EFFECTS OF PUBLIC DEBT, TRADE AND MONETARY POLICY ON INFLATION IN KENYA

BY

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DECLARATION

Declaration by Candidate

This thesis is my original work and has not been presented for a degree in any other University. No part of this thesis may be reproduced without the prior written permission of the author and/or Moi University.

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DEDICATION

I wish to dedicate this thesis to my parents and family, for invaluable guidance and financial support.

ABSTRACT

Inflation is a crucial macroeconomic variable in an economy owing to its diverse and proximate influence on rapid economic growth and development. The study focused on determining the influence of public debt, trade and monetary variables on inflation. The study analyzed the effect of external debt, total debt servicing, interest rates,

money supply, exchange rate, domestic credit, trade and gross domestic product on inflation in Kenya. The study used annual time series data for the period 1980 to 2010 gathered from the World Bank data bank. Data was subjected to stationarity test in which the variables were found to be nonstationary at level but stationary at first level. Augmented Dickey-Fuller (ADF) and Philips Perron were used to investigate unit root. Test for normality were done using Jacque Bera. The Johansen model of cointegration revealed the presence of a long term relationship between the variables with inflation as the dependent variable. The Vector Error Correction Model (VECM) was used to the short run relationship between the variables. Marginal change in money supply, exchange rate and external debt, had 120, 141.5 and 2.263 changes on inflation significant at 5% level of significance respectively with p values of 0.000. Also, marginal change in total debt serving, trade and gross domestic product had a 1.56, 5.01 and 109.12 change on inflation respectively at 5% level of significance respectively with p values of 0.00. The results indicated that 11.335 of the disequilibrium can be corrected by external debt .The study determined that external debt and debt servicing had a significant relationship in the short run and in the long run on inflation. However the rate of adjustment in the short run was slow for debt servicing. It was determined that money supply, trade and interest rates contribute significantly towards inflation. Trade has an inverse effect on inflation owing on bias to imports in comparison to exports. Debt payments are potentially inflationary especially for domestic borrowing. Reduction of trade deficits and interest payments will reduce debt servicing. In addition, the government should increase investment in production to increase supply of goods to meet rising demand. Reducing debt and trade deficits in expansionary periods significantly reduces pressure on prices.

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God bless you all.

ABBREVIATIONS

ADF Augmented Dickey-Fuller

CBK Central Bank of Kenya

CPI Consumer Price Index

FTPL Fiscal Theory of the Price Level

GNP Gross National Product

KNBS Kenya National Bureau of Statistics

MoF Ministry of Finance

VECM Vector Error Correction Model

CHAPTER ONE: INTRODUCTION

1.1 Introduction

This chapter presents the background of the study, statement of the problem, objective of the study, hypothesis of the study, the significance of the study and scope of the research.

1.2 Background of the Study

The existence of a causal relationship between money supply and inflation is widely acknowledged by economists. The role of other macroeconomic variables such as debt and trade in influencing inflation is also evident from previous studies. The Central Bank of Kenya (CBK) has the mandate of maintaining price stability. The Central Bank of Kenya targets to achieve set goals of inflation through fiscal based regimes centered on money supply and interest rates and considerable management of the exchange rates fluctuations[CITATION Int08 \t \l 1033].The managed float of foreign exchange operations indicates the significant role of the central bank in exchange rate fluctuations. However, it is not outright the factors specifically designed to influence the exchange rate [CITATION Int13 \t \l 1033].The stabilization targets have missed the set targets set due to various external shocks. The external shocks significantly influencing the inflationary levels include food and fuel crisis of 2007 to 2008. Effects from the past global financial crisis and sharp changes in the prices contributed to the changes in inflation in the country[CITATION Int11 \t \l 1033]. The government has a tradition of using reserve money targeting in influencing inflation. However, recent focuses to domestic assets are notable with the central bank paying close attention to changes in the short term interest rates.

1.2.1 Inflation and Monetary Policy

The deregulation of economic activities in Kenya in the early 1990s opened the space for effective use of monetary policy frameworks, institutions and its objectives. The Central Bank Act was amended to allow for autonomy on in the monetary policy[CITATION Rot07 \t \l 1033]. An amendment in 1996 provided an institutional framework for conducting monetary policy. This allowed the CBK will a responsibility to formulate and implement monetary policies directed towards the stabilization of the general price levels. The policy stipulated for the procedure of appointment of the governor and the assistant governor to the CBK. It also provided for five other members of the board of directors appointed by the president for a period of four year which was renewable if so deemed. In 1992 the policy focused on broad monetary aggregate M2 defined as currency in circulation and term and non-term domestic currency deposits with banks as well as with non-bank financial institutions (NBFIs).

The CBK achieved termed control of the money supply in Kenya through the sale of government paper. The amounts of paper sold depended on the budgetary financing available and the prevailing monetary conditions at that time. The use of monetary policy was refined by the CBK to the use open market operations through repurchase agreements. The CBK reduced its reliance on the reserve requirement. The reserve requirement was lowered to 6 percent up from the highs of 20 percent in 1994. The organization of exchange rate in Kenya in regard to monetary policy is significant. Kenya receives high consideration for its free floating exchange rate. The interventions in exchange rate are meant to smoothen swift movements, service external obligations and achieve the targeted levels of foreign exchange reserves[CITATION Rot07 \t \l 1033].

The preceding years saw the Central Bank of Kenya miss the inflation target of 5% which if attained will see stable prices and sustain value of Kenya shilling. This will also facilitate higher levels of domestic savings and private investment and therefore

lead to improved economic growth, higher real incomes and increased employment opportunities[CITATION CBK10 \l 1033].

Inflation has moved to as high as 45% in the 1990s and 18% in the year 2008, although that is connected to the post-election violence crisis, to lowest between 1.6% and 4% in 1986, 1995 and 2000. These are the only instances the rate has been kept below and within the required Inflation Target Forecasting (ITF).

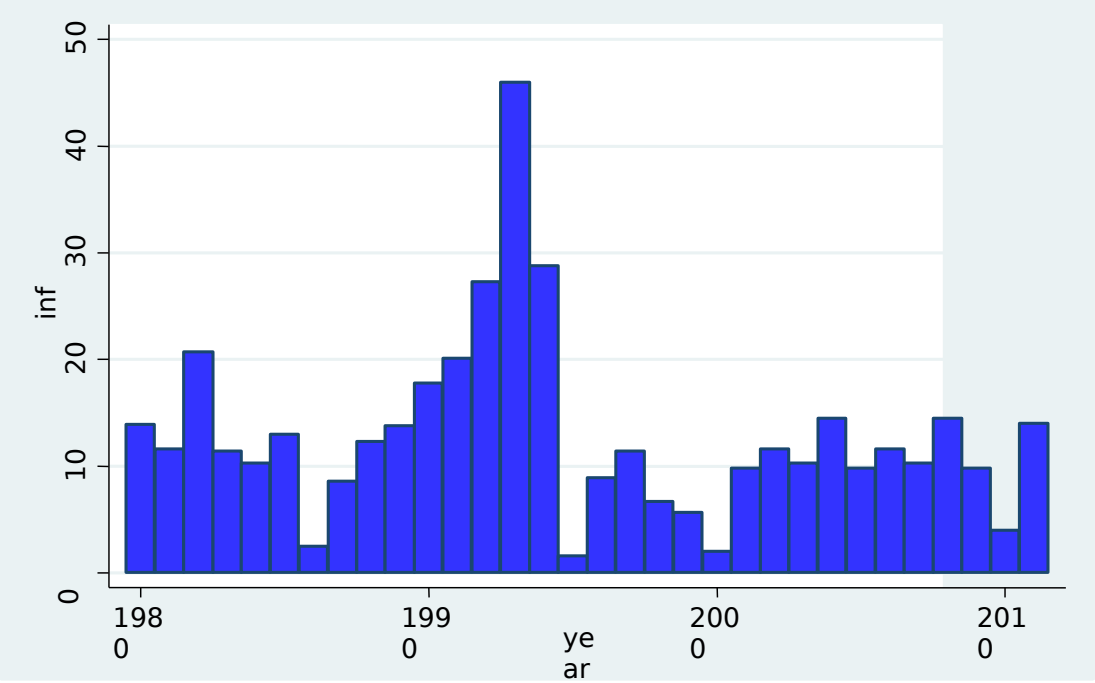


Figure 1.1 Level of Inflation

Source: World Bank

Figure 1.1 indicates the changes in inflation as set by the Central Bank of Kenya. The high rate around 2008 is majorly due to the food and oil external shocks due to spike of their prices in the year 2007-2008 and the global financial crisis in the year 2008-2009[CITATION Wer12 \l 1033]. This is a clear indication of the influence the external factors have on inflation in Kenya. Since early 1990s Kenya has taken the macroeconomic stability as a very important undertaking. This is due to Kenya's free floating exchange rate regime and therefore macroeconomic instability is a great hindrance to growth of the economy. Whilst the current money-targeting regime has

been both well-suited to and effective in delivering macroeconomic stability, it is less obvious that it still constitutes the most effective regime as Kenya seeks to establish itself as an emerging market economy in the 21st century. Unless Kenya adopts other inflation-targeting regimes' styles that have been applied widely across industrialized and middle-income emerging markets which have actually offered a potentially attractive alternative, it will face serious pit-falls and challenges in the goal of achieving macroeconomic stability. This style merges regional economies and together they stabilize the macroeconomic conditions of the member countries. CBK has mainly tried to regulate inflation levels using money supply (M3) and the repo (repurchase agreements) interests (Rotich, etal. , 2007). This policy has in most cases failed to achieve the optimum inflation target level especially in the recent economic underpinning.

1.2.2 Inflation and Fiscal Policy

The Kenyan government maintains a fiscal framework that supports macro-economic growth for sustainable development in the medium term. The government achieves this through maintaining the government borrowing requirement. The government has a policy to achieve a public debt to GDP ratio of 45% in the medium term[CITATION GoK12 \t \l 1033]. The public debt to GDP was at 53.4%. The result is impressive owing to the fact that Kenya is not a beneficiary of debt relief. The achievement owes credit to the rapid development of the local securities market that provides almost half of the government debt in domestic currency[CITATION Int13 \t \l 1033]. The achievement of the fiscal policy provides the government with guidelines for expenditure and borrowing both domestic and external.

According to the fiscal theory of the price level (FTPL), policy measures are taken such that prices are dependent on government debt and the tax spending and the tax spending plans without a link to the monetary policy[CITATION Sim94 \l 1033]. Woodford (1994) stated that in the new theory of price levels, price levels are

determined by the public debt. In the past theory of prices, price levels were determined by money supply and monetary aggregates. Research shows that changes in monetary policy that are accompanied by prudent fiscal policy result to deflationary or inflationary disequilibria. Economies defined by fiscal dominant regimes with public debt subject to regulation and uncertainty, anti-inflationary monetary policies result to hyperinflation. An active monetary policy results to increase in nominal interest rates in reaction to inflation, this will result to an increase in the nominal debt at faster rate which will lead to increase in price levels[CITATION Fav04 \l 1033].

1.2.3 The Trend of Total External Debt, 19980-2010

Kenya has undergone debt distress a number of time since the year 1980. Debt distress is the case where the country resorts into exceptional financial means such as incurring substantial arrears on their external debt, receiving debt relief from the Paris Club of creditors, and receiving non-concessional balance of payments support from the International Monetary Fund[CITATION Aar04 \l 1033].

During the 1970s and 1980s, Kenya received balance of payments support in excess of 50 percent of its quota for a total of ten years, while during the 1990s it had four years in which arrears were more than 5 percent of debt outstanding. Finally, it also received substantial Paris Club relief in 1994, and again in 2000 meaning that in total, between 1970 and 2000, Kenya experienced 17 years of debt distress.

In the recent years however, external debt has greatly been managed and made to decline due to the strong macroeconomic environment in place. In the year 2011 the debt stood at 24 percent of the growth, and dropped further to 23 percent at the end

the year 2012.

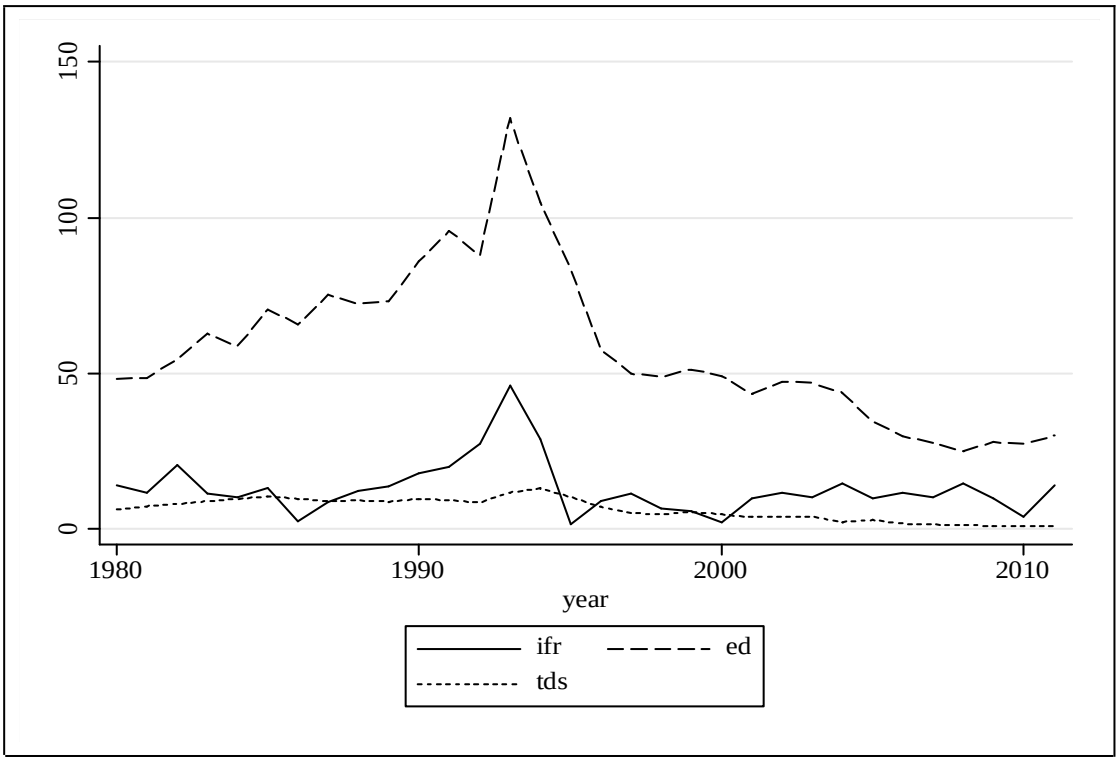


Figure 1.2 Kenya's External debt, Total debt Servicing and Inflation

Source: Ministry of Finance, 2011

The illustration shows that Kenya’s inflation rate and the entire macroeconomic stability are greatly influenced by the country’s external factors. The changes in

external debt through the period under study illustrate significant fluctuations that have influence on inflation levels. The rise in external debt from the year 1980 to 1993 is accompanied by significant changes in the inflation levels hinting at possible inflationary effects. This followed a decline in the amount of external debt owing to the increase in use of domestic debt. The change in external debt to domestic debt instituted by government had a significant effect on the interest payments and total debt servicing. The changes in external debt had less significant on the debt serving. Based on the discussion on the changes in the policy formulation frameworks by the central bank and government, the research undertakes to seek analytical evidence and explanations on the effects of external debt, monetary policy variables and fiscal variables on inflation.

