EFFECTS OF TERMS OF TRADE SHOCKS ON ECONOMIC GROWTH IN MALAWI UNDER DIFFERENT STABILITY BASED EXCHANGE RATE REGIMES

MASTER OF ARTS (ECONOMICS) THESIS

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DECLARATION

I, the undersigned hereby declare that this study is my own work which has not been submitted to any other institution for similar purposes. Where other people's work has been used acknowledgements have been made.

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CERTIFICATE OF APPROVAL

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DEDICATION

This study is dedicated to Gills and my family.

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ABSTRACT

This study examines the relationship between terms of trade and economic growth in Malawi. The research is founded on the underlying assumption that terms of trade shocks have effects on economic growth. This study also considers the effects of these shocks in different stability based exchange rate regimes. The study employs a threshold vector autoregression analysis method using time series annual data from 1970 to 2014. Two variability exchange rate regimes are chosen by the model indicating that there is a single threshold value. Moreover, Innovation accounting is used to investigate relationships among the variables. The results indicate that there are nonlinear relationships among the endogenous variables and hence justifies the use of the threshold vector autoregression analysis. The analysis also shows that terms of trade shocks have significant effects on economic growth in some time periods after a shock. The study further reveals that the exchange rate regimes also matter in how these terms of trade shocks affect economic growth. The high variability exchange rate regime seems to insulate the economy from terms of trade shocks than the low variability regime. The results found from this volatility based exchange rate classification supports the Freidman's hypothesis that flexible exchange rates are shock absorbers. Furthermore, the study concludes that more liberalized exchange rate systems which have high variability in the exchange rate are the best policy stance for Malawi. Therefore, the results suggest there is need to implement high variability exchange rate regimes in Malawi to insulate the economy from terms of trade shocks.

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LIST OF ACRONYMS AND ABBREVIATIONS

BOP	:	Balance of Payments
CPI	:	Consumer Price Index
FCDA	:	Foreign Currency Dominated Accounts
GBP	:	British Pound Sterling
GDP	:	Gross Domestic Product
GIRFs	:	Generalized Impulse Response Functions
GMM	:	Generalized Method of Moments
IMF	:	International Monetary Fund
LDCs	:	Least Developed Countries
LR	:	Likelihood Ratio
MWK	:	Malawi Kwacha
MWP	:	Malawi Pound
OLS	:	Ordinary Least Squares
RBM	:	Reserve Bank of Malawi
SAP	:	Structural Adjustment Programme
SDR	:	Special Drawing Rights
TT	:	Terms of Trade
TVAR	:	Threshold Vector Autoregression
USD	:	United States Dollar
VAR	:	Vector Autoregression
WB	:	World Bank
WDI	:	World Development Indicators

CHAPTER ONE

INTRODUCTION

1.1 Background

The potential influence that terms of trade have on economic growth has been a subject of discussion among researchers for many decades. The terms of trade are defined as the price of foreign consumption goods in terms of home goods (Obstefeld, 1984). Terms of trade shocks seem significant in explaining growth accelerations or turning points to higher or lower levels of growth (Pritchett, 2000; Haussmann 2006). For developing countries, an adverse change in the terms of trade is the most costly type of shock reducing income growth (Becker and Mauro, 2006). Furthermore, Terms of trade shocks can be transitory or permanent, and the effect can range from mild to extremely high. Therefore, appropriate macroeconomic policy and good institutions can help check terms of trade shocks.

Literature proposes that the exchange rate regime employed is a potential determinant of a country's macroeconomic performance. Fixed exchange rates are suitable for an economy facing nominal shocks whereas floating rates are adequate if a country is facing real shocks (Poole, 1970). Earlier theorists have also discussed the exchange rate regimes and how the exchange rate protects the country from shocks. The exchange rate regime that a country implements may protect the growth path from massive responses to shocks (Friedman, 1953; Fleming, 1962; and Mundell, 1963).

Many economies have adopted an exchange rate regime that presumably best suits the economy to sustain growth amid external and internal shocks. Malawi like many other developing countries faces terms of trade shocks that may alter the path of economic growth. Since the 1980's the Malawi government has implemented structural and

macroeconomic reforms recommended by the International Monetary Fund (IMF), the World Bank (WB) and other donors. All these are attempts to grow the economy and sustain growth. However, Malawi is still an underdeveloped country. Its economy faces fluctuations in the international prices of tea, coffee and tobacco resulting in worsening terms of trade (AFDB, 2011). The developed countries which export manufactured goods face relatively higher and stable prices for their exports (Fatima, 2010). For the reason that Malawi is a price taker, it experiences exogenous terms of trade shocks that might be unfavourable for growth to larger extents.

The government of Malawi also advocates for industrialisation to generate employment, enhance value addition and boost export growth (Ministry of trade and industry, 2012). However, many developing countries face large fluctuations in the price of the goods they export. The significant variations basically transmit to changes in terms of trade, affects investment and eventually economic performance. This pattern is attributed to the heavy reliance of Least Developed Countries (LDCs) on commodity exports, whose prices are more volatile than those of manufactured goods (Fatima, 2010), and Malawi is not an exception. However, as theory states, how reactive growth is to shocks in terms of trade depend on the exchange rate regime. Furthermore, there are different types of terms of trade shocks, and this suggests that the type of shock a country is facing will determine the optimal exchange rate regime it should adopt for sustainable economic growth.

Malawi has been an agro-based economy since independence. Tobacco is its major export commodity, and the country is susceptible to agriculture commodity price shocks that are very volatile. Commodity price shocks can become a major macroeconomic concern because a reduction in the prices can lead to a devastating slowdown in economic growth. A decline or an increase in the international tobacco price has grave consequences on macroeconomic variables in Malawi (Bangara and Dunne, 2015). Malawi as a country depends heavily on the exports of this single product and that is a high risk (Diao, et al., 2002). To reduce such risk, a country has to diversify its exports to other exports sectors such as mining, and the country has failed to do so (Bangara and Dunne, 2015). As an oil importer, changes in world oil

prices make the country vulnerable to unstable oil prices (AfDB, 2011). Above and beyond, all these shocks that Malawi faces affect its terms of trade. There are also other studies that have focused on growth in Malawi. Matchaya, et al. (2013) looked at international trade and income in Malawi. Arndt, et al. (2012) studied climate change and economic growth prospects in Malawi, and Simwaka, et al. (2012) wrote on financial development and economic growth in Malawi. Perhaps, Terms of trade shocks supersedes the other economic growth determinates because it emanates also from external influences that Malawi, and this makes it risky to be left unattended.

There are some things that have happened in the economy that can transmit to changes in terms of trade. For one, Malawi entered into a diplomatic relationship with China in 2007, and there is an expectation that this association has influenced the economy of Malawi. Trade between China and Malawi has increased ever since (Thindwa, 2014). The Chinese government imposes no political conditions on African governments (including Malawi) before signing contracts either for exploration or other economic activities. Perhaps, this gives the African countries freedom to channel the investment to their preferred sectors. China is also willing to invest where Western investors do not, such as physical infrastructure; industry; and agriculture (Ayodele and Sosola, 2014). (Thindwa (2014); Giovannetti and Sanfilippo (2009); Villoria, et al. (2009); and Chinguwo (2009)) also looked at the effect of Chinese investment on Malawi's economy.

Another notable occurrence is the growth in the mining sector of Malawi over the recent past years. The mining and quarrying sector grew at a rate of 8.5 percent in 2013 following increases in production of uranium, coal, and lime. For 2015, the growth was projected to be as high as 9 percent. The mining sector is deemed to be the fastest growing sector in Malawi (IMF, 2014). The growth might have an effect in terms of trade for Malawi since the export of these products is outside the agriculture sector.

1.2 Problem Statement and Significance of the Study

Malawi, like any other developing economy, is vulnerable to external shocks. All the shocks that affect import prices and export prices transmit to terms of trade shocks. For example, unexpected changes in the tobacco price; will affect the overall export price. The effect of terms of trade on growth is very crucial to look at especially for developing countries. Developing countries are prone to huge changes in GDP growth with small changes in terms of trade (Fatima, 2010). Studies proving the effect of terms of trade on economic growth in other economies do exist. (Kalumbu and Sheefeni (2014); Tan (2012); and Samimi, et al. (2011)) looked at effects of terms of trade on economic growth. However, even though this issue is pertinent, little has been done in Malawi regarding the effects of terms of trade on growth.

This study goes on to explore if the effect of terms of trade shocks are dependent on exchange rate regimes. Other studies that extended the analysis to include exchange rate regimes. (Broda (2004); Hoffmaister, et al. (1998); and Chia, et al. (2012)) looked at terms of trade shocks and economic performance under different exchange rate regimes. The idea is to find out if there is a difference in the way economic growth responds to terms of trade shocks in various exchange rate regimes. Essentially, the exchange rate regime that elicits relatively small responses in growth from terms of trade shocks is preferred. Therefore, there is need to find that suitable exchange rate structure that insulates the economy from terms of trade shocks for Malawi.

Even though these studies are significant, the influences of terms of trade shocks on Malawi's growth have not been studied despite their prominence on the international research forum. Vulnerability to terms of trade shocks is not good for sustainable growth (Fatima, 2010). Malawi, as a net importer, and as a primary dependent on outside supplies, is susceptible to growth alterations emanating from terms of trade shocks. Needless to say, for example, when food prices on the world market suddenly increased, terms of trade for Malawi is expected to deteriorate. The other expected sources of terms of trade shocks for Malawi are unexpected fall of the export of tobacco and unexpected rise in fuel prices. For Malawi then, this study is as important as the other growth studies that have been conducted. The absence of a study like this

is dangerous because terms of trade shocks should be countered as they can bring unsteady and undesirable growth levels. Therefore, for sustainable growth, Malawi needs the knowledge gap that this study intends to fill.

As an economy, Malawi stands out as a unique case where perhaps the potential policy gains from a study that links exogenous terms of trade shocks, the exchange rate regime, and economic growth are the highest because the country has changed its exchange rate policies frequently. It will also add knowledge as to what exchange rate regime best suit Malawi. It should be noted that this study does not use the IMF regimes classifications. This study helps add more clarity and suggest the policy framework that can best work for Malawi to cope with these shocks.

1.3 Objectives of the Study

The main objective of this study is to examine the relationship between terms of trade and economic growth under different volatility exchange rate regimes in Malawi. The specific objectives of this study are as follows:

1. To examine the relationship between terms of trade and economic growth in Malawi.
2. To assess the roles of volatility exchange rate regimes in terms of trade and economic growth.

1.4 Test Hypotheses

1. There is no relationship between terms of trade and GDP growth in Malawi.
2. The volatility exchange rate regimes do not influence terms of trade and economic growth.

1.5 Organization of the Study

The rest of the study is organized as follows; Chapter two looks at trends and patterns of economic growth, exchange rates and terms of trade. Chapter three looks at the theoretical literature on terms of trade and economic growth. It also provides empirical literature based on some studies done on this subject. Chapter four is

devoted to the presentation of the method of estimation employed in the analysis of this study. Estimation results and their empirical interpretation are presented in Chapter five. Lastly, Chapter six concludes the study and discusses the policy implications of the findings.

CHAPTER TWO

TRENDS AND PATTERNS OF ECONOMIC GROWTH, EXCHANGE RATES AND TERMS OF TRADE IN MALAWI

2.0 Introduction

The aim of this chapter is to give a contextual macroeconomic background of Malawi. It has to be pointed out that the macroeconomic background is given with a special focus on GDP growth trends, exchange rate regimes, actual movements in nominal exchange rates and terms of trade trends in Malawi.

2.1 Trends in Gross Domestic Product (GDP) Growth

Malawi has experienced fluctuating trends in its economic growth owing to both internal and external shocks. The economy is agro-based, and agriculture accounts for about 40 percent of total GDP and 80 percent of exports. The heavy reliance on agriculture makes the economy susceptible to external shocks like unfavourable weather, evidence to 2014 erratic rain and flooding (RBM, 2015) and declining terms of trade.

According to the various RBM annual papers, the growth trend in Malawi's real gross domestic product has been very inconsistent. As shown in Figure 1, before 1978, the country recorded high economic growth rates driven by tobacco and tea exports. In 1974, there was a dip in the economic performance following the oil shock of 1974.The GDP growth rate fell from 9.75 percent in 1978 to 4.40 percent in 1979 which could be attributed to the 1978 oil shocks. Due to the Mozambican civil war in the 1980s, the Nacala and Beira ports were closed. The closure had negative repercussions on Malawi's economy. The slump between 1991 and 1994 can, among other things, be attributed to the severe drought in 1991, aid withdrawal due to human

rights violations perpetrated by the one-party regime and the sudden liberalization of the economy.

