation model which are discussed fully in the next chapter.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

The purpose of this chapter is to describe the approaches that were used to in the study in order to achieve both the main objective as well as all the specific objectives. It also gives a detailed description of the variables that were used in the study and how they were measured, the data sources and the diagnostic tests that the study used.

4.2 Assessment of the impact of exchange rate movements on agricultural exports

A modified standard export demand model was used to examine the impact of exchange rate movements on agricultural trade. The export model estimates exports as a function of exchange rate, foreign income and production. The export function is given by

$$\boldsymbol{REXP = F\ (REXR, RFIN, PROD)}$$

and its model can be formulated as

$$REXP_t = \beta_0 + \beta_1 EXR_t + \beta_2 RFIN_t + \beta_3 PROD_t + \mu_t$$

[4.1]

where:

$REXP_t$ = Real agricultural exports of Malawi in current period;

$PROD_t$ = Production in current period (tonnes);

$RFIN_t$ = Real foreign income in current period

$REXR_t$ = Real exchange rate in current period;

β_0 = intercept;

$\beta_1, \beta_{2,} \beta_3$ = coefficients for independent variables; and

μ_t = error term.

4.2.1 Real agricultural exports (REXP$_t$)

Real agricultural exports, the dependent variable, were determined by dividing the nominal value of export by the export prices. It reflects the value of total quantities of agricultural exports to the rest of the world from Malawi in base year prices, i.e., after removing the effects of changes in export prices. Only values of tea, sugar, tobacco and cotton were analyzed, these being the main export commodities for the agricultural sector.

4.2.2 Production (PROD$_t$)

The production variable indicates quantities of agricultural commodities produced by the country in the current year. It is measured in tones. It is expected that the more Malawi has produced that year the more the exports and vice versa, thus a positive relationship is expected between production and exports (β_3 is expected to have a positive sign).

4.2.3 Real foreign income (RINC$_t$)

The real foreign income of an economy will be proxied by the real GDP of the importing country that i.e. the rest of the world. It is measured in the importing country's currency. Theory stipulates that the impact of real foreign income on exports should be positive. An increase in real GDP of an importing country implies that the overall purchasing power of the country has increased and thus demand for Malawian exports should increase and vice versa hence a positive coefficient is expected for β_2.

4.2.4 Real exchange rate ($REXR_t$)

This is the real spot exchange rate between Malawi and the rest of the world. An increase in the real exchange rate reflects a depreciation in the Malawian Kwacha. The expected sign of β_3 is positive where an increase in the exchange rate signified a depreciation of the Malawi Kwacha. It was taken from the Penn World Table, version 9.0 database.

4.3 Assessment of the impact of exchange rate movement on agricultural imports

The standard imports model was used to examine the impact of exchange rate movement on growth of imports. Imports are a function of exchange rate and domestic income. The import function can be formulated as;

$$RIMP_t = \gamma_0 + \gamma_1 RDOINC_t + \gamma_2 REXR_t + \mu_t \quad [4.2]$$

where:

$RIMP_t$ = Real agricultural imports into Malawi in current period;

$RDOINC_t$ = Real domestic income in current period; and

$REXR_t$ = Real exchange rate.

4.3.1 Real agricultural imports ($RIMP_t$)

Real agricultural imports into Malawi is the dependent variable. Real agricultural imports were determined by dividing the nominal value of imports by indices of import prices. It reflects the inflation adjusted imports from the rest of the world to Malawi.

The values were for agricultural raw materials such as fertilizers and also cereals such as maize.

4.3.2 Real domestic income ($RDOINC_t$)

Real domestic income was measured by the real GDP of Malawi. The coefficient is expected to be positive since an increase in the real GDP of Malawi is expected to increase the demand for foreign goods.

4.3.3 Real exchange rate ($REXR_t$)

This is exchange rate between Malawi and rest of the world (appendix 1). The real exchange rate was defined in a manner that an increase in exchange rate reflects a depreciation of the local currency (Malawi Kwacha), hence imports are expensive. This will negatively affect imports from the rest of the world, therefore a negative coefficient is expected.

4.4 Model Specification and Estimation

In order to estimate the relationship between exchange rate, imports and exports, the study adopted the autoregressive distributed lag (ARDL) bounds testing model that deals with single co-integration. The model was introduced by Pesaran and Shin (1999) and was further extended by Pesaran et al (2001). The choice of the model was due to its advantage that it is still applicable in the case where variables are I (0) and I (1) in other words whether the variables are stationary in levels or stationary after first difference. The bounds test has some advantages compared to other methods of co-integration some of which are the short-run and long-run coefficients of the model are estimated simultaneously and all variables are assumed to be endogenous.