1.2.4 Domestic Debt

Domestic debt is a crucial tool used to finance the internal and external gaps. Proper utilization of resources from debt can stimulate productive capacity and economic growth. On the contrary, misappropriated debt may result to adverse effects to the economy. The total domestic debt consists of stock of Government securities and Government Overdraft at Central Bank of Kenya. Government securities comprise of Treasury Bills, Treasury Bonds, Infrastructure bonds and the Pre-1997 Government Debt[CITATION GoK12 \t \l 1033]. The sources through which the government raises domestic debt include the central bank, commercial institutions and non-bank financial institutions. Borrowing directly from the central banks carries an inflationary risk due to the increase in aggregate demand resulting from the increase in money supply. To meet its debt with the central bank, the government issues treasury bills. If the current revenues of the government cannot service the debt, the stock of money will increase excessively involving inflationary issuing of money[CITATION Muh12 \l 1033].

Christensen (2005), identified commercial banks to be key holders of domestic debt in Africa accounting for more than half of the total debt. Commercial banks enjoy a relatively high income from government debt. However, the vast holdings of debt indicated fundamental shortcoming in the commercial banking operations. The nonbanking sector in countries like Kenya played a decisive role given that it is the second biggest holder of government debt. The central bank holds a modest amount of the government debt. The Ministry of Finance (MoF) annual debt report 2011/12 the statistics are coherent with Christensen's report as shown by the table.

1.3 Statement of the Problem

The extensive influence of inflation on economic growth and development attracts substantial attention from policy makers and economists. The central bank recognizes the detrimental effect of rising inflation on the economy and the trade. The changes in the Central Bank Act provide give a framework for influencing the levels of inflation. The impact of inflation extends to effects on trade as it impacts on the relative prices of commodities in the international market. The changes in prices of exports results to trade imbalances. The high inflation continued in 2009, largely as a result of increases in prices for food commodities due to the effects of the global financial crisis on the domestic economy. These effects did a big damage due to the economy and the level to which it is integrated into the global economy. The global economic and financial crisis impacted on Kenya's economy mainly by reducing external demand for Kenya's exports. Inflation has a significant implication on the general level of prices. The increases in prices level have a detrimental effect on economic development. The rise of inflation has a direct influence on the money supply which affects the value of money. The external factors such as global financial crisis have contributed to the rise of debt and influenced debt servicing. The rise on external debt and consequential changes in the levels of domestic debt has been identified to significantly influence the levels of inflation. The CBK has employed diverse monetary measures targeting

stabilization of price levels and achievement of rapid economic growth. The research taps into the aforementioned frameworks of tackling inflation and variables influencing inflation that it seeks to examine the relationship between money supply, interest rate, external debt, debt serving, trade and gross domestic product.

1.4 General Objective

To investigate long run relationships between macroeconomic variables

1.5 Specific Objectives

i. To determine the impact of public debt and trade on consumer price index in Kenya
ii. To determine the impact of monetary policy variables on consumer price index in Kenya

1.6 Research Hypothesis

The study will test the hypothesis that

H_{01}: There is no significant effect of public debt and trade on consumer price index

H_{02}: There is no significant effect of monetary policy variables on consumer price index

1.7 Significance of the Study

The study sought to enrich the literature regarding the effects of external debt, domestic debt and total external debt servicing in determining the price level. The study acknowledges a gap in empirical analysis and inference in the aforementioned subject of study. The research seeks to enrich the available literature on the efficiency of monetary policy frameworks selected over time and their influence on inflation. The results from the study are deemed to inform policy makers on public debt levels that sustain economic growth whilst maintaining the price level. The study will also

provide empirical literature on the nexus of different macroeconomic variables that affect inflation.

1.8 The Scope and Limitation of the Study

The study used yearly time series data over a period of 30 years for the period 1980 to 2010. The study focused on time series data for the country of Kenya. The study used time series data from 1980 to 2010 locking out some years that would offer more insight on the subject under study. The choice of time was limited to the availability of data for analysis. The study is also limited to the number of determinants of inflation.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter contains the theoretical model underpinning the research. Also, it highlights past studies done by different researchers in relation to the variables in the study and the results obtained from these studies and a critique of these studies.

2.2 Inflation and Monetary Policy

2.2.1 The New Keynesian Theory of Inflation

Modern macroeconomic studies on inflation are based on the New Keynesian model also known as the three equation model: IS curve, Phillips curve and interest rate-based monetary policy rule (IS- PC-MR). This approach is widely used by central banks in econometric models that provide policy simulations for inflation. The central banks employ monetary policy to diagnose the nature of shocks affecting the economy and the forecast the effects of these shocks. The way in which the central banks use this information in order to adjust the interest rate is expressed by the Taylors rule. The New Keynesian Philips Curve (NKPC) is derived from the sticky price assumption that the larger the per cent of firms that can set their price in the current period, the more important is current excess demand as a determinant of inflation. The intuition is that current excess demand will be more important than future factors if there is a high chance you can reset your price each period.

There is inability of the New Keynesian Philips Curve (NKPC) to account for the persistence of inflation following a shock is its Achilles heel: there is no inflation persistence following a change in monetary policy and only a single period impact on inflation following an inflation shock. The NKPC has the property that credibility matters but brings with it the disadvantage that there is no inflation persistence and therefore no output cost associated with a change in monetary policy. In prior models, the Keynesians argued that monetary and physical policies affect output and unemployment relatively fast through their effects upon aggregate demand. However, these policies have a weak effect on the rate of inflation. According to Keynesian

theory, the changes in aggregate demand in the short run affect real output and employment and not prices[CITATION Ste81 \l 1033]. The rate of inflation can only be reduced significantly by adopting income policy without seriously iatrogenic effects on output and employment. The Keynesians also believe that the behaviour of the price level in the future would not change if expected price levels depend on the past price level.

Keynes argued the notion of inflation using the concept of the inflationary gap. He defined inflationary gap as the planned expenditure in excess of the output available at full employment. Keynes linked inflationary gap and the consequent inflation to full employment output. This implies that the expenditure in excess of output at less than full employment level is not inflationary even if prices increase[CITATION Dwi10 \l 1033].

According to a study by Gyebi and Boafo (2013) real output and money supply, were found to have the greatest positive effect on inflation. Exchange rate depreciation reduced inflation. The study confirmed that inflation in Ghana was caused by a combination of aggregate demand and excess liquidity. A research paper by Misati, Nyamongo, Njoroge and Kaminchia (2012) aiming at determining the feasibility of inflation targeting in Kenya identified role of prices and output on inflation. The study employed Granger causality and VAR approaches to access the importance of the relationship between monetary policy variables and inflation. The study observed that the employment of the governor is relatively short term and less than the Kenyan election cycle. In addition, it determined that exchange rates have no role on both output and prices. It concluded that the Kenyan economy does not meet the conditions for inflationary targeting.

The classical economists Richard Cantillon, John Lock David Hume and William Petty postulated the Classical Theory of Inflation. The theory is based on the quantity theory of money. Irving Fisher propounded the first comprehensive version of the classical theory of inflation. The Quantity theory of money posits that the growth rate of nominal prices plus the growth rate of output is equals the growth rate of the money supply. The classical quantity theorem is derived from the quantity equation of exchange $M V^{Y} = P Y^{r}$.where Y^{r}denotes the real GDP, V^{Y}denotes the velocity of money related to GDP, M is the quantity of money and P is the price level[CITATION Dia13 \l 1033].

The quantity theory assumes that, in the short term, output and employment are exogenous and are constant. Further, assuming that velocity of money is exogenous and constant. The classical quantity theory is written as $P = aM$, where a is a constant of proportionality. Under these assumptions money affects the price level only[CITATION Gra08 \l 1033]. The shortcoming of the quantity theory of money is that it does not explain the process by which an increase in money supply causes the increase in the price level. Wicksell a classical economist responded to this criticism using loans and advances made by the banks to finance. The increase in the investment increase aggregate demand. The economy being at full employment, additional resources are not available at the prevailing prices. The additional resources are acquired through bidding higher prices to acquire the resources. This marks the beginning of the rise in the price level[CITATION Dwi10 \l 1033].

Bayo (2011) did a research focused on investigating the determinants of inflation in Nigeria for the period between 1981 and 2003. The study determined that fiscal deficits, money supply, interest rates and exchange rates are significant in the

determination and influence of inflation. The variables under study explained 78 percent of the total influence on inflation and the error term explains 22 percent.

Rutasitara (2004) investigates the influence of exchange rates on inflation in Tanzania. Model estimation lend support to the structural view of inflation and show a high degree of persistence as the current rate reflects about 0.6 of its value four quarters back. The study contributes to the debate on the controversies about the relative role of exchange rates in discussion of Structural Adjustment Programmes (SAP) and stabilization policies. Unfortunately, most key reforms occurred in the second half of 1990s, which are not captured the study since the T.O. Akinbobola 125 study period ends in 1995. It is also interesting to note that, almost all macro variables in the model, are stationary in levels.

2.3 Inflation and Trade

The structural theory was postulated by Oliver (1964) and asserted that inflation results partly from flaws in the social and economic organisation of the economy. It refutes the argument that monetary policy restriction should on to check the price level. It attributes changes in the price level to sectional disequilibria and real prices. Trade imbalances in exports and imports negatively affect economic growth and inflation owing to the exposure from imported inflation, reduced output as cheap imports are likely to suppress growth of domestic industries responsible for increased output.

According to Mohammad & Samaneh (2013) trade openness in agreement with most countries has a positive relationship with inflation in Middle East and North African countries. They used panel data covering the period 1990 to 2010. In their suggestios they say oil shocks cause most of these effects as established by their findings.They recommend that countries shouln’t rely a lot on external produsts.

Research study by Tahir (2010) show that in Pakistan trade is negatively related to inflation. He used an error correction model in finding the long-run relationship, covering the period 1960 to 2007. He recommended that Pakistan should not fear that trade openess and flexible exchange rate will increase microeconomic instability. Combining these fondings and that of Mohammad & Samaneh (2013), having in mind Pakistan is an oil rich country, it is easy to say that actually external inflation is caused by imports rather than exports.

The research done by Christopher & David (2008) finds a significant positive relationship between trade and inflation but the magnitude of the trade effect on inflation depends on key characteristics of a country. They conluded, by comparing US data and that of Europe, thatwealthier countries experienced very minimal effect of trade on inflation as compared to the national activities of those countries. The rich countries have advanced institutions, such as an independent Central Bank, and developed financial markets.

2.4 Inflation and Debt

The theory of demand pull inflation asserts that inflation occurs when aggregate demand increase more rapidly than the aggregate supply. Demand pulls inflation can be caused by real and monetary factors. The monetary approach to demand pull inflation argues that increase in the money supply in excess of the increase in potential output is inflationary. The real factors that cause demand pull inflation are those that cause the upward shift in the IS curve. These factors include an increase in government spending, change in tax rates without change in government expenditure, upward shift in the investment function, the downward shift in the saving function, upward shift in export function and downward shift in the import

function[CITATION Dwi10 \l 1033]. In the introduction, a close link is identified between external debt and inflation, money supply, trade and debt servicing. However, few studies have been done in this area. Majority of the studies investigates the effect of domestic debt and domestic debt servicing on economic growth.

According to Cherif & Hasanov (2012) inflation has an effect on the external debt ratios but the causal relationship tests only in a unidirectional. They found, by applying a VAR model for regression, a positive relationship between inflation and external debt. In their recommendations they suggest that government should focus on a short-term growth goals and as soon as the gowth begin to expand the debt start being reduced simultaneously. Effective and uniform responses from economic agents and policymakers should correlate the bebt buildup. A study by Atique & Malik (2012) shows that in Pakistan, applying time series running from 1980 to 2010 by use of the OLS method, external debt is such detrimental to the country's economic conditions. The debt not only does it get serviced but it also uses foreign currency to manage it. This in case equal results don't show from investing into the right projects, weakens the country's currency as foreign reserves get depleted. The weak currency is inflationary.

According to Nasir & Saima (2010) using Pakistan data,inflation up to a certain level negatively affect economic growth but maintain a unidirectional effect from inflation towards growth. They found 6% and below to have an insignificantly positive effect. But inflation between 6% and 11% was significant and has a negative effect to growth. The rate above 11% was significant and negatively related to growth but the magnitute was diminishing.

A Research by Raghbendra & Dang (2011) covering 182 develoding countries and 31 developed countries, using panel data over the period 1961-2009 found inflation to

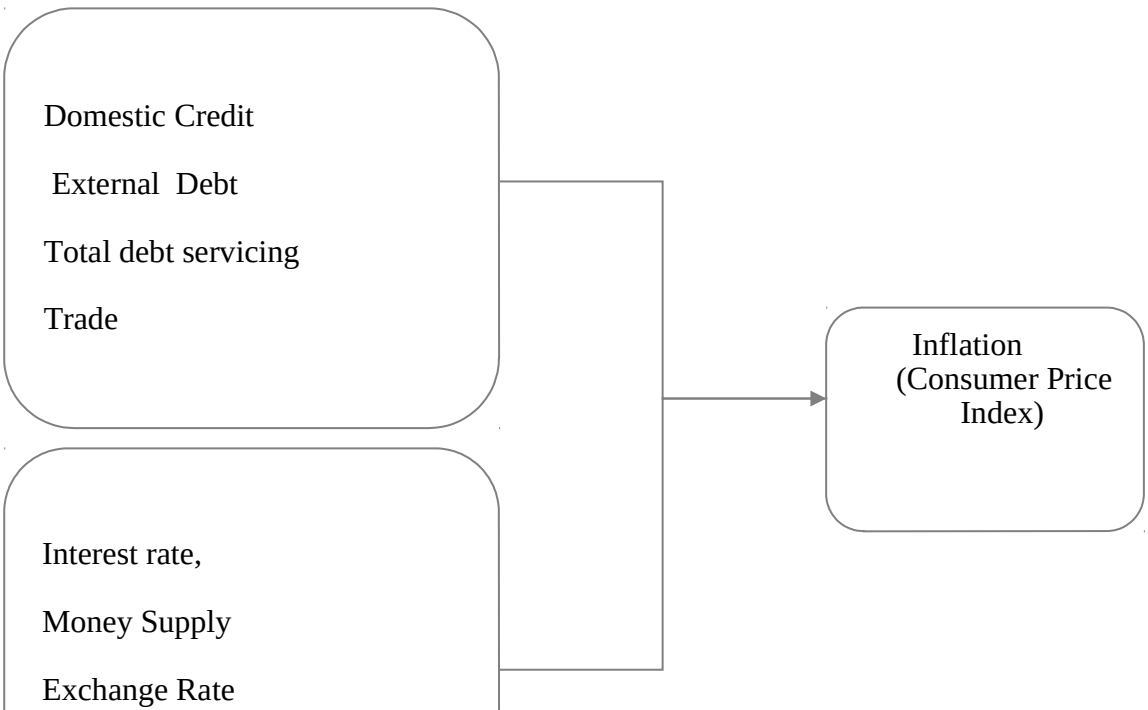
affect growth negatively but significant at the rate above 10%. For the developed countries inflation showed an insignificant relationship with Growth. This confirmed the fact that once inflation gets above a certain level it is prone to acceleration.

