INFLUENCE OF FISCAL, TRADE AND MONETARY FACTORS ON INFLATION IN KENYA

BY

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DECLARATION

Declaration by the Candidate

This thesis is my original work and has not been presented for the award of a degree in any other university or institution of learning. All sources of information have been acknowledged by means of referencing.

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DEDICATION

To my beloved wife Susan, son Keith and daughter Patience

ABSTRACT

Inflation has been a topical issue since the 1970s oil price instability which resurged in the 2000s with a rate of 3.6% for advanced economies and 10.2% for Africa. In Kenya, labour unrests have mainly been attributed to inflation that has persistently remained above the Central Bank's target of 5%. Studies on the determinants of inflation have reported mixed results, focused on aggregated fiscal, trade and monetary factors and analytical techniques inadequate in providing information on the direction of shock transmission between inflation and the factors. This makes the influence of fiscal, trade and monetary factors on inflation uncertain and inconclusive. This study therefore analyzed the influence of fiscal, trade and monetary factors on inflation in Kenya. The specific objectives included establishing; influence of fiscal factors, influence of trade factors and influence of monetary factors on inflation in Kenya. The study was modeled on the demand pull, cost push and monetary theories of inflation and applied correlation research design. Monthly time series data from Central Bank of Kenya spanning 132 months from 2005 to 2015 was used for analysis. Vector autoregressive techniques of Johansen cointegration, vector error correction, variance decomposition, impulse response and Granger causality were used to analyze the relationship between inflation and its influencing factors in Kenya. Results indicated that total government expenditure and total imports had a significant negative long run influence on inflation where a percentage increase in total government expenditure and total imports decreased inflation by 0.59% and 0.86% respectively. On the other hand, total tax, total exports and total money supply had a significant positive long run influence on inflation that was supported by impulse analysis where a percentage increase in total tax, total exports and total money supply increased inflation by 1.38%, 1.39% and 1.63% respectively. There was unidirectional causality from the fiscal, trade and monetary factors to inflation. The study concluded that fiscal, trade and monetary factors influence inflation in Kenya. However, they are highly influenced by recurrent expenditure, indirect taxes, domestic exports and extended broad money. This adds to literature on the determinants of inflation from the Kenyan perspective. In view of this, the study recommends adoption of diverse policies that encompass fiscal, trade and monetary policies that target reduction in taxation, exports, money supply and increase in government expenditure and imports that are likely to lower production costs and product shortages thus leading to a reduction in inflation in Kenya.

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ABBREVIATIONS

AD	Aggregate Demand
ADF	Augmented Dickey Fuller
AS	Aggregate Supply
CBK	Central Bank of Kenya
CIMP	Commercial imports
CPI	Consumer Price Index
DEV	Development expenditure
DEXP	Domestic exports
ECT	Error Correction Term
ED	Excise duty
EU	European Union
GDP	Gross Domestic Product
GIMP	Government imports
GOK	Government of Kenya
ID	Import duty
IT	Income tax
INFM	Inflation rate
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
M0	Currency outside the banking system
M3	Extended broad money
MENA	Middle East and North African
MS	Total money supply

MTP II	Second Medium Term Plan
OLS	Ordinary Least Squares
OPEC	Organization of Petroleum Exporting Countries
REEXP	Re-exports
REC	Recurrent expenditure
TEXP	Total exports
TEXPEN	Total government expenditure
TIMP	Total imports
TTAX	Total tax
US	United States
USA	United States of America
USD	United States Dollar
VAR	Vector Auto Regressive
VAT	Value Added Tax
VECM	Vector Error Correction Model

OPERATIONAL DEFINITION OF TERMS

Development Government Expenditure – Expenditure incurred by the government on the purchase of capital assets.

Recurrent Government Expenditure - It is the current expenditure for purchase of goods and services at all levels of government

Exports of goods and services - symbolizes the worth of all commodities and other market services sold to the other countries worldwide.

Excise Duty - It is a domestic tax on the production or sale of a commodity in a given country i.e. a levy on manufacture, sale, or use of locally produced goods.

Import tax - It is the tax charged on imports by the custom authority of Kenya to raise state income and or protect local firms from foreign competitors.

Imports of goods and services - represent the value of all goods and other market services received from the rest of the world which include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services

Inflation - The percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals

Aggregate data – Data not split into components but involving the total sum of all components that make up a specific factor.

Disaggregate data – Data split into specific components that combined together form the total sum of a factor.

Fiscal factors – Macroeconomic factors that involve changes in government expenditure and taxation with an aim of achieving price stability.

Trade factors – Macroeconomic factors that influence international trade through changes in exports and imports with an aim of achieving price stability.

Monetary factors – Macroeconomic factors concerned with changes in the quantity of money supply in the economy with an aim of achieving price stability.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Inflation is a continuous process for the rise of the general price levels in the economy which can result in the reduction of the value of money (Mehrara & Sujoudi, 2015). This poses a concern to macroeconomic stability around the world (Bashir, Nawaz, Yasin, Khursheed, Khan, & Qureshi, 2011). The pursuit of price stability is vital for long run economic growth and development, and should be alarm each country thus narrowing the focus to pursuing low inflation rather than output or unemployment (Odusanya & Atanda, 2010). Governments use various economic policies for the purposes of macroeconomic stabilization which includes price stability, economic growth, full employment and balance of payment stability (Rena & Kefela, 2011). In this respect, the main macroeconomic instruments used by governments include fiscal, trade and monetary policies (Rena & Kefela, 2011). Fiscal, trade and monetary policies influence aggregate demand in the economy by ensuring a sense of balance between government expenditure and taxation, exports and imports, money supply and money demand consistent with stable price level and sustainable growth (Ocran, 2009).

Inflation may have many adverse economic and social consequences (Kilindo, 1997). Khan and Gill (2010) outlined the adverse economic consequences for the economy as: first, inflation may eat into the purchasing ability of the individuals leading to a contraction in economic growth. Secondly, inflation may have regressive costs on the

poverty profile of an economy where the rise in prices may hurt those with low incomes more as their consumption declines significantly in every inflationary stint. Thirdly, inflation affects the competitiveness of a country by causing an appreciation of the domestic currency and a consequent overvalued exchange rate, which may have a negative effect on exports. On the other hand, the social effects of inflation according to Kilindo (1997) may be labour unrest, go slows and even political unrest.

In economic history according to Sola and Peter (2013), one of the macroeconomic challenges facing governments has been the maintenance of price stability making inflation a subject matter that has received diverse attention due to its sensitivity to economic issues. Kabundi (2012) asserts that inflation has been and continues to be a big concern for policy makers, individual consumers and private sector firms. Salimfar, Razmi and Taghizadegan (2015); Durevall and Sjö (2012); African Development Bank (2011); and International Monetary Fund (2008) reiterates that, there is no agreement on the factors that cause increase in inflation. A common view is that expansionary monetary policy with rapid increase in money supply is the main cause of inflation (African Development Bank, 2011; International Monetary Fund, 2008).

There are a myriad of conflicting studies on the causes of inflation in different countries given the evolving dynamics of a globalized economic system (Ramady, 2009). Whereas the proponents of demand pull theory argued that inflation is due to changes in aggregate demand, the proponents of cost push theory viewed inflation as a result of changes in aggregate supply (Ramady, 2009). On the other hand, monetarists regard inflation as a

monetary phenomenon caused by increase in quantity of money in circulation (African Development Bank, 2011). Based on these conflicting paradigms, it is evident that the factors that influence inflation are diverse and the causes of inflation in one country cannot be generalized to other countries. As Greenidge and DaCosta (2009) argued that for purposes of managing a process, identification of the influencing factors is of very importance; hence the first step in curtailing inflation in Kenya requires the understanding influencing factors.

1.1.1 Inflation in Kenya

According to Greenidge and DaCosta (2009), inflation has been a topical issue since the early 1970s oil price instability. Since then, curbing inflation has been a key priority for many countries with open economies. Inflation in Kenya fluctuated between 10 and 20 percent in the period 1970 to 1980s, and rose to 47.7 percent in 1993 (Gichuki & Moyi, 2013). The 1990s is considered to be the period in which inflation came under control worldwide whereby in advanced economies between 1982 and 1991 was 4.9 percent and by December 1999, it was 0.8 percent (Lotfalipour, Montazeri, & Sedighi, 2013). More importantly, inflation in developing countries reduced from 45.1 percent between 1982 and 1991 to 6.9 percent in 1999 (Lotfalipour, Montazeri, & Sedighi, 2013).