The study, therefore estimated the following ARDL models for both the exports and imports models as specified by equations [4.3] and [4.4] respectively:

$$\Delta lnREXP_t = \propto_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnREXP_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta lnREXR_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta lnRFIN_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta lnPROD_{t-i} + \delta_1 lnREXP_{t-1} + \delta_2 lnREXR_{t-1} + \delta_3 lnRFIN_{t-1} + \delta_4 lnPROD_{t-1} + \varepsilon_{1t} \quad [4.3]$$

and

$$\Delta lnRIMP_t = \emptyset_0 + \sum_{i=1}^{m} \gamma_{1i} \Delta lnRIMP_{t-1} + \sum_{i=0}^{m} \gamma_{2i} \Delta lnREXR_{t-i} + \sum_{i=0}^{m} \Delta lnRDOINC_{t-i} + \vartheta_1 lnRIMP_{t-1} + \vartheta_2 lnREXR_{t-1} + \vartheta_3 lnRDOINC_{t-1} + \varepsilon_{2t} \quad [4.4]$$

where $\propto_0$ and $\emptyset_0$ are intercept terms; $\beta_1$to β_4 and γ_1 to γ_2 are short run coefficients; $\delta_1 to\ \delta_4$ and ϑ_1 to ϑ_2 are long run coefficients; n and m are the lag lengths; Δ is the difference operator, ε_{1t} and ε_{2t} are white noise error terms and all other variables are as defined in equation [4.1] and [4.2] respectively.

The error correction models of the ARDL model given in equations [4.3] and [4.4] are expressed as shown in equation [4.5] and equation [4.6] respectively:

$$\Delta lnREXP_t = \propto_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnREXP_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta lnREXR_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta lnRFIN_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta lnPROD_{t-i} + \rho_1 ECM_{t-1} + \varepsilon_t\ ; \quad [4.5]$$

and

$$\Delta lnRIMP_t = \emptyset_0 + \sum_{i=1}^{m} \gamma_{1i} \Delta lnRIMP_{t-1} + \sum_{i=0}^{m} \gamma_{2i} \Delta lnREXR_{t-i} + \sum_{i=0}^{m} \Delta lnRDOINC_{t-i} + \pi_1 ECM_{t-1} + \varepsilon_t \quad [4.6]$$

where ρ_1 and $\pi_1$are the coefficients of the error term; ECM_{t-1} is the error term lagged by one period and all the other terms are as previously defined in equation 4.1 and 4.4 respectively.

4.5 Data Source

All the data was obtained from the World Bank database except for data on agricultural exports and imports which was obtained from the Malawi's National Statistics Office (NSO) and data on exchange rates was obtained from the Penn World Table .Gaps were filled by obtaining figures from Malawi yearly economic reports. Annual data from 1980 to 2017 was used. E- Views package was used for data analysis.

4.6 Diagnostic Tests

Since time series data was used it is important to test if the data is stationary, the Dickey Fuller test using generalized least squares (DF-GLS) was used to test whether the time series is stationary and to determine the order of integration. Since the DF-GLS is a single tail (one side) test, the rule of thumb is to reject the null hypothesis if the t calculated is less that t critical. The null hypothesis is that the series is not stationary against the alternative that the series is stationary (Johnson and Dinardo, 1997; Enders 2015). A normality test was also done to test if the residuals are normally distributed. The test uses the Jarque-Bera statistic which has a chi-square distribution and operates under the null hypothesis of normally distributed residuals and we reject the null hypothesis if the p value is significant at any of the different confidence intervals. To test for heteroskedasticity, the whites test was used and the rule of thumb is that, the null hypothesis of there is no heretoskedasticity is rejected if the p value is significant at any of the confidence interval. Serial correlation was also tested. The Ramsey Reset test was used to test for specification errors and has the null hypothesis that there is no specification errors, while the cumulative sum of recursive residuals (CUSUM) test was used to test for stability of the parameters.

CHAPTER FIVE

RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter presents results of the different diagnostic tests that were conducted and results for the economic models that were used in order to achieve both the main and the specific objectives of the study. The chapter also provides discussions of the findings.

5.2 Stationarity Test Results

The concept of stationarity means that the long run relationship between variables have their means and variances constant and that they are not depending on time. However with time series data there is a tendency in which there is divergence away from their mean over time and as such non stationarity exists and this leads to spurious regressions. A non-stationary time series is a stochastic process with unit roots or structural breaks and the presence of the unit root implies that time series under consideration is non-stationary while the absence of it entails that time series is stationary(Enders, 2015)

To test for stationarity, the study used the DF GLS test rather than the famous ADF test. This was because the DF GLS test has a greater power in the presence of an unknown mean and trend than the ADF test and it has the best overall performance in small samples. Table 5.1 below show the results of the stationarity test of the different variables that were used in the study and the AIC and SBC were used to determine the number of lags that should be used.