In 1994, the growth declined to negative 10.24 percent, which was probably due to the transition from dictatorship government to a democratic one. The new democratic state saw to the resumption of aid and goodwill which contributed to the positive growth of 16.73 percent in 1995, the highest growth in the period considered. In years before 2007, Malawi experienced a period of very low growth rates. In 2007, the growth rates shot up high to 9.49 percent and these high rates continued to 2010. However, the growth started to decline in the year 2010 and reached its lowest in 2012 at 1.89 percent. The drop can be attributed to the exchange rate misalignments that led to the devaluation of the kwacha later in 2012. Additionally, the political atmosphere that led to major donors pulling out their support from the Malawi annual budget also contributed to the decrease in growth.

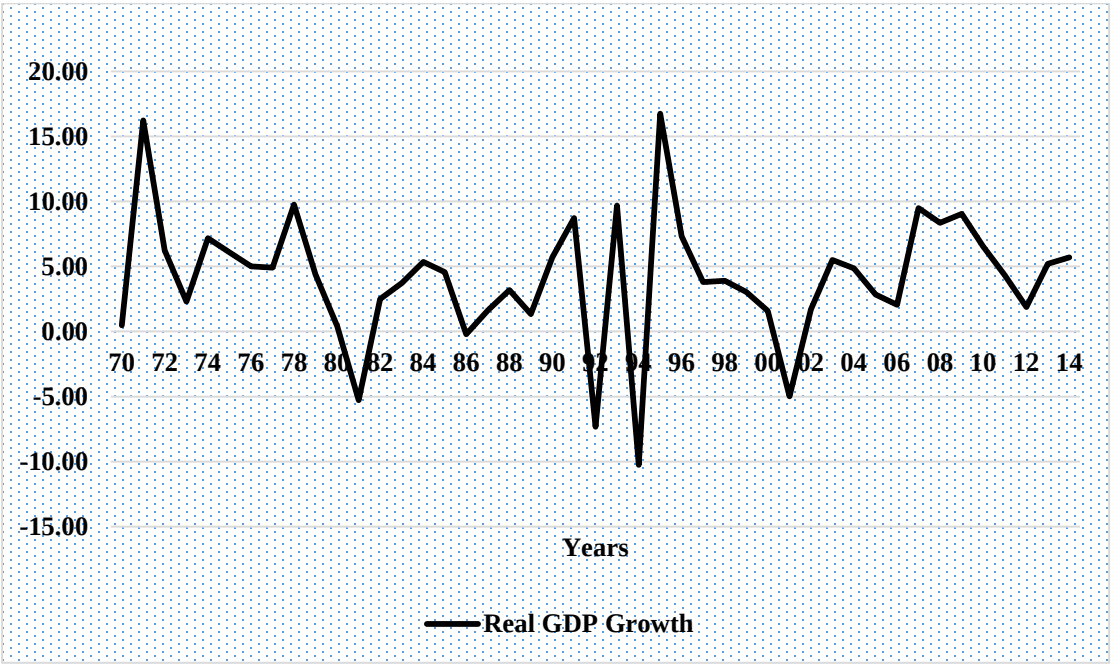

Figure 1: Real GDP Trends in Malawi

The source of data: World Development Indicators (WDI).

2.2 Exchange Rate Regimes and Nominal Exchange Rate Trends in Malawi

This section explains the different exchange rate regimes that have been implemented in Malawi over the years. As discussed in Kayira (2006) and the various IMF and RBM papers, there have been a lot of changes with regard to exchange rate regimes in Malawi.

Since independence in 1964, the government of Malawi has implemented different kinds of exchange rate regimes. In 1964, the nation adopted its own currency then known as the Malawi Pound (WMP). However, the very first exchange rate regime was a pegged exchange rate system. The MWP was pegged to the British Pound Sterling (GBP). That is, any movements in the GBP affected the MWP as well. At this point, the MWP was MWP1/GBP1 and remained the exchange rate until 1970 (IMF, 1973). In 1971, the currency was changed to be called the Malawi Kwacha (MWK), and then the exchange rate was pegged at MWK2/GBP. Due to the collapse of the Bretton Woods system (a revolutionary structure for monetary and exchange rate management established in 1944), the GBP was floated, and thus the GBP had depreciated significantly against the dollar. Consequently, the MWK went through a period of instability that negatively affected the newly organized economy. To stabilize the currency and counter effects of the fluctuations in GBP, the government of Malawi through the monetary authorities adopted a basket pegging (RBM, 1984).

At first, the Kwacha was pegged to two currencies, the GBP and the United States Dollar (USD). This arrangement went on until June 1975. In July 1975, the Kwacha was pegged to the Special Drawing Rights (SDRs) at MWK1.0541 to the SDR, after a shift by the International Monetary Fund (IMF) in the valuation of SDRs from gold and the dollar to a basket of currencies (IMF, 1977). SDRs are additional international reserve assets in regards to Bretton Woods' fixed exchange rate system which was formed by the IMF this pegging continued to January 1984. Again, this was implemented to check further fluctuations and depreciations of the Kwacha stemming from GBP depreciation.

In 1984 the Kwacha was pegged to a basket of seven currencies namely, the United States Dollar (USD), GBP, German Deutschmark, South African Rand, French Franc, Japanese Yen and the Dutch Guilder. During this time, foreign trade was expanding, and the country needed to enhance its export competitiveness. The situation led to the devaluation of the Kwacha. The devaluation was done several times in the years that kwacha was pegged to this basket of currencies (RBM, 1984). The first adjustment was done in August 1986 where the Kwacha was devalued by 10 percent, and again in February 1987 by 20 percent. Furthermore, the Kwacha was also devalued in January of 1988 by 15 percent and by 7 percent in March 1990. In March 1992, the currency was devalued by 15 percent and was later further devalued by 22 percent after misalignment problems arose. However, even though the monetary authorities tried to adjust the foreign exchanges frequently, there was a development of a parallel market for foreign exchange (IMF, 1997).

For the reason that the country had to be in line with the World Bank's Structural Adjustment Programme (SAP), the fixed exchange rate regime was abandoned in 1994. The Kwacha was then liberalized in February 1994. To support this development, an inter-bank market was immediately introduced to determine the exchange rate through supply and demand forces. The currency floatation led to the removal of exchange controls: importation was liberalized, and foreign currency denominated accounts (FCDAs) was introduced (RBM, 1996). A direct consequence of this major policy shift was a substantial depreciation of the local currency. The Kwacha sapped by 220.9 percent against the USD, moving from MWK4.5 in February 1994 to MWK15.3 as at December 1994.

During the flexible exchange rate regime, several systems that were in operation. To begin with, a two-tier auctioning system was put in place whereby the highest bidder purchased the available amount of foreign currency from the Reserve Bank of Malawi (RBM). This system was abandoned before the end of 1994 as it required many foreign exchange suppliers, which were scarce at that time. The auctioning system was replaced with managed float in 1995 (RBM, 1996). The central bank intervened in the foreign exchange market to artificially influence the rate. From 1995 through to

1997, the exchange rate was allowed to fluctuate within a given band. This was supported by foreign exchange reserves. After 1998, the band was removed and the exchange rate was calculated in a free-floating system strictly determined by market forces. This lasted up to 2003 when government reverted to the band.

From 2003 to 2012, Malawi reverted to a heavily controlled exchange rate regime with periodic rationing and as a result, there was persistently low foreign exchange reserve coverage. Since Malawi's official foreign exchange reserves were extremely low between this during period, the country experienced repeated periods of foreign exchange shortages and rationing, and large parallel market premiums. The situation also led to shortages of fuel and foreign exchange for other significant imports. In April 2012, the exchange rate was floated and this was done to collect the large exchange rate misalignments and collect for the acute shortages of foreign exchange (Matchaya, et al., 2013). The Malawi kwacha is still floated, and it has been mostly depreciating with occasional small appreciations since its liberalization (RBM, 2015). Table1presents a summary of the main events that have characterized Malawi's exchange rate history since independence in 1964.

Table 1: Exchange Rate Regimes History

Month and Year	Exchange Rate Developments
November 1964	The Central African Pound was replaced by the Malawi Pound and it was pegged with the British Pound Sterling at MWP1= GBP1.
February 1971	The government introduced a new currency, the Malawi Kwacha. It was pegged to the British pound and the USD. The peg was recalculated toMWK2 = GBP1.
June 1975	The IMF special Drawing rights (SDR) were adopted as the anchor currency. The currency was pegged at

	MWK1.054074 per SDR. This was a reaction to the volatility of the pound sterling and US dollar.
April 1982	Devaluation of the currency was employed, and the peg shifted to MWK1.21212/SDR. This amounted to 15 percent devaluation.
January 1984	Pegged to a basket of currencies composed of US dollar, British Pound, South African Rand, German Mark, Japanese Yen, French Franc, and Netherlands Guilder. There some of devaluations against the basket that followed before 1994.
February 1994	Fill in for weekly auction sessions by the central bank with an exchange interbank market. Malawi Kwacha was floated, beginning at MWK6.70/USD and an immediate depreciation followed. It weakened by more than 40 percent. By the end of 1994, the exchange rate was MWK15.30/USD
December 1997	IMF reclassified Malawi's exchange rate arrangement as managed float. Kwacha depreciated to MWK34 = US$1. Commercial banks told they were free to set foreign-exchange rates at market clearing levels. Kwacha immediately depreciated to MWK47/USD but was restricted to a

	band.
April 2000	The Exchange rate arrangement was reclassified to independent float as the central bank ceased foreign exchange intervention except to meet targets for net foreign assets and to perform seasonal smoothing of the exchange rate.
August 2003	The arrangement was restored to a managed float. This is an organization where the exchange rate was allowed to move within a given band.
April 2012 to the present	The exchange rate was floated. This was done mainly to collect for the enormous exchange rate misalignments and collect for the acute shortages of foreign exchange.

Source: Kayira (2006), Reserve Bank of Malawi and IMF papers.

Turning to nominal exchange rate movements, as can be seen in the Figure 2, the exchange rate has generally depreciated over the years. Using the symbol ▲, the graph has been marked at the time periods when there were changes in the exchange rate regimes. These markings correspond to Table 1 which explains the exchange rate regimes history. The graph shows that there are rapid exchange rate changes in the years of exchange rate regime changes.

As can be seen in the Figure 2, the nominal exchange rates for Malawi have rapidly increased from a single digit per dollar to triple digits per dollar. The trend has been upward sloping ever since the depreciation in 1994. In 2012, after the depreciation the nominal exchange rate trend has been steeply sloping depicting a continuous depreciation in the kwacha.

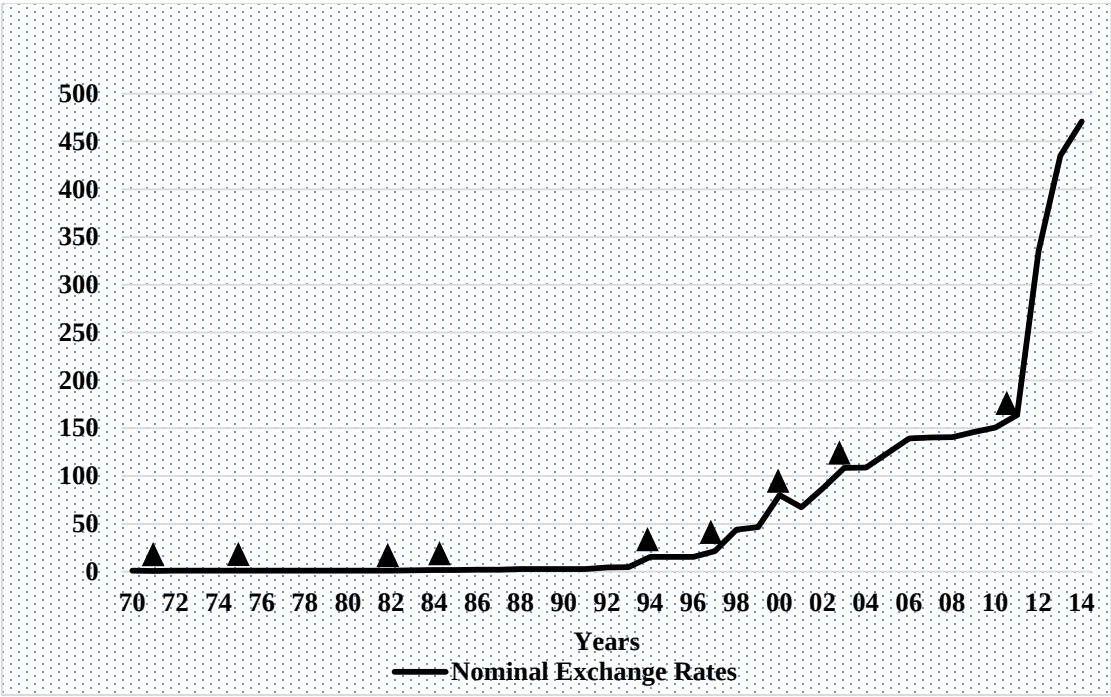

Figure 2: Nominal Exchange Rate Movements in Malawi

The source of data: WDI

2.3 Classification of Exchange Rate Regimes

As can be seen from Table 1, in Malawi, some exchange rate regimes have been short-lived than others. The government has reversed its exchange rate policies so many times that the subject of exchange rate regimes is important to the country in the economic decision-making process. At the present, the country has a free float exchange rate arrangement since 2012. The exchange rate policy changes and reversals have not served Malawi well, and some of the effects have been: high inflation; lower official foreign reserves; higher nominal exchange rate depreciations; and lower growth (Maehle, et al., 2013). However, this study does not use the reported exchange rate regimes by the authorities but uses the threshold VAR analysis to determine the exchange rate regimes for Malawi. Hence, it uses actual movements in the exchange rate to determine the regime.