In 2000s, there was rebirth of inflation with rates of 3.6 percent for advanced countries, 7.3 percent for emerging Asia and 10.2 percent for Africa (Government of Kenya, 2009). The rise of inflation in Kenya is not a secluded episode given that other African countries have been experiencing the same macroeconomic challenge (African Development Bank, 2011). However, the country has been witnessing labour unrests from various sectors that

are mainly attributed to the rising cost of living due to inflation. According to Bashir *et al*. (2011), the period 2010 to 2011 was the most eventful period for the world inflation in the 2000s. East African countries witnessed in October of 2011 a substantial surge in inflation reaching a high of 20 percent, Kenya in the same period recorded an inflation rate of 18.9 percent (Kabundi, 2012). In the first half of 2015, overall month-on-month inflation remained above the government's medium term target of 5.0 percent (KIPPRA, 2015). However, it rose from 5.5 percent in January 2015 to 8 percent in December 2015 (KIPPRA, 2016; Central Bank of Kenya, 2015).

The government's commitment to the maintenance of a stable macroeconomic framework is anchored on key macroeconomic objectives which include containing average annual inflation rate to below 5 percent (Government of Kenya, 2003). This target set in the 2003 -2007 economic recovery strategy period as outlined by the KIPPRA (2016) and Central Bank of Kenya (2015) remained the Central Bank of Kenya (CBK) target as at December 2015. As evidenced in Table 1.1, Figure 1.1 and corroborated by Gichuki and Moyi (2013), the CBK's goal of having inflation rate lower than the 5 percent mark has remained elusive for most of the years averaging over 8 percent as depicted in Tables 4.1 and 4.2 an indication of ineffectiveness of the monetary policy in Kenya which may be attributed to lack of proper identification of factors that influence inflation.

Studies on the determinants of inflation in Kenya such as Okara (2015); Kirimi (2014); Kiganda (2014); Durevall and Sjö (2012); African Development Bank (2011) focused on

broad money supply (M2), output(proxied by GDP), exchange rates, food and non-food world prices, world energy prices and domestic agricultural supply shocks as the main causes of inflation. This makes the influence of fiscal factors, trade factors and monetary factors on inflation in Kenya uncertain. This justifies a study to analyze the influence of fiscal, trade and monetary factors on inflation in Kenya.

Table 1.1: Inflation Trend in Kenya

Year	2004-08	2009	2010	2011	2012	2013	2014	2015	Dec 2016	June 2017
Inflation (%)	9.0	8.0	5.8	18.9	3.2	7.1	6.0	8.0	6.5	9.
Target (%)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.

Note. From "The Regional Economic Outlook: Sub-Saharan Africa," by International Monetary Fund, 2015. Column 9 & 10 data are from " Inflation trends 1961- present," by Kenya National Bureau of Statistics, 2017.

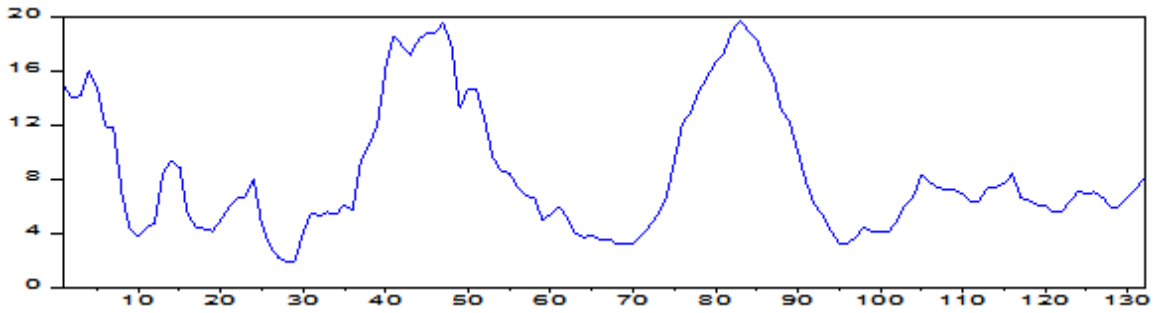

Figure 1.1. Month on month inflation trend in Kenya. Source: author's computation

1.1.2 Fiscal Factors and Inflation

In literature, according to Ocran (2009) fiscal factors are identified as government expenditure, public debt and taxation. It is supposed in public and academic discourse that inflation and government expenditure are related (Han & Mulligan, 2008). Kenya has been experiencing rising government expenditures, In 2011/12, government expenditure

stood at Ksh.1.2 trillion compared to Ksh. 922.6 billion in 2010/11 (Government of Kenya, 2012). The total estimated expenditure for 2012/13 according to the Institute of Economic Affairs (2012) stood at Ksh. 1,459.9 billion, in 2014/2015 financial year total expenditure amounted to Ksh 1,640.3 billion (KIPPRA, 2015). In the financial year 2016/2017, government expenditure was Ksh 2,138 billion (Central Bank of Kenya, 2017). This increase in government expenditure has been a concern of the policy makers such that in the second Medium Term Plan (MTP II), the government seeks to pursue fiscal and debt sustainability (KIPPRA, 2015) and during the fiscal year 2011/12, the government adopted a policy geared towards constraining public spending to complement the tight monetary policy adopted to reduce aggregate demand and contain inflationary pressure (Government of Kenya, 2012).

Taxes remain a major source of revenue for a country and can have several impacts on the economy. According to the tax competition theory, a reduction in tax rate of capital causes capital inflow into a country. This is because the tax rate is one of the costs for the capital holder (Hakim & Bujang, 2012). In particular, to boost revenues, governments opt to raise rates of direct taxation, such as income tax and or indirect taxes such as value added tax (VAT), excise duty and import duty (Gautier & Lalliard, 2014). According to European Central Bank (2011), fiscal policy adjustments involving changes in taxes, may have a direct and immediate effect on inflation. However, likely influence remains debatable where some analysts claim that tax reduction would both spur the economy in the short run and raise output in the long run (Romer & Romer, 2010). Others argued that they would raise interest rates and lower confidence and thereby reduce output in both the

short run and the long run (Romer & Romer, 2010). According to Gautier and Lalliard (2014) changes in taxation influence prices (inflation) because the after-tax price paid by the consumer is the sum of the before-tax price and imposed taxes.

Studies by Iya and Aminu (2014), Arif and Ali (2012), Magazzino (2011), Ezirim *et al*. (2008), Ahmed *et al*.(2014), Patoli *et al.* (2012), Bashir *et al*. (2011) among others attempted to establish the influence that the fiscal factors of government expenditure and taxation have on inflation. These studies reported mixed results, did not break down government expenditure and taxation into their components. Specifically, they did not consider recurrent and development expenditure as components of government expenditure. For taxation, it was not defined to its constituents such as excise duty, import duty, income tax and Value Added Tax (VAT). This implied uncertainty with regard to the influence of fiscal factors on inflation and specifically how recurrent expenditure, development expenditure, excise duty, import duty, income tax and Value Added Tax (VAT) influence inflation. In addition to using the components, the study used impulse analysis, a method which was not applied in the reviewed studies. This brought out clarity with regard to how a shock on government expenditure and taxation components would influence inflation in Kenya.

1.1.3 Trade Factors and Inflation

According to Joiya and Shahzad (2013), Ahmed *et al*. (2013) and Jaradat *et al*. (2011), trade factors are identified as a country's exports and imports. Through globalization, market connectivity and interdependence rose due to the removal of limitations and barriers for exchanging skills and goods across borders leading to increased trade

volumes (Ramzan, Fatima, & Yousaf, 2013). Exports as a leading economic activity especially the developing nations promotes growth, both directly by enhancing production, and indirectly by encouraging imports of goods and services, ideas and technology into a country (Gylfason, 1997). Rising value of exported goods also potrays a country's financial stability, this is one of the ways the country is able to attract funds in form of foreign exchange from developed countries and invest into the domestic economy to achieve progression (Khan, 2013). However, increase in exports as outlined by Shah *et al*. (2014) and Bashir *et al*. (2011) is not only beneficial to a country but also deterimental as it brings about inflation through the increase in aggregate demand. Although, Kenya has been reporting declining value of total exports where in 2014, 2015 and 2016, the total value of exports stood at Ksh. 632.9 billion, Ksh. 581 billion and Ksh. 578.1 billion respectively, inflation has continued to flactuate from 6% in 2014, 8% in 2015 and 6.5% in 2016 (Government of Kenya, 2016; Government of Kenya, 2017).