Table 0.3 Stationarity test results

Variable	DFGLS t statistic	1% critical value	
ln EXR	-4.482	-3.770	I(0)
ln RFIND1	-4.694	-3.770	I(1)
ln RIMPD1	-7.677	-3.770	I(1)
ln REXPD1	-4.343	-3.770	I(1)
ln DOIND1	-5.045	-3.770	I(1)
ln PRODD1	-7.238	-3.770	I(1)

The null hypothesis for the test is that there is a unit root which means that it is non stationary and so when the test static is greater than the critical value in absolute terms we reject the null hypothesis. From the table the results show that exchange rate was stationary in levels while real foreign income, real imports, real exports, domestic income and production were stationary at first difference. Given these results, estimation of the ARDL model is permissible as the model allows for a mixture of I (0) and I (1) variables.

5.3 ARDL Bounds Test Results

Given a group of non-stationary series, we may be interested in determining whether the series are co integrated, and if they are, in identifying the co integrating (long-run equilibrium) relationships. If the variables do not co-integrate then there is also a problem of spurious regression. If the calculated F statistic falls below the lower bound then the null hypothesis of no long run relationship cannot be rejected but if the calculated F statistic is greater than the upper bound critical value then the null hypothesis is rejected (Nkoro and Uko, 2016).

The study used the Bounds test for co-integration (see Appendix 2 and 3) where the Bound F statistic is computed in order to establish long run relationships and is compared with the given critical values at different significant levels. Table 5.2 below present's results of the bound test for both the export and import models.

Table 0.4 ARDL Bounds Co-integration test results

	Import model		Export model	
Test statistic	6.317		5.712	
Significance	I(0)	I(1)	I(0)	I(1)
10%	3.17	4.14	2.72	3.77
5%	3.79	4.85	3.23	4.35
1%	5.15	6.36	4.29	5.61

From the results the export model showed that the calculated F statistic (5.712) was greater than the I (0) (4.29) which is the lower critical bound and also the I (1) (5.61) at 1% significance level which is the upper critical bound which assumes that all variables are I (1) we therefore reject the null hypothesis which states that no long run relationship exists (see appendix 2). This shows there is a long run relationship between exports, exchange rate, foreign income and production.

On the other hand, the test statistic of the import model at 1% significance level the F statistic (6.317) was in between the lower bound (5.15) and the upper bound (6.36) and so this result is inconclusive however at 5% significance level the test statistic (6.317) was greater than both the lower bound (3.79) and the upper bound (4.85) hence we are able to reject the null hypothesis of no long run relationship exists hence existence of long run relationship between imports, exchange rate and domestic income. A conclusion can therefore be made that for both the export model and the import model co-integration exists.

5.4 Empirical Estimation of the ARDL Model

5.4.1 Diagnostic tests for export model

To ascertain the relevance of the interpretations presented by the estimated model, diagnostic tests were conducted. Table 5.3 below show the results of the diagnostic tests for the export model.

Table 0.5 Diagnostic test results for the agricultural export model

Test	Test statistic*	P-value
Normality test	0.48134	0.826402
Breusch Godfrey serial correlation test	0.9856	0.9064
Ramsey Reset test	3.3978	0.1672
White test	158.2231	0.8774

**All tests use F statistic for hypothesis testing except for the Normality test which uses the Jarque-Bera test statistic*

To ascertain that the residuals in the model are normally distributed, the normality test was conducted (Appendix 4). The test uses the Jarque-Bera statistic which has a chi-square distribution and operates under the null hypothesis of normally distributed residuals. As shown in Table 5.3 above, we fail to reject this null hypothesis as evidenced by insignificant Jarque-Bera statistic and p-value thereby concluding that the residuals are normally distributed.

The Breuch Godfrey Serial correlation test was also used to test for serial correlation (Appendix 5). This test operates under the null hypothesis of no serial correlation. From the results obtained, there is no presence of serial correlation in this model as the F statistic and p-value are statistically insignificant hence we fail to reject the null hypothesis.

According to the White test (Appendix 6), there is no heteroskedasticity in the data as we fail to reject the null hypothesis of homoscedasticity due to the insignificant F statistic and p-value. Results from the Ramsey RESET (see Appendix 7) test show that there is no specification error in the model as we fail to reject the null hypothesis of white noise residuals (no specification error) due to insignificant test statistics.
The cumulative sum (CUSUM) of recursive residuals were also used to test for parameter stability (see Appendix 8). As depicted in figure 5.1 below, the parameters appear to be stable over time at 5% significance level as the cumulative sums did not go beyond the area between the critical lines.

