DYNAMIC EFFECTS OF EXTERNAL SHOCKS ON MALAWI'S INFLATION

MASTER OF ARTS (ECONOMICS) THESIS

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UNIVERSITY OF MALAWI

CHANCELLOR COLLEGE

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Master of Arts (Economics) Thesis

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DECLARATION

I the undersigned hereby declare that this dissertation is my own original work which has not been submitted to any other institution for any degree award. Where other people's work has been used acknowledgements have been made.

_____

Full Legal Name

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Signature

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Date

CERTIFICATE OF APPROVAL

The undersigned certify that this thesis represents the student's own work and effort and has been submitted with our approval.

Signature: _____Date:_____

Ronald Mangani, PhD (Senior Lecturer)

First Supervisor

Signature: _____Date:_____

Ben Kaluwa, PhD (Professor)

Second Supervisor

DEDICATION

I dedicate this work to Lord God Almighty who has been with me through the hills and valleys. Your amazing grace has brought me safe thus far and for a purpose. I will always lift up my eyes to the hills from where comes my help, for your love endures forever.

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To all members of my family, am grateful for the support you offered in numerous ways.

ABSTRACT

This study provides empirical evidence on the existence of a long run equilibrium relationship between inflation and its covariates in Malawi using the ARDL bounds testing approach to cointegration. The study uses monthly data for the period January, 2002 to December, 2010 and reveals that money supply, maize prices, industrial production, South Africa's inflation, and the exchange rate play a dominant role in the long run inflationary process in Malawi.

Fuel prices were found to be statistically insignificant in determining inflation in the long run, probably because of its link to the exchange rate which was the most important source of imported inflation in the short run. It is possible that in the short run, money supply may indirectly influence inflation via the exchange rate channel, an issue not investigated in the study. The study recommends that authorities in Malawi should consider adopting inflation targeting policy framework which has been successful in fighting inflation in South Africa, its main trading partner.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADMARC	Agricultural Development and Marketing Corporation
AIC	Akaike Information Criteria
ARDL	Autoregressive Distributed Lag
B-G LM	Breusch-Godfrey Lagrange Multiplier
CPI	Consumer Price Index
CUSUM	Cumulative Sum
CUSUMsq	Cumulative Sum Squares
DF-GLS	Dickey Fuller Generalized Least Squares
ECCU	Eastern and Caribbean Currency Union
ECF	Extended Credit Facility
EU	European Union
GNP	Gross National Product
IMF	International Monetary Fund
IPI	Industrial Production Index
MGDS	Malawi Growth and Development Strategy
MCTU	Malawi Congress of Trade Unions
NSO	National Statistics Office
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
OPEC	Oil and Petroleum Exporting Countries
PPP	Purchasing Power Parity
RESET	Regression Specification Error Test

SADC	Southern African Development Community
VAR	Vector Autoregression
VAT	Value Added Tax
2SLS	Two-Stage Least Squares

CHAPTER ONE

INTRODUCTION

1.0 Background

Inflation is generally defined as the continuous increase in the general price level as measured by the consumer price index or the GNP deflator (Frisch, 1977). Monetarists argue that in the long run inflation is always a result of the growth in the amount of money circulating in the domestic economy. However, in the real world, the persistent increase in the general price level is usually a result of a combination of shocks emanating from both the real and external sectors. In particular, most developing countries are highly vulnerable to external shocks. For example, during the period 2009-2012 Malawi experienced an economic crisis which was mainly reflected in persistent fuel and foreign exchange shortages. This, among other things, led to an increase in the cost of doing business which in turn led to rapid increases in consumer prices as producers raised their product prices. Thus, the increasingly high costs of production in Malawi are inflationary.

Price changes can be regarded as a measure of availability because prices tend to rise as the supply of goods and services falls in relation to demand, and they tend to fall when supply expands in relation to demand. In view of this, the Malawi government in the year 2000 established a price monitoring committee which was mandated to monitor prices so that their increases could be justified by prevailing economic conditions.

Worldwide, during the great recession (2007-2011) many countries that had strong trade links with the West experienced imported inflation as production in the Western countries declined and consumer prices rose. However, studies have revealed that Malawi's financial sector is not yet fully connected to the global financial sector and hence it was not very much affected by the global financial crisis. In fact, Malawi came out of the economic crisis with high growth rates but a weak external position (Kaluwa & Deraniyagala, 2011). The country has strong trade ties with countries that have direct trade links with the West–for example, South Africa. As such, one can argue that there have to be feedback effects on Malawi's macroeconomic variables emanating from such countries.

Most central banks around the world are so concerned with the issue of inflation and the Reserve Bank of Malawi has price stability as one of the main objectives of monetary policy. It is interesting to note that Malawi was able to reduce inflation from around 34.6 percent in 1994 to single digit in 2010. However, starting from early 2011, Malawi has been experiencing rapid increases in prices. It can be argued that Malawi's inflation started rising in July, 2011 largely because of the impact of an array of new tax measures, including a 16.5 percent value added tax (VAT) on a number of goods such as bread and milk, introduced in the 2011/12 budget. The price of bread doubled during the year 2011 mainly because of the rise in the price of wheat on the international market. This is a reflection of how vulnerable the country is to external shocks.

The inflation rate for January, 2012 stood at a double digit rate of 10.3 percent. This sharp rise in the inflation rate was attributed to the 50 percent maize price adjustment effected in December, 2011 by the country's grain marketing board, ADMARC. Food

costs account for 58.1% of the consumer price index in Malawi. The country seemed to be getting settled on the double digit seat as the headline inflation rate stood at 10.9%, 11.4% and 12.4% for February, March and April, 2012 respectively.

Authorities missed the annual average inflation rate target for 2011 set in the 2011/12 budget at 7.2 percent by 0.4 percentage points. The missing of the 2011 target meant that most of the targets set in the 2011/12 budget may also have been missed because authorities made their assumptions based on the annual average target closing at 7.2 percent. In the 2011/2012 budget, civil servants received a salary increase of only 7 percent which was below the average annual rate of inflation for the year 2011.

Since 2009, there had been pressure from the IMF on the Malawi government to devalue the Malawi Kwacha. However, the government had been reluctant to significantly devalue its currency arguing that such an action would result into high inflation. This argument can be supported by the fact that Malawi's exports and imports are not responsive to the exchange rate (Mangani, 2012). In addition, Malawi is heavily dependent on imports and has a very narrow export base which is also dominated by commodities.

1.1 Statement of the Problem

With regard to the modelling of inflation, there are two major competing schools of thought–structuralist and monetarist. The vast literature on inflation dynamics in Sub-Saharan African countries demonstrates that there is no single factor that can be taken as the major cause of inflation. Currently, Malawi is experiencing a number of economic problems and inflation is emerging to be one of the biggest challenges. High inflation

rates are generally not desired in any economy especially due to their negative effects on the welfare of certain segments of society. In fact, high levels of inflation tend to reduce real wages, make exports less attractive to foreigners, make planning more difficult as uncertainty increases, and act as a disincentive to savings.

Prices can be regarded as a measure of access because they affect the household's purchasing power. Hence, high rates of inflation imply that some segments of society would not be able to access particular commodities. This argument can be supported by the fact that during the 2011/2012 budget the Malawi government raised salaries of civil servants by a rate below the average annual rate of inflation for the year 2011.

The extent to which the Reserve Bank of Malawi has control over the inflation process and the relative efficacy of alternative monetary policy frameworks and instruments can best be uncovered by having an understanding of the forces driving and perpetuating inflation in Malawi. The rapid increases in prices pose a challenging question on whether the inflation developments in Malawi reflect a series of short-term shocks or a fundamental change in inflation generating process.

Malawi is highly dependent on imported goods, thereby making it more vulnerable to external shocks. As a matter of fact, Mangani (2011) argued that monetary authorities should be more concerned with imported cost-push inflation rather than demand-pull inflation. The study also revealed that the exchange rate was the most important variable in predicting prices. A similar study by Ngalawa & Viegi (2011) used only the exchange rate to account for movements in external factors. However, these two recent studies were

more concerned with analyzing the macroeconomic effects of monetary policy and hence did not capture much on the effects of external shocks on domestic macroeconomic variables like inflation.

Lea & Hanmer (2009) in a study on the constraints to growth in Malawi found that growth in Malawi is primarily driven by the domestic multiplier effect from export revenues. This finding further calls for the need to pay more attention to the role of the external sector on Malawi's macroeconomic variables.

Despite the presence of a consistent body of knowledge in support of the view that Malawi imports most of its inflation, most previous studies on the nature and determinants of inflation in Malawi were more inward looking and paid very little or no attention on the role of the external sector. For instance, Simwaka (2004) focused on the role of domestic real and monetary shocks, Matchaya (2010) was biased towards the role of domestic booms and recessions and Kwengere (1994) focused mainly on the role of government budget deficits.

The few available studies on inflation in Malawi mostly made use of VAR modeling framework (Ngalawa & Viegi, 2011; Mangani, 2011; Matchaya, 2010), 2SLS technique of estimation (Kwengere, 1994; Zgovu, 1994; Ndaferankhande, 2000), and the Johansen cointegration technique (Simwaka *et al.,* 2012; Ndaferankhande & Ndhlovu, 2006). However, this study adopts the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration proposed by Pesaran *et al.* (2001) which, to the best of the

author's knowledge, has never been used in the modeling of inflation in Malawi. This procedure is capable of testing for the existence of a relationship between a dependent variable and a set of independent variables when it is not known with certainty whether the variables are trend stationary or difference stationary.

This study deviates from previous studies in the sense that it focused more on the role of external factors, adopted a bounds testing approach to cointegration which has never been applied in Malawi's inflation modeling and it also used a different dataset. Despite food costs accounting for 58.1 percent of Malawi's CPI and most of the imported inflation being fuel driven, all inflation studies in Malawi conducted after the year 1994 have ignored these variables. The current study fills this knowledge gap by including maize and fuel price variables.

1.2 Objectives of the Study

In order to manage inflation, the discovery of its underlying determinants is of utmost importance. The available body of literature gives prima facie evidence that Malawi imports much of its inflation and hence, this study investigates exactly where Malawi imports most of its inflation. The main objective of this study is to model Malawi's inflation process and ascertain its stability.

1.3 Hypotheses

Received theory and empirical investigation especially in the developing world suggest that the following are reasonable hypotheses in an apt inflation model for Malawi;

- The exchange rate,
- South Africa's inflation,
- Industrial production,
- Money supply,
- Fuel prices,
- Maize prices,
- and interest rates, do not influence inflation in Malawi.

1.4 Significance of the Study

This study contributes to the modelling of inflation by focusing more on the previously ignored external sector and specifically by adopting the developed ARDL bounds testing approach which has never been used in the modeling of inflation in Malawi. The ARDL approach is particularly applicable in the presence of a disequilibrium nature of the time series data and it then becomes a more suitable modelling framework for Malawi, a country characterized by market imperfections. Taking cognizance of the fact that most of the imported inflation in Malawi is fuel-driven, the study includes a fuel price variable. In addition, the study recognizes the role of food costs (which accounts for 58.1 percent of the CPI) in driving inflation by including a maize price variable.

1.5 Organization of the Study

The rest of the paper is organized into five chapters. Chapter 2 gives a brief overview of the economy and inflationary experiences. Chapter 3 contains theoretical and empirical literature focusing on determinants of inflation. Chapter 4 outlines the methodology used in this study. Chapter 5 presents the results and discussion and the final chapter gives conclusion, policy implications and areas for further research.

CHAPTER TWO

ECONOMIC BACKGROUND AND INFLATION CONTROL IN MALAWI

2.0 Introduction

The major aim of this section is to provide a brief analysis of Malawi's economic structure and policies used to fight inflation. Emphasis is also made on demonstrating the vulnerability of the country to external shocks and analyzing inflation control strategies used in South Africa, Malawi's major trading partner.

2.1 Overview of the Economy of Malawi

Malawi is a poor country whose economy is predominantly based on rain-fed agriculture, with tobacco, sugar and tea as main export commodities. The agricultural sector accounts for more than a third of GDP and more than 90 percent of foreign exchange earnings. Production costs continue to rise amidst persistent power failures, fuel and foreign exchange shortages.

In 2005/06 the government developed the Malawi Growth and Development Strategy (MGDS) as a single strategy geared to stimulate economic growth and bring about prosperity and improve welfare of most Malawians. The overall goal was to transform the country from a predominantly importing and consuming country to being a predominantly producing and exporting country. However, the country is still a net importer despite the government's efforts to reverse the situation. A survey conducted by the World Bank in

2009 revealed that 53.4 percent of Malawian companies use foreign inputs but only 6.4 percent of their export products generate foreign exchange for use in their business sector. This means that most of the export revenue earned is used for importing raw materials.