Higher prices of imported goods exert pressure on inflation for economies open to the outside world (Jaradat *et al.*, 2011). Higher import prices cause a decrease in aggregate supply hence an increase in prices of goods (Shah *et al*., 2014). In Kenya, the gap between exports and imports has been widening rapidly from 2010 because of the large import bill relative to exports causing volatility in exchange rate that in turn affects prices (KIPPRA, 2015). In 2015 and 2016, the total value of imports was Ksh. 1,577.6 billion and Ksh. 1,431.7 billion respectively.

Studies by Venkadasalam (2015), Ahmed *et al.* (2013), Jaradat *et al.* (2011), Lim and Sek (2015), Undji and Kaulihowa (2015), Bari (2013), Islam (2013), Joiya and Shahzad (2013) among others investigated the influence of trade factors on inflation. These studies depicted mixed results and did not breakdown exports and imports into their respective components. Specifically, the studies did not consider domestic exports and re-exports as components of exports. For imports, no consideration was done for its components which include commercial and government imports. This implied uncertainty with regard to the influence of trade factors on inflation and specifically how domestic exports, re-exports, commercial and government imports influence inflation. The study besides taking into consideration the components of exports and imports, robust techniques such as causality and impulse analysis which were not applied in the previous studies were used. This created new knowledge on the direction of causality between trade factors and inflation and how a shock on trade factors would influence inflation.

1.1.4 Monetary Factors and Inflation

In literature according to African Development Bank (2011), Durevall and Sjö (2012) International Monetary Fund (2008) and Salimfar *et al*. (2015), money supply is identified as the key monetary factor. Monetarists deem money supply growth as the fundamental basis for inflation (West African Monetary Agency, 2009). Consequently, this group of Economists maintains that money supply should be reserved within a tolerable bandwidth so that the levels of inflation can be curtailed (West African Monetary Agency, 2009). Kenya continues to witness a steady growth of money supply (Government of Kenya, 2016). In 2014, money supply was Ksh. 2,283.4 billion (Government of Kenya, 2016). 2015 and 2016 showed a continous growth to Ksh.

2,658.2 billion and Ksh. 2,753.5 billion respectively (Government of Kenya, 2017). The primary objective of monetary policy formulation and implementation in Kenya has been to maintain price stability (KIPPRA, 2015).

Despite long history and the considerable facts, the envisaged connection between money supply and inflation among scholars' remains disputed (Gerald *et al.,* 1999). Studies by Okara (2015), Undji and Kaulihowa (2015), Sola and Peter (2013), Yasmin *et al*. (2013) and Qayyum (2006) among others have reported mixed results where some indicate positive influence while others negative influence. These studies also relied on broad money (M2) as a measure of money supply and did not consider total money supply and other money supply components. This indicated uncertainty with regard to the influence of currency outside the banking system (M0), extended broad money (M3) and total money supply on inflation which the studies did not involve. In addition to taking into consideration the money supply components the study employed variance decomposition and impulse analysis which were not applied in the reviewed studies. This implied new information on how total money supply, M0 and M3 influence inflation.

1.2 Statement of the Problem

Inflation is the continuous rise in the price levels in the economy. This has led to labour unrests and go slows in Kenya due to the rising cost of living associated with higher prices. Kenya's monetary policy objective has been to maintain price stability anchored on the achievement of the Central Bank's inflation target of below 5 per cent. However, inflation has consistently remained above the Central Bank's target averaging 8.5% which may be attributed to lack of proper identification of the factors influencing

inflation in Kenya. Determinants of inflation remain debatable both theoretically and empirically where the proponents of demand pull, cost push and monetary theories argue that inflation is caused by increase in aggregate demand, costs of production and money supply respectively. On the other hand, empirical studies on the factors influencing inflation in Kenya focused on broad money supply (M2), output(proxied by GDP), exchange rates, food and non-food world prices, world energy prices, domestic agricultural supply shocks as the main causes of inflation and failed to use robust tests such as causality and impulse analysis. This makes the influence of fiscal factors, trade factors, total money supply on inflation in Kenya uncertain. The study therefore analyzed the influence of fiscal, trade and monetary factors on inflation in Kenya to provide knowledge on whether the factors together with their components significantly influence inflation.

1.3 Objectives

The purpose of this study was to analyze the influence of fiscal, trade and monetary factors on inflation in Kenya

1.3.1 Specific Objectives

i. To establish the influence of fiscal factors on inflation in Kenya.
ii. To determine the influence of trade factors on inflation in Kenya.
iii. To investigate the influence of monetary factors on inflation in Kenya.

1.4 Research Hypothesis

i. H_0: Fiscal factors have no significant influence on inflation in Kenya.

H_1 **:** Fiscal factors have a significant influence on inflation in Kenya

ii. H_0: Trade factors have no significant influence on inflation in Kenya.

H_1 **:** Trade factors have a significant influence on inflation in Kenya

iii. H_0: Monetary factors have no significant influence on inflation in Kenya

H_1 **:** Monetary factors have a significant influence on inflation in Kenya

1.5 Scope of the study

This study on the analysis of the influence of fiscal, trade and monetary factors on inflation in Kenya was conducted based on monthly time series data obtained from the Central Bank of Kenya (CBK) spanning 132 months from January 2005 to December 2015. The study period was tied to availability of monthly data which was present from January 2005 to December 2015 for all the variables of interest. It should also be noted that annual inflation in Kenya is an average of month-on-month inflation hence a justification for monthly data. The variables in the study included inflation, total government expenditure and its components of recurrent and development expenditure, total tax and its components of excise duty, income tax, import duty and VAT, total exports and its components of domestic and re-exports, imports and its components of commercial and government imports, total money supply and its components of M0 and M3.

1.6 Significance of the Study

Inflation continues to rattle policy makers as it creates doubtfulness and confusion in the economy which affects economic growth adversely. The concern with inflation stalks not only from the goal of maintaining price stability, but also because it hurts the low income earners hard as they do not have valuable cushion against inflation (Samimi *et al.*, 2012). Inflation also makes individuals worse off by reducing the purchasing power of income. This erodes living standards, discourages savings and adds in many ways to life's uncertainty (Rizvi *et al*., 2012). Therefore, low inflation and stability in prices is always one of the core objectives targeted by the policy maker in designing macroeconomic policies (Lim & Sek, 2015). Kenya's monetary policy objective has been the achievement of inflation of below 5 per cent. However, inflation has consistently remained above the target. The influence of factors such as fiscal, trade and money supply on inflation remain debatable among scholars. This is due to mixed results reported and inadequacies in the analytical methodologies used which did not break down the factors into their components. This study considered analyzing the influence of fiscal, trade and monetary factors on inflation in Kenya using impulse analysis, variance decomposition, causality tests and broke down the factors into their components which were not done in majority of the reviewed studies. Hence the study forms useful material of knowledge to academia by expanding existing literature with regard to determinants of inflation from the Kenyan perspective. It provides information on how disaggregated components of government expenditure, taxation, exports, imports and money supply affect inflation. On the other hand, to the CBK, treasury economists, and other policy makers the study provides information on the most influential factor for determining inflation in Kenya. This is

relevant in identifying which component to target hence adoption of relevant economic policies for regulating inflation in Kenya which may lead to the achievement of the desired elusive inflation target and reverse the negative effects inflation has caused to the economy.

1.7 Theoretical Framework

This study was modeled on demand pull, cost push and monetarist theories of inflation which form the canons on which other theories of inflation are constructed. The theories postulate that inflation results from a rise in aggregate demand, a decrease in aggregate supply and an increase in money supply respectively. The factors influencing inflation as outlined by Keynes (1936), Friedman and Schwartz (1963) comprises consumption, investment, government expenditure, exports, money supply, taxation, higher wages, firms' mark-up prices, imports, exchange rates, price expectations among other structural factors. As applied to this study, the demand pull, cost push and monetary theories of inflation hold government expenditure, exports, taxation, imports and money supply among the main factors influencing inflation. However, it should be noted that the theories analyze the influence of total government expenditure, total tax, total exports, total imports, total money supply on inflation and not their components.