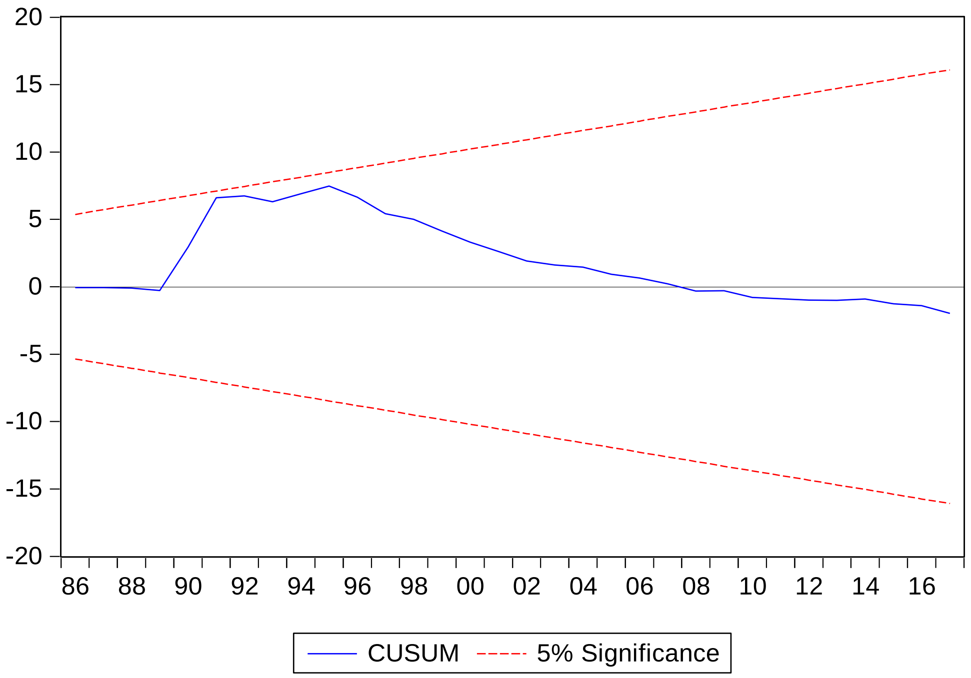

Figure 0.4 CUSUM for agricultural exports

5.4.2 Impact of exchange rate movement on agricultural exports

The ARDL model was estimated in order to assess the impact of exchange rate movement on agricultural exports. According to automatic selection criteria, the Akaike Information Criteria (AIC) was the model selection method chosen and the model ARDL (1, 0, 0, 0) was selected (see Appendix 9). According to Nkoro and Uko (2016) the ARDL long run coefficients are already normalized on the dependent variable and as such they are interpreted as they are. Table 5.4 shows the long-run results after estimation of the model and this is in line with the co-integration results which has already shown that there exists a long run relationship (see section 5.3). The model was estimated using the EViews package.

Table 0.6: Long-run ARDL estimation results for agricultural exports

Variable	Coefficient	Standard error	t statistic	P-Value
ln RFIN	15.146422**	7.242383	2.09139	0.0445
ln EXR	8.837414	7.439479	1.18790	0.1736
ln PROD	5.955699**	6.134424	-0.970865	0.0389
Constant	217.133834	133.458106	-1.626981	0.1155

*Dependent variable: ln REXP, ***denotes significance at 1%, ** significance at 5% and * significance at 10%*

The results show that, in the long-run, there was no relationship between exchange rate and agricultural exports, this was not significant as it is evidenced by the high p value (0.1736). This is contrary with what the theory says that an increase in the exchange rate, which is a depreciation of the domestic currency, will increase the country's exports as it makes the exports cheaper to the world market this is however in line with a study done by Mangani (2011), that found out that in the long run exchange rate does not have any effect on exports in Malawi. Therefore in this study exchange rate movement does not have an effect on agricultural exports.

A positive relationship also exists between foreign income and exports as a 1% increase in foreign income will lead to 15% increase in agricultural exports and this is evidenced by a significant p value of 0.0445 which was significant at 5% and this is as expected, as foreign income increases we expect more of our trading partners to buy more of our produce, *ceteris paribus*.

Production showed to have a positive relationship with exports which was as anticipated because it is expect that as a country, produces more than it should be able to export more and this was significant at 5% with a p value of 0.0389 this means a 1% increase in production will lead to a 5% increase in agricultural exports.

Table 5.5 shows the short-run dynamics of the ARDL model and the results show that the previous year's exports has an effect on the current year's agricultural exports as it also showed a significant result.

Table 0.7: Short-run ARDL estimation results for agricultural exports

Variable	Coefficient	Standard error	t statistics	P-Value
$\Delta lnREXP1_{t-1}$	0.773486***	0.109078	7.091150	0.0000
$\Delta lnEXR$	2.001802	1.706913	1.172762	0.2495
$\Delta lnRFIN$	3.430883	2.100566	1.633313	0.1122
$\Delta lnPROD$	-1.349052	1.419675	-0.95025	0.3491
ECM_{t-1}	-0.226514**	0.109078	-2.0766	0.0459

****denotes significance at 1%, **significance at 5% and *significance at 10%*

The results show that there is a positive relationship between the previous year's exports and the current year's exports; a 1% increase last year's exports will lead to a 0.77% increase in this year's agricultural exports and this was significant at 1% as the p value was very significant (0.0000). The reasoning behind why an increase in last year's exports would lead to an increase in this year's agricultural exports would be because if Malawi exported more produce in the previous year then more farmers are likely to get an incentive to produce more of agricultural products and hence they would like to export more so as to get more earnings. The other variables showed to be statistically insignificant in the short-run.