In light of Malawi's location and huge transport costs, nearby regional markets need to be given priority in any strategy which involves using international trade as an instrument to achieve long-term development. Actually, Malawi already depends on regional sources for more than three quarters of its imports; but only about a quarter of its exports go to markets in the region. Thus, the shift towards developing countries and regional sources is more pronounced on the import side. The EU share in particular has shrunk a great deal, from a third of total imports in 1995 to less than 15 percent in 2011 (NSO, 2011).

In 2011, over 50 percent of Malawi's imports were from SADC. During the period January- June, 2011, South Africa ranked second from Canada as Malawi's major export destination and it also ranked first as Malawi's major source of imports (NSO, 2011). In 2006, 60 percent of Malawi's SADC imports were from South Africa and they were almost entirely for intermediate use (Kaluwa & Junge, 2009). South Africa is the main source for a large variety of imported final goods products, machinery and equipment as well as inputs such as fertilizers and pharmaceuticals. As such, South Africa has the largest weight in Malawi's trade weighted basket of foreign inflation and this is shown in Table 1 on page 11.

Table 1: Trade Weighted Basket of Foreign Inflation

Trading Partner	Weight
USA	0.16
ZAMBIA	0.09
UK	0.05
JAPAN	0.04
RSA	0.39
EU(excluding UK)	0.27

Source: Reserve Bank of Malawi (2011)

On the basis of the above table, it can be inferred that movements in foreign inflation are very much dictated by movements in South Africa's inflation as the country accounts for 0.39 of foreign inflation. This is also reflected in Figure 1 below.

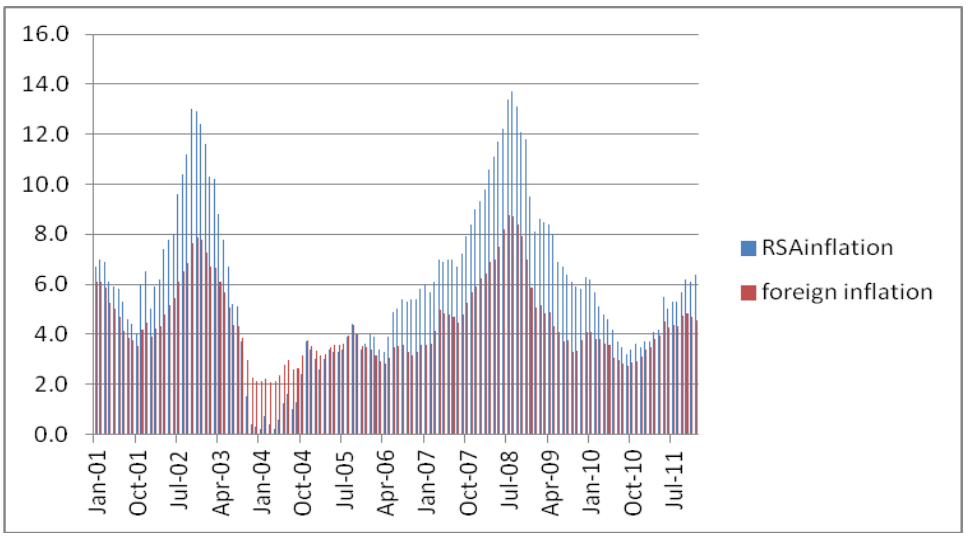


Figure 1: South Africa Inflation vs. Foreign Inflation

Since 1998 Malawi has been importing more goods from the SADC region than from COMESA. In particular, a huge proportion of SADC imports are from South Africa as shown in Table 2. This coupled with information given in Table 1, gives prima facie evidence that Malawi imports much of its inflation from South Africa.

Table 2: Malawi's Regional Trade as Percent of Total Exports/Imports

South Africa	**1998**	**1999**	**2000**	**2010**	**2011**
Exports	13.6	10.8	8.5	8.87	14.59
Imports	37.5	32.3	40.1	35.72	30.15
SADC					
Exports	16.9	16.5	16.9	26.99	32.5
Imports	58.3	47.7	52.9	58.83	51.2
COMESA					
Exports	4.0	8.3	10.4	31.2	23.9
Imports	18.9	14.4	10.2	11.74	11.25

Sources: Capricorn (2001) and National Statistics Office of Malawi. Note that the figures for 2010 and 2011 are for the period January-June

2.2 Review of Policy Frameworks Affecting Malawi's Inflation

Since independence Malawi has been adopting a number of policies to ensure price stability. Some of these policy instruments have included exchange rate and interest rate adjustments. The exchange rate policy chosen changes a country's relative price structure between tradable and non-tradable goods and ultimately the domestic price level. The nation has also undergone interest rate liberalization programmes which had implications on the inflation rate.

2.2.1 Exchange Rate Policy in Malawi

In its attempt to fight inflation, the country has attempted a number of exchange rate regimes. Malawi's exchange rate was fixed at par to the British Pound after the country attained its independence (1965-1973). From that time on, the determination of the exchange rate has evolved over time, having been pegged to the weighted average of the pound sterling and the US dollar (1973-1975), to the IMF's Special Drawing Rights (1975-1984) and to the weighted average of seven currencies (1984-1994) before adopting a managed float exchange rate regime in February, 1994. Following this, the Kwacha has been devalued several times –July 1997, August 1998 and August 2011 –before finally floating it on 15th May, 2012.

Since 2006, a de facto fixed exchange rate system was pursed in order to stabilize inflation. This regime had been successful in fighting inflation for some period until the country run out of foreign exchange reserves to defend the exchange rate in 2011.

2.2.2 Interest Rate Policy in Malawi

The basic structure of interest rates in Malawi was directly administered by the Reserve Bank of Malawi prior to July, 1987. Under this regime, the major concern was to keep interest rates low in order to reduce government expenditures and promote private investment. Little attention was paid to underlying macroeconomic conditions like inflation. In July, 1987 the lending rate was freed and commercial banks were given the freedom to set their own lending rates. In April, 1988 deposit rates were deregulated and

in August, 1988 preferential interest rates to the agricultural sector were abolished. By May, 1990 all rates became fully liberalized.

The authorities in Malawi use changes in interest rates as one of the ways of attaining the intermediate target and the ultimate objectives of monetary policy. Under this framework, interest rates are used as a policy variable and the control of inflation is the ultimate objective while the broad measure of money or exchange rate is the intermediate target. The Reserve Bank of Malawi affects the level of short-term interest rates by its discount policy which is often supplemented by open market operations in order to influence money supply (Sato, 2001).

2.3 South Africa's Inflation Control

The South African Reserve Bank regards its primary goal as the achievement and maintenance of price stability. In view of this, South Africa adopted inflation-targeting framework in February, 2000. The South African government sets the target after consultation with the central bank and the current target ranges from 3% to 6% (Hammond, 2011). Inflation first reached the target band in August 2001 but this was short-lived as the depreciation of the Rand pushed the inflation rate to 10.5% in October, 2002. Inflation was reduced gradually to below 6% in 2003 but it again crossed the 6% limit in June, 2007. From June, 2006 onward the South African Reserve Bank has followed contractionary monetary policy and yet during the same period inflation has increased from 3.9 to 8.6% in December, 2007. However, it can be said that overall South African has been successful in fighting inflation (Bonga-Bonga & Kabundi, 2008).

2.4 Recent Policy Developments in Malawi

The 2011/2012 government budget introduced a lot of measures that can be considered to be detrimental to the welfare of most Malawians. For instance, a 16.5 % value added tax (VAT) was introduced on food items. This undoubtedly negatively affected low income consumers as they tend to spend a large proportion of their income on food and producers have the tendency of pushing the tax burden to consumers through high prices. To buttress this point, a large proportion of civil servants in Malawi are junior staff and in the 2011/2012 government budget all civil servants received a pay hike of only 7 percent which was below the annual inflation rate for 2011.

The year 2011 saw Malawi getting submerged into its worst ever economic turmoil. Tobacco sales revenue drastically reduced due to the very low prices that were offered. In fact, the Tobacco Control Commission (TCC) revealed that in August 2011, Malawi had a shortfall in sales revenue of about US $100 million as compared to the revenue of 2010 and by December, 2011 total sales revenue had dropped by 30 percent.

During the same period, foreign exchange shortages were so persistent to the extent that the nation failed to import most of its basic commodities and most firms were forced to scale down their production. Worse still, the foreign exchange shortage resulted into a fuel crisis where the nation experienced prolonged shortages of the commodity. Despite repeated efforts by the IMF and the World Bank to force the country to devalue its overvalued currency as a means of resolving the crises, the Malawi government vehemently refused to adopt that policy stance. The government's argument was that

devaluing the currency would not bring in the much needed foreign exchange but rather it would result into high inflation for the heavily import dependent country.

The country's diplomatic relations also worsened during the year 2011 as it saw a lot of donors withholding their funds among others things, on condition that the government should improve its human rights record. The expulsion of the British high commissioner saw Britain, a long time bilateral donor, withdrawing its support to Malawi. Furthermore, the IMF suspended its extended credit facility (ECF), among other things, on condition that Malawi devalues its overvalued currency.

The Malawi industrial sector continues to shrink as manufacturers lay off more people in order to cut wage bills in the wake of acute foreign exchange shortages that has led to a reduction in the ability to import raw materials used for production. Empty shelves in some shops and commodity rationing have been experienced across the country. The Malawi Congress of Trade Unions (MCTU) estimated that more than 400 industrial workers were fired solely due to the foreign exchange shortage.

2.5 Trends in Inflation

The worst ever inflation rates in Malawi were experienced in the early 1990's. In 1994 inflation rate averaged 35 percent before reaching a record high of 83 percent in 1995. This was attributed to the floatation of the Kwacha in February, 1994. By the end of the year 1996 the rate had slowed down to 38 percent before slowing further to just 9.2

percent in 1997. However, this drop was fleeting as the August 1998 depreciation of the Kwacha pushed up the inflation rate of 1999 to 45 percent.

Starting from 2000 the country experienced declining trends in its inflation rate and by January 2003 the rate was at 10.66 percent. Interestingly, the country was able to achieve and sustain single digit rates starting from January 2007 where it registered a rate of 9.6 percent and in December it reached a record low of 6.3 percent. However, starting from July, 2011 the country started experiencing rising inflation. The rate for July, 2011 was 7.4 and by December, 2011 it had reached 9.8 before finally reaching the double digit seat in January and February, 2012 at 10.3 and 10.6 percent respectively. Part of this trend is demonstrated in the Figure 2 below.

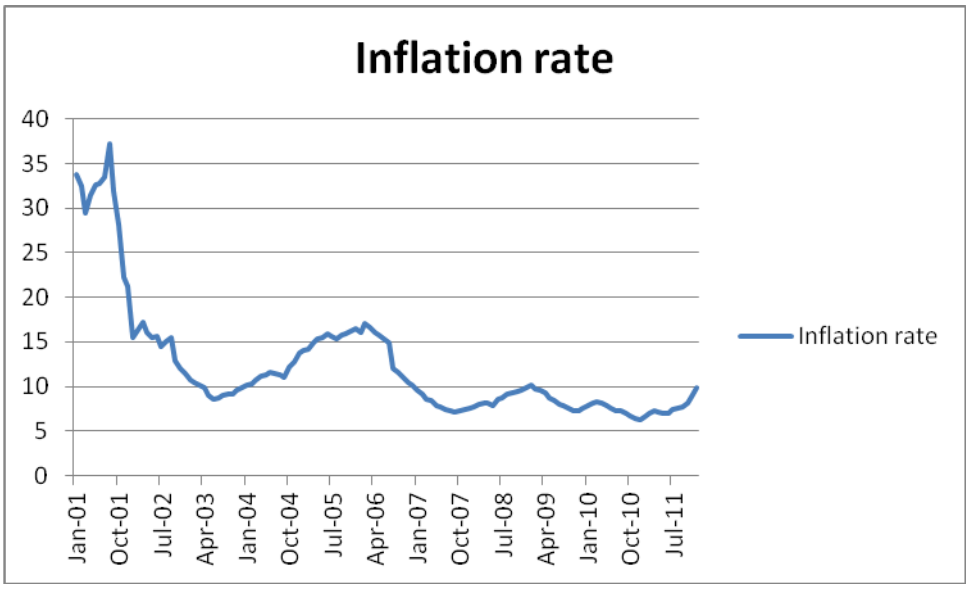


Figure 2: Trends in Malawi's Inflation (2001-2011)

2.6 Trends in Maize Prices

The price of the staple food has been experiencing seasonal fluctuations since 2000. However, between 2007 and 2009 the average price of maize hit record highs. This was accompanied by escalating rates of food inflation. Malawi's agricultural sector is heavily dependent on rains and this makes it highly prone to adverse weather conditions such as drought and floods.