The study analyzed the influence of fiscal, trade and monetary factors on inflation in Kenya using both aggregate and disaggregated data. This provided information on how total government expenditure and its components of development expenditure and recurrent expenditure influence inflation; total tax and its components of excise duty,

import duty, income tax and VAT influence inflation; total imports and its components of commercial imports and government imports influence inflation; total exports and its components of domestic and re-exports influence inflation; total money supply and its components of currency outside the banking system (M0) and extended broad money (M3) influence inflation. This study therefore hypothesized the relationship between inflation and its influencing factors in Kenya by modifying Greenidge and DaCosta (2009) demand pull and cost push inflation model (1.1) which only captured money supply, real income and interest rate, to capture total government expenditure, total tax, excise duty, import duty, income tax, VAT, recurrent expenditure, development expenditure, total exports, domestic exports, re-exports, total imports, commercial imports and government imports, total money supply (MS), currency outside the banking system (M0), extended broad money (M3) as specified in models (1.2) and (1.3) based on aggregate and disaggregate components respectively.

$$\pi = f(y, m_s, i) \tag{1.1}$$

Where; π - inflation, y-real income, m_s-money supply and i - interest rate.

$$INFM_t = f(MS_t, TTAX_t, TEXP_t, TEXPEN_t, TIMP_t, \mu_t) \tag{1.2}$$

Where; $INFM_t$ - inflation, MS_t-total money supply, $TTAX_t$ -total tax, $TEXP_t$ - total exports, $TEXPEN_t$-total government expenditure, $TIMP_t$ -total imports and μ_t – error term (capturing other factors).

$$INFM_t = f(REC_t, DEV_t, DEXP_t, REEXP_t, ED_t, ID_t, IT_t, VAT_t, CIMP_t, GIMP_t, M0_t, M3_t, \mu_t) \tag{1.3}$$

Where; $INFM_t$ - inflation, REC_t – Recurrent government expenditure, DEV_t – Development expenditure, $DEXP_t$ – Domestic exports, $REEXP_t$ – Re-exports, ED_t – Excise duty, IE_t – Import duty, IT_t – Income tax, VAT_t – Value added tax, $CIMP_t$ – Commercial imports, $GIMP_t$ – Government imports, $M0_t$ – Currency outside banking system, , $M3_t$ – M2+ resident foreign currency deposits, t – time period in months and μ_t – error term (capturing other factors).

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed both theoretical and empirical literature on the relationship between inflation and its influencing factors. Part one reviewed inflation theories which exposed the theoretical foundations that explain the factors influencing inflation. The second part reviewed empirical literature and the last part dealt with the critique and summary of the literature outlining the knowledge gaps.

2.2 Theoretical Literature

This part discussed the demand pull, cost push and monetary theories of inflation. The theories form the canons on which other theories of inflation are constructed such that through the avenues of demand pull, cost push and monetary theories, followers of the Keynesian and Monetarist schools of thought formulated different approaches to understand the inflationary process (Whyte, 2011).

2.2.1 Demand Pull Theory of Inflation

Demand pull inflation theory of John Maynard Keynes (1883 - 1946) states that inflation is caused by an increase in aggregate demand and as such, inflation is due to surplus demand in product and resource markets (Whyte, 2011). Keynes (1936) and his followers (Keynesians) as noted by Totonchi (2011) emphasized that a rise in aggregate demand comprises a rise in consumption expenditure, investment, exports and government expenditure such that when the worth of aggregate demand surpasses the value of aggregate supply at the level of optimal resource utilization, then inflationary gap arises.

The wider the gap between aggregate demand and aggregate supply, the more rapid is the inflation (Keynes, 1936). However, Keynesian also noted that even before attaining optimal utilization of resource, production factors and various appearing constraints can lead to increase in inflation (Totonchi, 2011).

According to Keynes (1936), a policy that causes decrease in each component of total demand will be effective in reduction of pressure demand and inflation which may involve the reductions in government expenditure, reduction in exports, tax increase or control of the volume of money and increase in imports (Totonchi, 2011). In complicated circumstances, e.g. hyperinflation during war the control of money supply quantity or decline in general expenditures may not be sensible, appropriate approaches involve increase in tax (Keynes, 1936). Bashir *et al*. (2011) in their analysis of the demand pull inflation besides money supply, tax and government expenditure also noted that an increase in exports or Gross Domestic product (GDP) leads to an increase in aggregate demand. Keynesians stated that increases in GDP or exports beyond natural level, accelerates inflation since suppliers increase prices and if GDP or exports decrease below its natural level, inflation decelerates since suppliers cut excess capacity by lowering prices (Tafti, 2012).

To contest criticisms from the Monetarists, the Keynesians formulated a modified theory of inflation based on imperfect competition where the Keynesian theorists stated that to an individual employee in wage negotiations, the price level is exogenous. However, to all the personnel in the negotiation, the price level is endogenous (Whyte, 2011). As a

consequence, inflation will occur because employees want a rise in earnings and firms want increased profits. Therefore, if workers are granted a pay rise, firms will raise prices which lead to inflation. That is, inflation is influenced by pay increase and firms' mark-up prices (Whyte, 2011).

2.2.2 Cost Push Theory of Inflation

Cost push theory of inflation is as a result of factor prices rising more rapidly than factor productivity (Greenidge & DaCosta, 2009). Essentially, cost push inflation occurs due to a decrease in aggregate supply because of an increase in taxes, imports and other costs of production such as wage increases (Greenidge & DaCosta, 2009). In the 1950s and 1960s cost push inflation was due to a rise in wages enforced by strong labour unions and profit increases by employers with monopoly pricing policies (Feleke, 2014). The labour unions push employers to award pay increase significantly, thereby pushing up the cost for commodity production. Employers, the oligopolistic and monopolistic firms in turn, increase the price of their goods to make up for the rise in labour and cost of production to receive high profits which in turn raises prices of their commodities (Totonchi, 2011). Higher salaries make possible for the employees to acquire as much as before, in spite of higher prices. On the other hand, the swell in prices induces unions to demand still higher remuneration. In this way, the wage cost twist continues, thereby, leading to cost push or wage push inflation (Totonchi, 2011).

In 1970s, cost push inflation resulted from the special factors that were non-monetary such as crop failures, commodity shortages, and the Organization of Petroleum Exporting Countries (OPEC) - administered a rise in the price of oil, causing the rise of inflation to

double-digit levels (Feleke, 2014). A summary by Kirimi (2014) indicated that cost push inflation is brought about by factors that make costs to go up, which include taxes, wages, exchange rates and costs of inputs. This activates inflation through the supply side by increasing costs of production which are then passed on to the consumers through higher prices (Kirimi, 2014). Shah *et al*. (2014); Bashir *et al.* (2011) and Javed *et al.* (2010) also outlined other cost push factors as imports and taxation including excise and import duty.

2.2.3 Monetary Theory of Inflation

Monetarism refers to the supporters of Milton Friedman (1912- 2006) who held that only money matters such that monetary policy becomes an extra powerful instrument than fiscal policy in economic stabilization (Tafti, 2012). Money supply is the dictate, though not exclusive determinant of output and prices in the short run, and of the level of prices in the long run (Friedman & Schwartz, 1963; Totonchi, 2011). Through the modern quantity theory led by Milton Friedman, monetarist emphasized on the role of money and held that inflation is always and everywhere a monetary incident that arises from a more swift growth in the amount of money in circulation than in total productivity (Totonchi, 2011). Monetarist view further suggested that financing the budget deficits by obtaining seigniorage income increases the general level of prices and leads to inflation since inflation is a kind of a tax where it is imposed on the money retained by individuals and the real value of money is constantly reduced (Koyuncu, 2014). In order to achieve some of its objectives the state creates an unexpected inflation and obtains seigniorage revenue (Koyuncu, 2014).

To contest criticisms from the Keynesians, the Monetarists argued that incase firms are uncertain of the basis for a rise in prices, the firms will seek to establish the causes for price increase after which they will change their prices accordingly, based on rational expectations. Therefore, price expectations influence the inflation rate (Greenidge & DaCosta, 2009). In addition, structural factors such as weather conditions, policies aimed at protecting certain industries and other trading policies affecting imports and exports, may also influence the rate of inflation by resulting in higher prices for certain goods and services (Greenidge & DaCosta, 2009).

2.3 Empirical Literature

This section discusses compares and critiques empirical literature to establish a summary of the weakness and knowledge gaps for the respective studies in line with the study objectives.

2.3.1 Fiscal Factors and Inflation

The section reviews empirical literature that outlined how the fiscal factors of government expenditure and taxation relate with inflation and provided a summary of gaps in line with this objective.