The error coefficient term has a negative coefficient, it is between 0 and -1 and also is significant at 5%, it shows the speed of adjustment to long run equilibrium, in this case, deviation from the long run equilibrium of the dependent variable in the current period will be corrected by 22% in the next period to bring back to equilibrium.

5.4.3 Diagnostic tests for the import model

For the import model the same tests were used, the normality test (Appendix 10) showed that the residuals are normally distributed as evidenced by the insignificant P value, the autocorrelation LM test (Appendix 11) also showed that there is no presence of serial correlation and according to the whites test (Appendix 12) there was no hetereskedasticity in the data and the Ramsey Reset test (Appendix 13) showed that there was no specification error (Table 5.6).

Table 0.8 Diagnostic test results for the agricultural import model

Test	Test statistic*	P-value
Normality test	0.86367	0.5432
Breusch Godfrey serial correlation test	0.04227	0.9587
Ramsey Reset test	5.08269	0.2932
White test	0.6335	0.7424

**All tests use F statistic for hypothesis testing except for the Normality test which uses the Jarque-Bera test statistic*

The cumulative sum (CUSUM) of recursive residuals were also used to test for parameter stability. As depicted in figure 5.2 below, the parameters are stable over time at 5% significance level as the cumulative sums did not go beyond the area between the critical lines.

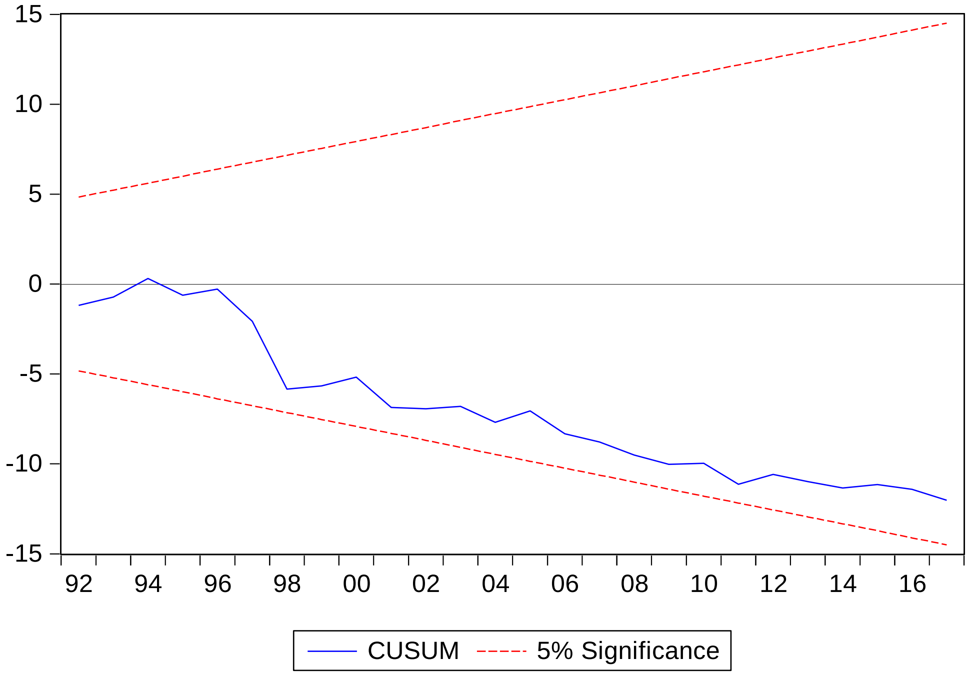

Figure 0.5 CUSUM for import model

5.4.4 Impact of exchange rate movement on agricultural imports

To assess the impact of the exchange rate movement on agricultural imports, the import model function was used (see section 4.3) and this model was estimated using the ARDL (see Appendix 14). According to the automatic selection criteria, the Akaike Information Criteria (AIC) was chosen and the model ARDL (3, 0, 3) was selected. Table 5.7 below presents the empirical results from the long run model obtained by normalizing the coefficients on the dependent variable real imports and after establishing that co-integration exists (see section 5.3).

Table 0.9: Long-run ARDL estimation results for agricultural imports

Variable	Coefficient	Standard error	t statistics	P-Value
ln EXR	15.46677	2.368131	0.059632	0.9529
ln DOINC	30.564959*	2.910758	0.101575	0.0694
Constant	264.469514	3.552045	0.111659	0.9120

*Dependent variable: INRIMP1, ***denotes significance at 1%, ** significance at 5% and * significance at 10%*

The results show that, in the long-run, there is a positive relationship between domestic income and imports and this evidenced by a p value of 0.0694 which was significant at 10% whereby a 1% increase in domestic income will lead to 30% increase in the growth of agricultural imports . This is as expected because as domestic income increases in a country we expect demand for imports to increase as citizens now can afford to buy more from its trading partners. On the other hand, results show that exchange rate does not significantly influence Malawi's agricultural imports. This could be due to the fact that Malawi does not domestically manufacture most of the agricultural inputs especially fertilizers, as such, the country depends more on imported agricultural inputs. Therefore, no matter how the Malawi Kwacha behaves, the country continues to import agricultural inputs, hence exchange rate not having an effect on the imports.