As shown in Appendix 1, the major price spikes are observed in 2001/02, 2005/06, 2007/08, and 2008/09. The drought in 2001 and 2005 can be attributed to the first two episodes. However, it is more difficult to explain the price spikes of 2007/08 and 2008/09 taking cognizance of the fact that the official production statistics indicate that both years were associated with good harvests, the 2007 harvest being a historic production record (Jayne *et al.*, 2010).

2.7 Trends in International Fuel Prices

The price of petroleum products on the global market skyrocketed to alarming levels in February 2011. After closing the month of January 2011 at US$95.53 per barrel, the OPEC basket price had by 24th February, 2011 skyrocketed to US$111.01, representing an increase of 16.2 percent in a space of three weeks. There had been an increase in the political risk premium in the oil market as a result of the unrest in the Middle East. The domestic economy registered a significant draw down on foreign reserves during the year 2011 which partly reflected a rise in the cost of importation of petroleum products following the increase in oil prices on the global market.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

This chapter reviews the theoretical and empirical literature that helps in explaining the evolution of inflation. A brief discussion of the theories of inflation is followed by a critical analysis of selected empirical work on inflation from Malawi, Africa and the rest of the world.

3.1 Theoretical Review

3.1.0 Theories of Inflation

This subsection reviews the theories of inflation. Specifically, quantity theory of money, structuralists' view on inflation, Keynesian theory of inflation, the purchasing power parity theory and the role of expectations are reviewed.

3.1.1 Quantity Theory of Money

This theory states that money has a direct, proportional relationship with the general price level. In fact, the theory was proposed by monetarists and they believe that inflation is always and everywhere a monetary phenomenon – a saying coined by Milton Friedman. The monetarists argue that inflation is a result of too much money chasing too few goods. The quantity theory of money is attributed to Irving Fisher but has its origins in the

equation of exchange as proposed by John Stuart Mill (Laidler, 1985). The equation of exchange relates the money supply to the value of money transactions and is stated as

$$MV_T = P_T T \tag{1}$$

In equation (1), M represents the total amount of money in circulation in an economy, V_T represents the transactions velocity of money or the number of times money changes hands in an economy. It is also an indicator of the availability of financial institutions. P_T represents the price level associated with the transactions in the economy for the period under study while T is an index of the real value of aggregate transactions. Since data may not be available for all transactions and with the development of national income accounting systems, emphasis shifted from gross transactions to national-income or final-product transactions. This is where the quantity theory of money was built and is presented as

$$MV = PY \tag{2}$$

In this case, V captures the velocity of money with respect to final expenditures and Y is a measure of real output. The monetarists believe that velocity of money (V) and real output (Y) are exogenously fixed. Equation (2) can be re-written in growth form as

$$d\ln(M) + d\ln(V) = d\ln(P) + d\ln(Y) \tag{3}$$

This reduces to

$$d\ln(P) = d\ln(M) + d\ln(V) - d\ln(Y) \tag{4}$$

which further reduces to

$$d\ln(P) = d\ln(M) \tag{5}$$

$d\ln(V)$ and $d\ln(Y)$ collapse to zero since velocity and money supply are assumed to be fixed. Equation (5) states that the rate of inflation, $d\ln(P)$, is exactly equal to the growth rate in the stock of money, $d\ln(M)$.

3.1.2 Structuralists' View of Inflation

Structuralists emphasize supply-side factors as determinants of inflation. Their views on inflation emerged in the 1950's as part of the structuralists' theories of development promoted by Prebisch. Structuralists view inflation as being driven by developments and bottlenecks on the real side of the economy. In fact, food prices, wages and import prices are considered sources of inflation. Structuralist models assume that such factors have to be accommodated by monetary policy makers because they are determined outside the monetary sphere. Monetary developments in themselves are given little importance as independent determinants of inflation.

Structuralism is an approach to economics that emphasizes the importance of taking into account structural features when undertaking economic analysis. Early structuralist models emphasized both internal and external disequilibria arising from the productive structure and its interactions with the dependent relationship developing countries had with the developed world. The alleged declining terms of trade of the developing countries as stressed in the Prebisch-Singer hypothesis played a crucial role in this theory. Dutt & Ros (2003) argued that structuralist economists try to identify specific rigidities, lags as well as other characteristics of the structure of developing countries in order to assess the way economies adjust and their responsiveness to development policies.

Structuralist inflation theorists coined the term *inertial inflation* which refers to a situation where all prices in an economy are continuously adjusted with relation to a price index by force of contracts. This is to say that changes of price indices trigger changes of prices of goods which in turn results in the process of indexation. This is where contracts are made to accommodate such a price-changing scenario. In a nutshell, economic agents make use of current inflation as a basis for future inflation- they adjust prices solely on the basis of their expectations of future inflation (Arestis & Sawyer, 2003).

Structuralists believe that inflation cannot be described as a full employment phenomenon, neither is it a monetary phenomenon but rather, inflation is fundamentally a structural problem arising from structural imbalances or bottlenecks in the economy. These imbalances are reflected in inelastic agricultural production, structural bottlenecks in the foreign exchange sector and structural imbalances in government revenue.

3.1.3 Keynesian Theory of Inflation

According to Keynes, inflation can be caused by an increase in demand and/or an increase in cost, respectively termed as demand-pull and cost-push inflation. Demand-pull inflation is a situation where aggregate demand persistently exceeds aggregate supply when the economy is near or at full employment. Aggregate demand could rise because of several reasons; (1) a cut in personal income tax would increase disposable income and result into a rise in consumer expenditure, (2) a reduction in the interest rate may stimulate investment, (3) a rise in foreigners' income may lead to an increase in exports of a country, and (4) an expansion of government spending financed by borrowing from the banking system. All these result in an increase in aggregate demand which, if persistent, results in

inflation. Thus, demand-pull inflation is caused by excess demand, which can originate from high consumer spending, high exports, strong investment, rise in money supply or government financing its spending by borrowing.

Keynesian theory of cost-push inflation attributes the basic cause of inflation to supply side factors. This means that according to the theory, rising production costs lead to inflation through firms passing on the higher costs to consumers in the form of higher prices. In turn, workers will demand higher wages which would result in rising aggregate demand which eventually fuels inflation once again. The process continues as prices in the product market and factor market are being pulled upwards. The cost-push inflation is usually regarded as being primarily a wage inflation process because wages usually constitute the greater part of total costs. However, this process requires the presence of powerful trade unions that persistently negotiate wage increases. In addition to wages, an increase in the price of oil and many other basic inputs or even semi-manufactured goods used as component parts in the production process would result in cost push inflation.

Furthermore, cost-push inflation may occur when there is a depreciation of the home currency. A depreciation of a country's currency results in increases in the price of say, imported raw materials and capital equipment which then results in a rise in production costs.

3.1.4 Purchasing Power Parity Theory and Inflation

Purchasing power parity (PPP) is a condition between countries where an amount of money has the same purchasing power in different countries. The movements of prices of

the goods between the countries would only reflect the exchange rate movements. The concept is based on the law of one price where in the absence of transaction costs and official trade barriers, identical goods will have the same price in different markets when the prices are expressed in the same currency. Another interpretation of this theory is that the difference in the rate of change in prices at home and abroad-the difference in the inflation rates-is equal to the percentage depreciation or appreciation of the exchange rate. Although it may seem as if the PPP theory and the law of one price are the same, there is a difference in that the law of one price applies to individual commodities whereas the PPP theory applies to the general price level.

3.1.5 The Role of Expectations in Inflation

The expectations of private economic agents about future inflation play a significant role in determining current inflation. In earlier models, expectations were implicitly captured via the lags of inflation which proxied for an autoregressive or adaptive expectations process. Thus, the expected inflation rate is captured as a weighted average of previous actual and expected prices. However, in more recent models, private economic agents form rational expectations of future inflation (Fuhrer & Olivei, 2010). For example, in the New Keynesian Phillips curve, current inflation depends on the rational expectation of next period's inflation as well as on the current value of an output gap.

3.2 Empirical Literature

The available empirical work on the nature of inflation is too numerous to mention in this study. On this basis, this study only reviews empirical studies that benefit it through their emphasis on the role of external shocks or specifically through an application of the

ARDL bounds testing approach in their analysis of inflation. However, no study on inflation in Malawi has ever used the bounds testing approach and little attention has been paid on the role of external shocks.

3.2.1 Studies in Malawi

Simwaka *et al.* (2012) focused on the role of money supply in determining inflation in Malawi. The study revealed that money supply growth drives inflation with lags of about 3 to 6 months, the exchange rate adjustments play a relatively crucial role in fuelling cost push inflation, and slumps in production also fuel inflation. The study applied the Johansen cointegration approach.

Mangani (2011) examined the effects of monetary policy on prices in Malawi by tracing channels of its transmission mechanism within the environment of VAR modeling. The study found out that the exchange rate was the most important variable in predicting prices and recommended that authorities should be more concerned with imported cost-push inflation rather than demand pull-inflation. Ngalawa & Viegi (2011) conducted a similar study on the dynamic effects of monetary policy shocks in Malawi using innovation accounting in a structural VAR model. The study revealed that the bank rate is a more effective measure of monetary policy than reserve money. The study only used the exchange rate to account for movements in the external sector.

Matchaya (2010) examined the sources of inflation in Malawi since early 70's up to early 2000's using a VAR model. The study revealed that money supply, exchange rate, past values of inflation, recessions and booms were main determinants of inflation. It was

further revealed that there was a clear differential impact between recessions and booms on inflation with the impact of recessions being more pronounced.

Ndaferankhande & Ndhlovu (2006) used monthly data from 1980-2002 and employed an eclectic model of inflation which revealed that outbreaks of inflation embody both the structuralists and monetarists views of inflation. Inflation had a long memory and the study argued that the high inflation inertia is an indication that the central bank can contribute to stabilizing exchange rate expectations by committing to an inflation target.

A study by Simwaka (2004) on the inflationary process in Malawi, conducted in a VAR modeling framework, revealed that inflation in Malawi is a result of both real and monetary shocks to the economy. In particular, it was revealed that current slumps in production generate inflationary pressures.

Ndaferankhande (2000) found that money supply, nominal wages and salaries, exchange rate, treasury bill rate, and price deregulation were the major determinants of the inflationary experiences in Malawi. The inclusion of nominal wages and salaries was based on the structuralist inflation theorists' argument that their increase tends to increase the cost of production by firms and in turn result in rising prices.

Potani (1997) estimated an adaptation of Ditakal and Kandil's monetary model of inflation. To investigate the long-run relationship between the inflation rate and its determinants, the study employed a distributed lag model which provided support for the

monetarist view of inflation. It was also revealed that foreign inflation is imported through the import price, foreign interest rate, and the real exchange rate.

Kwengere (1994) applied the 2SLS method of estimation and established that money supply and inflation are linked in a two-way relationship. The study also revealed that government deficit increases money supply which in turn increases the price level. The Aghevli-Khan model was used as a basis for simulation analysis (Aghevli & Khan, 1978).

Zgovu (1994) investigated the impact of growth of money wages and salaries on inflation in Malawi. The study employed a simultaneous equation approach and established the presence of bicausality between growth in money wages and salaries and inflation. lt was revealed that inflation is also caused by prices of imports, transport costs of imported goods and price deregulation.

Despite finding evidence that Malawi imports much of its inflation, the studies by Mangani (2011) and Ngalawa & Viegi (2011) did not reveal exactly where Malawi's inflation is imported. The studies only focused on tracing the transmission mechanism of monetary policy and had the exchange rate as the only external shocks variable. Potani (1997) and Zgovu (1994) provide evidence of imported inflation in Malawi via import prices, foreign interest rate and the real exchange rate but these studies are outdated.

Additionally, most of the studies on Malawi's inflation were centered more on demand-pull inflation. For example, Simwaka *et al.* (2012), Matchaya (2010),

Ndaferankhande (2006), Simwaka (2004), Kwengere (1994), and Zgovu (1994) centered on money supply, business cycles, inflation inertia, real and monetary shocks, government deficits, and money wages respectively. Kwengere (1994) argued that Malawi was so vulnerable to external shocks like civil war in Mozambique, lower export prices and sharp increases in oil prices and yet no attempt was made to include a variable that would capture the influence of such external shocks on inflation.

In addition to differences in model specification, the current study also differs from the previous studies in the modeling framework adopted. Ndaferankhande (2000), Kwengere (1994), and Zgovu (1994) made use of 2SLS estimation technique while studies by Matchaya (2011), Mangani (2011), Ngalawa & Viegi (2011), and Simwaka (2004) were conducted in a VAR environment. Despite the variations in modeling frameworks, all studies in Malawi are unanimous in finding money growth among the most important variables in determining inflation. The current study adopts the ARDL bounds testing approach proposed by Pesaran *et al.* (2001) and also recognizes the role played by maize and fuel prices, critical variables which have been ignored by most previous studies.