Magazzino (2011) assessed the empirical evidence of the nexus between public expenditure and inflation for six Mediterranean countries during the period 1970-2009 using a time-series approach. Results revealed a negative association between inflation and government expenditure in Greece, Malta, Portugal and Spain but a positive correlation in France and Italy. A long-run relationship between the growth of government expenditure and inflation was only evident for Portugal. Furthermore,

Granger causality tests results showed a short run evidence of a unidirectional flow from expenditure to inflation for Cyprus, Malta and Spain; a bidirectional flow for Italy; and from inflation to public expenditure for France. From the study, it was evident that although the study employed robust analytical techniques there was an inconclusive debate on the influence of government expenditure on inflation given the mixed results, lack of information on how government expenditure components such as recurrent and development expenditure relate with inflation and how a shock in government expenditure would influence inflation given that impulse and variance decomposition analysis tests were not conducted hence a justification for the study.

Ezirim *et al.* (2008) investigated the relationship between public expenditure growth and inflation in the United States of America using the cointegration analysis and Granger Causality Model applied to time series annual data from 1970 – 2002. The results indicated a long-run positive equilibrium relationship between the two variables and a bi-causational relationship between public expenditure growth and inflation in the United States of America. This study's analysis was inconclusive in establishing the relationship between government expenditure and inflation given that impulse and variance decomposition analysis that explain how a shock in government expenditure would influence inflation were not conducted. In addition, the study did not breakdown government expenditure into its components of development and recurrent expenditure. This made it impossible to understand how the components of government expenditure influence inflation.

Ahmed *et al.* (2013) explored the long run and short run dynamics of inflation in case of Pakistan using annual data from 1971 to 2012. Johansen cointegration approach was used to check long run equilibrium while ECM (Error Correction Model) was used to check short run dynamics. It was noted that recurrent government expenditure positively affected inflation while development expenditure negatively influenced inflation. This was attributed to the fact that recurrent government expenditure stimulates aggregate demand while development government expenditure decreases inflation since high development expenditure stimulates aggregate supply and encourages domestic and foreign investment. Although this study made an effort to establish how the components of total government expenditure influence inflation, the analysis remained uncertain in the sense that causality test, impulse and variance decomposition analysis were not conducted to provide information on the direction of causality and how a shock in government expenditure would influence inflation.

Arif and Ali (2012) analyzed the major determinants of inflation in Bangladesh using data for the period from 1978 to 2010 using Johansen cointegration and error correction methodology. The findings indicated that government expenditure had a positive effect on inflation in the long run which implied that an increase in government expenditure caused inflation to increase. The VAR techniques employed in the study did not include causality and impulse analysis tests. This implied uncertainty on the direction of causality and the effect of a shock in government expenditure on inflation.

Iya and Aminu (2014) investigated the determinants of inflation in Nigeria between 1980 and 2012 using Granger causality, Johansen and vector error correction techniques. The

results revealed that there was no causation between government expenditure and inflation but there existed a negative long run and short run influence of government expenditure on inflation. The study focused on total government expenditure rather than its components. This implied that the VAR techniques employed would not provide information on how components of government expenditure such as development and recurrent expenditure influence inflation, an indication of inconclusive analysis.

Patoli *et al.* (2012) examined the relationship between tax revenue and inflation in Pakistan using annual time series data for the period 2000-2010. By use of correlation and regression analysis (OLS), they established that inflation and taxes were positively correlated in Pakistan. Similarly, Rizvi *et al.* (2012) and Khan *et al.* (2007) who investigated the determinants of inflation in Pakistan for the periods 1980 to 2007 and 1972-73 to 2005-06 respectively using OLS also established that taxes had a significant positive influence on inflation. Although consenting on the effect of taxes on inflation, the weaknesses for the studies involved employing an inferior methodology which has no power to show long run relationship and indicate direction of causality. Moreover, taxation was not broken down into its components such as excise duty, import duty, income tax and VAT. Thus, the studies were inconclusive in analyzing the influence of taxation on inflation.

In examining the determinants of inflation in Pakistan for the period 1972 to 2010, Bashir *et al*. (2011) employed robust analysis techniques that included Johansen cointegration,

Vector Error Correction and Granger causality tests. The results indicated that in the long run inflation was found to be negatively influenced by taxation. It was also noted that in short run past values of taxation influenced inflation and there was a unidirectional causality running from taxation to inflation. This study's weakness emanated from the fact that it failed to conduct impulse analysis required to provide information on how a shock in taxation would influence inflation. Additionally, no taxation components were considered in the analysis hence an inconclusive review of the influence of taxation on inflation.

Ahmed *et al*.(2014) explored the short and long run dynamics of inflation in Pakistan using Johansen cointegration technique for the period 1972 to 2013 with Consumer Price Index (CPI) and indirect taxes as indicators. The result showed that there was a positive long run relationship between indirect taxes and inflation. Similarly, Rehman and Khan (2015) by employing Vector Error Correction model and Johansen cointegration tests to identify the factors affecting food price inflation in Pakistan during the period 1990 – 2013 established that indirect taxes had a positive and significant impact on food price inflation in Pakistan. Comparatively, the studies consent on the influence of indirect taxes on inflation. However, the failure to use aggregate data on taxation and to analyze how a shock in taxation would influence inflation made these studies inconclusive with regard to analyzing the influence of taxation on inflation.

Analyzing the major determinants of inflation in Bangladesh using data for the period1978 to 2010, Arif and Ali (2012) employed Johansen cointegration and error

correction methodologies to establish long run and short run relationship. The findings based on correlation analysis indicated a weak negative association between taxation, imports, exports, money supply and inflation. It was also noted that taxation and export had a negative effect on inflation while broad money, government expenditure and imports had a positive effect on inflation in the long run. In spite of the fact that the study employed robust VAR analysis techniques, they failed to employ causality and impulse analysis. More importantly, the factors were not disintegrated into their components. This implied an inconclusive analysis of the influence of fiscal, trade and monetary factors on inflation.

From the reviews, it was evident that available studies were inconclusive in synthesizing the influence fiscal factors had on inflation. It was noted that although majority of the studies employed robust VAR analytical techniques such as cointegration and error correction, they reported mixed results, none conducted in Kenya and failed to employ impulse analysis. This implied that results in one country cannot be generalized to another country and therefore the influence that fiscal factors of government expenditure and taxation would have on inflation in Kenya remains uncertainty.

2.3.2 Trade Factors and Inflation

The section reviews empirical literature that outlined how the trade factors of exports and imports relate with inflation and provided a summary of knowledge gaps emanating from the various studies.

Investigating the long run and short run significance of macroeconomic variables such as exports, broad money, gross domestic product and household final consumption expenditure towards the consumer price index in Malaysia Venkadasalam (2015) employed Johansen system co-integration and Vector Error Correction (VEC) model tests for the period 1960 to 2012. The results showed that in the long run, export of goods and services, broad money, gross domestic product and household final consumption expenditure were significantly positively related to inflation. This implied that an increase in exports, broad money, gross domestic product and household final consumption expenditure causes inflation to increase. The VECM indicated that exports influenced inflation in the short run and there was no causality between the exports and inflation. As much as the study employed robust analysis techniques, it failed to employ impulse response and did not breakdown exports into its components such as domestic and re-exports. This implied lack of knowledge on the influence of exports components such as domestic exports and re-exports on inflation and how a shock on export influences inflation hence an inconclusive analysis of the influence of exports on inflation.

Jaradat *et al.* (2011) examined factors affecting inflation in Jordan using quarterly data from 2000 to third quarter of 2010 by applying the concepts of cointegration, Error Correction Model, analysis of Variance Decomposition and Impulse Response Function. The results indicated that national exports, imported inflation and credit facilities had a positive long run relationship with inflation while money supply had an insignificant effect on inflation. The impulse responses and variance decomposition analysis also

indicated that shocks on national exports, imported inflation, GDP, credit facilities and money supply influenced inflation from the second period in Jordan. Despite the employment of robust data analysis techniques in this study, lack of causality analysis to identify the direction of causality among the variables and reliance on aggregate data which implied lack of information on the influence of exports components such as domestic and re-exports on inflation made the study inconclusive in providing a comprehensive overview of the influence of exports on inflation.