Table 5.8 shows estimation results for the short-run dynamics for the imports. The results show that the two-lagged values of agricultural imports and exchange rate were significant. There exists a negative relationship between agricultural imports in the previous two consecutive years and the current year's imports, a 1% increase in the past two years imports will decrease the current year's imports by 0.5% and this was significant at 1%(0.0020). The previous year's imports also showed to have a negative relationship with the current year's imports that is to say a 1% increase in last year's imports will lead to 0.3% decrease in this year's imports and this was significant at 5% (0.0417). There was a negative relationship between exchange rate in the previous year and current year's imports, a 1% increase in the exchange rate, which is the depreciation of the Malawi Kwacha will lead to a 2.7% decrease in the imports of agricultural inputs in Malawi and this is evidenced by a p value which is significant at 5% (0.0268). Domestic income was found not to be statistically significant which means in the short-run domestic income does not affect imports.

Table 0.10: Short-run ARDL estimation results for agricultural imports

Variable	Coefficient	Standard error	t statistics	Prob
$\Delta \ln RIMP1_{t-1}$	-0.3885**	0.181358	-2.142509	0.0417
$\Delta \ln RIMP1_{t-2}$	-0.5831***	0.169408	-3.44291	0.0020
$\Delta \ln DOINC$	-0.4189	1.741725	-0.240534	0.8118
$\Delta \ln EXR$	1.4265	1.633540	0.873266	0.3905
$\Delta \ln EXR_{t-1}$	-4.628520**	1.972186	-2.346899	0.0268
$\Delta \ln EXR_{t-2}$	2.4691	1.475805	1.673096	0.1063
ECM_{t-1}	-0.013707*	0.132095	0.103763	0.0582

****denotes significance at 1%, ** significance at 5% and * significance at 10%*

The error correction term was between 0 and -1 for the import model however it was significant at 10%, it shows the speed of adjustment to long run equilibrium, in this case, deviation from the long run equilibrium of the dependent variable in the current period will be corrected by 1.3% in the next period to bring back to equilibrium.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter gives the summary of study results, policy recommendations that are made based on the results and limitations of the study.

6.2 Summary of results

The study aimed at examining the relationship between exchange rate movements and agricultural trade in Malawi specifically to assess the impact of exchange rate movements on agricultural exports and to assess the impact of exchange rate movements on agricultural imports. The study used annual data from 1980 to 2017 and was analyzed using E views package and the ARDL model was the estimation model used.

The results also showed that there was no relationship between exchange rate movements and agricultural exports in the long run however there was a positive relationship between foreign income and agricultural exports and also production had a positive relationship with agricultural exports in this study in the long run. In the short run only the previous year's exports had an effect the current year's exports as it was the only variable that was significant.

Lastly the results also showed that there was a positive relationship between domestic income and agricultural imports but exchange rate movements did not affect agricultural imports in the long run. In the short run previous imports and exchange rate movements had a negative effect on the agricultural imports.

6.3 Policy Recommendations

The study therefore provides the following recommendations based on the findings of the study;

- Government should not devalue the Kwacha with the hope that it will make our exports competitive in the world market and that we will export more, our exports are not affected by the exchange rate.
- Malawi should move to more diversified exports and not just rely on agricultural products.
- In the meantime Malawi's main cash crops which are Tobacco, Tea, Sugar and Cotton should also be given special attention as an increase in production for the crops will lead to more exports as a result more foreign earnings.
- Ideas on how Malawi can start manufacturing more of its agricultural inputs especially fertilizers should come in and be implemented so as to reduce imports.
- Government to enhance export competitiveness and encourage farmers with financial incentives to use high sophisticated technologies.

6.4 Limitations

The study used annual data for a period of 37 years due to unavailability of most of variables in quarterly figures which would have been more appropriate as it would have allowed us to use more variables in the analysis. The study also only focused on the four main cash crops for Malawi which are Sugar, Cotton, Tea and Tobacco other than all agricultural exports particularly Coffee which maybe would have given different results if all agricultural exports would have been used and as a result only the main trading partners for these crops were also used (see appendix 1) other than all trading partners.

The study may have suffered from aggregation bias, maybe different results would come out if it was a study of bilateral trade flows between Malawi and its individual trading partners and so this is another area of exploration.

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APPENDICES

Appendix 1: Malawi's major trading partners

South Africa
Kenya
United States of America
Portugal
Germany
China
United Kingdom
Zimbabwe
Netherlands
Ireland
Mozambique

Appendix 2:co-integration test for import model

ARDL Bounds Test
Date: 04/09/18 Time: 16:15
Sample: 1983 2017
Included observations: 35
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	6.317101	2

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Appendix 3: cointegration test for export mode…………….