As if this is not enough, most of the available studies are outdated. For instance, Ndaferankhande (2006), Ndaferankhande (2000), Potani (1997), Kwengere (1994), and Zgovu (1994) made use of data from 1980-2002, 1970-1998, 1965-1995, 1970-92, and 1972-1992 respectively. The study fills the time gap that exists by using a different dataset since there could have been changes in the inflation generation process.

3.2.2 Selected Studies from Africa

Odhiambo (2011) conducted a study on inflation dynamics and economic growth in Tanzania using the ARDL bounds testing approach. The study revealed a unique cointegrating relationship among inflation, investment and economic growth. Furthermore, a distinct unidirectional causal flow from inflation to economic growth, without any feedback relationship was revealed.

Adu & Marbuah (2011) using the bounds testing approach revealed that real output, nominal exchange rate, broad money supply, nominal interest rate, and fiscal deficit played a dominant role in the inflationary process in Ghana. The strongest impact on inflation was seen to emanate from output growth and hence the study recommended targeting supply-side constraints.

Using an ARDL modeling framework, McIndoe (2009) conducted a study on hyperinflation in Zimbabwe and revealed that prices in Zimbabwe are driven by increases in money supply rather than by changes in price setting behaviour. Since real money balances were found to be cointegrated with inflation, the study used the estimated inflation elasticity to estimate the maximum amount of seigniorage that could be raised.

Enoma (2011) in a study on the relationship between exchange rate depreciation and inflation in Nigeria applied the ARDL cointegration approach proposed by Pesaran *et al.* (2001). It was revealed that the exchange rate depreciation, money supply and real GDP were the main determinants of inflation.

Ziramba (2008) applied the bounds testing approach in modeling South Africa's inflation. The study applied three models of inflation involving money supply and bank credit components all of which confirmed presence of cointegration. The major causes of inflation were import prices, real income, and final consumption expenditure.

Durevall & Ndung'u (1999) investigated the dynamics of inflation in Kenya and it was revealed that exchange rate, foreign prices, and terms of trade had long run effects on inflation while, the money supply and interest rate only had short run effects. Using an ECM, the study failed to find evidence that excess money supply affects inflation in the long run in the way implied by monetarist models.

The finding by Durevall & Ndung'u (1999) that money supply plays a relatively insignificant role in determining inflation is in sharp contrast with most of the studies in Malawi. For example, Simwaka *et al.* (2012), Matchaya (2010), Ndaferankhande (2000), and Potani (1997) were in full support of the monetarist model of inflation.

3.2.3 Selected Studies from the rest of the World

Wahid *et al.* (2011) applied an ARDL bounds testing approach in modeling inflation in Bangladesh. The study examined the impact of inflation on financial development and it was revealed that high trends of inflation impede the performance of financial markets.

Erbaykal & Okuyan (2008) examined the relationship between inflation and economic growth in Turkey. The cointegration procedure was done using the ARDL bounds test

developed by Pesaran *et al*. (2001) and there was no statistically significant long term relationship but a negative and statistically significant short term relationship was found. The causality relationship between inflation and economic growth was tested using a framework developed in 1995 by Toda Yamamoto. A unidirectional causality from inflation to economic growth was revealed.

Peker & Mercan (2011) analyzed the inflationary effect of price increases in oil products in Turkey and applied the ARDL bounds testing approach developed by Pesaran *et al*. (2001). In the long term analysis, the inflationary effect of price increases of oil products was found to be positive and statistically significant.

Yeh & Chi (2009) analyzed the relationship between inflation and real stock returns in 12 OECD countries. The results support the existence of an inverse co-movement and long run relationship between these variables. Using ARDL bounds testing approach, an increase in inflation was found to depress real stock prices.

A study on inflation dynamics in Eastern and Caribbean Currency Union (ECCU) by Hodge & Riley (2008) applied both the ARDL bounds testing approach to cointegration proposed by Pesaran *et al*. (2001) and a structural VAR. It was revealed that the US CPI and oil prices were the most significant influences on the ECCU inflation rate. Results from the ECM revealed that shocks to inflation were short-lived.

A number of the above studies confirm the significant role played by oil prices, exchange rate and money supply. These support findings by Mangani (2011), Ngalawa & Viegi (2011), and Potani (1997) that the exchange rate and money supply are important variables in determining inflation in Malawi. However, some of the critical variables that generate inflation may differ across regions. For example, food prices may have an insignificant effect on inflation rate in the developed world and that is why most studies excluded this variable. However, in poor countries like Malawi food costs account for very large components of the CPI and it is essential that they be considered in modeling inflation.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.0 Introduction

This chapter presents the tools of analysis employed in this study. It also describes the data used in the study and the methods of analyzing them. The methodology is in general motivated by the reviewed literature and the nature of data that is available.

4.1 The Model

The specification of the model is based on a combination of the money demand function and a modified purchasing power parity (PPP) equation. This is based on the fact that monetarist models focus mainly on demand-pull inflation and do not capture cost-push inflation. The general real money demand function is expressed as

$$\frac{M^d}{P} = f(Y, r) \tag{6}$$

Equation (6) states that real money demand is a function of real output, Y, and interest rate, r. Money market equilibrium requires that real money demand equals real money supply. The domestic monetary equilibrium condition is specified with a fixed nominal money supply $(\overline{M})$ as shown in equation (7) below

$$\frac{M^d}{P} = \frac{\overline{M}}{P} \tag{7}$$

Expressed as a long run log-linear equation, in equilibrium terms the real money demand function can be restated as

$$m - p = \alpha_1 y + \alpha_2 r \tag{8}$$

where m now represents the log of money stock, p is the log of general price level, y is the log of real output, and r is the log of interest rate.

The standard formulation of the purchasing power parity (PPP) theory expressed in log form is given as

$$p = e + p^f \tag{9}$$

where p represents the log of domestic price level, e represents the log of the nominal exchange rate and p^f stands for the log of foreign prices. However, the standard formulation of the PPP theory does not provide a full description of domestic price dynamics. For instance, the theory excludes non-traded goods. Hence, two variables, fuel price (p^F) and maize price (p^M), are added in their log forms to equation (9) to get

$$p = e + p^f + p^F + p^M \tag{10}$$

The long run equations (8) and (10) can be combined to solve for the general price level. Then the log of the domestic price level would be a function of all the other variables (thus, $p = f(m, y, r, e, p^F, p^M, p^f)$) and this yields a monetarist-structuralist inflation model that can be specified as

$$p = \alpha_0 m + \alpha_1 y + \alpha_2 r + \alpha_3 e + \alpha_4 p^F + \alpha_5 p^M + \alpha_6 p^f + \mu \tag{11}$$

In order to test for the existence of the long run linear relationship stated in equation (11), the study applied the bounds testing approach within the ARDL environment as proposed by Pesaran *et al.* (2001). This approach to cointegration is capable of testing for the existence of a relationship between variables irrespective of whether the underlying regressors are purely I(0), purely I(1) or mutually cointegrated. Furthermore, the procedure is more appropriate for estimation in small sample studies whereas the Engle-Granger and Johansen's cointegration procedures are not reliable for relatively small samples (Pesaran & Shin, 1999). Moreover, the results of these other cointegration tests largely depend on the choice of optimal lag length, which cannot be conclusively determined. Furthermore, the ARDL cointegration procedure provides unbiased estimates of the long run model and valid t-statistics even when some of the regressors are endogenous. These are the reasons why the study chose this approach and with respect to equation (11), the ARDL framework for the inflation model based on Pesaran *et al.* (2001) was specified as

$$\begin{aligned}\Delta p_t = {} & \alpha_0 + \sum_{i=1}^{k} \rho_i \Delta p_{t-i} + \sum_{i=1}^{k} \delta_i \Delta m_{t-i} + \sum_{i=1}^{k} \pi_i \Delta y_{t-i} + \sum_{i=1}^{k} \beta_i \Delta r_{t-i} + \sum_{i=1}^{k} \varphi_i \Delta e_{t-i} + \\ & \sum_{i=1}^{k} \eta_i \Delta p^F{}_{t-i} + \sum_{i=1}^{k} \lambda_i \Delta p^M{}_{t-i} + \sum_{i=1}^{k} \Lambda_i \Delta p^f{}_{t-i} + \Omega_1 p_{t-1} + \Omega_2 m_{t-1} + \Omega_3 y_{t-1} \\ & + \Omega_4 r_{t-1} + \Omega_5 e_{t-1} + \Omega_6 p^F{}_{t-1} + \Omega_7 p^M{}_{t-1} + \Omega_8 p^f{}_{t-1} + \varepsilon_t\end{aligned} \tag{12}$$

where ε_t is a white noise error term, Δ is the first difference operator, k is the optimal lag length, α_0 is the intercept and the rest of the variables are as defined in equations (8), (9) and (10) . By incorporating the short run dynamics, the above procedure accounts for the adjustment path towards the long run. In fact, this approach provides joint estimates of the

short-run and long-run effects of the regressors (Mangani, 2012). For example, the short run effect of fuel prices on inflation is measured by η_i coefficients while its long run effect is measured by Ω_6 normalized by Ω_1 (hence by $-\Omega_6 / \Omega_1$).

Cointegration is confirmed in the above inflation model if the Ω_i coefficients are jointly significant. The cointegration tests were conducted in the environment of standard Wald F-tests for linear restrictions. Pesaran *et al*. (2001) provides the upper and lower bound critical values for resolving this hypothesis, based on the standard *F*-statistics. If the *F*-statistic is greater than the upper bound critical value, cointegration may not be rejected but if the statistic is smaller than the lower bound critical value then there is no cointegration. However, the test becomes inconclusive if the statistic falls in between the critical values.

4.2 Data Sources, Variable Justification and Expected Signs

The study uses monthly data for the period January, 2002 to December, 2010 collected from various sources. Data on CPI, exchange rate, industrial production, interest rate, and money supply was collected from the Reserve Bank of Malawi. Maize price data was collected from the Ministry of Agriculture and Food Security while data on South Africa's inflation was obtained from the national statistical service of South Africa, Stats SA. Fuel price data for the period, January, 2002 to December, 2008 was obtained from British Petroleum Malawi Limited while for the remainder of the study period data was collected from Center for Social Concern Malawi. All these variables, except industrial production are expected to have positive coefficients. Estimation was done using E-views 5 software.

The study would have preferred to use GDP instead of industrial production, as a measure of economic activity and to extend the sample size to cover the year 2011. However, GDP in Malawi is only available on annual basis and there exists no convincing interpolation method. During the period under study, the foreign exchange market in Malawi had been heavily intervened and in the year 2011 the shortage of foreign exchange was so serious such that the overvalued official exchange rate had very little economic meaning.

4.2.1 Exchange Rate

Taking cognizance of the fact that the foreign exchange market was heavily intervened, the study made use of the average MW Kwacha/US dollar forex bureau rates as they are believed to approximate the black market rate, the true value of currency. Depreciation of the exchange rate is expected to result into high costs of imported goods which eventually raise prices in the domestic market. For example, this may be through high costs of imported raw materials used for production of domestic goods.

4.2.2 Fuel Price

It is generally believed that most of the imported inflation in Malawi, a land locked country, is fuel-driven and hence the study included a fuel price variable to capture the extent of fuel-driven inflation. Local rises in fuel prices increase the cost of transportation which in turn raises the prices of consumer goods that have to be transported from production zones to consumption centers. This variable, measured as the average pump price of a litre of diesel and petrol, also acts as a proxy for transportation costs.

4.2.3 Maize Price

In view of the fact that food costs account for 58.1 percent of the consumer price index, there is prima facie evidence that movements in the price of maize influence the level of inflation in Malawi. As such, a maize price variable, measured as the price of maize per kilogram, was included in the model.

4.2.4 South Africa's Inflation

This variable is included on the basis that South Africa is Malawi's largest trading partner and accounts for 39 percent of the foreign inflation basket. As shown in Chapter two, Figure 1 indicates that there is a consistent pattern in the movements of foreign inflation and South Africa's inflation. Additionally, South Africa is an inflation targeter and this means that it is more serious with fighting inflation than Malawi. Acting as a proxy for foreign inflation, rising prices in South Africa would result in rising inflation in Malawi through increases in import prices. This variable is measured using the urban index which is the growth rate of the CPI for metropolitan areas.

4.2.5 Interest Rate

The study made use of the nominal lending rate and this variable is expected to have a positive coefficient. According to Fischer Effect Hypothesis, the nominal interest rate should reflect movements in the expected rate of inflation, holding the real interest rate constant (Fischer, 1930).

4.2.6 Industrial Production Index

The study used industrial production index (IPI) to capture economic activity. Despite this variable being more biased towards measuring non-food inflation only, it can be seen as being capable of measuring imported inflation as most industries in Malawi rely on imported raw materials. The index captures goods manufactured mainly for the domestic market most of which require imported raw materials which would be excluded had we used GDP instead. Moreover, the food inflation component which is ignored by the IPI would be captured by the maize price variable. Since prices are a measure of availability, this maize price variable would also act as a proxy for both availability and cost of food items.