Joiya and Shahzad (2013) analyzed the determinants of high food prices in Pakistan using Autoregressive Distributed Lag approach and error correction model for long-run and short-run, respectively based on time series data for the period 1972-73 to 2009-10. The findings of the study showed that food exports contributed towards high food prices while food imports caused the reduction in the food prices. Similarly, Rehman and Khan (2015) in investigating the factors affecting food price inflation in Pakistan during 1990–2013 by applying econometric tests of Vector Error Correction model and Johansen co-integration test showed that food exports had a positive and significant long run impact on food price inflation in Pakistan. They concluded that because food inflation occurs due to high demand of food items only those products with excess supply should be exported. In spite of the fact that the studies employed different cointegration techniques for varying time periods they consented on the positive effect of food exports on inflation. However, their studies did not involve data on total exports and failed to conduct causality and impulse tests. This implied lack of information on how total exports influences inflation, what is the direction of causality and how does a shock in exports

influence inflation hence an inconclusive analysis of the relationship between exports and inflation.

Ahmed *et al.* (2013) in exploring determinants of inflation in Pakistan for the period 1971 to 2012 applied Johansen cointegration and Error Correction Model (ECM). The results showed that exports of goods and services had a significant negative effect on inflation because higher exports increased domestic production which leads the firm to achieve economies of scale and cost of production decline. In the same way, Arif and Ali (2012) analyzed the major determinants of inflation in Bangladesh using data for the period from 1978 to 2010. The findings based on correlation coefficients indicated a weak negative association between imports, exports, government revenue, money supply and inflation. On the other hand, long run analysis indicated that exports had a negative effect on inflation in Bangladesh. Despite the fact that the studies consented on the negative effect of exports on inflation, lack of information on the direction of causality meant an inconclusive analysis for the influence exports had on inflation.

Olatunji *et al.* (2010) examined the factors affecting inflation in Nigeria using time series data based on cointegration and error correction analysis. Results indicated that total exports had a negative impact on inflation while total imports and food price index exerted a positive effect. Total government expenditure had an insignificant effect on inflation with inflation in the short run correcting disequilibrium at the rate of 70% in the next period. The review of the study indicated that important relationship analysis techniques such as causality and impulse analysis were not employed creating knowledge gaps on the direction of causality and how a shock on exports influences inflation. This

implied the study findings were inconclusive in providing information on the relationship between inflation and its determinants of exports and government expenditure, interest rate, crude oil imports and food price index.

An empirical investigation for the factors affecting inflation in Pakistan such as imports, GDP, government lending and direct taxes by Rizvi *et al.* (2012) who employed OLS indicated that imports, GDP, government lending and direct taxes had a significant positive effect on inflation. The application of OLS, an inferior analytical tool implied that there was no information regarding long run and short dynamics, direction of causality and response to shocks thus an inconclusive analysis for the influence that imports has on inflation.

Bari (2013) in his study on the main determinants of inflation in Turkey over the period 2002-2012 employed Johansen cointegration, Vector Error Correction (VEC) Model, impulse response and variance decomposition. The results indicated that imports had an insignificant effect on inflation in Turkey. Despite the study employing robust VAR analysis techniques, the failure to incorporate causality test and use of total imports as an aggregate implied lack of knowledge on the direction of causality and how the components of imports such as commercial and government imports would influence inflation. This made the study inconclusive in analyzing the influence of imports on inflation.

Bashir *et al*. (2011) in examining the determinants of inflation in Pakistan for the period 1972 to 2010 using Johansen cointegration, Vector Error Correction and Granger causality tests established that in the long run inflation was found to be positively influenced by imports but there was no causality between imports and inflation. This study's weaknesses emanated from the fact that although VAR techniques were employed, use of aggregate data i.e. total imports and failure to conduct impulse analysis meant lack of information on how imports components such as commercial and government imports affect inflation and how a shock in imports would influence variation in inflation. Thus, the study remained inconclusive in determining the influence of imports on inflation.

Islam (2013) in his analysis on the relationship between import trade and inflation in Bangladesh using quarterly data for the period January 2006 to December 2010 employed decriptive techniques of trend analysis and correlation analysis. The results indicated that there was a positive correlation between imports and inflation. Similarly, Arif and Ali (2012) in analyzing the determinants of inflation in Bangladesh using data for the period from 1978 to 2010 employed Johansen cointegration and error correction. The findings based on correlation indicated a weak negative association between imports and inflation. It was also noted that in the long run imports had a positive effect on the inflation in Bangladesh. Although the studies were conducted in the same country, mixed results may be attributed to analysis techniques employed. Further, the studies relied on total imports as an aggregate component and failed to conduct other tests such as causality and impulse analysis. Thus it remained unclear what is the direction of causality between imports and

inflation, how a shock on imports would influence inflation and what is the relationship between import components such as commercial imports and government imports with inflation hence an inconclusive relationship analysis.

Lim and Sek (2015) examined factors affecting inflation in two groups of countries (high inflation group and low inflation group) using annual data from 1970 to 2011. The factors comprised of imports, GDP, national expenditure and money supply. An Error Correction Model was used to explain the short run and long run impacts of each variable on inflation. The results indicated that imports of goods and services, national expenditure had a significant positive long run impact on inflation in low inflation countries while a negative significant long run impact was noted on inflation in high inflation countries. In the short run imports had no significant impact on inflation in low inflation countries while imports had a significant negative relationship with inflation in high inflation countries. Analysis of the study indicated mixed results due to different study areas of focus, reliance on total imports and failure to conduct some VAR tests such as causality, impulse response and variance decomposition. This implied an inconclusive analysis given lack of information on the effect of import components such as government imports and commercial imports on inflation and direction of causality between imports and inflation.

The study on the long run and short run dynamics of inflation in Pakistan by Ahmed *et al.* (2013) who employed Johansen cointegration and Error Correction Model based on annual data from 1971 to 2012 showed that import of goods and services had positive

effect on inflation. Similarly, Joiya and Shahzad (2013) using Autoregressive Distributed Lag approach for cointegration in analyzing the determinants of high food prices in Pakistan for the period 1972-73 to 2009-10 established that food imports caused the reduction in the food prices. On the other hand, Khan and Gill (2010) by applying OLS using annual data from 1971-72 and 2005-06 found that an increase in the value of imports contributed to shooting up of inflation. The mixed results in the studies can be attributed to different analysis approaches employed. However, it is important to note that the studies relied on total imports such that the effect of imports components such as government imports remained unknown. Thus, the studies were inconclusive in analyzing the influence imports had on inflation.

Alexander *et al.* (2015) investigated the main determinants of inflation in Nigeria for the period 1986 – 2011. They employed Johansen cointegration, Granger causality, impulse response analysis and variance decomposition tests. The results revealed that there was a long-run equilibrium relationship between the rate of inflation and import of goods and services, money supply and exchange rate. The Granger causality test revealed evidence of no causality between inflation and its determinants. The variance decomposition and impulse response results showed that own-shocks were significantly responsible for the variation and innovations in all the variables in the equation. Although the study undertook a comprehensive analysis by employing robust VAR techniques, the study majorly focused on aggregate data by using total imports. This implied lack of information on how imports components such as commercial imports and government

imports would influence inflation. Therefore, the study inconclusively analyzed the influence of imports on inflation.

Undji and Kaulihowa (2015) examined the determinants of inflation in Namibia for the period 1993–2013 by employing Engle- Granger cointegration technique to assess the determinants of inflation in Namibia. Empirical results suggested that inflation was mainly driven by imports, government spending, money supply and GDP where imports and government expenditure had a positive relationship with inflation while money supply and GDP recording negative but insignificant relationship with inflation. It was noted that the failed to conduct some tests necessary for establish relationships such as causality and impulse analysis. This implied lack of knowledge on the direction of causality and how a shock in imports would influence inflation thus an inconclusive analysis for the relationship between inflation and its determinants.

The review of studies on the relationship between inflation and trade factors of exports and imports depicted the use of robust VAR techniques. However, in synthesizing the influence of trade factors on inflation it was noted that the studies reported mixed results given the different study areas, none focused on Kenya, failed either to conduct causality tests or impulse analysis and did not breakdown exports and imports into their respective components. Specifically, the studies did not consider domestic exports and re-exports as components of exports. For imports, no consideration was done for its components which include commercial and government imports. This shows that the influence of trade factors on inflation in Kenya remains unknown and findings in one country cannot be generalized to another country. The study took into consideration the components of

exports and imports. Moreover, robust techniques such as causality and impulse analysis which were not applied in the studies were used. This implied new knowledge on the direction of causality between trade factors and inflation and how a shock in trade factors would influence inflation.