2.5 Critique of Literature

Reviews of the studies conducted indicate that the impact of external debt and total external debt servicing on inflation vary from one country to another depending on the interest rate and prudence of fiscal policy. However, most studies obtain results that money supply drives inflation. There are voluminous texts regarding the influence of external debt on economic growth with a positive relationship being defined. However, there is scanty literature on the effect of external debt on inflation. Studies done regarding inflation, focus on the effect of oil prices and monetary policy. The studies available also define the relationship trade. The glaring gap on the effect of external debt and external debt servicing on inflation in Kenya informed the purpose of this study

2.6 Conceptual Framework

The conceptual framework illustrates the link between the variables under study. The following figure gives a diagrammatic representation of the nexus in the dependent and independent variable.



Gross Domestic Product

Source: Researcher, 2017

Figure 2.3 Conceptual Framework

CHAPTER THREE: RESEARCH METHODOLY

3.0 Introduction

The chapter focuses on the design of the research, area of study, data sources, theoretical framework and data analysis techniques.

3.1 Research Design

The research adopted an explanatory design informed by the objectives of the study. Explanatory research provides a framework for investigation of the variables with the aim of either supporting or refuting the contention that a cause and effect relationship exists between the variables[CITATION Sal10 \l 1033].

3.2 Area of Study

The study was conducted in Kenya focusing on the Kenyan economy as a case study. Kenya was chosen so that the policy recommendations are relevant to the policy makers in the country. The study focused on the dynamics of inflation, money supply,

interest rates, economic growth, total debt servicing, trade and external trade. The time frame in the study ranges from 1980 to 2010 with annual data.

3.3 Data Sources

The study used annual secondary time series data, spanning the period 1980 to 2010 on inflation (INF), money supply (MS), and external debt (ED). Other variables are the interest rate (IT), exchange rate (EXR), total debt servicing (TDS), economic growth (GDP) and trade (TRD). Data was sourced from World Bank data bank by extracting the annual data for the variables for the period under study.

3.4 Data Analysis

The study employed inferential and descriptive statistics in the analysis. STATA statistical analysis software was used in data analysis. The Jarque-Bera test was used to test for normality. The Johansen method of co-integration technique was used to determine the presence of long-run relationships. The VECM was employed to analyse the dynamic relationships in the variables.

3.5 Model of Data Analysis

The structuralist approach to inflation acknowledges the effects of money on price levels. However, they argue that it is not the only contributing factor to changes in the price level. The monetarist approach holds that there is a strong link between inflation and money supply. In econometric terms, inflation from the different approaches is a function of numerous variables. Following Bayo (2011) the study postulates that changes in the price level arise from external debt levels and deviations from long run equilibrium in money market. The inflation function adopted in this study, therefore, combines the structuralist, monetarist and fiscalist approaches as follows:

$$INF = F(GDP, MS, IT, EXR) \quad \text{..... (3.1)}$$

$INF = F(ED, TDS, TRD, DC)$ ..... (3.2)

The equations 3.1 and 3.2 point the variables that affect inflation. The long run equilibrium relationships are expressed by the equations 3.3 and 3.4.

$L\,INF = A_0 + A_1 L\,GDP_1 + A_2 L\,MS_1 + A_3 L\,IT_1 + A_4 L\,EXR_1 + \varepsilon_1$ ..... (3.3)

The equation 3.4 is derived from equation 3.2

$LINF = B_0 + B_1 L\,ED_1 + B_2 L\,TDS_1 + B_3 L\,TRD_1 + B_3 L\,DC_1 + \varepsilon_1$ ..... (3.4)

Where

$LINF$ = log of inflation, $LGDP_T$ = log of gross domestic product, LMS_T= log of money supply,

$LIT = \log of\ interest\ rate\ LEXR = \log of\ exchange\ rate, LED = \log of\ external\ debt$,

$L\,TDS_T = \log of\ total\ debt\ servicing\ LDC = domestic\ credit$ and $L\,TRD\ is\ the \log of\ trade$

.

3.6 Definition and Measurement of Variables

Inflation – inflation is measured by the consumer price index. It is as a measure of the weighted aggregate change in retail prices paid by consumers for a given basket of goods and services. The Kenya National Bureau of Statistics collects price data through conducting a survey of retail prices for consumption goods and services. Price changes are measured by re-pricing the same basket of goods and services at regular intervals, and comparing aggregate costs with the costs of the same basket in a selected base period. The percentage change of the CPI over a one-year period is what is usually referred to as inflation.

External Debt- It is the amount of the external debt in Kenyan million shilling obtained by the government through borrowing from the WB IMF and external financial institutions.

Total debt service is the sum of principal repayments and interest actually paid in currency, goods, or services on long-term debt, interest paid on short-term debt, and repayments (repurchases and charges) to the IMF.

Interest Rate (INT) – The study employed the real interest rate.

Money Supply (M2) - Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.

Domestic credit – domestic credit is the sum of net claims on the central government and claims on other sectors of the domestic economy

Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.

3.7 Normality Test

The study employed the Jarque-Bera test proposed by Lomnicki (1961) and Jarque and Bera (1987). The test static used in the study is

$$JB = \frac{T}{6}\left[T^{-1}\sum_{t=1}^{T}\left(\hat{v}_t^s\right)^3\right]^2 + \frac{T}{24}\left[T^{-1}\sum_{t=1}^{T}\left(\hat{v}_t^s\right)^4 - 3\right]^2 \quad \text{.....3.5}$$

The null hypothesis of normality is tested against the alternative hypothesis of non-normal distribution. For a normal distribution, the JB statistic is expected to be statistically indifferent from zero.

H 0: JB = 0 (normally distributed)

H1: JB ≠ 0 (not normally distributed)

Rejection of the null for any of the variables would imply that the variables are not normally distributed, and a Logarithmic transformation is necessary.

3.8 Unit Root Test

3.8.1 Augmented Dickey-Fuller Test

It is important to determine the order of integration or non-stationarity of time series data. Regressing a time series variable on another time series variable may result to obtaining spurious results – one obtains a very high R^2 even though the variables do not have a significant relationship. If a vector y_t is integrated of order d, represented as $(y_t \ \ I(d))$, then the variables in y_t needs to be differenced d times to induce stationarity. If the individual series has a stochastic trend it means that the variable of this series does not revert to average or long run values after a shock strikes and its distribution does not have a constant mean and variance. To compute the test statistic, we fit the following augmented Dickey-Fuller regression model.

$$\Delta y = \alpha + \beta y_{t-1} + \delta t + \sum_{j=1}^{k} \tau_j \Delta_{t-j} + e_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.6)$$

The constant term is given by α, δt is the trend term and *k* is the number of lags specified.

The null hypothesis is that the process is a random walk rather than trend stationary. It is given as $H_0 : \delta = \gamma = \theta - 1 = 0$. If the null hypothesis is rejected it means that $y_t$is a stationary time series with around a deterministic trend[CITATION Ver04 \l 1033]. This equation will be used to test for stationarity in this study.

3.8.2 Phillips-Perron Unit Root Test

As noted in the Dickey–Fuller test involves fitting the regression model;

$$\Delta Y_t = \varphi Y_{t-1} + \sum_{j=1}^{p-1} \alpha_j \Delta Y_{t-j} + \upsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.7)$$

by ordinary least squares (OLS), but serial correlation will present a problem. To account for this, the augmented Dickey–Fuller test's regression includes lags of the first differences of ΔY_t . The Phillips–Perron test involves fitting (1), and the results are used to calculate the test statistics. Phillips and Perron (1988) proposed two alternative statistics, Phillips and Perron's test statistics can be viewed as Dickey–

Fuller statistics that have been made robust to serial correlation by using the Newey–West (1987) heteroskedasticity- and autocorrelation-consistent covariance matrix estimator.

3.9 Co-integration Test

The Cointegration process was introduced by Granger (1981) and Engel & Granger (1987) in which they posited that the variables in a K – dimensional process $y_t$are cointegrated of order (d,b) if all components of y_t $I(d)$ and there exists a linear combination $z_t=\gamma^{'} y_t$where $\gamma=¿¿$ such that z_t is$I(d-b)$. In this case γ is a cointegrating vector[CITATION Lüt05 \l 1033]. In other words, a set of variables are cointegrated if each variable is integrated yet there exists a linear combination of the variable that is stationary.

The Johansen and Juselius Cointegration test employs two tests to determine the number of cointegrating vectors; the maximum Eigen test and the trace test. The maximum Eigen value statistics test the null hypothesis of $_r$ cointegrating relations against the alternative r+1cointegratin relations for $r=0,1,2\ldots n-1$. The test is given as

$$LR_{max}=\left(\frac{r}{n}+1\right)=-T^{¿}\log\left(1-\lambda^{\wedge}\right)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..3.9$$

Where $\lambda$the maximum eigenvalue and T is is the sample size.

The trace statistics investigates the null hypothesis of r cointegrating equations against the alternative of n cointegrating relations where n is the number of number of variables in the system for $r=0,1,2\ldots n-1$. The test is given as

$$LR_{tr}=(r/n)=-T^{\iota}\sum_{i=r+1}^{n}\log\left(1-\lambda_i^{\wedge}\right)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.10$$

If the trace and Eigen give different yields then the trace test is preferred. This study will employ the Johansen test for Cointegration due to its robustness generated by the underlying VAR model since it does not depend on normalising one variable to another. In addition, it provides a framework to test for more cointegrating relations.

3.10 Vector Error Correction Model (VECM)

The VECM is used in to determine the short run and the long run relations between the variables if Cointegration will be determined to exist. The cointegrating rank shows the number cointegrating vectors, such as, a cointegrating rank of one indicates that there exists one linearly independent combination of non-stationary variables which will be stationary. If there is a negative and significant ECM then, any short term fluctuations between the independent variables and dependent variables will give rise to a stable long run relationship between the variables. The vector error correction model is represented as follows.

$$\Delta X_t=\mu+\Gamma_i\Delta X_{t-1}+\Gamma_2\Delta X_{t-2}+\ldots+\Gamma_{k-1}\Delta X_{t-k-1}+\Pi X_{t-k}+\varepsilon_t\ldots\ldots\ldots\ldots\ldots\ldots..3.11$$

Where ΔX_t is vector of growth rates , $\Gamma_j=-\left[I-\sum_{i=1}^{j}\phi_i\right]$ is an nxn matrix containing information on short run adjustments of changes in X_t , $\Pi=-\left[I-\sum_{i=1}^{j}\phi_i\right]$ is an nxn impact matrix of parameters containing information on long run adjustments , μ is a vector of constants,

ε_t is $nx\,1$ vector of white noise errors , and I is an empty matrix[CITATION Joh92 \l 1033 \m Har95].

3.11 Lag Length Selection Criteria

The selection of the numbers of lags to be included in the analysis requires balancing of the marginal benefits of including more lags against the marginal cost of additional estimation uncertainty. If the order of estimation is too low, the research faces a risk of omitting crucial information contained in the omitted lag periods. On the other hand, if it is set too high then many unnecessary coefficients will be estimated. The study uses the Akaike Information Criterion and the Schwarz Information Criterion. The Schwarz Information Criterion selects the most parsimonious models with the fewest coefficients whereas AIC selects the most lavish models[CITATION Lut053 \l 1033].

Akaike Information Criterion

$$AIC(n) = LogDet\left(\sum_{\upsilon}^{\sim}(n)\right) + \left[\frac{2}{T}nK^2\right] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.11$$

Schwarz Information Criterion

$$SBIC(n) = LogDet\left(\sum_{\upsilon}^{\sim}(n)\right) + \frac{LogT}{T}nK^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.12$$

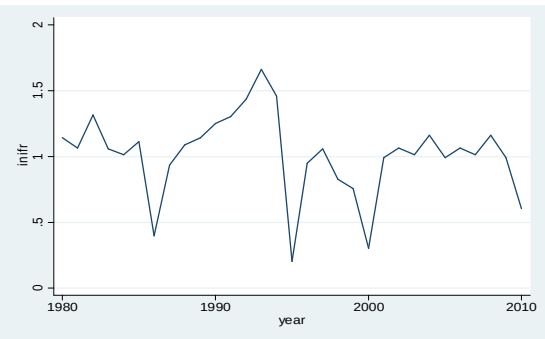
CHAPTER FOUR: RESULTS AND DISCUSSION

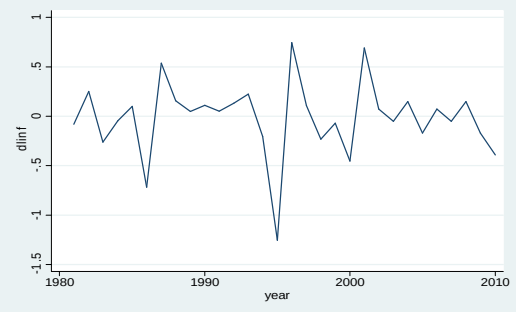
4.0 Overview

This section begins by providing the defining characteristics of the time series data used in analysis. It proceeds to discuss the unit Root Test Results, Co-integration Analysis, Diagnostic Tests, Granger Causality and stability tests. The section completes by giving the empirical discussion from the analysis.