4.2.7 Money Supply

Broad money supply was used to validate the quantity theory of money which states that inflation is always and everywhere a monetary phenomenon. This variable proxies the role of monetary policy and the persistent upward trend of money supply, as shown in Appendix 1, is indicative of inflationary pressures.

4.2.8 Consumer Price Index (CPI)

The growth rate of the CPI is a measure of the all items inflation which is composed of food and non-food components. Food costs account for 58.1% of the CPI while the rest is made up of clothing and foot wear, housing, household operation, and transportation.

4.3 Time Series Properties of the Data

4.3.1 Unit Root Tests

While acknowledging the fact that the ARDL bounds testing approach does not require pre-testing of the variables for the order of integration, it is also imperative to ensure that none of the variables is integrated of order 2 or higher. This is because the critical values for evaluating the test are computed on the assumption that the variables are integrated of either order 1 or 0 and the cointegration test collapses if this does not hold. The study applied the Dickey Fuller Generalized Least Squares (DF-GLS) method proposed by Elliot, Rothenberg and Stock in 1996 to test for unit root. The test is a modification of the conventional Augmented Dickey-Fuller (ADF) *t*-test as it applies generalized least squares (GLS) detrending prior to running the ADF test regression. Compared with the ADF tests, the DF-GLS test has the best overall performance in terms of sample size and power especially when an unknown mean or trend is present.

4.3.2 Diagnostic Tests

These tests were conducted to avoid running spurious regressions and to make sure that the model was correctly specified. First and foremost, it was highly reasonable to suspect that some of the variables used in the study may exhibit seasonal trends. Since the study made use of monthly data, each of the explanatory variables was regressed against 11 dummies which assumed a value of 1 in the i^{th} month and zero otherwise. Hence, seasonality tests were conducted on each of the variables in the model by running the regression

$$X_t = \psi_1 + \sum_{i=2}^{12} \psi_i d_{it} \qquad (13)$$

In equation (13), X_t is the series being tested for seasonality, d_{it} assumes the value 1 in the i^{th} month of the year and zero otherwise, and ψ_j are parameters to be estimated. Seasonal effects are said to be prevalent if at least one of the coefficients for the dummies is significant at 5 percent level.

The study made use of the Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) in order to establish the appropriate order of the differenced lag terms in the cointegrating equation. This helped to address the issues of overparameterization and to save the degree of freedom. The smaller the information criterion, the better the model.

The Breusch-Godfrey Lagrange multiplier (B-G LM) tests were conducted to test for serial correlation of orders 1 through 5. This general test of serial correlation is more efficient than other tests in that it allows for non-stochastic regressors (such as the lagged values of the dependent variable), higher order autoregressive schemes and simple or higher order moving averages of white noise error terms (Gujarati, 2003). Ramsey's RESET test (regression specification error test) was also applied to test for specification error and establish model adequacy. This is a general test of specification error and the study tested for the appropriateness of including a quadratic term.

The autoregressive conditional heteroskedasticity Lagrange Multiplier (ARCH LM) tests of orders 1 through 5 were conducted to check if the residuals were conditionally heteroskedastic. Even though ARCH in itself does not invalidate the standard OLS inference, ignoring ARCH effects may result in loss of efficiency. To test for the null hypothesis that there is no ARCH up to order q in the residuals we run the regression

$$e_t^2 = \beta_0 + \beta_1 e^2_{t-1} + \beta_2 e^2_{t-2} + ... + \beta_q e^2_{t-q} + \mu_t \quad (14)$$

In the E-views environment, the Obs*R-squared statistic is the Engle's LM test statistic, computed as the number of observations times the R^2 from the test regression. Conditional heteroskedasticity is said to exist if at least one of the coefficients of the lagged values of the squared residuals is statistically significant.

The study also invoked CUSUM and CUSUMsq tests to examine the stability of the long run coefficients of the model. When the plots of the CUSUM and CUSUMsq statistics fall within the critical bounds, then the long run coefficients are said to be stable and structural breaks are said to be nonexistent.

CHAPTER FIVE

ESTIMATION RESULTS AND DISCUSSIONS

5.0 Introduction

This chapter presents and interprets the results of the present study. The descriptive statistics are presented first before discussing the results of the diagnostic tests and regression estimations.

5.1 Descriptive Statistics

As can be seen in the table below, during the period under study, South Africa's inflation reached a record high of 13.7 and its lowest rate was 0.1. The highest price of maize per kilogram was K74. 32 while the lowest was K9.76. The average value of the lending rate was as high as 30.81. This shows that the cost of borrowing in Malawi was high and according to the Fischer equation this was inflationary.

Table 3: Descriptive Statistics

	CPI	RSAINF	XRATE	MAIZE	MONEY	FUEL	LRATE	IPI
Mean	221.79	6.05	137.19	28.02	89886.94	143.6	30.81	120.0
Median	225.8	5.8	145.75	21.24	73082.24	140	27	115.2
Max	328	13.7	181.27	74.32	203898	243.7	52	184.6
Min	134.6	0.1	75	9.76	23958.82	43.65	17.75	82.1
Std. Dev.	57.46	3.43	31.43	15.85	52280.74	67.39	12.14	22.42

5.2 Seasonality Tests

Seasonality tests on each of the variables were conducted and the results are presented in Table 4 below.

Table 4: Seasonality Test Results

VAR.	ψ_2	ψ_3	ψ_4	ψ_5	ψ_6	ψ_7	ψ_8	ψ_9	ψ_{10}	ψ_{11}	ψ_{12}
fuel	0.87	0.81	0.84	0.82	0.76	0.62	0.59	0.53	0.62	0.43	0.43
lrate	0.99	0.99	0.99	0.89	0.82	0.82	0.74	0.74	0.72	0.60	0.53
maize	0.86	084	0.82	0.22	0.15	0.19	0.29	0.46	0.63	0.71	0.88
money	0.97	0.94	0.80	0.69	0.64	0.55	0.50	0.48	0.46	0.45	0.42
cpi	0.81	0.83	0.95	0.92	0.72	0.69	0.63	0.94	0.97	0.86	0.72
rsainfl	0.62	0.73	0.74	0.64	0.53	0.48	0.53	0.53	0.55	0.74	0.76
xrate	0.92	0.85	0.82	0.78	0.70	0.70	0.58	0.54	0.50	0.50	0.45
ipi	0.86	0.32	0.79	0.76	0.32	0.34	0.59	0.69	0.64	0.64	0.58

Note: The figures represent probability values for the coefficients of the seasonal dummies. ψ_i represents seasonal dummy coefficients where i = 2, 3, 4… 12. 2 represents February, 3 is March, 4 stands for April.

As can be seen in Table 4 above, all the probabilities indicate that at 5 percent significance level, all the dummy coefficients are statistically insignificant. This implies that none of the variables in the study exhibits seasonality.

5.3 Unit Root Tests

As indicated in the previous Chapter, the study applied the Elliot, Rothenberg and Stock (ERS) DF-GLS unit root test. The results of the unit root tests conducted on each of the variables are presented in Table 5.

Table 5: DF-GLS Unit Root Test on the Variables

Variable in Levels	ERS Statistic(CV)	First Difference	ERS Statistic(CV)
cpi	-3.9876(-3.046)*		
fuel price	-1.5620(-3.0260)	d(fuel price)	-9.7136(-3.0280)**
indusprod	-2.0897(-1.9439)*		
lrate	-1.8705(-3.0230)	d(lrate)	-10.0647(-3.0240)**
maize price	-2.4397(-3.0280)	d(maizeprice)	-7.1132(-3.0280)**
money	-2.5250(-3.0230)	d(money)	-7.2715(-3.0240)**
rsainfl	-2.0303(-3.0230)	d(rsainfl)	-11.3390(-3.0240)**
xrate	-0.8661(-3.0332)	d(xrate)	-8.9370(-3.0396)**

*represents indicates that the corresponding variable is I(0) while **represents an I(1) variable. The figures in parenthesis represent the 5% critical values of the DF-GLS test.

As can be seen in Table 5, all the variables are integrated of order 1 except for Malawian prices (cpi) and the industrial production index (indusprod) which are integrated of order zero. These results reveal that there is no variable that is integrated of order 2 or beyond and hence permit the application of the bounds testing approach.

5.4 The ARDL Model Specification

5.4.1 The Short Run Approach

In order to specify a good inflation model, with the guidance of standard information criteria, the study first sought to come up with the appropriate lag order of the differenced terms that would result in a more parsimonious model. As shown in Table 6, both the AIC and SIC suggested that a model with a lag order of 1 was the most suitable. However, further effort was made in ensuring that the resulting model also accounted for serial correlation of at least order 5.

Table 6: Short Run Model Selection Statistics

Lag	Information Criteria		Breusch-Godfrey Serial Correlation LM Test	
	AIC	SIC	$\chi_1^2(p)$	$\chi_5^2(p)$
1	-4.528195*	-4.289305*	20.32420(0.000007)	25.78378(0.000098)
2	-4.495219	-3.965261	0.111415(0.738539)	7.407641(0.192045)
3	-4.485501	-3.918754	0.860965(0.353469)	12.86228(0.024704)
4	-4.451856	-3.522855	0.059790(0.806829)	18.33083(0.002559)

*represents the lag chosen by the information criterion. χ_1^2 and χ_5^2 are the BG LM test statistics for the null hypothesis of no 1st order and no 5th order serial correlation respectively and the p in parenthesis represents the corresponding probability of accepting the null hypothesis of no serial correlation.

The model with a lag order of 1 that was suggested as being the most parsimonious, failed to account for the presence of serial correlation. The problem of serial correlation was corrected by including an extra lag in the model. As seen in Table 6, the inclusion of a second lag successfully removed the signs of serial correlation of orders 1 through 5. However, the results for serial correlation tests of order 2, 3, and 4 are not presented in the table for space purposes. Adding a third and fourth lag proved futile as such models could not account for higher order serial correlation. As such, the inflation model with differenced terms of lag order of 2 was the most appropriate.

5.4.2 The Long Run Approach

The study further conducted model selection tests on the long run equation in order to check if the lag order 2 was appropriate in both the short run and long run. The results are presented in Table 7.

Table 7: Long Run Model Selection Statistics

Lag	Information Criteria		Breusch-Godfrey Serial Correlation LM Test		
	AIC	SIC	$\chi_1^2(p)$	$\chi_2^2(p)$	$\chi_5^2(p)$
1	-3.3355	-3.1271*	51.798(0.000)	51.251(0.000)	55.521(0.000)
2	-3.3878*	-2.9897	50.521(0.000)	50.512(0.000)	55.239(0.000)
3	-3.4470	-2.8518	45.723(0.086)	46.244(0.793)	46.482(0.816)

*represents the model chosen by the information criterion. χ_1^2, χ_2^2 and χ_5^2 are the BG LM test statistics for the null hypothesis of no 1st order, no 2nd order and no 5th order serial correlation respectively and the p in parenthesis represents the corresponding probability of accepting the null hypothesis of no serial correlation.

As can be seen in Table 7, the AIC selected a model with a lag order of 2 while the SIC selected the model with a lag of order of 1. Since the SIC gives more punishment for including extra regressors than does the AIC, then the model with a lag order of 1 would be the most appropriate. However, such a model was not able to account for serial correlation. As seen by the statistically insignificant p-value in Table 7, the model with a lag order of 3 was the one that corrected for serial correlation. It must be pointed out that Table 7 only presents results for serial correlation tests of orders 1, 2 and 5 for space purposes but the tests for orders 3 and 4 also yielded consistent results.

5.5 Estimation Results

The ARDL model with differenced terms of lag order 2 selected under the short run approach was adopted due to the fact that the study had a small sample size and was more interested in short-run dynamics. The estimation results are presented in Table 8.