Exchange rate regime classification is carried out and reported by IMF in its annual report. Initially, the classifications were based on the reported regime by the member-countries (de jure), with increasing doubts on the accuracies of these reports, now

they report verified exchange rate regimes. Following the work of Calvo and Reinhart (2002), some studies found that de jure regimes (the regimes reported by the countries) are not the same as the de facto regimes (the actual regimes operating in the countries). Levy-Yeyati and Sturzenegger (2003), Reinhart and Rogoff (2004), and Klein and Shambaugh (2008) also developed their own de facto classifications of the exchange rate regimes.

The IMF classifications are not used for two main reasons. Firstly, the IMF's conventional dejure classifications are known for their inconsistency with countries' de facto exchange rate regimes (You and Kim, 2014). That is, the reported exchange rate regimes by the IMF have been found to be different from the actual regimes being implemented in the different countries. Secondly, in the IMF classification, a fixed exchange rate is classified when a country fixes its currency to another currency, a base currency. This bilateral method used by the IMF is not an accurate way of distinguishing exchange rate regimes because the method ignores exchange rate influences of other trade partners. It is imperative to recognise that actual exchange rate movements are affected by movements in other currencies other than just the base currency.

2.4 Trends in Net Barter Terms of Trade in Malawi

Turning to terms of trade, Figure 3 shows the trends of net barter terms of trade in Malawi. The graph shows that the terms of trade for Malawi have been deteriorating in the 90's and 2000's. This indicates that Malawian exports fetch lower prices on the international market in the 90's and 2000's than in the80's. The trend also shows that there are periods of deteriorating terms of trade and periods where it improves. Nevertheless, there is a general deterioration in terms of trade over the years. In 1982, terms of trade registered 200, an improvement and the maximum observation in this case. Between the years 1978 to 1984, terms of trade registers the highest for the period in consideration. This is the only time throughout this sample period that it is seen that terms of trade are greater for Malawi. Increases in the price of exports relative to the price of imports indicate an improvement in the country's terms of trade. This implies that more exports are fetching much more value on the markets.

This improves the Balance of Payments (BOP) position, investment, and economic growth. The notion of shocks in terms of trade emanates from the fact that increases in terms of trade volatility increase risk, and discourages investment and hence affect growth.

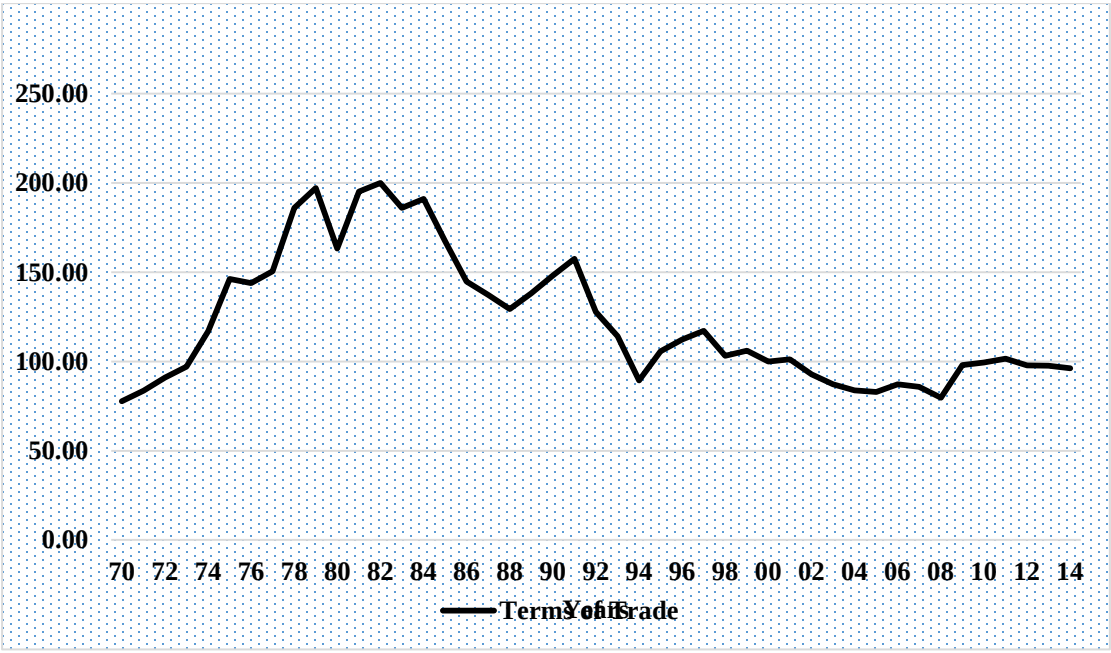

Figure 3: Net Barter Terms of Trade Trends in Malawi

Source of data: WDI

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

This chapter discusses both the theoretical and empirical aspects of the relationship between terms of trade and economic growth with a consideration of the exchange rate regimes. On the theoretical part, the study concentrates on the different theories about terms of trade and economic growth and the exchange rate regime hypothesis. On the empirical part, the study looks at a number of studies carried out on the topic, their results and implications and how this study is different.

3.1 Theoretical literature

The movements in terms of trade are as a result of movements in relative prices between imports and exports. Kent and Cashin (2003) theorized about persistence of terms of trade shocks. Theoretically, the study discusses how the duration of terms of trade shocks are important when determining just how much the terms of trade affect economic growth. It postulated that longer and persistent term of trade shock would result in even lower investment levels and also high savings because economic agents are expecting a lower output level. This study acclaims the extension to look at the persistence of terms of trade and the addition on expectations and how this alters the path of growth. The study's position gives a new dimension to the earlier 1950's work. Obstefeld (1982) also talked about persistent terms of trade and how these have a greater impact on economic growth.

Some of the first people to discuss terms of trade are Harberger, Laursen and Metzler in the 1950's. Their works were later coined the Harberger-Laursen-Metzler effect (HLME). It suggested that a shock in terms of trade of a country, specifically, a

deterioration, will result in a decrease in the income of a country or may actually increase real expenditure depending on the level of income. When this happens to maintain a customary life at a given level, consumers will increase their propensity to consume and concurrently reduce their propensity to save. This will reduce national savings and worsen the current account and hence raise the price of imports. This implies that, when there is a reduction in income, savings will be reduced because economic agents will be less thrifty and be extravagant on their consumption behavior. However, as per Sachs (1981), the HLME depends on the duration of the shock and can only be seen when the shock is temporary, a major drawback on the HLME.

The Prebisch-Singer hypothesis is another important concept in terms of trade. The hypothesis does not only talk about the effects of terms of trade on economic growth, but also hints on the differences of this effect between developed and developing countries. The theories though developed separately are all based on the assumption that there exists a long-term tendency of deterioration in the primary product exported from developing countries compared to the manufactured goods imported (Wang, 2009).These theories further propose that as time goes by, countries that export and trade raw materials will eventually be made worse because their resources start to deplete. The depletion of resources will affect terms of trade. As a result, the naturally endowed economies are likely to face a reduction in trade balances and consequently economic growth. The hypothesis is very useful to this study and in agreement with the hypothesis that tries to look at Malawi as a developing country trading in raw materials.

There are other theories that have been developed following the Prebisch-Singer hypothesis. Cashin and McDermott (2002) state that the arguments presented in the Prebisch-Singer hypothesis are accurate. It postulated that it is because of the lower income elasticity of demand for commodities that developing countries produce that they face deteriorating terms of trade. It also pointed out that the manufactured goods that the developed countries produce also face smaller productivity increases which contribute to greater gains. Other recent theorists, Gillitzer and Kearns (2005)

proposed that there is less homogeneity in the manufactured goods that industrialized countries produce than the commodities that the developing countries export. This suggested that the developed countries have more price setting powers on the international market than do the less industrialised traders. The theory also pointed out that there are fewer barriers to entry in the production of primary goods than in the finished goods. Thus, there are more downward pressures to the primary products' price. These studies are useful to the study because the prior is that Malawi as an underdeveloped country is susceptible to terms of trade shocks.

A later theory in terms of trade is the Linder theory (Krugman & Obstfeld, 2003). This theory links terms of trade and economic growth, but advocates that trade is determined by the market's demand and postulates that small economies need to open up their economies to grow. It also says that countries with similar income levels will trade with each other differentiated manufactured goods.

Additionally, Bhagwati (1958) also studied the concepts of economic growth and Terms of Trade (TT) in a concept "immiserising growth". In its proposition, the increase in output caused by technical progress and the increase in factor accumulation may make terms of trade disadvantageous to the countries which are growing (Wang, 2009). In this assertion, economic growth could actually make a country worse off than before. If the growth is heavily caused by export growth, the result will be a fall in terms of trade. The danger will be when the fall of terms of trade is so huge that it offsets the gains from economic growth. However, this situation applies and is relevant to countries that can influence prices on the world markets, unlike for a country like Malawi. The study was initially about developing countries and trade, and it later developed to this postulation. Bhagwati revealed the relevance of TT movements as a factor related to growth rates for trading countries.

The role of exchange rate in coping with external shocks also has a lot of literature. Friedman (1953) proposed that a floating exchange rate system has protecting features from external shocks while Mundell (1963), Fleming (1962) and Poole (1970), all

argue that fixed exchange rates were preferable for dealing with nominal shocks whereas floating rates were preferable for real shocks.

In the writings of Friedman, it pressed preference in the flexible exchange rate regime because of the assumption that prices are sticky, and movements in the nominal exchange rate could help insulate the economy against shocks. This idea was coined the Friedman's hypothesis. Further on, the hypothesis postulates that the exchange rate regimes that allow for high variability in their prices will have flatter adjustments of output after real shocks. Therefore, those countries with fewer movements in the exchange rate (fixed exchange rate) output fall drastically after a negative real shock because the prices only go down at the level permitted by the stickiness.

Furthermore in Friedman's hypothesis, a flexible exchange rate system shocks will automatically depreciate the currency. The depreciation will increase the domestic price of exported goods exactly when the international price of these goods has fallen and in that way partially offsets the negative effect of the shock. Also, the currency depreciation reduces real wages at exactly the time when labour demand has also fallen, a significant contribution to smother adjustments of macroeconomic variables in flexible exchange rate regimes. It can then be implied that for developing countries, Malawi included, real shocks are better dealt with by floating exchange rates regimes because of its automatic adjustment property. Hence less of the shock affects output in floating regimes. It is at the extension of Friedman's writing that this study is based. The assertion that a country's exchange rate structure can insulate an economy from such shocks is agreeable to this study.

3.2 Empirical Evidence

Empirically, there have been many studies in different countries and regionally that have investigated the relationship between terms of trade and economic growth. Some have gone on to investigate the relationship in contemplation of the exchange rate regimes. Most studies have used the IMF classification of the exchange rate regimes or have adopted augmentations of the IMF classification.

For Pakistani, Fatima (2010) looked at the impact of terms of trade on its income and consumption potentials. The study used time series data from 1990-2008.The study employed two measures of terms of trade, specifically, barter terms of trade and income terms of trade. It found that worsening terms of trade had a negative impact on economic growth of Pakistan and concluded that deteriorating terms of trade eventually leads to a reduction of the gross domestic product. Ahmad and Pentecost (2010) in looking at terms of trade shocks and economic performance under different exchange rate regimes used a structural VAR for 22 African countries between the periods 1980 to 2007. The study found that the exchange rate regime matter in how countries respond to exogenous external shocks.