ARDL Bounds Test
Date: 04/09/18 Time: 14:57
Sample: 1981 2017
Included observations: 37
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	5.712158	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Appendix 4: Normality test for exports model

Component	Jarque-Bera	Df	Prob.
1	0.2210	2	0.0000
2	0.0201	2	0.9500
3	0.2300	2	0.4861
4	0.0102	2	0.0000
Joint	0.4813	8	0.8264

Appendix 5: Serial correlation test for exports model

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.098561	Prob. F(2,30)	0.9064
Obs*R-squared	0.241529	Prob. Chi-Square(2)	0.8862

Appendix 6: **Whites test for export model**

Heteroskedasticity Test: White

F-statistic	1.655442	Prob. F(13,23)	0.14077
Obs*R-squared	17.88531	Prob. Chi-Square(13)	0.16199
Scaled explained SS	154.5270	Prob. Chi-Square(13)	0.00000

Appendix 7: **Ramsey RESET Test for exports model**

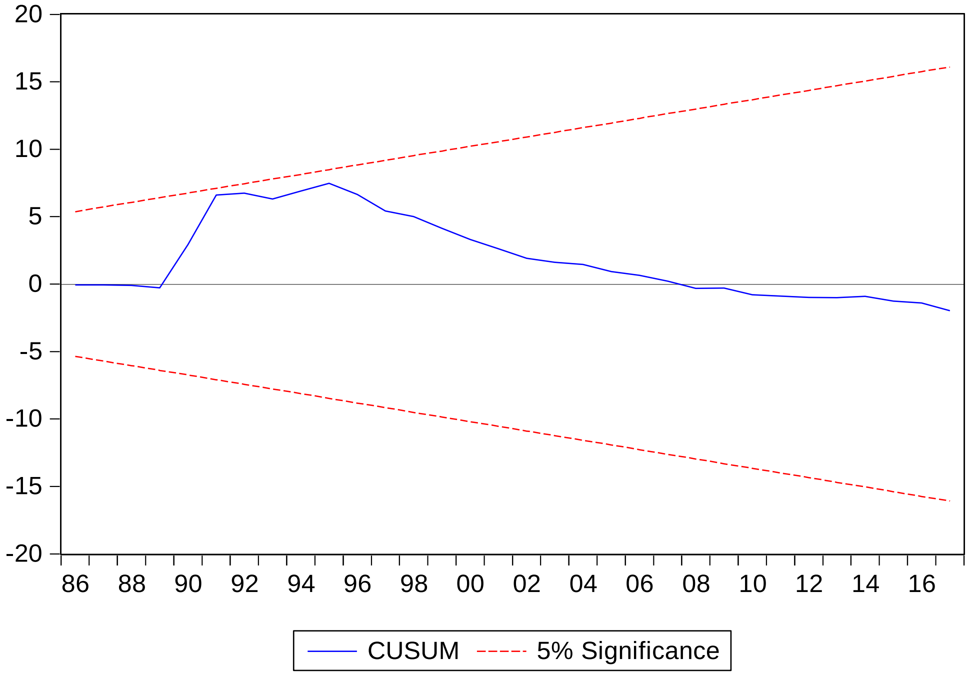
Ramsey RESET Test
Equation: UNTITLED
Specification: LNREXP1 LNREXP1(-1) LNEXR LNPROD LNRFIN C
Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	1.896804	31	0.1672
F-statistic	3.597866	(1, 31)	0.1672

F-test summary:

	Sum of Sq.	Df	Mean Squares
Test SSR	4.556109	1	4.556109
Restricted SSR	43.81254	32	1.369142
Unrestricted SSR	39.25643	31	1.266336

Appendix 8: CUSUM for the export model



Appendix 9: **Estimation ARDL for exports model**

Method: ARDL
Date: 04/24/18   Time: 11:32
Sample (adjusted): 1981 2017
Included observations: 37 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LNEXR LNRFIN LNPROD
Fixed regressors: C
Number of models evalulated: 500
Selected Model: ARDL(1, 0, 0, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNREXP1(-1)	0.773486	0.109078	7.091150	0.0000
LNEXR	2.001802	1.706913	1.172762	0.2495
LNRFIN	3.430883	2.100566	1.633313	0.1122
LNPROD	-1.349052	1.419675	-0.950254	0.3491
C	-49.18395	35.12456	-1.400272	0.1711

R-squared	0.881014	Mean dependent var	17.64936
Adjusted R-squared	0.866141	S.D. dependent var	3.198163
S.E. of regression	1.170103	Akaike info criterion	3.277149

Sum squared resid	43.81254	Schwarz criterion	3.494841
Log likelihood	-55.62727	Hannan-Quinn criter.	3.353896
F-statistic	59.23497	Durbin-Watson stat	2.030329
Prob(F-statistic)	0.000000		

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

ARDL Cointegrating And Long Run Form
Dependent Variable: LNREXP1
Selected Model: ARDL(1, 0, 0, 0)
Date: 04/24/18 Time: 11:35
Sample: 1980 2017
Included observations: 37