2.3.3 Monetary Factors and Inflation

The section reviews empirical literature that indicated how monetary factors of money supply relate with inflation and provided a summary of knowledge gaps that existed in the studies.

Exploring the empirical relationship between inflation and money supply in Pakistan using Vector Auto Regressive (VAR) model and causality, Qayyum (2006) and Yasmin *et al*. (2013) found that broad money supply (M2) had a positive effect on inflation in the long-run but differed on the direction of causality by establishing a bidirectional and unidirectional causality between inflation and money supply respectively. Similarly, Khan and Gill (2010) in analyzing the determinants of inflation in Pakistan by using OLS based on annual data from 1971-72 and 2005-06 established that M2 does not influence inflation. It is clearly evident that, there were mixed results and lack of consensus on the direction of causality. Further, the use of broad money (M2) as a measure of money supply implied lack of information on the influence of total money supply and other components such as extended broad money on inflation hence an inconclusive analysis for the relationship between inflation and money supply.

Sola and Peter (2013) examined money supply and inflation rate in Nigeria for the period 1970-2008 using Vector Auto Regressive (VAR) model. The results indicated that there existed a positive relationship and unidirectional causality between money supply and inflation. Similarly, Akinbobola (2012) using Vector Error Correction Mechanism (VECM) provided quantitative analysis of the dynamics of money supply, exchange rate and inflation in Nigeria. The results confirmed that in the long run, money supply had significant inverse effects on inflation. From the researchers' analysis, though conducted in the same country using same methodology and broad money (M2) as a measure of money supply, they did not consent on the influence of money supply on inflation given the mixed results. Besides the mixed results, the failure by the studies to conduct some tests such as impulse response analysis implied lack of knowledge on how a shock on money supply would influence inflation. Further, the use of broad money (M2) made their studies inadequate in providing knowledge on the influence that currency outside banking system (M0), extended broad money (M3) and total money supply has on inflation. Hence, the studies were inconclusive in examining the influence of money supply on inflation.

Undji and Kaulihowa (2015) examined the determinants of inflation in Namibia for the period 1993–2013 by employing Engle- Granger cointegration technique to assess the determinants of inflation in Namibia. Empirical results suggested that inflation had a positive relationship with money supply. Use of broad money (M2) as a measure of money supply in the study implied that the influence of other components of money supply such as currency outside the banking system (M0), extended broad money (M3)

and total money supply on inflation remained uncertain. The study therefore provided an inconclusive analysis for the influence that money supply has on inflation.

Durevall and Sjö (2012) assessed the main drivers of inflation in Ethiopia and Kenya for the period 2000 to 2012. VAR econometric techniques of cointegration and error correction mechanism were employed involving the variables of Consumer Price Index, money supply (M2), exchange rates, food and non-food world prices, world energy prices and domestic agricultural supply shocks. They found that inflation in both Ethiopia and Kenya were driven by similar factors with money supply (M2) growth having a positive effect. The weakness of this study emanated from use of broad money as a measure of money supply which implied the study failed to incorporate other money supply components such as currency outside the banking system and total money supply. Further, tests such as the causality and impulse response analysis were not conducted implying that information on direction of causality and the effect of money supply shocks on inflation were unknown. Thus, the study was inconclusive in analyzing the influence of money supply on inflation.

Okara (2015) establish the determinants of inflation in Kenya using time series for the period 1980 to 2011.The study employed the use of Johansen cointegration, Vector Error Correction Model (VECM) for long run and short run dynamics, causality and impulse response analysis. The results indicated that narrow money supply (M1) had a positive effect on inflation while broad money supply (M2) had a negative effect on inflation both in the short run and long run and unidirectional causality from narrow money to inflation. Use of narrow money and broad money implied lack of information on the influence that currency outside

the banking system (M0) and total money supply has on inflation. Thus the study inconclusively analyzed the influence of money supply on inflation in Kenya.

Kiganda (2014) establish relationship between inflation and money supply in Kenya using annual time series data from 1984 – 2012. The study used Vector Error Correction Mechanism to integrate long run and short run dynamics and Granger causality for directional causality. The results indicated that there was a significant positive correlation and positive long run relationship between inflation and money supply (M2) in Kenya. Inflation was significantly error correcting with unidirectional causality running from money supply. Similarly, Kirimi (2014) in establishing the main determinants of inflation in Kenya for the period 1970-2013 using ordinary least squares noted that money supply (M2) had a positive relationship with inflation. Although the studies reported same results, reliance on M2 as a measure of money supply meant lack of knowledge on how total money supply and currency outside the banking system would influence inflation. This implied that the studies inconclusively analyzed the influence of money supply on inflation.

Based on the reviews, it was evident that several studies on the relationship between money supply and inflation have been conducted world over. However, the reviews have reported mixed results and relied on M2 as a measure of money supply failing to consider other components like total money supply, M0 and M3. Furthermore, the studies did not employ tests such as variance decomposition and impulse analysis. This implied lack of information on how total money supply, M0 and M3 influence inflation. Thus, the outcome of available studies remains inconclusive in explaining the influence of

monetary factors on inflation. This study therefore employed variance decomposition and impulse analysis to generate new information on how total money supply, M0 and M3 influence inflation.

2.4 Summary of Literature

The review of various theories of inflation clearly indicated divergent views on what are the factors that influence inflation. Demand pull proponents attribute the causes of inflation to a change in aggregate demand, monetarist view money supply as the determinant of inflation whereas the cost push proponents attribute the causes to a change in the costs of production. In addition, several empirical studies on fiscal, trade and monetary factors as determinants of inflation have been conducted world over. However, these studies have reported mixed results given diverse study areas and did not breakdown government expenditure, taxation, exports, imports and money supply into their respective components. Specifically, the studies did not consider the influence of recurrent expenditure, development expenditure, excise duty, import duty, income tax, VAT, domestic exports, re-exports, commercial imports, government imports, M0 and M3 on inflation which indicates uncertainty on how fiscal, trade and monetary factors influence inflation in Kenya. This study took into consideration the components of government expenditure, taxation, exports, imports and money supply. Moreover, robust techniques such as causality and impulse analysis which were not applied in the studies were used. This implied new knowledge on the direction of causality between fiscal, trade, monetary factors and inflation and how a shock on fiscal, trade and monetary factors would influence inflation.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter comprises the research design, study area, model specification, measurement of variables, sources of data and data presentation.

3.2 Research Design

This study was conducted using correlation research design based on monthly time series data and positivism research philosophy. Positivism emphasizes focus on strictly scientific empiricist method designed to yield pure data and facts uninfluenced by human interpretation or bias (Saunders *et al*., 2016). According to Whitley and Kite (2013); Oso and Onen (2011), correlation research design provides rigorous and replicable procedure for understanding relationships and determines whether, and to what degree, a relationship exists between quantifiable variables. The study analyzed the influence of fiscal, trade and monetary factors on inflation in Kenya by use of cointegration test, error correction mechanism, Granger causality test, impulse response and variance decomposition analysis.

3.3 Study Area

Kenya is located on the Eastern of Africa, bordering Somalia to the east; Ethiopia to the north; Sudan to the northwest; Uganda to the west and Tanzania to the south. The Indian Ocean lies to the southeast (Kituyi, Saibel, & Nalo, 2005). Kenya is located approximately between latitudes 5^{o}N and 4^{o} 40’ and extends from longitude 33^{o} 53’ East of Greenwich Meridian to 41^{o} 55.5’ East. Kenya’s geographical position makes it a major

gateway for trade to the Eastern and Central Africa region (Kituyi, Saibel, & Nalo, 2005). The growth objectives of the country require the rate of growth of the economy to rise to 10% per annum and an inflation rate of less than 5% (Government of Kenya, 2012). Over the years, Kenya has been experiencing volatility in inflation that has remained above the CBK target of 5% (Gichuki & Moyi, 2013).