Another study by Wong (2010) used a VAR method to investigate the impact terms of trade and terms of trade volatility. It conducted their study in Japan and Korea using time series data and found a positive link between terms of trade and economic growth for Japan and Korea. The results also showed that real GDP and terms of trade are jointly determined. Furthermore, an increase in terms of trade volatility was found to have decreasing effects on GDP per capita. It concluded that less volatile terms of trade are favourable for economic growth.

Tan (2012) studied international trade and economic growth in Singapore. Using data from 1965 to 2009, he used an Ordinary Least Squares (OLS) procedure to investigate the relationship between international trade and growth. The study established that terms of trade have a positive impact on economic growth in Singapore. Likewise, for Pakistani Javed, et al. (2012) looked at international trade and economic growth, it used an OLS procedure using time series date from 1973 to 2010 and found positive and significant effects of trade to economic growth.

Furthermore, Daniel, et al. (2011) also studied terms of trade and economic growth in Argentina. The study used growth accounting methods to examine this relationship for the period 1981 to 2009.It concluded that terms of trade have a crucial positive impact on Argentina's economic growth. In addition, Samimi, et al. (2011) also studied the effect of terms of trade and its volatility on economic growth. The study

employed dynamic panel data models and system Generalized Methods of Moments (GMM) on the dataset for the period 1980 to 2005. It determined that volatility in terms of trade leads to a reduction in GDP. They based their analysis on selected 20 oil exporting countries.

Hadas and Williamson (2003) examined the relationship between terms of trade and economic growth using data for the period 1870-1940. The findings were that, although terms of trade movements favour primary product exporters, it reduces their economic growth. It also found a strong disassociation between economic growths, terms of trade and exports. Hoffmaister, et al. (1998), uses data for the period 1971-1993 to analyse macroeconomic fluctuations in sub-Saharan Africa and finds that external shocks, particularly terms of trade shocks were more important in pegged countries of CFA (African financial community) zones than in non-CFA countries with more flexible exchange rate regimes.

To show the relationship between terms of trade and economic growth, Mendoza (1997) examined the impact of terms of trade on economic growth of a sample of 40 countries (9 industrial countries and 31 developing countries). The study used cross-country evidence data over the period 1971-1991. It used a stochastic endogenous growth model, and the results showed a positive correlation between the two variables and drew the conclusion that terms of trade variability have a large adverse effect on economic growth.

A study by Awel (2015) investigated the effect of terms of trade growth and its volatility on economic growth in Sub-Saharan Africa. Using data from 1985 to2010, it employed dynamic panel data models of difference and system GMM. The study used both net barter terms of trade and income terms of trade as a measure of terms of trade the results showed that the net barter terms of trade and income terms of trade growth have a positive and significant effect on economic growth. Additionally, the results proved that volatility of net barter terms of trade and income terms of trade have a negative and significant effect on economic growth.

Edward and Yeyati (2003) analyzed the effect of terms of trade shocks on economic performance under alternative exchange rate regimes. The study investigated whether terms of trade disturbances have a smaller effect on growth in countries with a flexible exchange rate regime than in countries with a more rigid exchange rate arrangement. It also analyzes whether negative and positive terms of trade shocks have asymmetric effects on growth and whether the magnitude of these asymmetries depends on the exchange rate regime. In the findings, terms of trade shocks get amplified in countries that have more rigid exchange rate regimes. It also got evidence that an asymmetric response to terms of trade shocks: the output response is larger for negative than for positive shocks. Finally, evidence is found supporting the view that, after controlling for other factors, countries with more flexible exchange rate regimes grow faster than countries with fixed exchange rates.

In another study, Cheng, et al. (2011) examined the impact of terms-of-trade and foreign interest rate shocks on key macroeconomic variables by numerically solving a Dynamic Stochastic General Equilibrium (DSGE) model of a small open economy. The study found that output responses to terms-of-trade and foreign interest rate shocks are smoother in floats than in pegs and in moving from pegs to floats. It also found that the rise in nominal exchange rate volatility is coupled by the rise in real exchange rate volatility; and in both exchange rate regimes, net foreign assets is the most volatile variable.

Broda (2004) wrote on terms of trade and exchange rate regimes in developing countries. The study looked at Friedman's hypothesis which puts an advantage often attributed to flexible exchange rate regimes over fixed regimes is their ability to insulate more effectively the economy against real shocks. It used 75 developing countries to assess whether the responses of real GDP, real exchange rates, and prices to terms-of-trade shocks differ systematically across exchange rate regimes. The results suggested that responses are significantly different across regimes in a way that supports Friedman's hypothesis. The study also examined the importance of terms-of-trade shocks in explaining the overall variance of output and prices in developing countries.

In Malawi, Munthali et al. (2010) studied the real exchange rate and growth in Malawi. The study found real effective exchange rate volatility to be adverse for economic growth. The study also looked at real exchange rates and savings, and it established that appreciation of the exchange rate would encourage saving in Malawi. However, even though the study established these significant results, it did not include the trade and its terms. This is a gap that will be filled. All in all, studies proving the role of terms of trade on economic growth and exchange rate regimes are many. However, those studies do not focus on the Malawian economy. It is in this view that a similar study is conducted in Malawi to determine the impact of terms of trade on growth.

The studies reviewed above have contributed to literature and have come up with helpful findings. However, the methods that these studies have used were thoroughly reviewed, and none of them quite suits Malawi the way threshold VAR analysis does. For one, the structural VAR model that Broda (2004) used is not fitting for Malawi because it cannot efficiently capture regime changes. This is because some regimes as reported by IMF have few time series observations than required for Malawi. For example, regimes were changed in 1994, 1997, 2000, and 2003. All these changes are less than 5years. It is defective to ignore such changes and estimate the VAR because there are just too few observations to make conclusions about a regime. Furthermore, some studies like Ahmed and Pentacost (2010) used a structural VAR and placed limitations on the short-lived regimes and this over cleaning of data can have an impact on the results found.

Another weakness with some of the studies reviewed is the use of the IMF classified exchange rate regimes which have significant shortfalls. The reports of the exchange rates are done by the particular country monetary and government officials, and the IMF adopts and classifies the regimes. It has been known that some countries report on the exchange rates that have been placed in policy but not the ones that are actually operational. Additionally, some classifications of the exchange rate regimes are not perfect. For example, an exchange rate can be regarded as a fixed exchange rate by fixing it to a base currency, say the US dollar. However, a country that also trades

heavily trades with five other countries will be affected by the movements of trade in those other countries that may alter the exchange rate. To this effect, the preference is to classify the exchange rate regimes by actual movements in the nominal exchange rates.

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This chapter presents methodological issues. Firstly, the study gives a description of the threshold VAR model. Secondly, a presentation of the specific form of the econometric models used in the study including the description of variables is made. Thirdly, the study talks about the measurement of terms of trade. Fourthly, a discussion is made on diagnostic tests that are conducted to ensure that the empirical results are reliable. Fifthly, there is a discussion innovation accounting for a TVAR. Finally, this chapter focuses on sources data and the statistical package used for analysis.

4.1 The Threshold VAR model

As a matter of background, one important assumption in regression analysis is that the variables on the right-hand side are predetermined or exogenous. However, if there is a correlation between the variables and the error term, the variables are endogenous and simple OLS gives biased and inconsistent results. To deal with endogeneity, a Vector Autoregression (VAR) Analysis is used. In a VAR model, there is no distinction between variables as endogenous or exogenous, that is, all variables are treated as endogenous (Gujarati, 2005). However, to adeptly investigate the issue of different variability exchange rate regimes, the study uses a threshold VAR model.

Threshold VAR models have been used extensively in other studies. Some use it to study the effects of certain fiscal policy and monetary policy measures which may depend on the phase of the business cycle. Others have looked at different volatility exchange rate regimes, inflation regimes and inflation pass-throughs. This study goes

beyond the ordinary VAR analysis and estimates the threshold VAR model to distinguish the effect of TT shocks on economic performance in different volatility exchange rate regimes.

The study has used the threshold VAR analysis because the observed time series may indicate that the variables of interest could be nonlinearly related. Therefore, the Threshold Vector Autoregression (TVAR) model is different from the ordinary VAR model because it estimates nonlinear relationships. The study test for the nonlinear relationships before estimation and proceeds to estimate a TVAR model only if it is established that there are indeed nonlinear relationships. The TVAR model is designed to illustrate circumstances in which the dynamic behavior of a set of random variables can be modeled by defining a limited number of linear regimes that the process can determine. That is, the TVAR is can appoint a threshold value(s) that distinguishes regimes (Hubrich, et al., 2013). A one threshold TVAR distinguishes two regimes while two thresholds TVAR distinguish three regimes and so on. Hence, a TVAR is a relatively simple and accurate way to capture possible nonlinearities such as asymmetric reactions to shocks, or the existence of multiple equilibria and the impulse response functions are no longer linear.

The existing popular exchange rate regime classifications are based on bilateral rates. A threshold VAR model was also found appropriate for this analysis because it goes beyond normal time series estimation that requires an adequate number of observations per regime. The TVAR analysis divides the data into regimes depending on the number of thresholds that it determines.In the context of Malawi, exchange rate regimes have been frequently changed. To use the IMF classification of exchange rate regimes will not provide us with adequate time series observation for analysis. This study recognizes this limitation is grim, and in trying to circumvent the issue of frequent changes in exchange rate regimes a TVAR model is estimated. Following Greene (2012) an ordinary VAR model can be defined as follows:

$$Y_t = V + \sum_{i=1} A_t Y_{t-1} + u_t \qquad (1)$$

Where Y_t is a (K×1) vector of endogenous variables. V is a vector of intercepts. Each A_t is a matrix of autoregressive coefficients. And u_t is a (K×1) dimension white noise. A TVAR model is a modification of the standard VAR model. Following Tsay (1989), threshold VAR has the following properties:

$$Y_t = V^{(j)} + \sum_{i=1} A_i^{(j)} Y_{t-1} + u_t^{(j)} \quad if \quad r_{j-1} < Z_{t-d} \leq r_j \tag{2}$$

Where *j= 1, …..k* and *d* is a positive integer. The thresholds are $-\infty = r_0 < r_1 < \ldots r_k = \infty$; for each *j*. Therefore, r_j are the thresholds that define the different regimes. Threshold VAR models assume that there exists more than one possible regime for the system. At each time *t* the regime is d fined by the value taken by the variable Z at time *t-d*, where *d* is the delay. Lastly, *Z* is the regime switching variable, in this case nominal exchange rates. This means the nominal exchange rates are determining the regimes. It can be seen that in the threshold VAR, for each regime *j* a VAR model is defined. That is, the model divides the observations into different categories and estimates a VAR model for each category. Depending on the number of thresholds determined, the model will come up with a number of regimes.

A drawback of the threshold VAR model is that is that like any other VAR model, it produces so many coefficients that are impossible to interpret as they come. Hence, one has to plot impulse response functions to be able to draw conclusions. Even though this is a weakness of the model, it also brings in a notion of sophistication because nonlinear relationship are able to be studied in their complex way by graphical illustrations.

4.2 Model Specification

The threshold VAR model helps us investigate the relationship between terms of trade and economic growth and also efficiently incorporate this relationship in different variability exchange rate regimes. The choice of the threshold variable to separate different regimes is an important empirical question. Like You and Kim (2014), the study uses the absolute value of annual percentage change in the nominal exchange rates for the threshold variable, which is obtained as:

$$S_t = 100 \times |\log(er_t) - \log(er_{t-1})| \quad (3)$$

The study estimates the VAR model as:

$$A_0 Y_t = B^1(L) Y_t + (B^2(L) Y_t) I[s_t > \gamma] + U_t \quad (4)$$

Where Y_t = (tt_t,, $gdpg_t$, er_t, cpi_t, $open_t$,$fpol_t$, , fi_t) is a column vector of stationary endogenous variables (d = (1-L)).The variables are: terms of trade *(tt*), real GDP growth (*gdp g*), nominal exchange rate *(er*) and consumer price index level (c*pi*), openness (*open$_t$)*, fiscal policy (*fpol$_t$)*, and foreign interests rates (*fi*) $u_t = (u_t^{tt}, u_t^{gdp\,g}, u_t^{er}, u_t^{cpi}, u_t^{open}, u_t^{fpol}, u_t^{fi})$ is a vector of model errors.B^1(L) and B^2(L) are polynomial matrices in the lag operator of order q = 4, and var(u_t) = Σ.I [$s_{t-d} > \gamma$] is an indicator function that equals 1 when$s_{t-d} > \gamma$, and 0 otherwise. Precisely, the absolute value of the annual percentage change in *er* would be the natural threshold variable s_{t-d} which distinguishes exchange rate regimes. If $s_{t-d}$is large enough to surpass an unknown threshold value γ; the system is in high variability exchange rate regime. Otherwise, the system is in low variability exchange rate regime.