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXR)	2.001802	1.706913	1.172762	0.2495
D(LNRFIN)	3.430883	2.100566	1.633313	0.1122
D(LNPROD)	-1.349052	1.419675	-0.950254	0.3491
CointEq(-1)	-0.226514	0.109078	-2.076636	0.0459

Cointeq = LNREXP1 - (8.8374*LNEXR + 15.1464*LNRFIN +5.9557 *LNPROD -217.1338)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXR	8.837414	7.439479	1.187908	0.1736
LNRFIN	15.146422	7.242383	2.091359	0.0445
LNPROD	5.955699	6.134424	0.970865	0.0389
C	-217.133834	133.458106	-1.626981	0.1135

LNREXP1 = C(1)*LNREXP1(-1) + C(2)*LNEXR + C(3)*LNRFIN + C(4)*LNPROD + C(5)

Appendix 10: **Normality test for imports model**

Component	Jarque-Bera	Df	Prob.
1	0.2200	2	0.0000
2	0.1236	2	0.2516
3	0.5200	2	0.6522
Joint	0.8636	6	0.5432

Appendix 11: **Serial correlation test for imports model**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.042279	Prob. F(2,24)	0.9587
Obs*R-squared	0.122882	Prob. Chi-Square(2)	0.9404

Appendix 12: **Ramsey RESET Test for import model**

Ramsey RESET Test
Equation: UNTITLED
Specification: LNRIMP1 LNRIMP1(-1) LNRIMP1(-2) LNRIMP1(-3) LNDOINC LNEXR LNEXR(-1) LNEXR(-2) LNEXR(-3) C
Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	2.254483	25	0.2932
F-statistic	5.082692	(1, 25)	0.2932

F-test summary:

	Sum of Sq.	Df	Mean Squares
Test SSR	4.120896	1	4.120896
Restricted SSR	24.39016	26	0.938083
Unrestricted SSR	20.26926	25	0.810770

Appendix 13: **Whites test for import model**

Heteroskedasticity Test: White

F-statistic	0.633549	Prob. F(8,26)	0.7424
Obs*R-squared	5.709780	Prob. Chi-Square(8)	0.6797
Scaled explained SS	17.49552	Prob. Chi-Square(8)	0.0253

Appendix 14: ARDL for the imports model

Dependent Variable: LNRIMP1
Method: ARDL
Date: 04/26/18 Time: 14:28
Sample (adjusted): 1983 2017
Included observations: 35 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Ak
Dynamic regressors (4 lags, automatic): LNDOINC LNEXR
Fixed regressors: C
Number of models evalulated: 100
Selected Model: ARDL(3, 0, 3)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRIMP1(-1)	0.597732	0.167234	3.574224	0.0014
LNRIMP1(-2)	-0.194606	0.198010	-0.982805	0.3348
LNRIMP1(-3)	0.583167	0.169408	3.442391	0.0020
LNDOINC	-0.418944	1.741725	-0.240534	0.8118
LNEXR	1.426514	1.633540	0.873266	0.3905
LNEXR(-1)	-3.373873	1.903353	-1.772595	0.0880
LNEXR(-2)	4.628520	1.972186	2.346899	0.0268
LNEXR(-3)	-2.469164	1.475805	-1.673096	0.1063
C	3.624997	24.67710	0.146897	0.8843

R-squared	0.920193	Mean dependent var	16.98508
Adjusted R-squared	0.895637	S.D. dependent var	2.998114
S.E. of regression	0.968547	Akaike info criterion	2.990994
Sum squared resid	24.39016	Schwarz criterion	3.390941
Log likelihood	-43.34240	Hannan-Quinn criter.	3.129056
F-statistic	37.47339	Durbin-Watson stat	1.944434
Prob(F-statistic)	0.000000		

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

ARDL Cointegrating And Long Run Form
Dependent Variable: LNRIMP1
Selected Model: ARDL(3, 0, 3)
Date: 04/26/18 Time: 14:29
Sample: 1980 2017
Included observations: 35

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNRIMP1(-1))	-0.388562	0.181358	-2.142509	0.0417
D(LNRIMP1(-2))	-0.583167	0.169408	-3.442391	0.0020
D(LNDOINC)	-0.418944	1.741725	-0.240534	0.8118
D(LNEXR)	1.426514	1.633540	0.873266	0.3905
D(LNEXR(-1))	-4.628520	1.972186	-2.346899	0.0268
D(LNEXR(-2))	2.469164	1.475805	1.673096	0.1063
CointEq(-1)	-0.013707	0.132095	-0.103763	0.0582

Cointeq = LNRIMP1 - (-30.5650*LNDOINC + 15.4667*LNEXR + 264.4695

)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDOINC	30.564959	2.910758	0.101575	0.0699
LNEXR	15.466677	2.368131	0.059632	0.9529
C	264.469514	3.552045	0.111659	0.9120