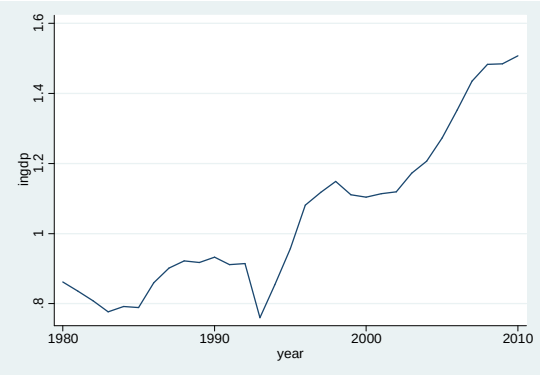
4.1 Characteristics of Variables

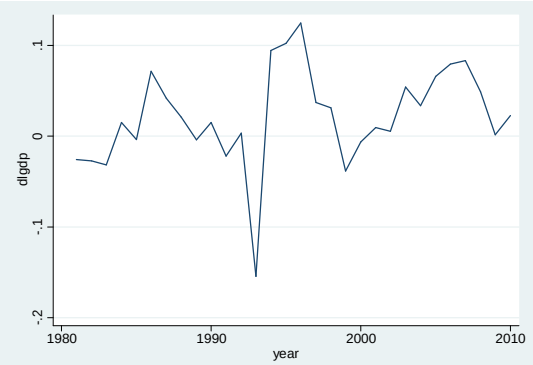
Best practices have always indicated that the first step in the analysis of time series is to display the visual plot of the data to give an impression about the time series under analysis[CITATION Guj041 \l 1033]. The plots from the left show graphs at level while the graphs at the right show the plots at first difference. Through visual inspection the variables are not stationary at level except for trade and inflation that shows an almost constant trend at level that may indicate weak stationarity. The plots for money supply, domestic credit, exchange rate and gross domestic product show a linear upwardly increasing trend. Graphs for external debt and debt servicing indicate a linear downward declining trend. The graphs also depicted seasonal variations and presence of outliers in the data.

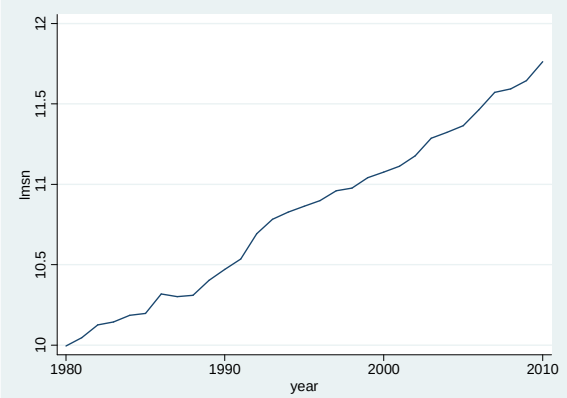


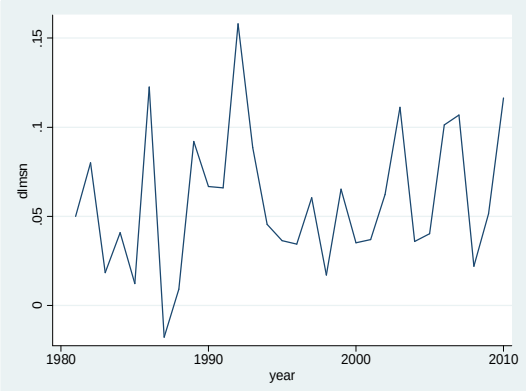


The above graph displays inflation is mean reverting both at level and first level with trends appearing and extreme variables in mid 1980s and mid-1990s.



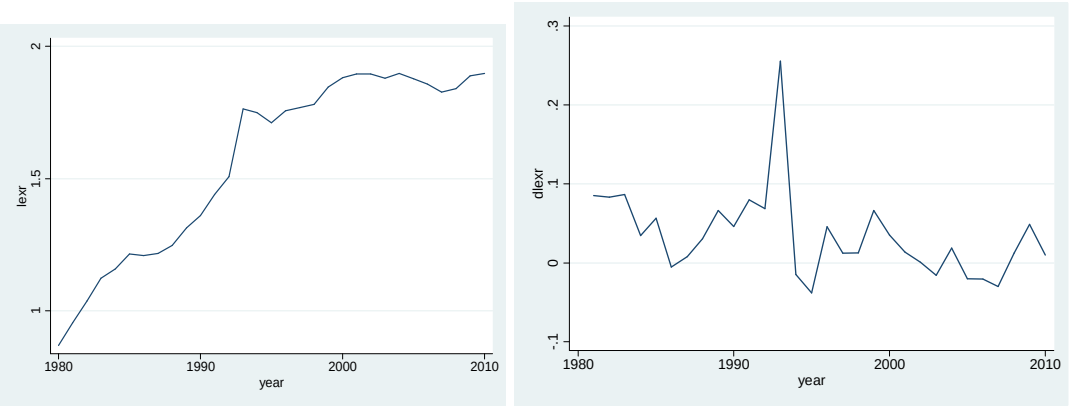




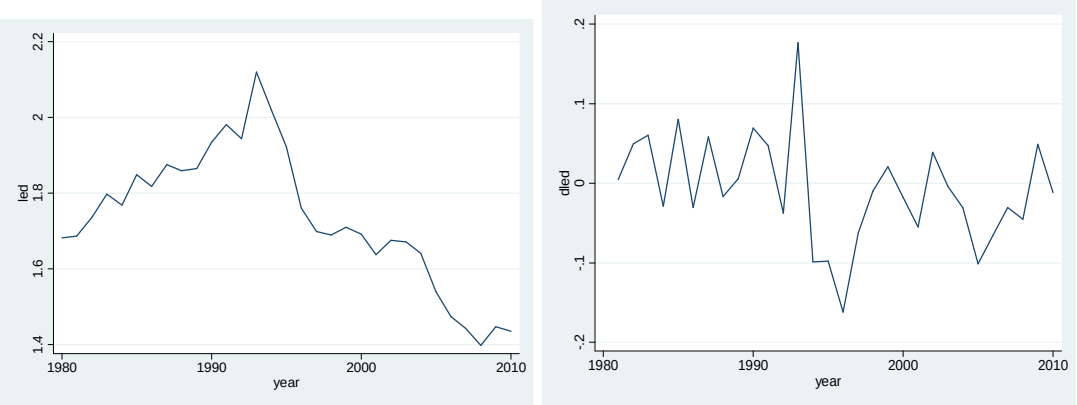


Graph of gross domestic product and money supply indicates that it is mean reverting at first level contrary to a increasing trend at level.

Interest rate is not mean stationary from visual introspection at level but is level at first difference. There are sharp declines in the early 1990s that indicate favorable economic periods and prudent financial management practices.



Exchange rate displays a rising trend at level and a mean reverting at first level. This informed the differencing of data to make it stationary. The trend in exchange trade is attributed to imbalances and devaluation of the local currency.



Trade depicts astable graph with variations especially in the mid-1990s when the economy improved with strong macroeconomic policies. Trade is clearly mean reverting at first level through visual introspection and this is confirmed by the augmented dickey Fuller test.

Figure 4.4Full sample time series multiple graphs at level and first difference.

Source: Author, 2016

The differenced variables are stationary as they show a clear mean reverting property. Stationarity at first difference simply indicate that the variables are integrated of order

one. The characteristics anticipate the nature of the data to be determined through testing. To formally investigate the presence of unit root, the study employs Dickey & Fuller (1979) and Philips & Perron (1988) tests.

4.2 Unit Root Test

4.2.1 Unit Root Test at Level and First Difference Using ADF and PP

Table 4.1 Unit Root Test at Level

	Level					Differenced				
Variable	ADF	Prob	PP	Prob	Remarks	ADF	Prob	PP	Prob	Remarks
LINF	-3.910	0.0020	-3.877	0.0022	No Unit root	-7.089	0.0000	-7.993	0.000	No Unit root
LGDP	0.776	0.9912	0.577	0.9870	Unit root	-4.033	0.0012	-3.98	0.001	No Unit root
LMS	0.730	0.7639	0.926	0.9934	Unit root	-5.251	0.0000	-5.240	0000	No Unit root
LIT	-2.897	0.0457	-2.880	0.0478	Unit root	-4.279	0.0005	-4.269	0.00	No Unit root
LED	-0.323	0.9222	-0.605	0.8699	Unit root	-4.584	0.0001	-4.402	0.000	No Unit root
LEXR	-2.621	0.0888	-2.536	0.1068	Unit root	-4.658	0.0001	-4.696	0.000	No Unit root
LTRD	-2.986	0.0363	-3.010	0.0339	No Unit root	-5.640	0.0000	-5.695	0.000	No Unit root
LTD	0.917	0.993	1.045	0.994	Unit	-5.329	0.0000	-	0.000	No Unit

S		3		7	root			5.330		root
LDC	-0.482	0.8955	-0.479	0.8960	Unit root	-4.354	0.0004	-4.307	0.004	No Unit root

Source: Author, 2016

The critical values for Augmented Dickey fuller are -3.716, -2.986 and -2.624 for 1%, 5% and 10% respectively. The critical values for Philip-Perron are -3.716, -2.986 and -2.624 for the 1%, 5% and 10% respectively for testing at level.The critical values for Augmented Dickey Fuller are -3.723, -2.989 and -2.625 for 1%, 5% and 10% respectively. The critical values for Philip-Perron are -3.723, -2.989 and -2.625for 1%, 5% and 10% for testing at first difference. The first test shown on table 4-1 indicate that there is no unit root for interest rate and trade at level but no unit root in all variables at first level. The computed t-ratios of the ADF and Philip-Perron are greater than the critical values at 1%, 5% and 10% at level but less at first difference. Hence, it was conclude that variables are integrated of order one. The presence of no unit root at first level is essential characteristic for the analysis using cointegration analysis.

The figures below give a vision of the relationship of the variables modeled for the two equations. From the graphs it can be visually determined the presence of a relationship between the variables to be examined. The relationship is established from the similarity identifiable in the trend of movement of the individual variables over time.

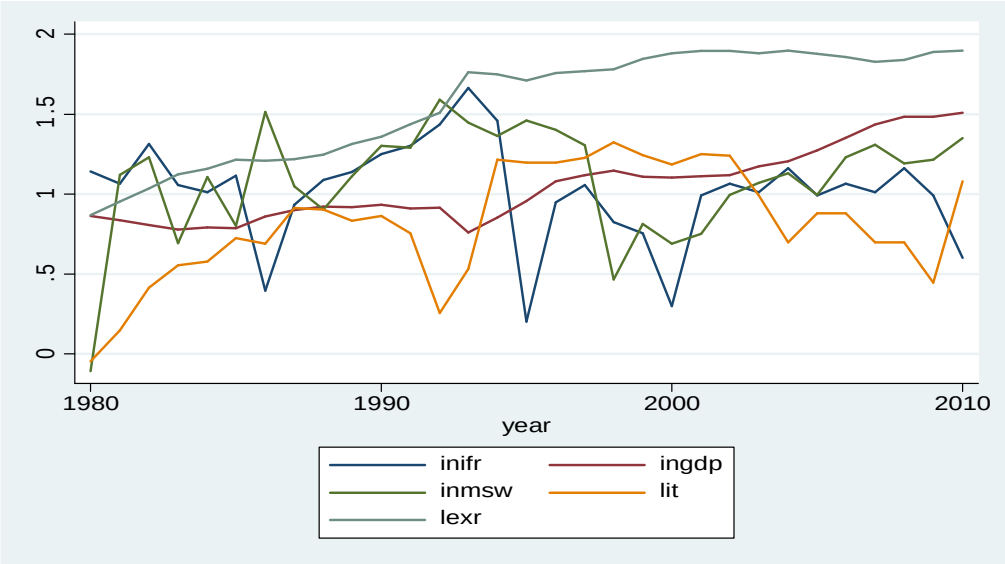


Figure 4.5 Plot of the modeled variables

The graph shows existence of a relationship in the movement of the variables which is evidence of the existing relationship between the variables under study. The visual relationship highlights the relationship to be expected between the variables. Exchange rate and gross domestic product have a similar increasing trend. Money supply and inflation have a similar trend of movement so is to interest rate.

4.3 Co-integration analysis

The establishment of the non stationarity hypothesis in the underlying variables was critical to examine the variables for Co-integration. Co-integration is the presence of a long-run equilibrium relationship that exists between variables in the regression system. Disregarding the test for existence of Co-integration when it exists can result to possible model misspecification. Put clearly, integrated variables of any order cannot be regressed using the usual OLS technique due to their unstationarity property but will apply a special case of the Johansen's normalization method to estimate the parameters of the underlying model. The study employed the vector error correction model to test the long-run relationships and short-run behaviors of the variables. VECM is well applicable for I(1) variables. This idea of bringing non-stationary

variables into a linear combination that is stationary using error correction by Granger (1983) was developed into a VECM model by Johansen (1995) to be able to estimate parametors for inference.

4.3.1 Determination of Lag length

In economics practicality demands that a dependent variable say Y does not respond instantaneously due to the effects of a dependent variable X. it takes Y a lapse of time to complete the intended changes it undergoes caused by the forces created by X variable. This lapse of period of time after which the effect is complete is referred to as a lag. To test for co-integration rank of the long-run equilibrium relationship between variables and consequently fit the VECM model so as to produce estimates for inferential purpose, one needs to determine the lag order first.

This study applies a model that produces results that are consistent in the manner that shocks created in the system will cause an impact that is does not die off over time, hence can be used for prediction of future effects of shocks. This implies that consistency is meaningful in determining the model lag order in this study. Given these consistency conditions are required the Hannan Quinn (HQ) and Schwarz Criteria (SC) are superior to Akaike Information Criteria (AIC) and Final Prediction Information Criteria (FPE), if applied adding the fact that the study sample is large[CITATION Lut053 \l 1033].

The lag length for the first model is reported in table 4-2. The Log Likelihood ration determined the lag length to be (4) but this is not an information criterion. The HQ and AIC identified the lag length to be one (3) while the SC determined the lag length to be (1). The lag order was selected to be one using SC.

Table 4.2 Lag length Determination for Model One

Sample:1984-2010 Number of obs = 27

lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	1.21511				9.10E-07	0.28036	0.351718	0.5203
1	133.047	263.66	25	0	3.50E-10	-7.63314	-7.20501	-6.1933*
2	157.921	49.747	25	0.002	4.30E-10	-7.62376	-6.83885	-4.9841
3	203.639	91.436	25	0	1.8e-10*	-9.15841	-8.0167	-5.3189
4	248.192	89.107*	25	0	2.30E-10	-10.6068*	-9.1084*	-5.5675

The lag length of one was selected owing to the fact that SC is a superior criterion and selects the most parsimonious models[CITATION Lut053 \l 1033]. The lag length was also selected to be one as it allows capturing the effects from the previous periods without excluding important effects.