Table 8: Estimation Results for the Selected ARDL Inflation Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
d(cpi(-1))	0.126222	0.107159	1.177888	0.2429
d(cpi(-2))	0.444720*	0.107437	4.139364	0.0001
d(money(-1))	-0.092364	0.079201	-1.166195	0.2476
d(money(-2))	0.030465	0.077415	0.393524	0.6951
d(maize price(-1))	0.006192	0.016275	0.380456	0.7048
d(maize price(-2))	-0.005098	0.016595	-0.307208	0.7596
d(lrate(-1))	-0.029248	0.053319	-0.548537	0.5851
d(lrate(-2))	-0.009800	0.052986	-0.184949	0.8538
d(rsainfl(-1))	-0.005975	0.005877	-1.016681	0.3129
d(rsainfl(-2))	-0.004760	0.005820	-0.817849	0.4163
d(xrate(-1))	0.023479	0.108193	0.217015	0.8288
d(xrate(-2))	0.270777*	0.110554	2.449283	0.0169
d(fuel price(-1))	-0.027637	0.049295	-0.560650	0.5769
d(fuel price(-2))	0.076420	0.049567	1.541745	0.1277
d(indusprod(-1))	0.152524*	0.038745	3.936622	0.0002
d(indusprod(-2))	0.123947*	0.031535	3.930497	0.0002
cpi(-1)	-0.198913*	0.064456	-3.086013	0.0029
money(-1)	0.126723*	0.028923	4.381356	0.0000
maize price(-1)	0.003582	0.008740	0.409799	0.6832
lrate(-1)	-0.029599	0.031430	-0.941753	0.3496
rsainfl(-1)	0.003106	0.003689	0.841872	0.4028
xrate(-1)	0.044868	0.068792	0.652224	0.5164
fuel price(-1)	-0.060477	0.043385	-1.393974	0.1678
indusprod(-1)	-0.130708*	0.038805	-3.368360	0.0012
R-squared	0.678923	F-statistic		6.079247
Durbin-Watson stat	1.952132	Prob(F-statistic)		0.000000

*represents statistical significance at 5 percent level

As can be seen in Table 8, the explanatory variables explained about 68 percent of the variability in the inflation rate. This is also supported by the highly statistically significant F-statistic which shows overall significance. In the short run, inflation is only affected by shocks emanating from lagged values of inflation, industrial production and exchange rate.

A unit change in the second period lagged value of the inflation rate results into a 0.44 percent increase in the current level of inflation. This substantial degree of inflation inertia is consistent with the Adaptive Expectations Hypothesis which is a backward-looking approach in modeling expected values of a given variable. This indicates that economic agents in Malawi make use of past realizations of inflation in the formulation of expectations about current inflation.

On the other hand, a unit change in the second period lagged value of the exchange rate results into a 0.27 percent increase in the inflation rate. This entails that following the depreciation of the Kwacha, net foreign assets in local currency could expand and the direct result of this is an increase in money supply which feeds into inflation. Consumer prices are also directly affected by the change in the prices of imported goods. The statistical significance of the exchange rate also supports the finding by Mangani (2011) and reaffirms the vital role played by the external sector.

A unit increase in the first and second period lagged values of industrial production index reduce the inflation rate by 0.15 and 0.12 percent respectively. This entails that inflation decreases due to an increase in the production of goods in the domestic economy. This finding is consistent with that of Matchaya (2010) who established that real GDP was a significant determinant of inflation in Malawi.

Money supply, consumer price index and industrial productivity are the one period lagged variables that were statistically significant. These are properly interpreted as long run variables after normalization of their coefficients and this is executed in Table 12.

5.5.1 Diagnostic Tests

The results of the Ramsey RESET test and ARCH LM test which were conducted on the selected model are shown in Table 9 below.

Table 9: Diagnostic Tests for the Selected Inflation Model

Ramsey's RESET Test	**Jarque-Bera Test**	**Engel's ARCH Test**	
$F_2(p)$	JB Test Statistic (p)	$\chi_1^2(p)$	$\chi_5^2(p)$
0.01(0.92)	5.44(0.07)	0.036(0.85)	5.74(0.33)

Notes: F_2 is the test statistic for investigating the appropriateness of a quadratic model while χ_1^2 and χ_5^2 are the test statistics for ARCH (1) and ARCH (5) effects, respectively. p denotes the corresponding probability of accepting the respective null hypotheses of correct specification, normality or no ARCH effects.

The statistically insignificant F_2 statistic from the Ramsey RESET test indicates that the inclusion of a quadratic term is inappropriate and would not improve the specification of the model. Thus, the model was correctly specified. The statistically insignificant Jarque-Bera test statistic indicates that it was not necessary to invoke quasi-maximum likelihood assumptions and generate robust standard errors and covariances as would be required if conditional normality did not hold. The results from the ARCH LM test indicate that there was absence of conditional heteroskedasticity in the selected model. This is reflected by the statistically insignificant ARCH LM test statistics. Table 9

presents only the results of test regressions with squared residuals of orders 1 and 5 but the results of the orders in between also revealed no signs of ARCH effects.

5.5.2 Joint Short-Run Effects

Since there were only three variables that were individually significant in the short run, in the spirit of Granger-causality testing, the study evaluated the joint significance of each explanatory variable's lagged difference terms. The results of these tests are presented in Table 10.

Table 10: Joint Short Run Test Results

Variable	**F-statistic** (p)
Cpi	3.852301(0.0255)*
money supply	0.911029(0.4065)
maize price	4.79571(0.01030)*
lending rate	6.51611(0.00218)*
rsa inflation	1.092273(0.3407)
exchange rate	5.85023(0.00404)*
fuel price	9.01402(0.00025)*
industrial production	0.073935(0.9288)

Note: *denotes statistical significance at 5 percent and (p) is the probability of accepting the null hypothesis of joint insignificance.

Table 10 indicates that the coefficients of the lagged values of the inflation, maize prices, lending rate, exchange rate, and fuel prices were jointly significant. It must be noted that out of these variables it was only inflation and exchange rate that also had individual statistical significance. The statistical significance of maize and fuel prices is

consistent with the structuralists' view on inflation since they emphasize supply side factors.

5.5.3 Cointegration Test Results

After running the ARDL model, an F-test was conducted in the environment of Wald test for linear restrictions. The F-statistic was compared with the upper and lower bound critical values provided by Pesaran *et al.* (2001), as presented in their Table C1.iii. The results are summarized in Table 11 below.

Table 11: Results for ARDL Bounds Test for Cointegration

Null Hypothesis	**F-statistic**	**5 % critical value**		**10% critical value**	
		CV_L	CV_u	CV_L	CV_u
$\Omega_1 = \Omega_2 = ... = \Omega_7 = \Omega_8 = 0$	8.278245	3.79	4.85	3.17	4.14

Note: CV_L and CV_u are lower bound and upper bound critical values provided by Pesaran et al (2001).

Since the calculated F-statistic is greater than the upper bound critical values, both at 5 and 10 percent significance levels, then the null hypothesis of no cointegration is rejected. The presence of a co-integrating relationship indicates that the CPI inflation model used in this study is specified correctly and that it is stable over the sample period.

5.5.4 Long Run Effects

As stated in the previous Chapter, the ARDL model has the ability of capturing long run effects through the process of normalization. The long run sensitivities of the inflation rate to its covariates established through normalization are presented in Table 12 below.

Table 12: Normalized Long Run Effects

Variable	LR Effect	Null Hypothesis	$\chi_1^2(p)$
money supply	0.6371*	$-\Omega_2/\Omega_1=0$	4.9393(0.0263)
maize price	0.0180*	$-\Omega_3/\Omega_1=0$	15.1730(0.0075)
lending rate	-0.1488	$-\Omega_4/\Omega_1=0$	1.0052(0.3160)
RSA inflation	0.0156*	$-\Omega_5/\Omega_1=0$	7.8453(0.0179)
exchange rate	0.2256*	$-\Omega_6/\Omega_1=0$	5.5376(0.0334)
fuel price	0.3040	$-\Omega_7/\Omega_1=0$	1.4185(0.2336)
industrial production	-0.6571*	$-\Omega_8/\Omega_1=0$	3.2858(0.0299)

*indicates statistical significance, χ_1^2 is the Wald test statistic while the p in parenthesis represents the probability of accepting the null hypothesis of no long run effect.

Table 12 indicates that money supply, maize prices, South Africa's inflation, the exchange rate and industrial production have significant long run effects on the inflation rate. The high presence of long run statistical significance is supportive of the finding that there is cointegration among the variables.

The statistical significance of money supply implies that expansionary monetary policy results into high rates of inflation. In fact, money supply is the single most important factor influencing inflation in the long run with a unit increase resulting into 0.64 percent increase in inflation. This result is consistent with the monetarist view on inflation and empirical findings by Simwaka *et al.* (2012) and Matchaya (2010).

The long run statistical significance of South Africa's inflation and the exchange rate provide evidence that external shocks play a significant role in determining inflation in Malawi. An increase in South Africa's inflation can be said to result in inflationary pressures in Malawi via increases in the import prices.

5.6 Stability Tests

5.6.1 CUSUM and CUSUMQ Plots

Finally, the study examined the stability of the long run parameters by invoking the cumulative sum (CUSUM) and cumulative sum squares (CUSUMsq) tests. As can be seen in Appendix 2, the plots of CUSUM and CUSUMsq statistics stay within the critical 5 percent bounds for all equations. Thus, the stability test using the CUSUM and CUSUMsq suggest an absence of structural breaks.

CHAPTER SIX

CONCLUSION

6.0 Summary

With particular emphasis on the role of external shocks, the overall objective of this study was to empirically establish the existence of a stable relationship between inflation and its covariates. In order to achieve this, the study applied the ARDL bounds testing approach to cointegration proposed by Pesaran *et al.* (2001). Taking cognizance of the fact that most of the imported inflation in Malawi is fuel-driven, the study included a fuel price variable. A maize price variable was also included on the basis that food costs account for 58.1% of the CPI in Malawi.

The ARDL inflation model revealed that in the short run it was only lagged values of inflation, the exchange rate and industrial production index that were statistically significant. The cointegration test established the existence of a long run equilibrium relationship. Despite being individually statistically insignificant the short run lagged values of maize price, fuel price, and lending rate were found to be jointly significant. Through the process of normalization, South African prices and money supply were found to have long run effects on the inflation rate.

6.1 Policy Recommendations

The statistical significance of maize prices in the long run inflation model entails that food security policy may be effective in stabilizing the rate of inflation. On the other hand, the long run statistical significance of South Africa's inflation entails that authorities in Malawi may consider adopting inflation targeting policy. South African authorities have been successful in fighting inflation through inflation targeting and Malawi may learn from their successes. In order to deal with issues of inflation bias, Malawian authorities may consider formulating a credible inflation targeting framework.

Money supply was found to be statistically significant only in the long run. This implies that the use of money supply by monetary authorities as a mechanism of stabilizing inflation in the short run is ineffective. Past values of the exchange rate were found to be statistically significant in the short run and this gives rise to suspicions that money supply may influence the rate of inflation via the exchange rate channel.

6.2 Limitations and Areas for Further Study

A major limitation of the study was the use of variables that were not fully determined by market forces, like fuel price, maize price and exchange rate. The pump price of fuel for the period under study in Malawi did not truly reflect the movements in oil prices on the international market since the government had a fuel price stabilization fund. Thus, the fuel prices remained stable for relatively long periods irrespective of the conditions of scarcity. The exchange rate market was also heavily intervened by the government and the study attempted to minimize the effects of intervention by using the forex bureau rates.

However, amidst the persistent fuel and foreign exchange shortages, the true values of these variables would be found on the black market. Unfortunately, black market time series data on these variables was not readily available. On the other hand most of the maize grown in Malawi does not go on the market as most people grow it for subsistence. As such, maize prices do not fully reflect the conditions of scarcity.

Future studies on inflation may consider making use of the data provided by Center for Social Concern in Malawi to compute inflation figures. Such a study would provide answers to the growing concern that official inflation figures do not seem to reflect the true cost of living in Malawi. In addition, future studies may also consider finding a credible way of interpolating annual GDP into monthly data.

REFERENCES

Adu, G., & Marbuah, G. (2011). Determinants of Inflation in Ghana: An Empirical Investigation. *South African Journal of Economics,* 79(3) 245-315.

Aghevli, B., & Khan, S. (1978). Government Deficits and the Inflationary Process in Developing Countries. *Palgrave Macmillan Journals,* 25(3) 383-416.

Arestis, P., & Sawyer, M. (2003). Aggregate Demand, Conflict, and Capacity in the Inflationary Process. (The Levy Economics Institute, Working Paper No. 391). New York: The Levy Economics Institute.

Bonga-Bonga, L., & Kabundi, A. (2008). Monetary Policy Instrument and Inflation in South Africa: Structural Vector Error Correction Model Approach. *Journal of Economics and International Finance,* 375-415.

Capricorn, I. (2001). The Impact of Regional Trade Agreements and Formation of A Strategy with Regard to Participation in these Agreements and Maximizing Benefits to Malawi. *Quarterly Journal of Economics*, 190-210.

Durevall, D., & Ndung'u, N. (1999). A Dynamic Model of Inflation for Kenya, 1974-1996. (IMF Working Paper, WP/99/97). Washington DC: IMF.

Dutt, A., & Ros, J. (2003). Development Economics and Structuralist Macroeconomics. *Journal of Monetary Economics,* 645-724.

Enoma, A. (2011). Exchange Rate Depreciation and Inflation in Nigeria (1986-2008). *Business and Economics Journal,* 275-323.

Erbaykal, E., & Okuyan, H. (2008). Does Inflation Depress Economic Growth? Evidence from Turkey. *International Research Journal of Finance and Economics,* 1450-2887.