4.3 Description and Measurement of Variables

This section gives a description and measurement issues of each variable. It also explains the relationship between the variables. The variables GDP, terms of trade and exchange rate are the core variables while Consumer Price Index (CPI), openness, fiscal policy and foreign interests rates are control variables which are related to the core variables and need to be controlled for. The variable tt stands for terms of trade, and this is capturing the terms of trade for Malawi. This variable is calculated by the ratio of the value of exports and the value of imports as done by other researchers. This study includes this variable to ascertain the effects of its changes on the economic performance of Malawi. Terms of trade are one of those external shocks that have a significant effect on economic performance (Broda, 2004). This is used to investigate the effect of its shock on growth in GDP.

Gdpg is growth in real GDP. The level of GDP is used as a measure of market size. Like other studies on growth, the growth in the market size is used to capture

economic growth (Asiedu, 2003). To capture the effect of terms of trade on economic growth or performance; the study looks at this effect on GDP growth.
Exchange rates (er) are also used in our vector autoregressive structure. Following You and Kim(2014) this variable is very important in this analysis because it is used to determine the different exchange rate regimes and the threshold variable. It is calculated as a natural log of changes in exchange rates. The study used nominal exchange rates because real effective exchange rates raise collinearity problems with terms of trade because of the way the two variables are calculated.

Lncpi is the natural logarithm of annual consumer price index calculated as the average of monthly CPI per year. A rise in the price level entails a rise in the cost of production which hinders economic growth. On the other hand, an increase in the level of GDP results in a reduction of unemployment and according to the Phillips Curve, there is a trade-off between inflation and unemployment. Therefore, an increase in the level of GDP results in an increase in the price level. Sweidan (2004) argues that the negative impact of inflation on economic growth occurs after a structural break point, below which the impact tends to be insignificant. The structural point varies across countries.

Lnopen is the natural logarithm of trade openness. The sum of exports and imports as a ratio to GDP measured in millions of kwacha acts as a proxy for openness. The degree of openness, captures policy breaks in the data. Sachs and Warner (1995) constructed this measure of openness and it is preferred in this study to capture its effect on growth. A country's level of GDP has an impact on its degree of trade openness. Rogoff (1985) explains that an unanticipated expansionary monetary policy will cause the exchange rate to depreciate, and this has repercussions on the openness of an economy. Moreover, the Mundell (1963) also argues that trade contributes to economic growth and trade increases openness.

Like Broda (2004) we control for fiscal policy, the variable *fpol* is proxied by the change in real government expenditure as a share of GDP. The study controlled for government activities that affect the analysis of this study. That is, to avoid attributing

the effects that an increase or decrease in government expenditure has on the core variables. The government of Malawi has been spending more than it collects from revenue, leading to perpetual fiscal deficits (RBM, 2015).

A control for foreign interest rates (*fi*) effects is also considered. Using nominal interest rates of the United States as a proxy, external interest rates are controlled for. This is because interest rate changes of major industrial countries have a potential impact on the output growth of developing countries. The interest rates of major countries have strong impacts on the macroeconomic performance of other countries, especially those countries that have strong trade ties (Frankel et. al, 2001; Reinhart, 2000).

4.4 Measurement of Terms of Trade

The terms of trade are a quantitative relation between two commodities traded between two countries Fatima (2010). There are three definitions of terms of trade which can be used, namely: Barter terms of trade (gross and net), Income terms of trade and Single or double factorial terms of trade. The gross barter terms of trade and the double factorial terms of trade even though they are better than the net barter terms of trade, they are relatively difficult to calculate. For this reason, this study uses the net barter terms of trade.

Following Fatima (2010), the net barter terms of trade is expressed in index form as:

(TT) = [Unit Value Index of Exports / Unit Value Index of Imports]*100 (5)

The indices are expressed with reference to a certain year as a base. In this case, the indices used the year 2000 as a base. Net barter terms of trade exhibit relationship between the prices at which a country sells its exports and the prices it pays for its imports. A rise in exports improves terms of trade, while a fall deteriorates it.

4.5 Lag Length Determination

The lag length of the endogenous variables is determined by the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). A choice is made for the best lag length by taking the lag length with the lowest AIC and BIC. This is

essential because in a VAR model where previous periods of the variables are also included, the appropriate lag inclusion is essential for correct model specification.

4.6 Time Series Properties

The estimation and hypothesis testing using time series data are based on the assumption that the variables are stationary or independent of time. A series is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the gap between the two time periods and not the actual time at which the covariance is computed (Gujarati, 2005). If they are not, the means, variances, and covariance of the time series will not be well defined. Therefore, the regression results will be spurious and the estimated coefficients will be biased. The Dickey-Fuller (ADF) test for unit root is one of the methods used to examine stationarity of the time series and also the order of integration of the variables. According to Dickey and Fuller (1979), testing for stationarity is the same as testing for the presence of a unit root.

4.7 Diagnostic Tests

Since the threshold VAR estimation analysis is a nonlinear model the following tests are conducted before estimation.

4.7.1 Linearity Test

Firstly, a test for linearity is conducted to ascertain if the relationships in the VAR structure are nonlinear. Nonlinear relationships provide the backing the estimation of the threshold vector autoregression model. To do this, a likelihood ratio (LR) test which tests the linear VAR versus the one or more threshold VAR is conducted. This test is a multivariate extension of the linearity against threshold test from Hansen (1999).The LR test statistic is written as follows:

$$LR_{01} = T(\ln(\det \hat{\sum}_{0}) - \ln(\det(\hat{\sum}_{1})) \quad (6)$$

where $\hat{\sum}_0$ is the estimated covariance matrix of the model under the null hypothesis and $\hat{\sum}_1$ is the estimated covariance matrix under the alternative. The null hypothesis of linearity (m = 1 regime) is tested against the alternative of nonlinearity (m = 2, 3 regimes).

4.7.2 Number of Regimes Test

The likelihood ratio (LR) test can also be used to test for model specification in threshold VAR analysis. It was proposed by Lo and Zivot (2001) as a multivariate extension of the linearity test of Hansen (1999). To assess which model is appropriate for the estimation, the LR test between two regimes model and three regimes model is conducted, and the one that is chosen is the one estimated. In this case, the LR test decides if there are two regimes or three regimes or more.

4.8 Innovation Accounting

For VAR models innovation accounting is used for forecasting. Specifically, impulse response functions are used. The impulse responses in linear models are symmetric in the sign and size of the structural shocks, are constant over time and are directly estimated from coefficients. Conversely, for nonlinear models as shown by Potter (1994), this is not possible because they do not have these properties. Some shocks may lead to switches between regimes, and thus their Wald decomposition does not exist. If an exchange rate shock is large enough, the system can jump into the high variability regime system. To deal with these, Koop, et al. (1996) proposed the Generalized Impulse Response Functions (GIRFs). The GIRFs are defined as the difference between the forecasted paths of variables with and without a shock to a variable of interest. The GIRFs can be presented as:

$$GIRF_y(k, \varepsilon_t, \theta_{t-1}) = E(Y_{t+k} | \varepsilon_t, \theta_{t-1}) - E(Y_{t+k} | \theta_{t-1}) \quad (7)$$

Where $Y_{t+k}$is a vector of variables at horizon k is, θ_{t-1} is the information set available before the time of shock t. This formulation implies that the impulse response

functions depend on the initial condition and that the same shocks with different signs may generate asymmetric responses.In generating the GIRFs, the right-hand side of an equation is calculated by simulating the model. The simulation is repeated 500 times, and the resulting average is the estimated GIRF and the conditions for each regime are used to generate GIRFs for both regimes. At this point, confidence intervals for the response functions are constructed.

4.9 Data Source

The study uses time series data ranging from 1970 to 2014. The data on GDP, terms of trade, openness and CPI variables was collected from annual statistics from the World Bank's WDI. The data on exchange rates, fiscal policy and foreign interest was taken from the international financial statistics of the IMF for Malawi and the United States of America. The analysis uses the statistical package R, tsDyn package by Matthieu Stigler et al. (2015) for the threshold VAR model. The various diagnostic tests and tables designs used specific addin packages.

CHAPTER FIVE

RESULTS AND INTERPRETATION

5.0 Introduction

This chapter presents and discusses the results of the descriptive, diagnostic as well as econometric analyses of the variables used for estimation of threshold VAR model. The first segment present the descriptive statistics while the following sections presents time series, diagnostic, threshold VAR analyses and innovation accounting.

5.1 Descriptive Statistics

Table 2 shows a comparison of the standard deviations of terms of trade for different countries. It indicates that Malawi has a very high standard deviation than the other countries randomly picked. Malawi and Cote d'Ivoire register standard deviations of 36.78 and 41.91respectively. While the USA has the lowest standard deviation of 4.58 and South Africa has a standard deviation of 5.85. This can attest to the fact that Malawi faces more instabilities in terms of trade and that these fluctuations might have great effects on its growth.

Table 2: Standard Deviations of Net Barter Terms of Trade

Country	SD
Malawi	36.78
Cote d'Ivoire	41.91
China	13.36
South Africa	5.85
USA	4.58

Source: author, using data from WDI

Table 3 presents a summary of the descriptive statistics of the variables used in the study. The average in terms of trade is 122.57 in the time frame considered in this study. The minimum is reported to be 77.72 while the maximum is 200.00. As per the previous findings for similar studies, high volatility in terms of trade has adverse effects for this statistic. It can be seen from the Table 3 that the standard deviation is very high for terms of trade for Malawi. This entails that there is high variability in terms of trade in between annual observations

On the other hand, the exchange rates in Malawi have been very volatile due both depreciations and appreciations of the Malawi kwacha. The exchange rate regimes as discussed earlier have been changed so many times in the period considered in this study which has had an influence on the movements of the exchange rates. It can be seen that from 1970 to 2014 the minimum exchange rate has been 0.77 while the maximum is 470.78. The standard deviation is evidence that there have been very big changes in the exchange rate over the years. The standard deviation reported is 109.71, and these are deviations from the mean of 64.32.

Overall, GDP growth has been very unstable over the years with an average of 4.11percent and a maximum and minimum of 16.73 percent and -10.24 percent respectively. This can be seen by the high standard deviation of 5.01. There are so many forces that can explain these erratic changes in growth, including terms of trade. The government of Malawi always sets out a target growth rate for the year. However, in most cases, the targets are not met and many times these shortfalls have been attributed to external shocks. For example, the main exports commodities rely on rain-fed agriculture, drought and other natural disasters disrupt production and hence growth.

Table 3: Summary Statistics of variables

	Mean	SD	Min	Max
Terms of trade	122.57	36.78	77.72	200.00
GDP growth	4.11	5.01	-10.24	16.73
Exchange rates	64.32	109.71	0.77	470.78
CPI	31.86	49.25	0.06	206.71
Openness	0.66	0.13	0.48	1.08
Fiscal policy	0.17	0.037	0.12	0.32
Foreign interest rates	7.89	3.39	3.25	18.87

Source: author, using data from WDI and International Financial Statistics.

5.2 Stationarity Test Results

As discussed earlier, it is necessary to establish stationarity of the variables to avoid spurious regression results. As shown in Table 4, the augmented Dickey-Fuller test found that the variables terms of trade and fiscal policy are stationary in levels at 5 percent. However, GDP, exchange rates, CPI, openness and foreign interest rates are found to be non-stationary in levels at both the 5 percent and 1 percent significance levels. Nevertheless, exchange rates, CPI, GDP and foreign interest rates are stationary after first differencing while openness was stationary after second differencing. Therefore, some of the variables in the system are stationary at levels. Others are integrated of order 1 while openness is integrated of order 2.

Table 4: Unit Root Test Results

Variable	P-values (levels)	P-values (1st difference)	P-Values (2nd difference)	Order of integration
Terms of trade (tt)	0.00			I(0)
GDP growth	1.00	0.00		I(1)
Exchange rates	1.00	0.00		I(1)
CPI	1.01	0.00		I(1)
Openness	0.15	0.07	0.00	I(2)
Fiscal policy	0.00			I(0)
Foreign interest rates	0.10	0.00		I(1)

5.3 Lag Length Determination

To establish the optimal lag length for the VAR model, the study employed the Akaike and Bayesian information criteria. The results are presented in Table 5. The AIC and BIC estimate the quality of each lagged model about the other lagged models. These concepts are based on the information theory that estimates the information lost to each given model. The fact is there is bound to be some information loss when a specified model is used to represent the true model. The information criterion selects the model with minimum information loss (Greene, 2012). The smallest AIC and BIC represents the least information loss. The Bayesian information criterion and the Akaike information criterion selected a lag of order 2. The study proceeds to estimate a threshold VAR of lag order 2.