Table 4.3 Lag Length Determination for Model Two

Sample: 1984 - 2010 Number of obs = 29

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	49.7758				2.50E-08	-3.31673	-3.24537	-3.07676
1	171.664	243.78	25	0	2.00E-11	-10.4936	-10.0655	-9.05381*
2	201.887	60.446	25	0	1.70E-11	-10.8805	-10.0956	-8.24083
3	220.977	38.181	25	0.044	4.90E-11	-10.4428	-9.30108	-6.60325
4	287.365	132.78*	25	0	1.3e-11*	-13.5086*	-12.0101*	-8.46919

4.3.2 Summary Statistics for Co-integration Rank

The co-integration rank was determined using Johansen (1990) and Johansen and Juselius (1991) maximum likelihood method. The Johansen's testing procedure starts with the test for zero co-integrating equations (a maximum rank of zero) and then accepts the first null hypothesis that is not rejected. In the output in both table 4-4 and 4.5, we strongly reject the null hypothesis of no co-integration and fail to reject the null hypothesis of at most one co-integrating equation. Thus we accept the null hypothesis that there is one co-integrating equation in the model. The results are displayed in table 4.4 and 4.5. The co-integration rank was therefore determined as (1) for one lag.

Table 4.4 Determination of Co-integration Rank model 1

Johansen's test for co-integration

Trend: constant Number of observations = 29

Sample: 1981 -2010 Lags = 2

Maximum rank	Parms	LL	Eigen value	Trace statistic	Critical Value (5%)
0	35	159.9455	.	91.0703	77.74
1	44	179.2219	0.73537	52.5175*	54.64
2	51	191.5549	0.57282	27.8515	34.55
3	56	199.5704	0.42466	11.8204	18.17
4	59	205.4703	0.33428	0.0208	3.74
5	60	205.4807	0.00072		

Model one has one cointegration equation as determined by the Johansen test in table 4.4.

Table 4.5Determination of co-integration Rank for model 2

Trend: constant Number of observations = 29

Sample: 1981 -2010 Lags = 2

Maximum rank	Parms	LL	Eigen value	trace statistic	5% Critical value
0	35	170.035	.	95.0813	77.74
1	44	191.790 1	0.77695	51.5713*	54.64
2	51	201.882 2	0.50145	31.3857	34.55
3	56	209.353 9	0.40262	16.4451	18.17
4	59	214.852 3	0.31565	5.446	3.74
5	60	217.575 8	0.17121		

There is only one cointegrating equation in model two as determined by the Johansen model above. The vector error correction model is employed in analysis the existing relationships between the variables in both models of analysis.

4.3.3 Co-integration Parameter Model one

Table 4.6 Determination of Co-integration Parameter

Sample: 1981 – 2010		No. of obs =	30
		AIC =	-9.09244
Log likelihood = 0.3866		HQIC =	-8.88325
Det(Sigma_ml) = 3.04e-11		SBIC =	-8.43855

Equation	Parms	RMSE	$\mathbf{R^2}$	χ^2	$P>\chi^2$
D_LINF	2	0.892703	0.0109	0.308401	0.8571

D_LIT	2	0.197502	0.363	15.95479	0.0003
D_LGDP	2	0.046899	0.3712	16.52697	0.0003
D_LMS	2	0.039479	0.7081	67.92315	0.0000
D_LEXR	2	0.049595	0.4469	22.62673	0.0000

This part of the model shows how fitting each equation is using the R-squares and mean square error (RMSE). Information about the sample size and the overall fitting of variables in the model is also displayed, using the log likelihood and the information criteria value. The R squared for the variables is significant for all the variables except for inflation. The R squared for the variables is significant for all the variables with exclusion of inflation. R squared is significant for interest rate, gross domestic product, money supply and exchange rate since the probability of 0.000 < 0.05. However, the R squared for inflation is not significant given that 0.085>0.05. The significance of most of the variables supports the validity of the model under study and its ability to give statistics credible for policy making.

4.3.4 Long run Behaviors

Table 4.7 Summaries of Statistics for Co-integration Equation for Model 1

	Beta	Coef.	Std.	Err.	Z	P>|z|	(95% Conf. Interval)
CE1							
	LINF	1	.	.	.	.	.
	LIT	47.5777	6.13228	7.76	0.000	35.5572	59.59622
	LGDP	-109.124	25.0481	-4.36	0.000	-158.218	-60.0307
	LMSN	120.315	23.6736	5.08	0.000	73.9163	166.7155
	LEXR	-141.521	25.8776	-5.47	0.000	-192.241	-90.8022
	CONS	-1006.82	.	.	.	.	.

The results for the co-integrating relation are as shown above in equation. The results give significance of interest rate in influencing inflation. The results show that gross

domestic product had a negative effect on inflation. In addition, gross domestic product is significant at five percent level of significance. The results indicate that that a 1% change in GDP can cause 109.1% change in inflation. The result is similar to the findings of Lim & Sek (2015) that document the negative relationship between inflation and GDP. The effect is significant particularly low in inflation countries. An increase in levels of output provides market for the available aggregate demand arising from increase in real balances from the consumers. This will in turn result to a decline in the liquidity level in the market.

Money supply has a positive effect on inflation. A 1% increase in inflation results to an increase of 120.3159% on inflation. The positive relationship between money and inflation is consistent with the monetary policy theory. The significant positive effect of money supply confirms the overwhelming effect of monetary policy both from fiscal impulses and financial intermediation. Increase in liquidity in the economy increases the real money balances by people resulting to increased aggregate demand. The results are consistent with the findings of Rotich, Kathanje, & Maana (2008) which determined that money supply had a positive relationship with inflation in the long run. Studies are consistent on the effect of increased liquidity in the economy and its effects on the price levels.

The results further showed that 1% change in interest rate caused a 47.577% change on inflation and has a positive effect. The results are consistent to Durevall and Bo Sjö (2012) that identified the effect of interest rates and money supply on the Kenyan economy. It was concluded that money supply and interest rates are significant and have a significant effect on inflation as posited by the monetarist approach to inflation.

Exchange rate has a reverse effect to inflation. A 1% change in inflation has a 141.52% effect on inflation. This implied that increase in exchange rate lowered the level of inflation moderately. However, this contradicts with [CITATION Bay \t \l

1033] and Akinbobola (2012) which found out that an increase in the exchange rate is potentially inflationary. The difference on effect of exchange rate on inflation may be attributed to the different exchange rate regimes adopted by different economies targeting trade and inflation.

4.3.5 Short run Behaviors

Table 4.8 Summary of Statistics for Short-run Behaviors

		Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
D_LINF							
	CE1	-0.0097	0.019657	-0.49	0.622	-0.04823	0.028827
	CONS	-0.04931	0.163747	-0.30	0.763	-0.37025	0.271631
D_LIT							
	CE1.	-0.01677	0.004349	-3.86	0.000	-0.0253	-0.00825
	CONS	0.024033	0.036227	0.66	0.507	-0.04697	0.095037
D_LGDP							
	CE1	0.003298	0.001033	3.19	0.001	0.001274	0.005322
	CONS	0.024192	0.008603	2.81	0.005	0.007331	0.041052
D_LMSN							
	CE1	-0.00095	0.000869	-1.09	0.275	-0.00265	0.000755
	CONS	0.058119	0.007242	8.03	0.000	0.043925	0.072312
D_LEXR							
	CE1	-0.00314	0.00109	-2.87	0.004	-0.00528	-0.001

		2				
CONS	0.031796	0.009097	3.50	0.000	0.013966	0.049626

The vector error correction results (A) investigate the effects of monetary policy variables on disequilibria caused in the short-run on model one relationship in table 4.8.The results indicate that 0.9% of the adjustment from the equilibrium can be explained by inflation within one year However the results are not significant within 5% level of significance. The value of the constant term is insignificant at 5% levels of significance.

Further, the results indicate that 1.677% of the adjustment from the disequilibrium can be explained by the by interest rates within one year. The results are significant at 5% levels of significance as 0.0000<0.05. The constant term explains 2.3% of the adjustment within one year. However the result is not significant at five percent level of significance because 0.507>0.05.

The results also indicate that 0.33% of the adjustment is explained by gross domestic product within one year. The adjustment effect is significant at 5% level of significance since 0.001<0.05. The constant term explains 2.5% of the deviation in the constant term within one year. The value is significant within 5% level of significant. The effect of GDP in the short run indicates the ability of the economy to react to changes in growth in output and the corresponding effect on inflation.

Further, the results indicate that 0.09% of the change in the disequilibrium is explained by moneys supply within one year. The p value of the results is more than 0.05 hence not statistically significant. The variation of the constant term is explained by 5.8% within a period of one year. The result is significant because 0.000 < 0.05 as attained from the analysis. The result contradicts that of Akinbobola(2012) that

indicates the significant influence of money to increase the inflation levels in the short run due to its effect on liquidity.

Finally, the results show that 0.34% of the change in the disequilibrium in from the short run is explained by the exchange rate within one year. The results are significant within one year at 5% level of significance. The constant term explains 3.2 percent of the disequilibrium in the long run constant term. The value of the constant term is significant at 5% level of significance since 0.000 < 0.05. According to Akinbobola (2012), exchange rate is significant in influencing the level of inflation in the short run. In his study exchange rate follow money supply in hierarchy of effectiveness in reducing inflation.

4.4 Diagnostic Test Model 1

4.4.1 Lagrangian Multiplier Test for residual Autocorrelation

Autocorrelation is the relation between error-terms in the model produced. The presence of autocorrelation affects the consistence of parameters hence influences hypothesis testing especially to easily reject the null hypothesis. It is important to perform test to confirm the absence on autocorrelation and qualify the consistence of the paramenters. This effect on null hypothesis will significantly affect the study model interpretations.

see[i] . The p values of the variables are greater than 0.5 hence the null hypothesis cannot be rejected. This implies that there was no serial correlation among the modeled variables. The interpretation thereof is that there exist linear dependencies among the variables and the coefficients resulting from analysis can be used in for interpretation and policy making.

4.4.2 Test for normality

The joint combination of the normality test indicates that the variables are normality distributed as the probability 0.0112 < 0.05. The pass of the normality test provides support to the model under analysis the coefficients determined from the study.

The combination of all variables for skewness test shows that the model is skewed as the probability 0.05954 is greater than 0.05 *see* [ii]. This implied that most of the variables under study are not aligned to the normal distribution. However, the level of skewness may be attributed to changes in data resulting to different policy measures undertaken to deal with inflation in certain times.

The combination of all variables also passes the kurtosis test as the probability is less than 0.05 *see* [iii]. The model that satisfies the normality test at 5% level of significance; hence the study did not reject the null hypothesis of normal distribution of the multivariate residuals.

4.4.3 Stability Tests Model 1

Stability test entails both determining specification of the number of co-integration equation in the model and effects of structural changes on its stationarity. The specification of co-integration equations can be tested using the Eigen-value module test. The test requires that if the model contained K endogenous variables and r co-integration rank there must be K module and K-r of those must be equal to unit. The remaining r module should be less than unit and the further away from the unit circle they are the more the surety that the correct number of co-integration equations was specified.

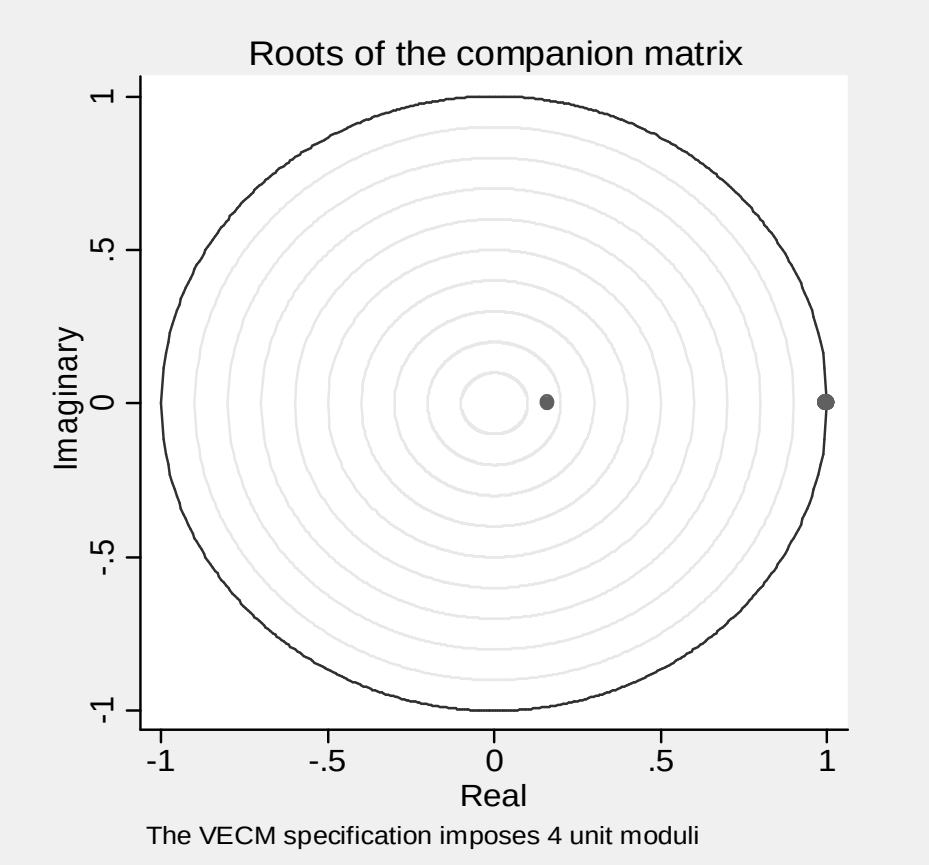


Figure 4.6 Results for Roots of the Moduli Unit Circle

The r module from analysis is unit implying that the model is stable for data analysis *see* [iv]. The roots of companion matrix indicate that the variables fall within the circle confirming the stability of the model of analysis.

4.4.4 Cusum Test

The cusum tests were estimated to test for the structural stability of the model. The cusum and cusum squared test result are given in figure 4.4 and figure 4.5. It is deduced that the model is stable given that the stability line lies between the set limits. Hence both the cusum and the cusum squared test confirm the structural stability of the model.