Fischer, I. (1930). The Theory of Interest. New York: Macmillan.

Frisch, H. (1977). Inflation Theory 1963-1975: A 'Second Generation' Survey. *Journal of Economic Literature,* 1289-1317.

Fuhrer, J.C., & Olivei, G.P. (2010). The Role of Expectations and Output in the Inflation Process: An Empirical Assessment. *American Economic Review*, 98(5) 210-226.

Gujarati, D.N. (2003). Basic Econometrics. New York: McGraw-Hill.

Hammond, G. (2011). State of the Art Inflation Targeting. (Bank of England, CCBS Handbook No. 29). London: Bank of England.

Hodge, A., & Riley, G. (2008). Inflation Dynamics in the ECCU. (ECCB Staff Research Paper). Basseterre: Eastern Caribbean Central Bank.

Jayne, T.S., Sitko, N., Gilbert, J.R., & Mangisoni, J. (2010). Malawi's Maize Marketing System. (Evaluation of the 2008/9 Agricultural Input Subsidy Programme, Malawi). Lilongwe: Ministry of Agriculture and Food Security.

Kaluwa, B., & Deraniyagala, S. (2011). Macroeconomic Policy for Employment Creation. (International Labour Office, Employment Working Paper No. 93). Geneva: ILO.

Kaluwa, B., & Junge, N. (2009). Impact of Compliance with SADC Free Trade Area Commitments: A Poverty and Social Impact Analysis (PSIA). Lilongwe: Ministry of Development Planning and Cooperation.

Kwengere, P. (1994). Government Deficits, Money Supply and the Process of Inflation in Malawi. Unpublished Masters Thesis, University of Malawi.

Laidler, M. (1985). The Demand for Money: Theories and Evidence (3rd ed). New York: Harper and Row.

Lea, N., & Hanmer, L. (2009). Constraints to Growth in Malawi. (World Bank Policy Research Working Paper No. 5097). Washington DC: World Bank.

Mangani, R. (2012). The Exchange Rate Sensitivity of Foreign Trade: Evidence from Malawi. *Applied Economics Letters*, 1466-1478.

Mangani, R. (2011). The Effects of Monetary Policy on Prices in Malawi. (AERC Research Paper). Nairobi: African Economic Research Consortium.

Matchaya, G.C. (2010). The Nature of Inflation in Malawi up to the Early 2000s. *Journal of Economics and International Finance,* 289-304.

McIndoe, T. (2009). Hyperinflation in Zimbabwe, Money Demand, Seigniorage and Aid Shocks. (Institute for International Integration Studies, Discussion Paper No. 293). Dublin: Trinity College Dublin.

Ndaferankhande, M. (2000). Determinants of Inflation in Malawi. Unpublished Masters Thesis, University of Malawi.

Ndaferankhande, M., & Ndhlovu, T.M. (2006). Inflationary Experiences in Malawi: An Investigation of the Underlying Determinants (1980.1-2002.4). (Final Research Report Presented to AERC). Nairobi: African Economic Research Consortium.

Ngalawa, H., & Viegi, N. (2011). Dynamic Effects of Monetary Policy Shocks in Malawi. (School of Economics and Finance, Working Paper No. 217). Durban: University of Kwazulu Natal.

NSO (2011). Trade Statistics Brief Release Mid Year (January–June, 2011) Provisional. Zomba: National Statistics Office.

Odhiambo, N. (2011). Inflation Dynamics and Economic Growth in Tanzania: A Multivariate Time Series Model. *Indian Journal of Economics and Business*, 9(5), 641-657.

Peker, O., & Mercan, M. (2011). The Inflationary Effect of Price Increases in Oil Products in Turkey. *Ege Academic Review*, 11(4) 553-562.

Pesaran, M.H. & Shin, Y. (1999). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis. *Journal of Econometrics*, 293-343.

Pesaran, H. M., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approach to the Analysis of Level Relationships. *Journal of Applied Economics*, 289-326.

Potani, E. (1997). Dynamic Process of Inflation in Malawi. Unpublished Masters Thesis, University of Malawi.

Reserve Bank of Malawi (2011). Monthly Economic Review, July 2011. Lilongwe: Reserve Bank of Malawi.

Sato, L.J. (2001). Monetary Policy Frameworks in Africa: The Case of Malawi. (Paper Presented at an International Conference on Monetary Policy Frameworks in Africa). Pretoria: South African Reserve Bank.

Simwaka, K. (2004). Dynamics of Inflationary Processes in Malawi: An Econometrics Analysis. *The International Journal of Applied Economics and Finance* , 84-98.

Simwaka, K., Ligoya, P., Kabango, G., & Chikonda, M. (2012). Money Supply and Inflation in Malawi: An Econometric Investigation. *The International Journal of Applied Economics and Finance* , 74-88.

Wahid, A.N., Shahbaz, M., & Azim, P. (2011). Inflation and Financial Sector Correlation: The Case of Bangladesh. *International Journal of economics and Financial Issues*, 1(4) 145-152.

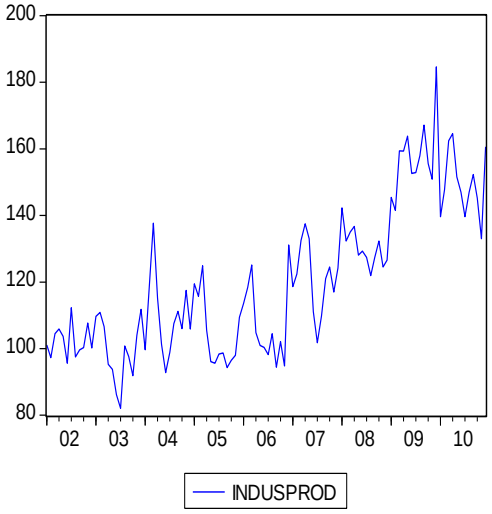
Yeh, C., & Chi, C. (2009). The Co-Movement and Long Run Relationship between Inflation and Stock Returns: Evidence from 12 OECD Countries. *Journal of Economics and Management*, 5(2) 167-186.

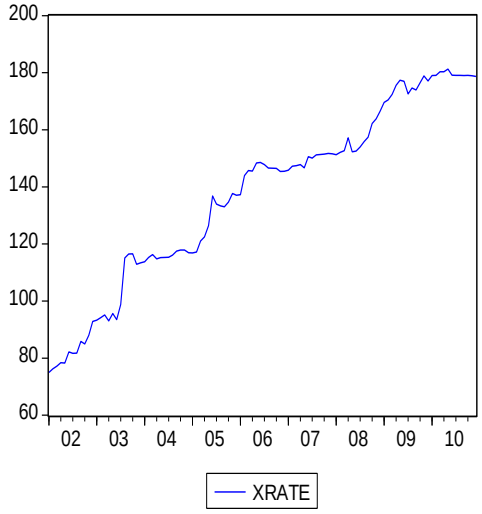
Zgovu, E.K. (1994). The Impact of Growth of Money Wages and Salaries on Inflation in Malawi. Unpublished Masters Thesis, University of Malawi.

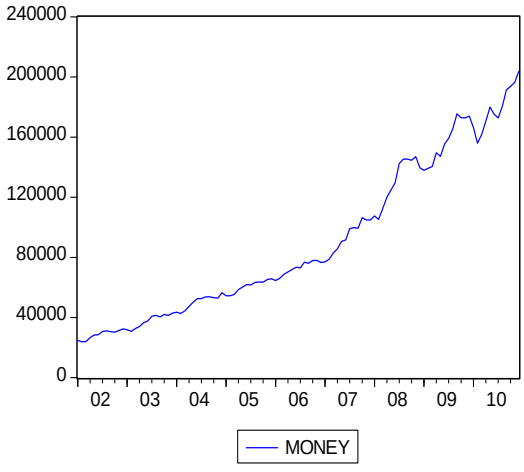
Ziramba, E. (2008). Bank Lending, Expenditure Components and Inflation in South Africa: Assessment from Bounds Testing Approach. *South African Journal of Economics,* 11(2) 217-227.

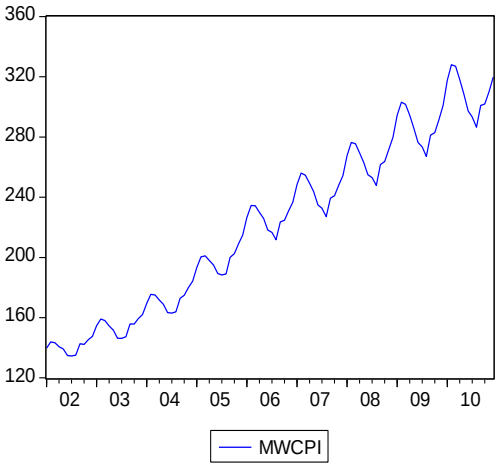
APPENDICES

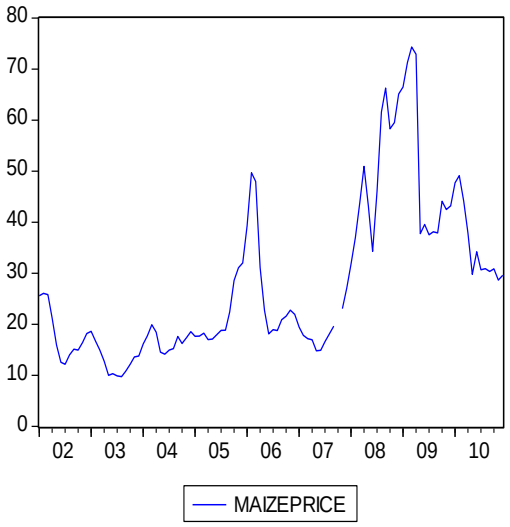
Appendix 1: Graphs of Variables used in the Study