Table 5: Lag Length Selection for a VAR

Lag	AIC	BIC
1	-8.62	-57,74
2	-10.14**	-65.57**
3	-8.83	-60.48
4	-6.77	-46.66

5.4 Linearity and Model Specification

Using the likelihood ratio tests, a test for linearity was conducted. The test first compares the unrestricted linear VAR against the one TVAR model. Secondly, another test for a linear VAR against a two TVAR was done. The LR test revealed that there are nonlinear relationships in the VAR model, thus rejecting the null hypotheses that there are no linear relationships. Hence, the tests allowed the study to estimate the TVAR model.

Table 6: Linearity Test

Panel A	
LR test:	Linear VAR versus 1 threshold VAR
Test	23.28
P-value	0.00
Panel B	
LR test:	Linear VAR versus 2 thresholds VAR
Test	31.89
P-value	0.00

Following the result that there are nonlinear relationships, the next step is to determine the number of regimes and an LR test is conducted. The test determines if a single threshold VAR model is superior to a two thresholds VAR model. The results

showed that the correct threshold VAR model is the one threshold VAR model. This implies that there is a single threshold value and two variability exchange rate regimes in our analysis of the Malawi economy.

Table 7: Number of Regimes Test

LR test:	Two regimes versus three regimes
Test:	12.69
P-value:	0.00

5.5 Threshold Vector Autoregression Results

After estimating the one threshold TVAR, the results found are summarised in Figure 4. The threshold variable is the nominal exchange rates in Malawi. The horizontal axis is the period in this analysis (45years).In the first panel in Figure4, the red line represents the threshold. It can be seen that the threshold variable demarcates the beginning and the end of two variability exchange rate regimes. The plot in this panel shows how unstable the exchange rates are throughout the time period in the different regimes. In this case, the best unique threshold is found at 0.20.This means, if the absolute value of the percentage change in the nominal exchange rate is less (more) than a 20 percentage point change, then the observation is considered to be in the low (high) variability exchange rate regime.

In the second panel in Figure 4, the TVAR system has ordered the exchange rate movements from the lowest variability value to the highest. Meaning, values of the nominal exchange rates occurring in the data are sorted from smallest to largest, and repeated values are removed such that each value is only represented once. In the plot, the ordered threshold variable falls in the period 17. The TVAR routine has an input “trim" that can be set by the user to specify the minimum proportion of values of the threshold variable which must belong to each of the two variability regimes. This study used a trim value of 0.1.

As can be seen in both panels in Figure4, the selected threshold value has split the whole sample into two sub-samples the low and high variability exchange rate regimes. A VAR system is estimated for the two sub-samples separately. 37.2 percent of the study period was categorized into a low variability exchange rate regime while 62.8 percent was considered to belong to the high variability exchange rate regime.

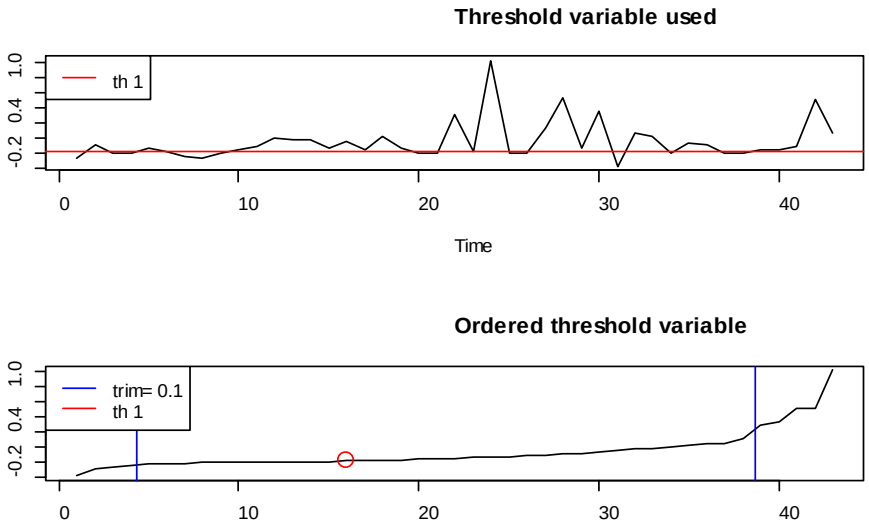

Figure 4: Summary of the Threshold VAR Output

Source: Output graphs from the TVAR using the tsDyn package in R

5.6 Innovation Accounting

For the reason that for a threshold VAR the actual coefficients are not interpreted, the study uses impulses or innovations in VARs. As discussed earlier, generalised impulse response functions are computed. The impulse response functions trace out the effects of a unitary shock of an endogenous variable on the variables in the VAR system in the current as well as previous periods.

5.6.1 Generalized Impulse Response Functions

Figures 5, 6, 7 and 8 depict generalized impulse response functions. These response functions are plotted within 95 percent confidence interval bands. The confidence interval bands show the significance of the impulse response functions. Only the

response graphs that fall within the confidence intervals and do not include zero are significant. Those that include zero and fall outside the bands are insignificant.

The first graph in Figure 5 shows the time path of GDP growth in response to a negative one standard deviation shock in terms of trade in Malawi. Initially, GDP growth does not respond to the negative shock in terms of trade. This is a deterioration in terms of trade. However, after 2 years, GDP growth begins to register a negative elasticity to the shock in terms of trade in both the low and high variability exchange rate regimes. In year 3 the response of GDP growth starts to increase and just before year 4, the response hits the point zero. This is true for both the low and high variability regimes. However, the positive response does not stay for long. In the fifth year after the shock, both the high and low variability regimes move closely to zero and the response explode in period 6 to the negative side.

The response in period 6 is more pronounced in the low variability exchange rate regime than the high variability regime. It can be seen that the responses in both regimes are jumping in the negative and positive side. It is imperative to note that not all the response mappings on the graph are significant. From year 2 to year 3 the results are significant. From period 3 to period 6 it can be seen that the confidence intervals include a zero and thus making the responses insignificant. Somewhere in year 7, slightly significant results are recorded. However, the results become significant in period 8 to the end.

Nevertheless, throughout the analysis, it can be clearly seen that the response is more prominent in the low variability regime than in the high variability exchange rate regime. At the end of the time horizon, the response of GDP growth explodes negatively. That is the negative elasticity does not die out even after 10 years. These findings support the Friedman's hypothesis that flexible exchange rate regimes can insulate more effectively the economy than can fixed exchange rate regimes. In this analysis where the threshold VAR differentiated a high variability exchange rate regime synonymous to the flexible exchange rate regime, the shocks in terms of trade

does not elicit very high responses in GDP growth as do in the low variability exchange rate regime that is similar to the fixed exchange rate regime.

These findings are also in line with Broda (2004) who tested the same for 75 developing countries using a structural VAR analysis. Cheng and Li (2011) also found that the responses of GDP are smoother in more flexible regimes than in fixed regimes.Many researchers have pointed out that the most important advantage of flexibility is that it allows the economy to buffer negative terms of trade shocks through smooth changes (depreciations) in the exchange rate. In this study, these results validate this argument.

However, other studies have found a positive relationship between terms of trade and GDP, for example, Mendoza (1997). As can be seen from the generalised impulse response functions, a negative shock of terms of trade initially stimulates a negative response in growth. However, as time goes by, the responses trace both positive and negative responses. At the end of the time horizon (10 years), an explosive negative response is recorded. In this analysis, the negative shock elicits both positive and negative responses depending on the period. Ultimately, a negative terms of trade shock results into a negative GDP growth response. This finding could be attributed to the fact that the first few years after a negative shock, the economy immediately reacts negatively then they are policy adjustments and economy agents react. Therefore, the responses jump from the negative to the positive. Furthermore, it would take some time before the accumulated effects result into a permanent negative response.

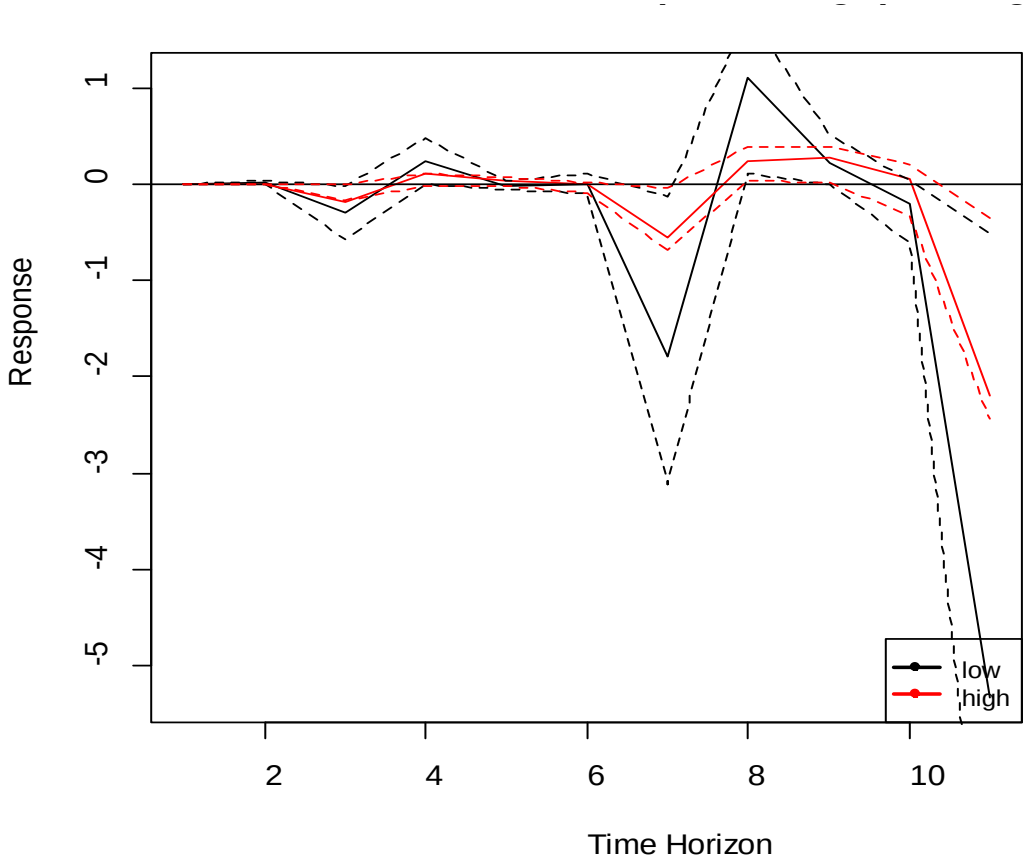

Figure 5: Response of GDP Growth to a Negative Shock of Terms of Trade
Note: Solid lines indicate the impulse response functions. The red line is a graph for the high variability exchange rate regime while the black line graph is the low variability exchange rate regime. Dashed lines are the 95 percent confidence intervals, with red corresponding to the red line graph and black dashed lines to the black line graph. The horizontal axis represents the time horizon for which the impulse response is simulated (10 years), and the vertical axis measures the magnitude of the response of GDP growth to a negative one unit terms of trade shock.

The second graph, in Figure 6 shows the responses of GDP growth to positive shocks in terms of trade in Malawi. Similar tithe one standard deviation negative terms of trade shock, a slight response in the first year is seen. A significant and positive response in GDP growth after year 2 for the low variability exchange rate regime is recorded. Even though for the high variability regime almost all the responses are insignificant, the responses are less than those of the low variability exchange rate regime. However, the responses are mostly significant for the low variability exchange rate regime.

In year 4, the positive response for the low variability regimes moves to the negative side and moves back to the positive side just before year 6. The volatility between the positive side and the negative side continues and the negative response hits very low in year 9 after the shock. Afterward, the response explodes to the negative side, and it continues after year ten. A positive shock in terms of trade eventually resulted to a positive response in GDP and the positive response is explosive.

This finding shows that just as the low variability regime is more responsive to negative terms of trade shocks; it is also more responsive to positive terms of trade shocks. The inference is that in negative terms of trade, the more flexible an exchange rate regime is, the more the insulation from the shocks. However, in terms of positive terms of trade shocks, the flexible exchange rate regime also does not respond as highly as does the low variability regime. This makes the low variability regime favourable to increasing terms of trade. Hence, Malawi will be better off with a low variability exchange rate regime where there are positive shocks in terms of trade.