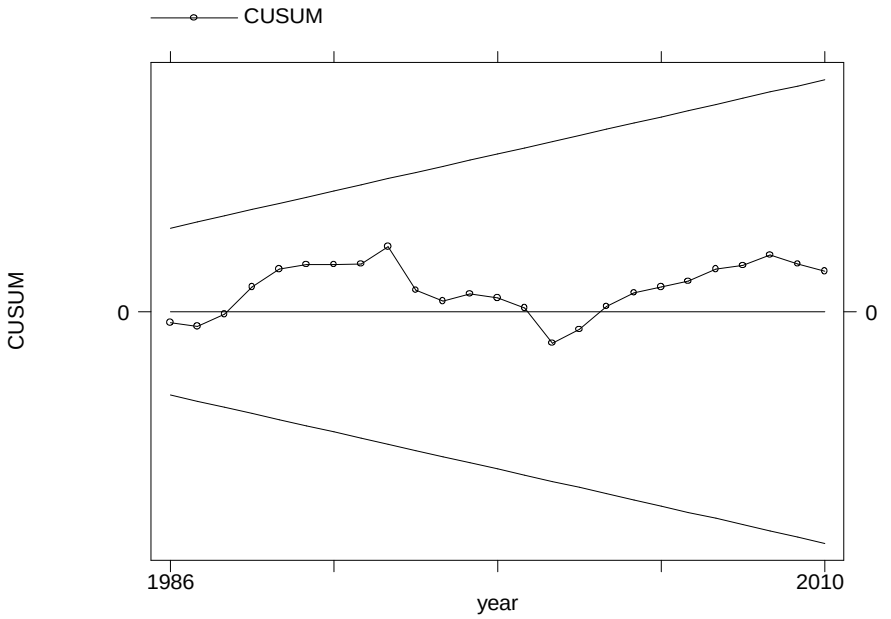


Figure 4.7 Cusum Test for Model 1

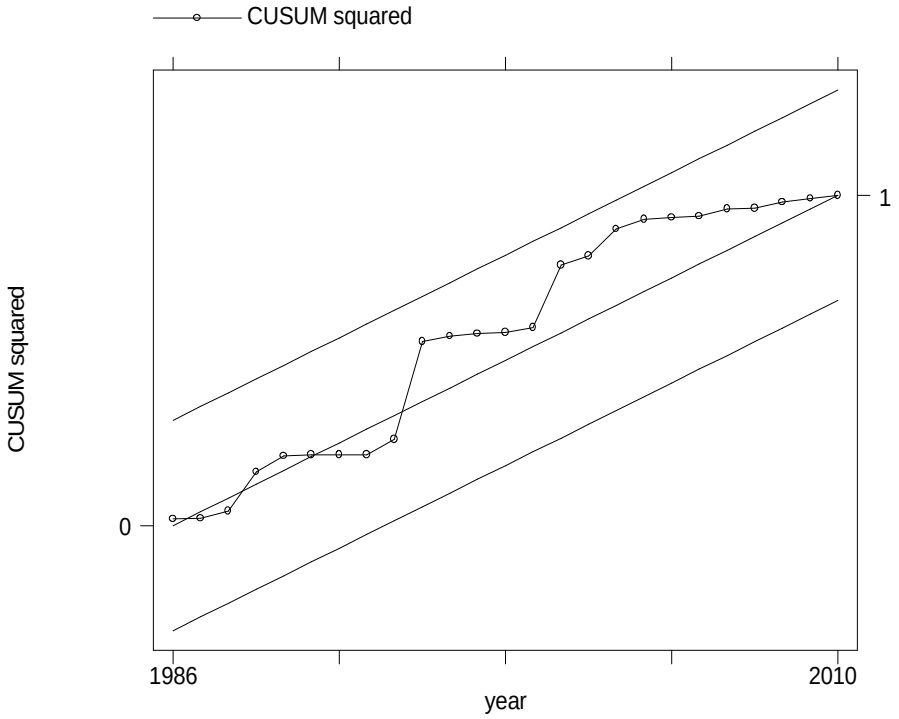


Figure 4.8 Cusum Squared Test for Model 1

4.4.5 Granger Causality Test Model 1

The granger causality tests were derived from the F statistic providing information on the significance of the variables in the equations. The tests revealed the presence of a bidirectional relationship between inflation and all other variables. The presence of a

bidirectional relationship implies that the effect is two sided. Changes in inflation will have a significant effect on the explanatory variables. There was a bidirectional relationship between gross domestic product and inflation which indicated the effect expected on inflation due to changes on inflation. This can be explained by the reduction in money supply expected during high inflation periods. Consequently, the levels of investment will decrease resulting to a decline in output.

However there exist a unidirectional relationship between gross domestic product and all other variables in general. It was determined that there was a bidirectional relationship between interest rate and all other variables. Exchange rate exhibited a bidirectional relationship with all other variables. Changes on exchange rate are thus expected to have effects on all the other variables in the model. It implies that exchange rate will be significantly affected by changes on the other variables. Finally, it was determined that there exists a bidirectional relationship between money supply and all other models since the probability was higher than 0.05 hence rejection of the null hypothesis.

Table 4.9 Granger Causality Model 1

Equation	χ^2	Df	Prob>χ^2	Remarks
LINF does not Granger cause LGDP	0.11132	1	0.739	Reject Null
LINF does not Granger cause	0.54128	1	0.462	Reject Null

LEXR				
LINF does not Granger cause LIT	3.0024	1	0.083	Reject Null
LINF does not Granger cause LMS	0.35011	1	0.554	Reject Null
LINF does not Granger cause ALL	5.1822	4	0.269	Reject Null
LGDP does not Granger cause	0.87825	1	0.349	Reject Null
LINF				
LGDP does not Granger cause	8.5492	1	0.003	Accept Null
LEXR				
LGDP does not Granger cause LMS	11.955	1	0.001	Accept Null
LGDP does not Granger cause ALL	21.691	4	0.000	Accept Null
LEXR does not Granger cause	0.00209	1	0.964	Reject Null
LINF				
LEXR does not Granger cause	2.6073	1	0.106	Reject Null
LGDP				
LEXR does not Granger cause LIT	5.0866	1	0.024	Accept Null
LEXR does not Granger cause LMS	3.2604	1	0.071	Reject Null
LEXR does not Granger cause ALL	5.9007	4	0.207	Reject Null
LIT does not Granger cause LINF	3.0399	1	0.081	Reject Null
LIT does not Granger cause LGDP	0.19459	1	0.659	Reject Null
LIT does not Granger cause LEXR	5.1485	1	0.023	Accept Null
LIT does not Granger cause ALL	14.143	4	0.007	Accept Null
LMS does not Granger cause LINF	3.7547	1	0.053	Reject Null
LMS does not Granger cause LGDP	2.7596	1	0.097	Reject Null
LMS does not Granger cause LEXR	1.8425	1	0.175	Reject Null
LMS does not Granger cause LIT	0.81757	1	0.366	Reject Null
LMS does not Granger cause ALL	6.7632	4	0.149	Reject Null

4.5 Co-integrating Parameter Model 2

The results for cointegation for the second model of analysis are given below beginning with analysis of the significance of the model in the values of R squared. The probability of the R squared is significant for inflation, external debt, trade and domestic credit with R squared of 0.1831, 0.3103, 0.2745 and 0.7411 respectively.

Total debt service has an R squared of 0.1662, but is not statistically significant since 0.0614 > 0.05. R squared for the variables is significant hence support the model under analysis in explain the relationship between the variables.

Table 4.10 Determination of Co-integration Parameter Model 2

Sample: 1981 – 2010		No. Of observations	=	30
		AIC	=	-10.0412
Log likelihood = 164.6173		HQIC	=	-9.83197
Det(Sigma_ml) = 1.18e-11		SBIC	=	-9.38726

Equation	Parms	RMSE	R^2	χ^2	$P¿\chi^2$
D_LINF	2	0.352343	0.1831	6.274111	**0.0434**
D_LTDS	2	0.087852	0.1662	5.581897	**0.0614**
D_LED	2	0.057436	0.3103	12.59495	**0.0018**
D_LTRD	2	0.038783	0.2745	10.59429	**0.005**
D_LDC	2	0.091582	0.7411	80.15519	**0.000**

4.5.1 Long run Behaviors

The long run results provide statistical analysis relating to the equilibrium relationship of inflation, external debt, debt service, trade and domestic credit. The results for co-integrating relation for model two are given in table 4-16.

Table 4.11 Summary of Statistics for Co-integration Equation for Model 2

BETA	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
CE1						
LINF	1	.	.	.	.	.

LTDS	1.5609	0.490579	3.18	0.001	0.599382	2.522418
LED	-2.26323	0.673182	-3.36	0.001	-3.58264	-0.94382
LTRD	-5.0101	0.907353	-5.52	0.000	-6.78848	-3.23172
LDC	0.105924	0.061068	1.73	0.083	-0.01377	0.225615
CONS	7.802249	.	.	.	.	.

The results show that total debt service, external debt, trades are significant at 5% level of significance since there probabilities are less than 5%. From the equation, it can be deduced that total debt service has a positive relationship with inflation. A unit change in debt service has a 1.56 increase in inflation. External debt has an inverse bidirectional relationship with inflation with a unit change in external debt resulting to a 2.263 change in inflation. The bidirectional relationship between inflation and external debt service provides credence to the effect resulting from the changes on inflation towards debt as evidence in the United States. An inflation shock results in an increasing debt ratio after only a few quarters, whereas a positive growth shock lowers debt substantially. We contend that the positive or negative response of debt to inflation, or for that matter, interest rate shocks, depends largely on the monetary and fiscal policy regimes in place[CITATION Che12 \l 1033].

Trade has an inverse effect on inflation. A unit change in trade has a 5.010 change in trade. This implies that a decline in trade results to an increase in inflation. According to Mahmoudzadeh & Shadabi (2012), tade freedom had a significant efffect on inflation especially on countries that have high debt levels. Trade freedom refers to the use of tarriff and non tarriff barriers hence influences the levvel of trade. This implied that high level of trade increases cash volumes resulting to a rise in inflation of 0.16%. An increase in trade levels increases the competitiveness in the market resulting to an increase in the output and movement of cash hence negatively affecting the level of inflation. However trade in no competitive markets which favour imports is likely to result in imported inflation[CITATION Ija24 \t \l 1033]. High

levels of imports against exports have a negative impact on inflation. The results are similar to the study done by[CITATION Lim15 \l 1033]

Domestic credit has a positive effect on inflation. A 10.5 increase in inflation is expected from a unit increase in domestic credit. The growth in domestic credit and its effect on inflation was also identified by Ndungu (1999) in his report monetary and exchange rate in Kenya. In his study domestic credit has an inflationary effect as it results to increase liquidity within the economy. The government uses borrowings from both the banking financial institutions and non-banking institutions. The debt used in expanding fiscal policies will significantly result to liquidity that has a potential effect of increasing the price levels.

4.5.2 Short run Behaviors

Table 4.12 Summary of Statistics for Short-run Behaviors

		Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
D_LINF							
	CE1	-0.49998	0.200867	-2.49	0.013	-0.89367	-0.10628
	CONS	-0.034	0.064648	-0.53	0.599	-0.16071	0.092706
D_LTDS							
	CE1	0.085403	0.050084	1.71	0.088	-0.01276	0.183565
	CONS	-0.0235	0.016119	-1.46	0.145	-0.05509	0.008092
D_LED							
	CE1	0.113336	0.032744	3.46	0.001	0.04916	0.177513
	CONS	-0.0046	0.010538	-0.44	0.663	-0.02525	0.016056
D TRD							
	CE1	0.071463	0.02211	3.23	0.001	0.028128	0.114798

	CONS	-0.00044	0.007116	-0.06	0.951	-0.01438	0.01351
D_LDC							
	CE1	-0.10103	0.05221	-1.94	0.053	-0.20336	0.001298
	CONS	0.142932	0.016804	8.51	0.000	0.109998	0.175866

The short-run table in model two also depicts how variables behave when another variable is out of the level determined by the long-run co-integration equation. The results of the error correction model are displayed in table 4.18. It was deduced that 49.998 rapidness of correction on the disequilibrium by inflation within a year is by inflation falling to the level of other independent variables. The induction is significant since 0.013 is lesser than 0.05 level of significance. The disequilibrium in the constant term in inflation can be corrected by a speed of 3.4 in a year. However, it is not significant as the portability 0.599 > 0.05.

The results also showed that 0.85 correction of the disequilibrium by total debt service can be achieved within one year. The deduction is not significant as the probability of 0.088 is greater than the 0.05 level of significance. The adjustment of the error term in the short run is explained by 2.35%. The adjustment is not significant as 0.145 is greater than 0.05 level of significance.

Further results indicated that 11.33 of the disequilibrium can be corrected by external debt in the short run. The correction of disequilibrium is significant at 5% level of significance since 0.001 < 0.05. The implication is that an increase in external debt in the short run lowers inflation. The disequilibrium in the error term in the short run can be corrected by 0.46 %. However the correction of the error term is not significant at 5% level of significance.

The results also indicated that 7.1 of the disequilibrium in the short run can be corrected by trade. The correction is significant at 5% since 0.001 < 0.05. This implies that an increase in level of trade by 7.1% in the short run will increase the level of inflation. According to Mahmoudzadeh & Shadabi (2012) trade openness had a significant effect on inflation in the short run. The effect implies that trade has a

significant effect in affecting the levels of prices in the short run period. The adjustment in the error term is corrected by 0.044%. However, the statistic is not significant at 5% level of significance since 0.951 > 0.05.

Finally the result showed that 10.1 level of correction is achieved in a year by domestic credit in the country. The correction is not significant at 5% level of significance since 0.053 > 0.05. The adjustment in the error term is corrected by 14 in the short run within one year. The correction is significant at 5% level of significance since 0.001 < 0.05. This contravenes the result by Ndungu (1999) that identified a positive significant effect of domestic credit on the price levels.

4.6 Diagnostic Test

4.6.1 Langragian Multiplier Test

The results of the lagragian multiplier for model two are given in table 4.17[v]. The p values of the variables in both lag 1 and lag 2 are greater than 0.05. The high p values indicate the absence of serial correlation among the modeled variables. The results were interpreted as existence of linear dependencies among the modeled variables.

4.6.2 Lominick-Jacque Bera Test for Normality

The Jacque Bera Test revealed that individually only a total debt service was normally distributed. The other variables had probabilities higher than 0.05 hence failed to meet the normality condition. In general the model obeyed the normality assumption as the probability is less than 0.05 *see*[vi].

The results for Kurtosis revealed that only total debt service had a probability of less than 0.5. All other variables did not meet the probability threshold set. The Kurtosis test revealed that the model passed the kurtosis test in general given that 0.015 is less than 0.05 *see* [vii].

The model also satisfied the skewness test as the probability for the model 0.04879 is less than 0.05 *see* [viii]. The results infer to the non-skewed nature of the models under investigation in this equation and the general level of skewness of the model.