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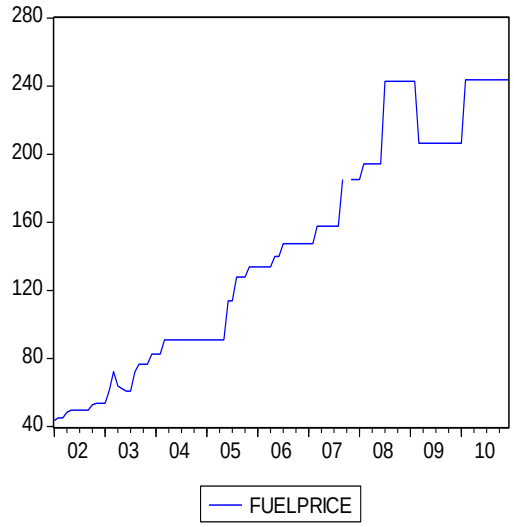
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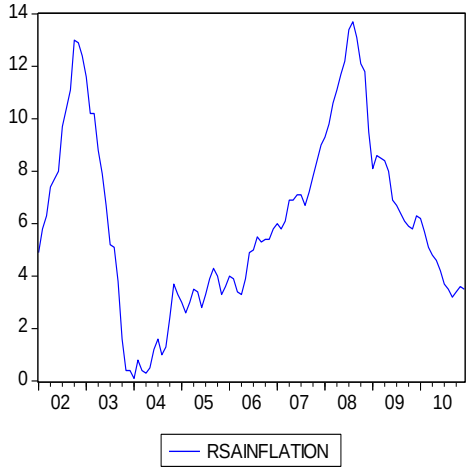
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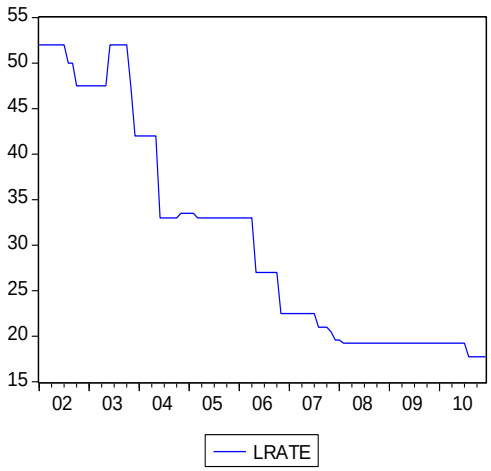
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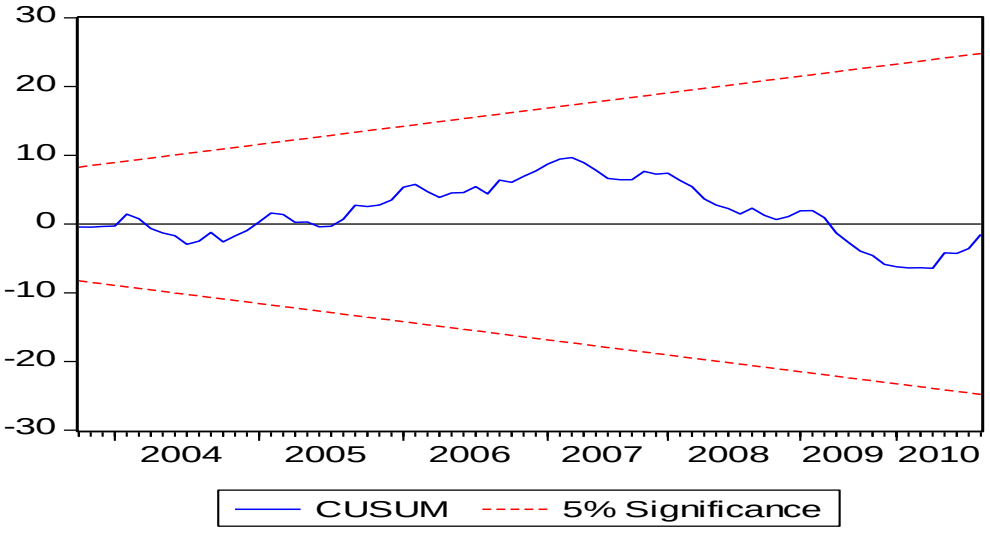
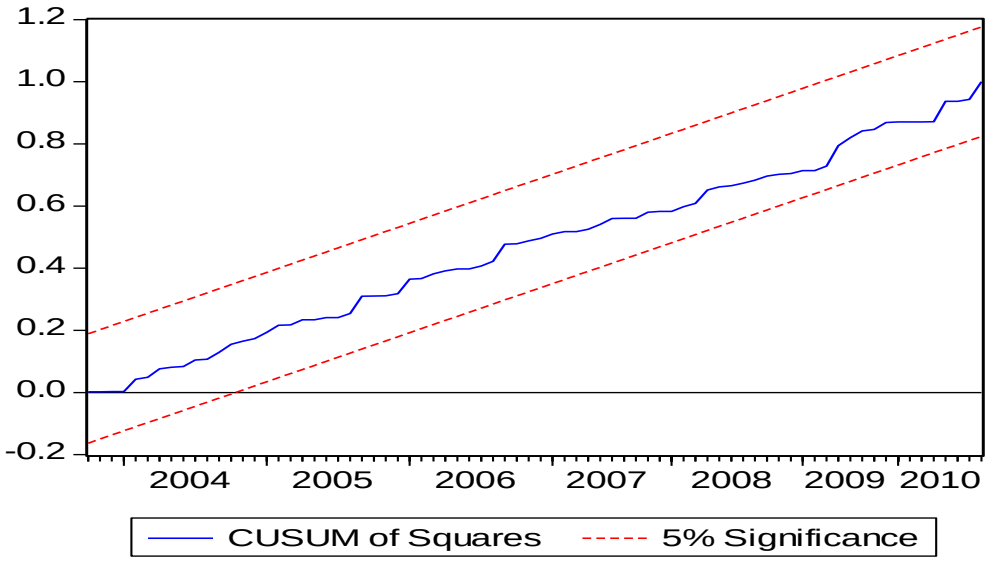
Appendix 2: CUSUM and CUSUMsq Plots





Appendix 3: Data used in the Study

obs	CPI	RSAINF	XRATE	MAIZEPRICE	MONEY	FUELPRICE	LRATE	PROD
2002M01	139.8	4.9	75	25.595	24736.94	43.65	52	101.1
2002M02	143.9	5.8	76.27	26.055	23958.82	45.15	52	97.3
2002M03	143.3	6.3	77.2	25.823	24062.42	45.15	52	104.5
2002M04	140.7	7.4	78.43	21.235	26598.82	48.35	52	105.9
2002M05	139.2	7.7	78.26	15.977	28300.38	49.65	52	103.7
2002M06	134.9	8	82.17	12.588	28523.18	49.65	52	95.6
2002M07	134.6	9.7	81.7	12.178	30736.18	49.65	52	112.3
2002M08	135.1	10.4	81.76	14.022	31146.67	49.65	50	97.5
2002M09	142.7	11.1	85.83	15.128	30608.57	49.65	50	99.6
2002M10	142.3	13	84.97	14.975	30290.29	52.83	47.5	100.3
2002M11	145.4	12.9	87.98	16.442	31335.79	53.68	47.5	107.7
2002M12	147.6	12.4	92.87	18.205	32422.66	53.68	47.5	100.2
2003M01	154.7	11.6	93.31	18.632	3.19E+04	53.68	47.5	109.7
2003M02	159.1	10.2	94.21	16.717	30855.74	61.5	47.5	110.9
2003M03	158	10.2	95.15	14.992	32618.54	72.31	47.5	106.6
2003M04	154.5	8.8	93.08	12.78	34092.14	63.9	47.5	95.3
2003M05	151.7	7.9	95.65	10.012	36530.48	62.3	47.5	93.8
2003M06	146.4	6.7	93.49	10.352	37778.81	60.8	52	86.2
2003M07	146.3	5.2	98.81	9.9033	40815.3	60.8	52	82.1
2003M08	147.3	5.1	115.08	9.76	41401.45	72.25	52	100.8
2003M09	155.8	3.8	116.5	10.845	40399.35	76.63	52	97.6
2003M10	155.8	1.6	116.53	12.185	42072.68	76.63	52	91.9
2003M11	159.4	0.4	112.89	13.64	41443.02	76.63	47.5	104
2003M12	162.1	0.4	113.42	13.795	42870.95	82.63	42	111.8
2004M01	169.5	0.1	113.76	16.165	43543.08	82.63	42	99.7
2004M02	175.5	0.8	115.3	17.772	42738.26	82.63	42	118.3
2004M03	175	0.4	116.27	19.95	44429	90.95	42	137.7
2004M04	171.7	0.3	114.77	18.445	47366.81	90.95	42	115.2
2004M05	168.9	0.5	115.22	14.543	50147.95	90.95	42	101.3
2004M06	163.4	1.2	115.26	14.16	52494.96	90.95	33	92.8
2004M07	163	1.6	115.38	14.973	52609.74	90.95	33	98.9
2004M08	163.9	1	116.14	15.235	53756.72	90.95	33	107.5
2004M09	172.9	1.3	117.51	17.622	53776.07	90.95	33	111.2
2004M10	174.8	2.4	117.88	16.247	53176.63	90.95	33	106
2004M11	180	3.7	117.85	17.375	52959.14	90.95	33.5	117.5
2004M12	184.3	3.3	116.9	18.555	56566.38	90.95	33.5	105.9
2005M01	193.2	3	116.89	17.675	54432.26	90.95	33.5	119.5
2005M02	200.4	2.6	117.17	17.705	54518.13	90.95	33.5	115.7
2005M03	201	3	121.01	18.267	55299.35	90.95	33	124.9
2005M04	198	3.5	122.51	17.03	58526.76	90.95	33	105.5

2005M05	195	3.4	126.43	17.107	60260.79	90.95	33	96.1
2005M06	189.3	2.8	136.81	17.98	61917.28	113.9	33	95.6
2005M07	188.4	3.3	133.98	18.803	61706.98	113.9	33	98.4
2005M08	189	3.9	133.35	18.853	63321.64	127.8	33	98.7
2005M09	200.1	4.3	133.05	22.412	63609.2	127.8	33	94.3
2005M10	202.5	4	134.65	28.607	63585.81	127.8	33	96.5
2005M11	209.1	3.3	137.73	31.085	65262.83	133.8	33	98
2005M12	214.8	3.6	137.09	32.01	65756.14	133.8	33	109.4
2006M01	226.6	4	137.29	39.277	64669.3	133.8	33	113.6
2006M02	234.5	3.9	143.96	49.71	66010.68	133.8	33	118.4
2006M03	234.4	3.4	145.75	47.983	68753.43	133.8	33	125.1
2006M04	229.9	3.3	145.56	31.145	70370.64	133.8	33	104.8
2006M05	225.8	3.9	148.38	22.755	71872	140	27	101
2006M06	218.2	4.9	148.59	18.147	73473.62	140	27	100.4
2006M07	216.6	5	147.78	18.962	73082.24	147.4	27	98.2
2006M08	211.8	5.5	146.61	18.795	76774.51	147.4	27	104.5
2006M09	223.5	5.3	146.53	20.92	76017.21	147.4	27	94.4
2006M10	224.7	5.4	146.51	21.59	77888.02	147.4	27	102.1
2006M11	230.9	5.4	145.43	22.79	78008.69	147.4	22.5	94.8
2006M12	236.6	5.8	145.48	21.945	76624.05	147.4	22.5	131.1
2007M01	248.4	6	145.88	19.478	77011.01	147.4	22.5	118.6
2007M02	256	5.8	147.23	17.827	78707.59	147.4	22.5	122.4
2007M03	254.6	6.1	147.45	17.185	83008.28	157.7	22.5	132.5
2007M04	249.2	6.9	147.79	16.98	85673.77	157.7	22.5	137.5
2007M05	243.7	6.9	146.7	14.817	90675.17	157.7	22.5	133
2007M06	234.9	7.1	150.57	14.935	91596.53	157.7	22.5	111.1
2007M07	232.6	7.1	150.1	16.622	99011.89	157.7	22.5	101.8
2007M08	227.1	6.7	151.23	18.13	99851.32	157.7	21	109.8
2007M09	239.3	7.2	151.32	19.655	99406.57	185.1	21	121
2007M10	241	7.8	151.44		106352.8		21	124.5
2007M11	248	8.4	151.7	23.073	104876.2	185.1	20.5	117
2007M12	254.4	9	151.62	27.122	104879.8	185.1	19.6	124.2
2008M01	267.6	9.3	151.25	31.782	107563.9	185.1	19.6	142.3
2008M02	276.4	9.8	152.1	37.005	105205.1	194.3	19.25	132.3
2008M03	275.5	10.6	152.7	43.815	112592.1	194.3	19.25	135
2008M04	269.5	11.1	157.2	50.928	119994	194.3	19.25	136.7
2008M05	263	11.7	152.3	43.142	124700	194.3	19.25	128.1
2008M06	254.9	12.2	152.56	34.313	129462.2	194.3	19.25	129.3
2008M07	253	13.4	153.98	46.04	142438.2	242.85	19.25	127.4
2008M08	247.8	13.7	155.87	61.59	145376.4	242.85	19.25	121.9
2008M09	261.6	13.1	157.38	66.275	145381.6	242.85	19.25	127.4
2008M10	263.7	12.1	162.18	58.295	144660.5	242.85	19.25	132.3
2008M11	271.8	11.8	163.87	59.535	146983.6	242.85	19.25	124.5

2008M12	279.7	9.5	166.53	65.1	139643.3	242.85	19.25	126.6
2009M01	294.5	8.1	169.61	66.475	137954.1	242.85	19.25	145.4
2009M02	303.1	8.6	170.5	71.29	139188.1	242.85	19.25	141.5
2009M03	301.7	8.5	172.37	74.315	140553.3	206.4	19.25	159.4
2009M04	294.4	8.4	175.57	72.895	149575.9	206.4	19.25	159.3
2009M05	285.9	8	177.36	37.75	147249.9	206.4	19.25	163.8
2009M06	276.4	6.9	177	39.56	155364.6	206.4	19.25	152.6
2009M07	273.3	6.7	172.55	37.55	159209.5	206.4	19.25	152.9
2009M08	267.1	6.4	174.67	38.14	165560.1	206.4	19.25	157.9
2009M09	281.2	6.1	173.98	37.9	175510	206.4	19.25	167.1
2009M10	282.9	5.9	176.45	44.1	172908.5	206.4	19.25	155.6
2009M11	291.3	5.8	178.87	42.505	172823.8	206.4	19.25	150.9
2009M12	300.9	6.3	177.099	43.21	174032.2	206.4	19.25	184.6
2010M01	317.7	6.2	179.03	47.705	166237	206.4	19.25	139.6
2010M02	328	5.7	179.08	49.135	155996.8	243.7	19.25	147.7
2010M03	326.9	5.1	180.31	44.155	161759.4	243.7	19.25	162.4
2010M04	318.2	4.8	180.32	37.9	170661.7	243.7	19.25	164.6
2010M05	308.3	4.6	181.27	29.78	179919.4	243.7	19.25	151.6
2010M06	297.3	4.2	179.1	34.235	175308.4	243.7	19.25	147
2010M07	293.3	3.7	179.05	30.687	172834	243.7	19.25	139.6
2010M08	286.4	3.5	179.05	30.9	180498.4	243.7	17.75	147
2010M09	300.9	3.2	179.03	30.37	191326.7	243.7	17.75	152.3
2010M10	301.9	3.4	179.06	30.87	193697.4	243.7	17.75	145.2
2010M11	310	3.6	178.97	28.67	196380.2	243.7	17.75	133
2010M12	319.8	3.5	178.66	29.615	203898	243.7	17.75	160.6