However, it is to be noted that, a developing country rarely faces increasing terms of trade shocks. In the Prebisch-Singer hypothesis, the postulation is that less developed countries like Malawi produce primary commodities that face ever decreasing prices on the international market and will face continuous decreases in terms of trade. Therefore, a low variability exchange rate regime is only appropriate if and when there is an expectation of positive terms of trade shocks.

In the spirit of Edwards and Yeyati (2004), the study has looked at both positive and negative shocks and established that there are symmetrical responses of GDP to negative and positive terms of trade shocks. Similarly, our findings show that there is almost a mirror copy of the responses of GDP to a one standard deviation positive shock and to the one standard deviation negative shock. Comparing Figures 5 to 6, it can be seen that the similarity is not perfect, but it cannot be denied. It is established that for the same magnitude of shock, one standard deviation, the negative terms of trade disturbances on growth are indeed larger than those of positive shocks.

Therefore, deteriorating terms of trade shocks have a higher influence on output growth than increasing terms of trade shocks.

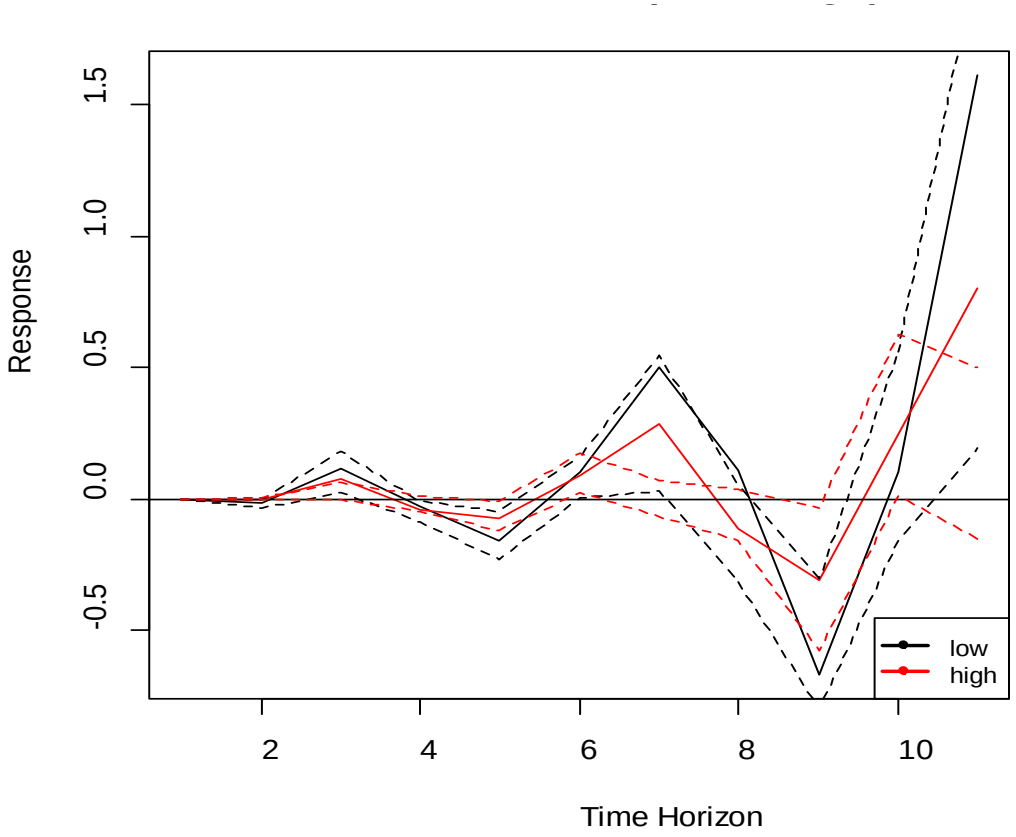

Figure 6: Response of GDP Growth to a Positive Shock of Terms of Trade

Note: Solid lines indicate the impulse response functions. The red line is a graph for the high variability exchange rate regime while the black line graph is the low variability exchange rate regime. Dashed lines are the 95 percent confidence intervals, with red corresponding to the red line graph and black dashed lines to the black line graph. The horizontal axis represents the time horizon for which the impulse response is simulated (10 years) and the vertical axis measures the magnitude of the response of GDP growth to a positive one unit terms of trade shock.

The third graph in Figure 7 shows the response of terms of trade to a negative standard deviation change in GDP growth. This analysis is done to find out if growth is important in determining a country's terms of trade. As per the graph, a slowdown in growth will start to produce a negative response in terms of trade after 1 year. For both the low variability and high variability exchanged rate regimes, the responses are significant within the 95 percent confidence bands up until year 4. At year 2, for the low variability exchange rate regime, the response increases steadily to the positive

side while for the high variability regime it starts to increase in year 4. The responses are very volatile throughout the time horizon, and they fluctuate from the positive side to the negative side.

In the ninth year after the shock, the responses of both regimes drastically fall, but low variability regimes respond faster than the high variability regime. However, the GDP growth rate of the high variability regimes drops more than that of the low variability regime. The responses after 9 years are both significant and very explosive. The lowest point of response is seen in year 10 in both the low variability exchange rate regime and the high variability exchange rate regime.

The conclusion to be drawn here is not very clear as there are instances where the both low variability exchange rate regime and the high variability exchange rate regime react more to the change. Therefore, a negative GDP growth shock provokes inconsistent reactions of terms of trade as regards to which variability exchange rate regimes reacts more.

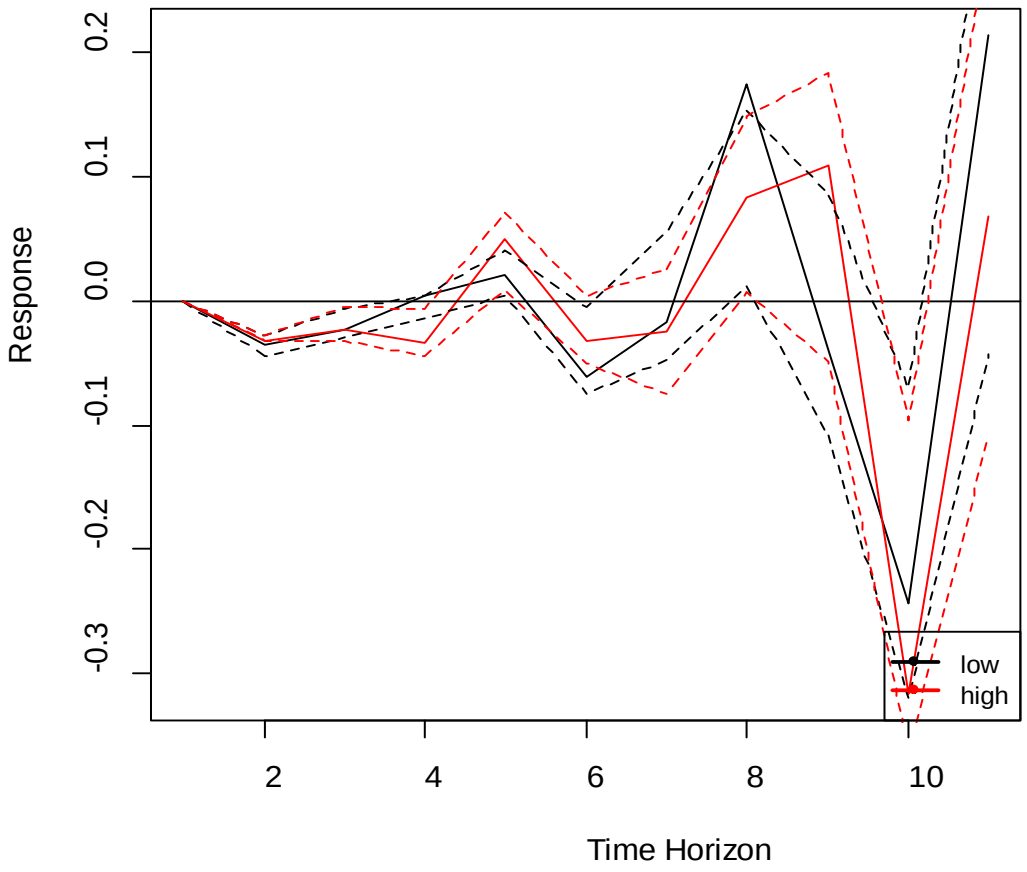

Figure 7: Response of Terms of Trade to a Negative Shock of GDP Growth

Note: Solid lines indicate the impulse response functions. The red line is a graph for the high variability exchange rate regime while the black line graph is the low variability exchange rate regime. Dashed lines are the 95 percent confidence intervals, with red corresponding to the red line graph and black dashed lines to the black line graph. The horizontal axis represents the time horizon for which the impulse response is simulated (10 years) and the vertical axis measures the magnitude of the response of terms of trade to a negative one unit GDP growth shock.

The last graph in Figure 8 shows the responses of terms of trade to a positive GDP growth shock by one standard deviation. The immediate response of terms of trade to an increase in GDP growth of one standard deviation is a positive response that is significant for both exchange rate regimes. The response is seen after 1 year for both regimes, and the responses are significant until year 4. The responses are highly volatile, and they fluctuate from the positive to the negative side and back. In year 9, the responses of terms of trade are also significant to the end of the 10 years of analysis. After 10 years, it can be seen that the positive shock in GDP growth rate has

led to a negative response in terms of trade.This revelation by the impulse response functions can prove that shocks in GDP lead to a reduction in terms of trade eventually.

The responses to positive shocks in GDP growth to terms of trade are not very consistent to draw a firm conclusion. Just like Edward and Yeyati (2004), the study finds that negative and positive shocks of the GDP growth have symmetric influences on terms of trade. As seen in Figure 7 and Figure 8, the responses are a reflection of each other. These show that there are some symmetrical properties.

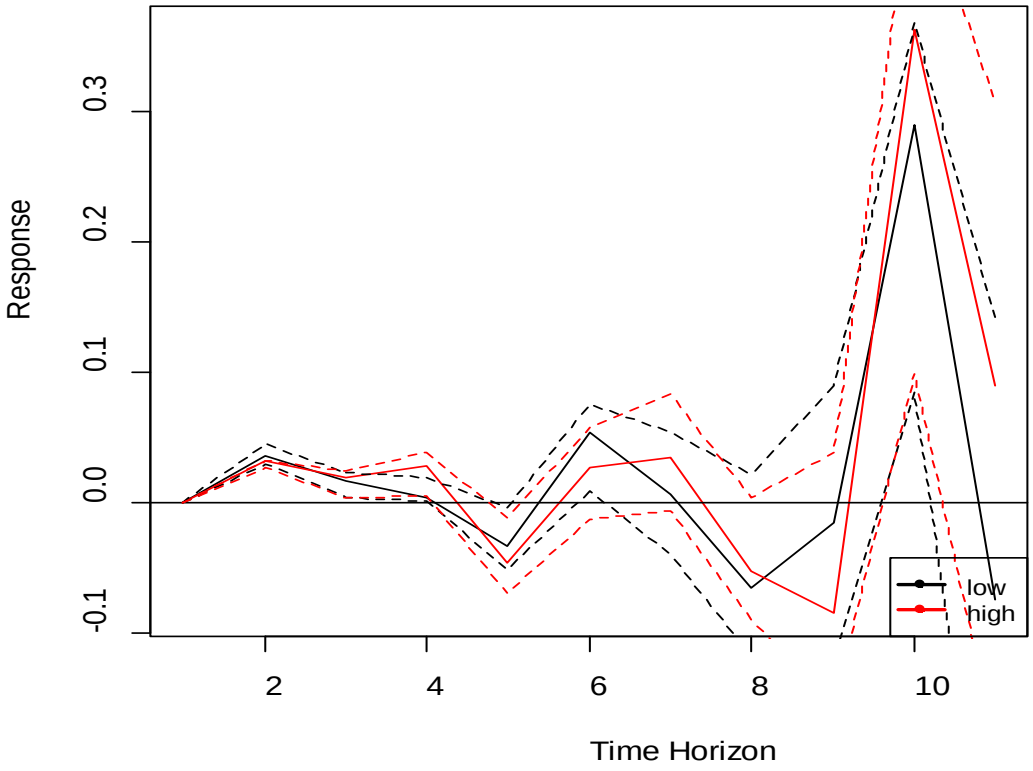

Figure 8: Response of Terms of Trade to a Positive Shock of GDP

Note: Solid lines indicate the impulse response functions. The red line is a graph for the high variability exchange rate regime while the black line graph is the low variability exchange rate regime. Dashed lines are the 95 percent confidence intervals, with red corresponding to the red line graph and black dashed lines to the black line graph. The horizontal axis represents the time horizon for which the impulse response is simulated (10 years) and the vertical axis measures the magnitude of the response of terms of trade to a positive one unit GDP growth shock.