4.6.4 Stability Tests model 2

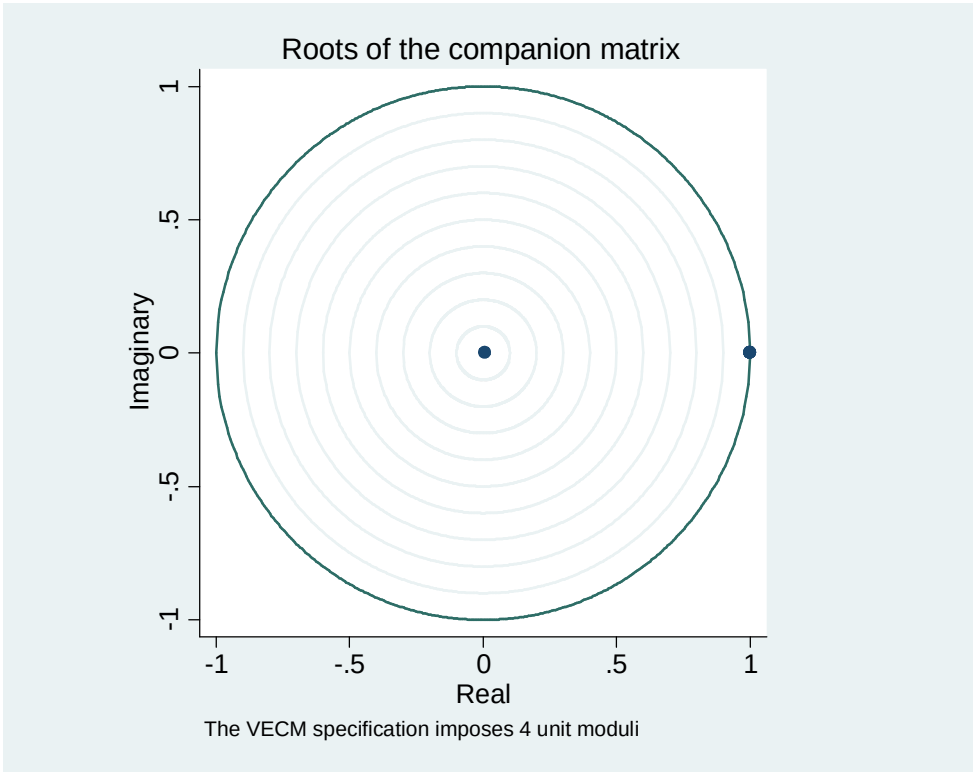


Figure 4.9 Results for Roots of the Moduli Unit Circle Model Two

The model satisfies the first stability test which tests whether the model variables lie within the unit circle. The variables satisfy this condition hence it is stable. The next text is stability against structural changes, the periods where models break if not stable that is, stationary. The probability of 0.008 is less than 0.5 at five percent level of significance implying that the model is stable and efficient recommendations are deducible from analysis[ix]. After such a time non-stable models produces forecast estimates that highly differ with those on the ground during those times [CITATION Lut053 \l 1033].

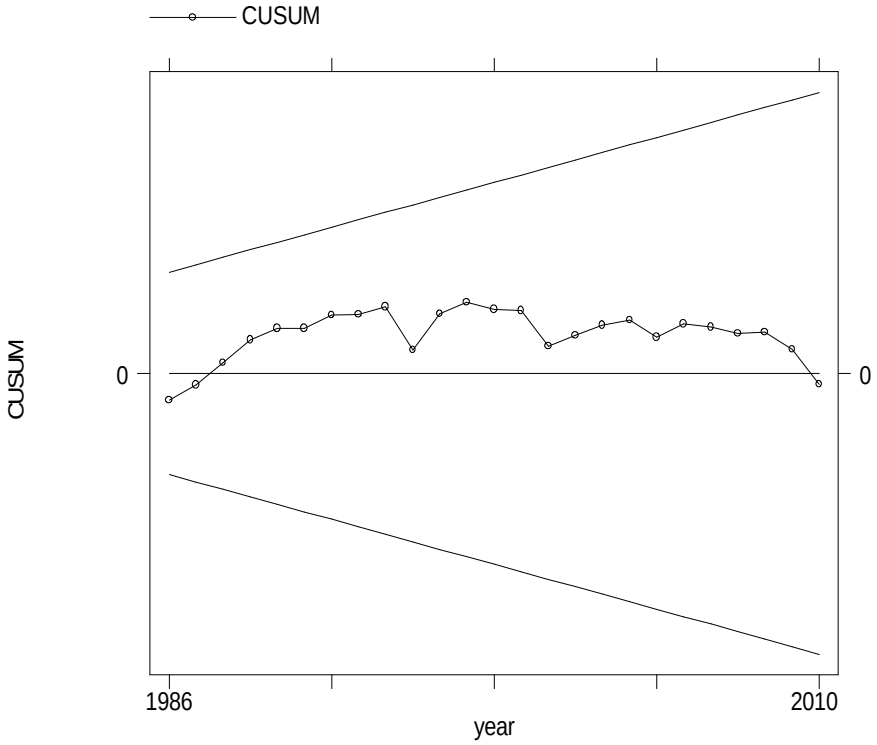


Figure 4.10 Cusum Test Model two

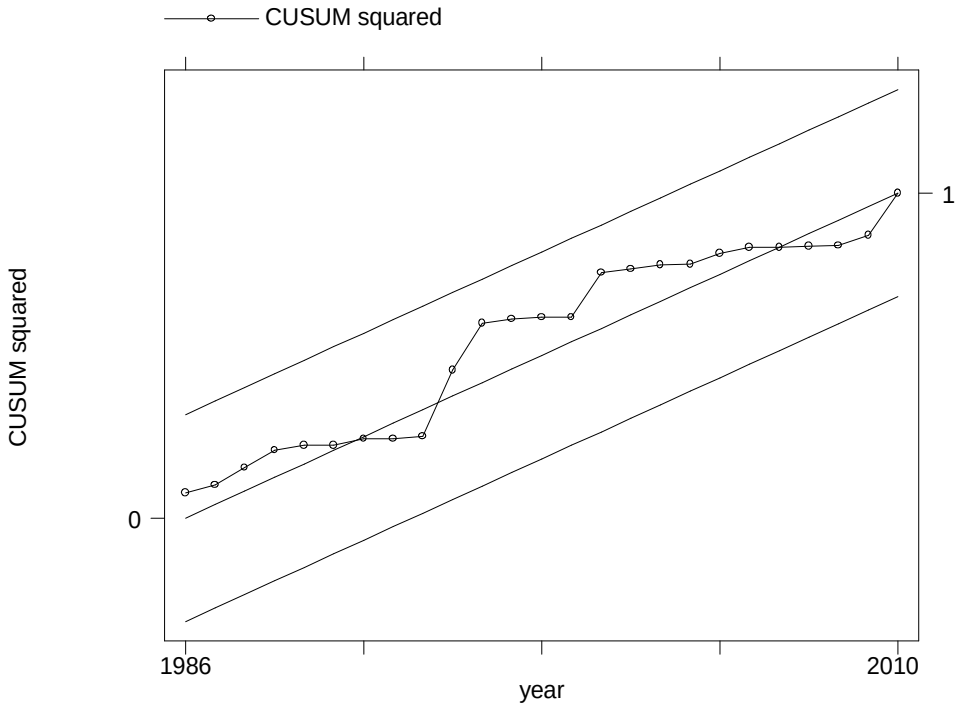


Figure 4.11 Cusum Squared Test Model 2

The cusum test both cusum and cusum squared satisfy the threshold for structural stability. The stability lines do not go out of the set limit on both side of the set limit. The test indicates that the model used in data analysis is stable and the result can be used for policy recommendation and forecasting..

4.6.5 Granger Causality Test Model 2

The granger causality test for the second model revealed the presence of bidirectional causal relationship between inflation and all the other variables (trade, external debt and total debt service). External debt has a bidirectional with total debt service and a unidirectional relationship unidirectional relationship with all the variables in this model. Trade has a bidirectional relationship withal the variables individual but a unidirectional relationship with all in an equation. Total debt servicing has a unidirectional relationship with all the variables in the model but a bidirectional one

with inflation and trade on individual analysis. Domestic credit on the other hand has unidirectional relationship with all the variables in a single equation but a bidirectional with external debt, inflation and debt servicing.

Table 4.13 Granger Causality

Equation	χ^2	Df	Prob > χ^2	Remarks
LINF does not Granger cause	2.6687	1	0.102	Reject Null
LED				
LINF does not Granger cause	0.0016	1	0.968	Reject Null
LTRD				
LINF does not Granger cause	2.888	1	0.089	Reject Null
LTDS				
LINF does not Granger cause	3.377	1	0.066	Reject Null
LDC				
LINF does not Granger cause	4.0561	4	0.398	Reject Null
ALL				
LED does not Granger cause	4.0409	1	0.044	Accept
LINF				Null
LED does not Granger cause	11.193	1	0.001	Accept
LTRD				Null
LED does not Granger cause	0.33358	1	0.564	Reject Null
LTDS				
LED does not Granger cause	2.1797	1	0.140	Accept
LDC				Null
LED does not Granger cause	25.351	4	0.000	Accept

ALL				Null
LTRD does not Granger cause	3.6394	1	0.056	Reject Null
LINF				
LTRD does not Granger cause	3.1529	1	0.076	Reject Null
LED				
LTRD does not Granger cause	1.5775	1	0.209	Reject Null
LTDS				
LTRD does not Granger cause	0.14643	1	0.702	Reject Null
LDC				
LTRD does not Granger cause	15.551	4	0.004	Accept
ALL				Null
LTDS does not Granger cause	0.84565	1	0.358	Reject Null
LINF				
LTDS does not Granger cause	4.5075	1	0.034	Accept
LED				Null
LTDS does not Granger cause	3.341	1	0.068	Reject Null
LTRD				
LTDS does not Granger cause	13.865	1	0.000	Accept
LDC				Null
LTDS does not Granger cause	25.76	4	0.000	Accept
ALL				Null
LDC does not Granger cause	0.02385	1	0.877	Reject Null
LINF				
LDC does not Granger cause	2.8218	1	0.093	Reject Null
LED				
LDC does not Granger cause	13.913	1	0.000	Accept
LTRD				Null
LDC does not Granger cause	3.0444	1	0.081	Reject Null
LTDS				
LDC does not Granger cause	20.388	4	0.000	Accept
ALL				Null

4.7 Impulse Response Function Model One

Impulses may always occur on a variable and this variable affected will cause certain responses from other variables in the model system. For example the impulses below generate from the variable in the left side while the response generate from the variables in the right side of the each equation graphed. Impulses cause non-permanent effects in the case of stationary variables I(0). Non-stationary integrated variables I(1) however generate effects to variables that are permanent, meaning the effects don't die away given a time horizon [CITATION Lut053 \l 1033]. That is why the responses always point to a non-zero end.

A shock in inflation is reported to have a significant effect on the level of inflation. The shock has a permanent effect on inflation since it does not stabilize but change path in the long run. Gross domestic product has a shock on inflation which does not return to its normal path but remains on the new path. This may be attributed to sudden change in the economy such entry of new sector that changes the level of gross domestic product. A shock on inflation deems to have a on off effect on the values of inflation implying that the changes are fixed. A shock on interest rates has a one off effect on inflation that does not stabilize to long run path but changes to a new fixed level. A shock on all the variables i.e. money supply, inflation, interest rates and gross domestic product have an adverse effect on the interest rates. The value of interest rates is affected over a long period of time before it stabilizes in the long run. The impulses created by other variables do not have any effect on the levels of money supply including money supply its self.

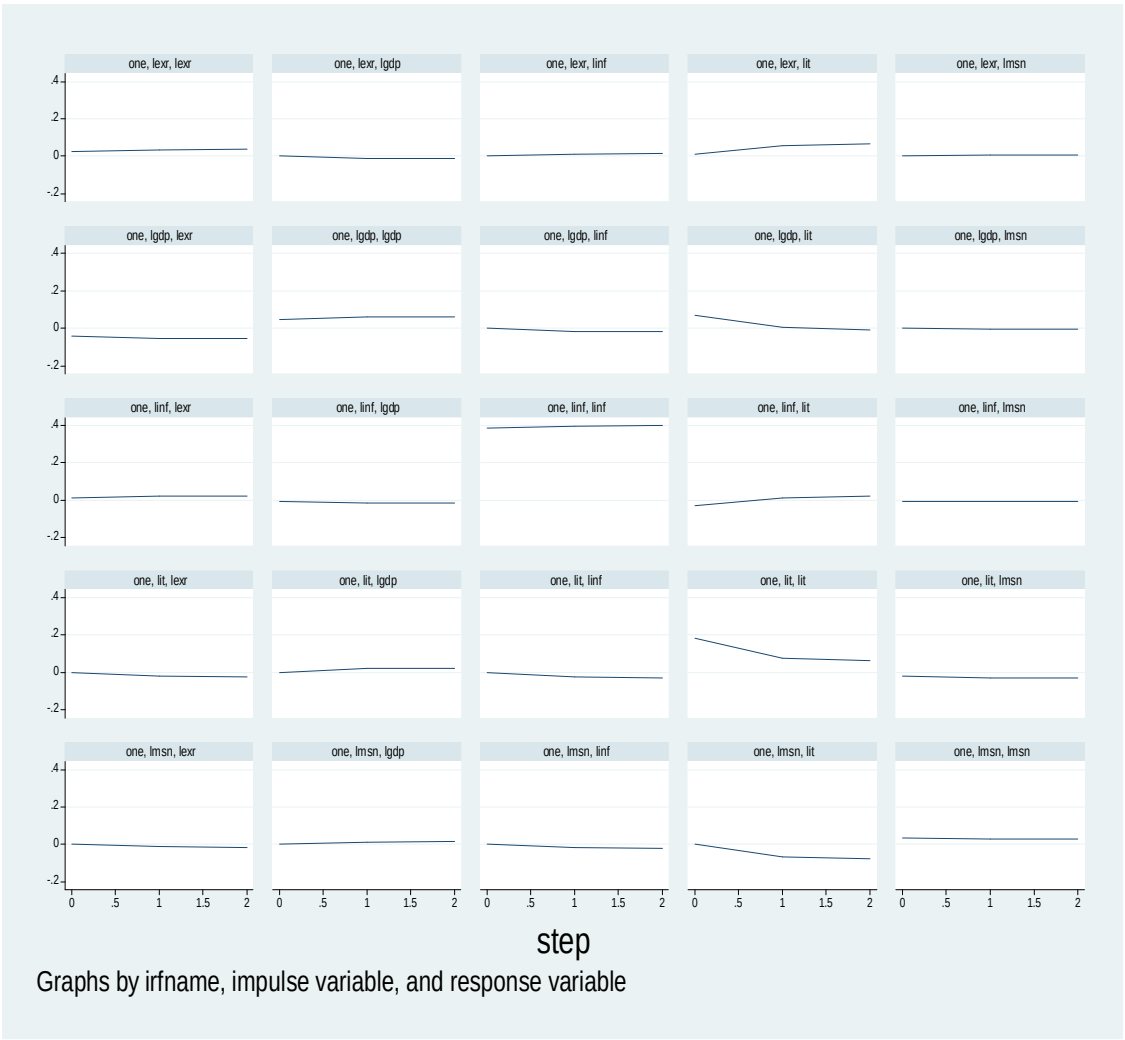


Figure 4.9 Summary Results for Impulse Response Function Model One

4.8 Impulse Response Function Model Two

In model two impulses by domestic credit do not have effect on domestic credit, trade and debt servicing. However it has a one off effect on inflation that has a sudden shock. A shock on inflation last for a relatively long period before it stabilizes in the long run. A shock on inflation has a sudden effect on domestic credit, debt servicing and external debt. A shock on external debt has an effect on all the variables that fade away immediately although it does not return to its original path rather settling on the new long run path. A shock on trade has an effect on inflation that fades away after ten years after which it stabilizes. A shock on domestic credit has an effect on inflation for five years after which it stabilizes.