5.7 Conclusion

This chapter has presented results after estimating a threshold VAR model that accounted for the nonlinear relationships in the VAR. The objective was to investigate the effects of terms of trade shocks on economic growth and also considered these effects in different variability exchange rate regimes. The study indicated significant results for the effects of terms of trade shocks on economic growth for most years after a shock. However, the shocks elicited both positive and negative responses in GDP growth in the 10 years of observation after a shock. It should be noted that when there are positive terms of trade shocks, a low variability exchange rate regime is appropriate foe Malawi. However as a country, it has rarely registered positive terms of shock. The underlying finding is that the effects of terms of trade of economic growth are less prevalent in high variability exchange rate regimes than in low variability regimes. High variability exchange rate regime elicits less change in output. This is because high variable exchange rates adjust to the terms of trade shocks and the effect on growth is less. In low variability the shock affects output more. Therefore, high variability exchange rate regimes are appropriate to cope with terms of trade shocks.

CHAPTER SIX

CONCLUSION AND POLICY IMPLICATIONS

6.0 Introduction

This chapter presents research conclusions and policy implications that have been drawn from this study. The first section summaries the methodology of the study and its key findings. The second section provides possible policy intervention measures that can be made by this study. The final section presents limitations and scope for future research.

6.1 Summary

This study set out to find firstly whether terms of trade shocks have an impact on economic growth and secondly if the effects of terms of trade on economic growth depend on the stability based exchange rate regimes. It used time series data from 1970-2014. The study employed a threshold VAR model to derive different volatility exchange rate regimes and investigated the relationship between the variables which are endogenous.

The analysis found that there are nonlinear relationships in the VAR model, and a threshold VAR was appropriate for modeling. The study used actual movements in nominal exchange rates to classify stability based exchange rate regimes. A two regimes threshold VAR model was found to be the correct model specification and therefore a single threshold value, 0.20, was found.

To recapitulate, it can be seen that even though the classification of the exchange rate regimes was different from the IMF classification, the high variability regime

synonymous to IMF's flexible regime had the ability to absorb shocks impacts of terms of trade. However, as per the IMF Classification, there are many exchange rate regimes that have been elaborated in chapter one. However, in this paper, those regimes have been put into on a continuum depending on the actual movements of the exchange rates. This study has established amidst all those exchange rate regimes that have been implemented; there exists a threshold that separates how responsive growth is to shocks. That is, no matter what exchange rate regime the IMF classifies, if the exchange rate changes below or above 0.20 percentage points, growth responds differently. Therefore, the study's Exchange rate regime classification cuts across the IMF classifications.

Nevertheless, these results provide further support for the hypothesis that flexible exchange rates have played a role as shock absorbers, helping countries accommodate real terms of trade shocks. This ability to accommodate these shocks appears to have been particularly important in the presence of negative external shocks. The conclusion to be drawn here is that the relation between the terms of trade and the economic growth is reliant on the period after the shock and may differ under different variability exchange rate regimes. High variability exchange rate regime elicits less change in output. This is because high variable exchange rates adjust to the terms of trade shocks and the effect on growth is less. In low variability, the shock affects output more.

6.2 Policy Implications

Based on the empirical results, it is clear that with the high variability exchange rate regime, a shock in terms of trade will not affect growth as intense as it would in a low variability exchange rate regime. Therefore, a highly variable exchange rate regime is best for Malawi to avoid high responses in GDP growth over a decline in terms of trade. This can also imply that leaving the exchange rate market free with little intervention of government and monetary authorities is good prevention measure of market failure that leads to high unstable and erratic growth rates. Therefore, more liberalised exchange rates are the best as regards to terms of trade shocks. Thus, the authorities can focus on other issues that can boost economic growth other than taking

an exchange rate protection stance that eventually leads to rapid responses to terms of trade shocks.

However, it can be seen from the results that Malawi's economic growth is vulnerable to shocks. Therefore, policy should be geared towards greater growth to move away from such vulnerabilities to external shocks. As per theory, export of manufactured goods is best to avoid such vulnerabilities. That is, as part of a long-term development strategy, it is imperative for Malawi to diversify its output and export structures for commodities and economic activities with more advantageous production and demand characteristics.

This study, therefore, contributes to the literature terms of trade and economic growth, with a consideration of exchange rate movements. It thus agrees with the Freidman's Hypotheses which has a preference for the flexible exchange rates system. In the case of Malawi, terms of trade's influence on output are more pronounced in the low variability exchange rate regime than in high variability exchange rate regime.

6.3 Limitation and Areas for Further Study

One limitation of this study is that it did not look at what is to be done and how Malawi's terms of trade can be improved. Future studies can look at how export diversification can help improve terms of trade. Furthermore, there is still potential to extend on the subject of terms of trade and look at the persistence of terms of trade shocks in Malawi. Alternatively, a distinction can be made on the sources of shock and their impacts.

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APPENDICES

Appendix A: TVAR Model Output

Best unique threshold 0.202481

Model TVAR with 1 thresholds (two regimes)	
Full sample size: 45	End sample size: 43
Number of variables: 7	Number of estimated parameters: 210 + 1

Low Variability Exchange Rate Regime

	Intercept	**er -1**	**tt -1**	**Gdp g -1**	**cpi -1**
Equation er	3.01*	-8.11*	-5.42**	-2.92**	02.65*
Equation tt	0.08	1.85*	0.96	-0.78*	-0.39
Equation gdp g	-0,51	2.65*	0.61	-0.62	-0.34
Equation cpi	0.80*	0.14	-1.02*	-1.93**	0.51*
Equation open	3.85*	-9.15*	-3.79**	-0,79	2.50**
Equation fpol	2.84**	-0.20	-4.24***	-2.34	1.76*
Equation fi	3.97**	-5.37	-1.14	-2.47	0.20
	open-1	**fpo -1**	**fi -1**	**er -2**	**tt-2**
Equation er	-4.07***	-2.76*	-0.39	0.31	2.81
Equation tt	0.77	0.66	-0.20	-0.62	-1.23
Equation gdp g	0.58*	0.26	0.04	0.41	0.30
Equation cpi	-0.29	0.74*	-0.14	-0.25	0.60
Equation open	-3.93***	-2.26*	-0.27	-0.72	1.23
Equation fpol	-2.71***	-1.75*	-0.48	0.4357	3.66*
Equation fi	-0.74	-0.86	0.42	-2.71*	-1.03
	gdp g-2	**cpi-2**	**open-2**	**fpo-2**	**fi-2**

Equation er	-2.13	-10.24**	-3.76**	-0.31	0.38
Equation tt	-1.57*	3.33*	1.13	0.01	0.37
Equation gdp g	-0.04	0.72	0.05	0.20	-0.11
Equation cpi	-2.00**	-0.77	-0.27	0.17	0.02
Equation open	-0.61	-8.75**	-3.35**	0.13	-0.31
Equation fpol	-1.83	-7.90***	-3.87***	0.88	-0.16
Equation fi	-2.74	2.13	0.6021	1.17	-0.75*

High Variability Exchange Rate Regime

	Intercept	**er -1**	**tt -1**	**Gdp g -1**	**cpi -1**
Equation er	0.10	0.01	-0.04	-0.64	-0.73
Equation tt	0.25	0.09	0.34**	-0.65*	-1.21*
Equation gdp g	0.08	0.01	-0.09*	-0.48***	0.25
Equation cpi	-0.09	0.11	0.10	-0.74*	0.21
Equation open	-0.03	0.33	0.47	0.16	-1.56*
Equation fpol	0.01	-0.16	0.12*	0.05	0.26
Equation fi	0.3971	-0.48*	-0.52	-0.377	0.97

	open-1	**fpo -1**	**fi -1**	**er -2**	**tt-2**
Equation er	0.15	0.19	0.04	0.17	0.52

Equation tt	-0.01*	0.11	-0.00	0.40*	0.15*
Equation gdp g	0.05l	0.05	-0.10	-0.02	-0.13**
Equation cpi	0.18*	0.15*	-0.03	0.15*	0.07
Equation open	-0.79**	-0.07	-0.10	-0.14	-0.09
Equation fpol	-0.15	-0.42*	0.08	-0.16	0.12
Equation fi	0.59*	0.10	1.06***	0.11	0.07
	gdp g-2	**cpi-2**	**open-2**	**fpo-2**	**fi-2**
Equation er	1.95*	-0.29	0.32	-0.52	-0.13
Equation tt	-0.79	0.49	-0.02	0.26*	0.08
Equation gdp g	0.01	-0.18	0.02	-0.04	0.13*
Equation cpi	-0.42*	0.17	0.08	0.11	0.04
Equation open	-1.19	0.67	-0.16*	-0.15	0.02
Equation fpol	0.76	-0.24	-0.32	-0.13	-0.15
Equation fi	-0.47	-0.15	0.43	0.12	-0.13

Significant codes: 0.001 '***' 0.01 '**' 0.05 *
Percentage of Observations in each regime: 37.2%, 62.8%.

Appendix B: Data Used in the Study

year	Tt	gdp g	Er	Cpi	open	fpol	fi
1970	77.72	0.48	0.83	0.06	0.63	0.16	7.91
1971	83.68	16.22	0.77	0.09	0.59	0.15	5.72
1972	90.98	6.23	0.85	0.10	0.61	0.14	5.25
1973	97.13	2.30	0.85	0.12	0.65	0.13	8.02
1974	117.01	7.18	0.84	0.18	0.67	0.14	10.80
1975	146.28	6.09	0.9	0.21	0.75	0.14	7.86
1976	143.87	5.00	0.91	0.26	0.69	0.14	6.84
1977	150.44	4.92	0.87	0.32	0.65	0.14	6.82
1978	186.08	9.75	0.81	0.36	0.64	0.17	9.06
1979	197.09	4.40	0.8	0.40	0.64	0.19	12.67
1980	163.33	0.41	0.83	0.47	0.64	0.19	15.27
1981	195.24	-5.29	0.91	0.53	0.57	0.18	18.87
1982	200.00	2.50	1.1	0.58	0.51	0.18	14.86
1983	185.96	3.72	1.3	0.66	0.49	0.16	10.79
1984	191.07	5.36	1.56	0.79	0.55	0.16	12.04
1985	167.35	4.57	1.68	0.87	0.54	0.18	9.93
1986	144.83	-0.21	1.95	0.99	0.48	0.20	8.33
1987	137.31	1.63	2.05	1.24	0.53	0.19	8.20
1988	129.33	3.18	2.54	1.67	0.56	0.16	9.32
1989	138.16	1.34	2.68	1.87	0.53	0.16	10.87
1990	148.24	5.69	2.65	2.10	0.57	0.15	10.01
1991	157.47	8.73	2.66	2.36	0.53	0.12	8.46
1992	127.78	-7.33	4.4	2.92	0.66	0.14	6.25
1993	114.12	9.69	4.49	3.59	0.48	0.13	6.00
1994	89.32	-10.24	15.3	4.83	0.91	0.32	7.14
1995	105.66	16.73	15.3	8.85	0.78	0.21	8.83
1996	112.38	7.32	15.32	12.18	0.55	0.14	8.27
1997	117.14	3.79	21.23	13.29	0.55	0.18	8.44
1998	103.09	3.90	43.88	17.24	0.71	0.15	8.35
1999	106.12	3.04	46.44	24.97	0.71	0.13	7.99
2000	100.00	1.58	80.08	32.36	0.61	0.15	9.23
2001	101.22	-4.97	67.29	39.70	0.67	0.16	6.92
2002	92.87	1.70	87.14	45.56	0.55	0.14	4.68
2003	87.22	5.50	108.57	49.92	0.67	0.12	4.12
2004	83.87	4.85	108.94	55.62	0.68	0.13	4.34
2005	82.92	2.84	123.78	64.20	0.76	0.14	6.19
2006	87.16	2.06	139.34	73.17	0.70	0.15	7.96
2007	85.72	9.49	140.32	78.99	0.69	0.13	8.05
2008	79.76	8.34	140.6	85.87	0.77	0.16	5.09

2009	97.93	9.04	146	93.10	0.64	0.20	3.25
2010	99.43	6.53	150.8	100.00	0.74	0.18	3.25
2011	101.65	4.35	163.75	107.62	0.69	0.23	3.25
2012	97.80	1.89	335.13	130.52	0.89	0.22	3.25
2013	97.64	5.20	434.96	166.12	1.08	0.23	3.25
2014	96.20	5.70	470.78	206.71	1.02	0.17	3.25