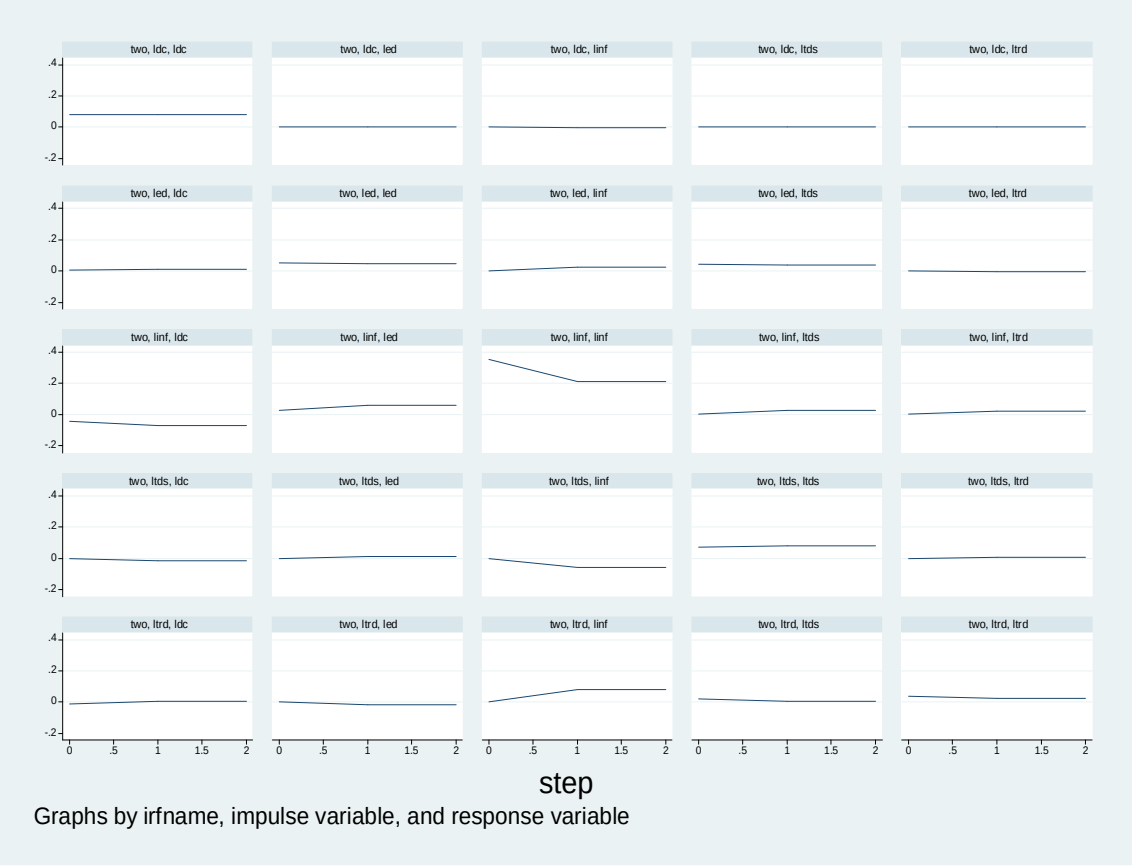


Figure 4.10 Summary Results for Impulse Response Function Model Two

4.9 Empirical Discussion from the Analysis

4.9.1 Monetary Short-run Behaviors

In the short run interest rate, gross domestic product and exchange rate have a significant effect on inflation at 5% level of significance. Money supply does not have a significant effect on inflation. The implication is that any changes in inflation are

affected by the changes in interest rates, gross domestic product and exchange rate. Although money supply is insignificant an increase in money supply has a positive effect on inflation. An increase in money supply will thus result to an increase in inflation Interest rates and exchange rates have an inverse relationship with inflation implying that an increase in the interest rates and exchange rates have a short run effect of reducing the rate of inflation. A positive change of 0.33% on the gross domestic product has a positive effect on inflation.

4.9.2 Monetary Long-run Relationships

In the long-run all the monetary variables were significant at 5% level. The relationship shows a constant term of -1006% meaning if all the variables in the system are not varying inflation rate would decline by 1006%. Money supply shows a positive and robust effect on inflation in the long-run. If the rest of variables don't change and money supply changes by 1%, inflation rate will also change positively by 120.3159 %. This confirms suggestions to monetary policy makers to include all stakeholders of financial markets in the process of stabilizing macroeconomic conditions. This goes in line with the findings of Bayo (2011).

Growth in output has a negative effect on inflation. This implies that increase in income affects inflation negatively as posited by the quantity theory of money. The negative effect of gross domestic product on inflation was also established by a research conducted by Mughal , Khan, & Ammama (2011). Interest rate also plays a key role in controlling inflation in the economy. One possibility is that increasing short-term rates in the face of increases in inflation is just an indirect way of reducing money growth: sell bonds and take money out of the system.

4.9.3 Public Debt and trade Short run effects

In the short-run trade, external public debts and public debt servicing can affect the disequilibrium in the short-run. 0.85% of disequilibrium is corrected by the external

debts in one year. Although the speed of adjustment here is small, it is significant at 0.05 with probability value of 0.001 compared to 5% confidence level. The positive change in external debt is likely to influence inflation by increasing it until it achieve it long run equilibrium state. Likewise when inflation is too high, total debt servicing corrects the disequilibrium caused by increasing at a speed of 0.08% per year. The disequilibrium can also be corrected by trade at 0.0714% per year. The positive coefficient in the short run implies trade significantly results to an increase in the levels of inflation when its values increase.

4.9.4 Public debt and Trade Long-run Relationships

Public debt, trade and debt servicing are significant in the long run influence the inflation dynamics. In the long run 7.80 of the influence in the model is determined by other variables apart from those listed on the model. External debt negatively influences the inflation rate. A unit change in external debt causes 2.26% of inflation to change. The negative influence to inflation is significant however the effect is not huge on the level of inflation. This owe to its ability to increase money supply and its importance in increasing output. Debt servicing has a positive effect on the levels of inflation as the amount paid on debt to the domestic credit increase the amount of money in the economy.

Finally trade negatively and robustly affect inflation rate. The nature of the trade in Kenya largely favors imports against exports. The independent economy model also determined that the terms of trade adversely affected the level of prices. The level of trade is highly dependent on imports and exports and any inequalities pose an effect on inflation. The results concur with findings of Druvell and Ndungu (1999) and Ijaz, Zakaria, & Fida(2014) that showed that terms of trade an adverse negative effect on trade in Pakistan.

CHAPTER FIVE: SUMMARY, CONCLUSION AND IMPLICATIONS

5.1 Introduction

The chapter contains the summary of findings, conclusions, policy recommendations and areas of further research.

5.2 Summary

The study aimed at determining the relationship that exists between inflation and monetary variables such as money supply, interest rate and that which exists with other variables such as trade, external debt, domestic credit, debt servicing and economic growth. The study utilized the Johansen method to determine the level of integration of the variables. The determination of integration of order one allowed for

the use of vector error correction. The VECM was used to give the long run and short run analysis results. The models passed the diagnostic tests for normality and stability to the minimum threshold. The period covered was running from 1980 to 2010. The study employed VECM model for analysis to avoid multicollinearity in the models due to the large number of variables involved in analysis and meet the intended objectives of the research.

The findings indicate that money supply, interest rates and exchange rates are proximate determinants of inflation in the long run. External debt, debt service and trade have a close effect on inflation both in the short run and the long run. The adjustment of inflation to disequilibria is draggy pointing to inflation inertia of up to 0.499. The high levels of inertia may result to wage inflations expectations or wage controls. The long run positive effect of money supply on inflation is in tandem with the monetarist approach on inflation. These findings were also obtained by Mehdi & Seyyed (2011) Asghar, Jaffri, & Asjed(2013). In addition, money might affected the inflation levels through the exchange rate and interest rate a subject the study did not address.

The exchange rate had significant effect on inflation making a desirable determinant in its effectiveness to influence inflation. The fast rate of adjustment to disequilibria present its quick effect on influencing inflation. The gross domestic product has a significant negative effect on inflation levels owing to the expected increase in output. The increase in output significant brings to use the moey in the market lowering the rise of demand pull inflation. Rotich, Kathanje & Maana (2007) identified a negative significant relationship between output and inflation. Real interest rates have a significant effect on levels of inflation. However, the slow rate of adjustment of inflation to the shocks in interest rates reduce the relative effectiveness on the use of interest rates on influecing rates of inflation.

External debt has a significant effect on inflation with a relatively fast adjustment to the disequilibria. The fast rate of adjustment explains its rrelative importance in regulating the debt levels towards maintaing stable levels of inflation. The effect of trade on inflation on inflation is significant although it has a slow adjustment rate to disequilbria oveer the years. Trade thus is important in influecing the price levels. The negative influence may arise from the increase in expenditure on imports. The results are affected by the high levels of dumping that affects the real trade off between exports and imports as noted by Soi, Koskei, Buigut, & Kibet (2013).

The effect of servicing debt to the levels of inflation is significant given that debt servicing including payment of domestic debt at high interests. The release of money and interest payments accounts for increase in money. The resultant effect is increase inprice levels due to the significant influence of money on inflation. Domestic credit has a significant positive effect in the short term to increase inflation due to its increase in the amount of money in the economy. The impact of domestic credit to the economy in the long run is insignificant. The increase in credit thus has a potential to increase inflation as it is linked to expansionary fiscal policy by the government.

5.3 Conclusion

The causal effect of gross domestic product, external debt, debt servicing, trade, interest rate, money supply and domestic credit with inflation is defined both in the short run and the long run. Following these findings the study holds that these macroeconomic variables are significant and critical during policy formulation intended in influencing inflation levels. Monetary policy variables exhibited a greater effect to inflation underlining the crucial role of these variables in influencing inflation. The behavior of these variables is also considerate of the development status of the economy and the challenges it’s facing such as trade imbalances and budget deficits resulting from a desire to increase infrastructural development.

5.4 Policy Implications

Maintaining a non-inflationary stable economic growth has been the core mandate of macroeconomic policy makers in Kenya. Low inflation rates provide a macroeconomic environment for growth and development. The CBK always targets at reducing the levels of interest rates targeting at increasing the amount of money for investment. However, the lowering of interest rates may have a significant influence if not controlled resulting to increased price levels. The CBK should institute responsive monetary measures to curb excessive money supply.

On the non-monetarist approach side, Central Bank should focus on trade deficits and external debts. The government should maintain low trade deficits. Unsustainable levels will require costly servicing and if the economy doesn't respond uniformly to the amount spent in debt management, the debts will negatively affect the economic growth and negatively influence trade balances. The money obtained from external borrowing result from inflation which begs for a different approach to funding infrastructural projects emerging expenditures that necessitate borrowing. Alternatively, the government should increase its income earnings from profit making investments. The expenditures from profits will reduce external borrowing as a possible solution to the inflation effects eminent from external borrowing. Domestic borrowing in the short run will affect inflation hence the use of external borrowing from other markets such as the floated Euro bond to fund infrastructural development. Policy structures that support increased output especially by the local industries will significantly reduce inflation as suggested by the negative effect of gross domestic product on inflation.

5.5 Areas of Further Research

The analysis of the research focused on the monetary policy effects on inflation. The research findings indicate that the variables affecting inflation are vast as evidence from the review of the literature. The presence of unexplained effects on inflation

arising from changing political climate provides a platform for other researchers to focus on.

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APPENDIX

[i] **Results of Langragian Multiplier Test Model 1**

Lag	χ^2	DF	**Prob >** χ^2
1	23.1257	25	0.5023
2	15.9241	25	0.91707

H_0: No autocorrelation

[ii] **Skewness Test**

Equation	Skewness	chi2	Df	Prob > χ^2
D_LINF	-0.97974	4.48	1	0.0343
D_LIT	-0.95612	4.266	1	0.03888
D_LGDP	-0.61336	1.756	1	0.18517
D_LMS	-0.15494	0.112	1	0.73785
D_LEXR	0.02583	0.003	1	0.9555
ALL	10.616	5		0.05954

[iii] **Kurtosis Test**

Equation	Kurtosis	χ^2	df	Prob > χ^2
D_LINF	3.3967	0.184	1	0.66833
D_LIT	5.8841	9.704	1	0.00184
D_LGDP	3.347	0.14	1	0.70785
D_LMS	2.0802	0.987	1	0.32045
D_LEXR	1.9658	1.248	1	0.26398
ALL	12.263	5		0.03135

[iv]

Stability Test for Model1

Eigen Value	Modulus
1	1
1	1

[v] **Results of Langragian Multiplier Test Model 2**

Lag	χ^2	Df	Prob > χ^2
1	22.9294	25	0.58168
2	20.6428	25	0.71235

H_0: No autocorrelation

[vi] **Results for the Lominick-Jacque Bera Test Model 2**

Equation	χ^2	Df	Prob > χ^2
D_LINF	1.374	2	0.50299
D_LTDS	17.494	2	0.00016
D_LED	2.403	2	0.3008
D_LTRD	3.693	2	0.15781
D_LDC	0.157	2	0.92444
ALL	25.121	10	0.00512

[vii] **Kurtosis Test**

Equation	Kurtosis	χ^2	Df	Prob > χ^2
D_LINF	2.0946	0.956	1	0.32808
D_LTDS	6.0802	11.069	1	0.00088
D_LED	2.9103	0.009	1	0.92278
D_LTRD	4.2669	1.873	1	0.17118
D_LDC	2.7381	0.08	1	0.77723
ALL	13.987	5		0.01569

[viii] **Skewness Test**

Equation	Skewness	χ^2	Df	Prob > χ^2
D_LINF	-0.29926	0.418	1	0.51798
D_LTDS	-1.1734	6.425	1	0.01125
D_LED	0.71612	2.393	1	0.12186
D_LTRD	0.62452	1.82	1	0.1773
D_LDC	0.12852	0.077	1	0.78129
ALL	11.134	5		0.04879

[ix] **Stability Test**

Eigen value	Modulus
1	1
1	1
1	1
1	1
.00808698	.008087