3.4 Model Specification

Inflation being a function of demand pull, cost push and monetary factors as hypothesized by modified Greenidge and DaCosta (2009) model (1.2). The model specification of this study was underpinned on demand pull, cost push and monetary theories based on the aggregate demand (AD) and aggregate supply (AS) models of the national income identity. Given that at equilibrium $AD = AS$, model (1.2) can be represented as;

$$INFM_t = f(AD_t, AS_t, Ms_t, \mu_t) \tag{3.1}$$

Where; $INFM_t$ - inflation, AD_t – aggregate demand, AS_t – aggregate supply and Ms_t – money supply components which include; REC_t – Recurrent government expenditure, DEV_t – Development expenditure, $DEXP_t$ – Domestic exports, $REEXP_t$ – Re-exports, $M0_t$ – Currency outside banking system, $M3_t$ – M2+ resident foreign currency deposits, ED_t – Excise duty, IE_t – Import duty, IT_t – Income tax, VAT_t – Value added tax, $CIMP_t$ – Commercial imports, $GIMP_t$ – Government imports, t – time period in months and μ – error term (capturing other factors).

From the national income identity concept based on Mittal (2008), aggregate demand is summarized as;

$$AD = C + I + G + X - M \tag{3.2}$$

Where AD= aggregate demand, C= consumption, I= investment, G=Government expenditure, X=exports and M= Imports.

Given

$$C = a + b(Y - T + R) \tag{3.3}$$

Where $C-$consumption, $a-$autonomous consumption, $b-$marginal propensity to consume, $Y-$income, $T-$ tax and $R-$transfer payments

$$I = I_0 + c(Y - r) \tag{3.4}$$

Where $I-$investment, I_0-autonomous investment, $c-$marginal propensity to invest, $Y-$income, $r-$ interest rate

Then

$$AD = a + bY - bT + bR + I_0 + c(Y - r) + G + X - M \tag{3.5}$$

Since according to Greenidge and DaCosta (2009), money supply fluctuations can have a strong positive effect on the level of prices through the aggregate demand (AD), then model (3.5) was modified as (3.6) to capture the aspect of money supply.

$$AD = a + bY - bT + bR + I_0 + c(Y - r) + G + X - M + Ms \tag{3.6}$$

Where AD= aggregate demand, a= autonomous consumption, Y= Output, T= taxation, R=transfer payments I_0= autonomous investment, c=marginal propensity to invest,

r=interest rate, G= government expenditure, X=exports, M= Imports and Ms = money supply.

Disaggregating Taxation, government expenditure, exports, imports and money supply such that;

$T = \text{import duty} + \text{excise duty} + incometax + \text{VAT}$,

$X = domestic + re - \exp orts$

$G = \text{Recurrent government expenditure + Development expenditure}$

$Ms = M0 + M3$

$M = \text{ Commercial + government imports}$

This implies that model (3.6) can be further modified to;

$$AD = f\begin{pmatrix} a + bY - b(\text{import duty} + \text{excise duty} + \text{income tax} + \text{VAT}) + \text{bR} + I_0 \\ + c(Y - r) + \text{recurrent expenditure} + \text{development expenditure} + domestic + \\ re - \exp orts - \text{commercial imports - government imports} + \text{M0} + \text{M3} \end{pmatrix} \quad (3.7)$$

Substituting (3.7) into (3.1)

$$INFM_t = f\begin{pmatrix} a + bY - b(\text{import duty} + \text{excise duty} + \text{income tax} + \text{VAT}) + \text{bR} \\ + I_0 + c(Y - r) + \text{recurrent expenditure} + \text{development expenditure} \\ + domestic + re \exp orts - \text{commercial imports - government imports} \\ + \text{M0} + \text{M3} \end{pmatrix} \quad (3.8)$$

Letting all the autonomous components (a, I_0) in model (3.8) to be captured by a constant α_0 and the error term (μ_t) to represent other intervening factors such as output, transfer payment and interest rate, the modified version of model (3.8) becomes;

$$INFM_t = \alpha_0 + \alpha_1 CIMP_t + \alpha_2 DEV_t + \alpha_3 DEXP_t + \alpha_4 ED_t, + \alpha_5 GIMP_t + \alpha_6 ID_t + \alpha_7 IT_t + \alpha_8 M0_t + \alpha_9 M3_t + \alpha_{10} REC_t + \alpha_{11} REEXP_t + \alpha_{12} VAT_t + \mu_t \quad (3.9)$$

Where;

$CIMP_t$ – Commercial imports,

DEV_t – Development expenditure,

$DEXP_t$ – Domestic exports,

ED_t – Excise duty,

$GIMP_t$ – Government imports,

ID_t – Import duty,

IT_t – Income tax,

$M0_t$ – Currency outside banking system,

$M3_t$ – M2+ resident foreign currency deposits,

REC_t – Recurrent government expenditure,

$REEXP_t$ – Re-exports,

VAT_t – Value Added Tax,

t – Time period in months, $t = Jan2005,\ldots,Dec2015$

$\mu_t \sim IID(0,\sigma^2)$ = the error term

α_i = Elasticity coefficients ($i = 1,2,\ldots,12$), α_0 = Constant

$INFM_t$ = Dependent variable (Inflation rate),

Based on model (3.9) inflation as a function of aggregated components is given as;

$$INFM_t = \alpha_0 + \alpha_1 MS_t + \alpha_2 TEXP_t + \alpha_3 TEXPEN_t + \alpha_4 TIMP_t, + \alpha_5 TTAX_t + \mu_t \qquad (3.10)$$

Where;

MS_t – Total money supply (M3+T),

$TEXP_t$ – Total exports ($DEXP_t + REEXP_t$),

$TEXPEN_t$ – Total government expenditure ($DEV_t + REC_t$),

$TIMP_t$ – Total imports ($CIMP_t + GIMP_t$),

$TTAX_t$ – Total tax ($ED_t + ID_t + IT_t + VAT_t$)

t – Time period in months, $t = Jan2005,\ldots,Dec2015$

$\mu_t \sim IID(0,\sigma^2)$ = the error term

α_i = Elasticity coefficients ($i = 1,2,\ldots,5$), α_0 = Constant

$INFM_t$ = Dependent variable (Inflation rate),

3.5 Measurement of Variables

The variables in this study were measured as below;

Inflation- Measured by consumer prices (monthly %). Inflation as measured by the consumer price index reflects the percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as monthly (World Bank, 2014). Specifically, the CPI is used in Kenya as the main estimator of inflation whereby the percentage change of the CPI over a one-month period is what is usually referred to as the rate of inflation (Government of Kenya, 2010).

Development Government Expenditure - It is the government expenditure on capital overheads and measured by the total government expenditure less recurrent expenditure (Njuru, 2012).

Recurrent Government Expenditure - It is the current expenditure for purchase of goods and services at all levels of government (Njuru, 2012). It was measured by summing up expenditures incurred by the government on domestic interest, foreign interest, wages and pensions.

Exports of goods and services - represent the value of all goods and other market services provided to the rest of the world which include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services (World Bank, 2014). They comprise of domestic exports for the export of goods produced within the country and re-exports which goods are bought by the country from other countries but also exported to other countries.

Excise Duty - It is a domestic tax on the production or sale of a commodity in a given country measured by summing up all taxes falling under this category (Njuru, 2012).

Import Duty - It is the tax levied on imports by the custom authorities of a country to raise state revenue or to protect domestic industries from efficient or predatory foreign competitors and measured by aggregating the taxes that fall under this category (Njuru, 2012).

Income tax - This is the tax imposed on income of individuals and companies and measured by aggregating the taxes that fall under this category (Njuru, 2012).

Value Added Tax (VAT) - This is an indirect tax on the domestic consumption of goods and services levied at each stage in the chain of production and distribution from raw materials to the final sale, based on the value added at each stage. It is derived through summing up of all taxes on value added paid by different agents in the economy (Njuru, 2012).

Imports of goods and services - The value of all goods and other market services received from the rest of the world which include the value of merchandise, freight,

insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services (WorldBank, 2014).

Total money supply (MS) – Also referred to as total liquidity (M3+T) where T is non-bank holdings of government paper (securities) (Central Bank of Kenya, 2015)

M0 – Currency outside the banking system (Central Bank of Kenya, 2015)

M3 - M2+ resident foreign currency deposits. Also referred to as extended broad money (Central Bank of Kenya, 2015)

3.6 Data Collection

3.6.1 Sources of Data

Secondary data used in the study was collected from official published documents of the Central Bank of Kenya. This is because CBK has reliable and valid monthly time series data on variables as opposed to World Bank that has annual data. The analysis was based on monthly time series data on Inflation (consumer price index- monthly %), Government expenditure (recurrent, development and total government expenditure), exports (domestic, re-exports and total exports), imports (commercial, government and total imports), taxation (income tax, excise duty, Income tax, VAT and total taxation) and money supply (currency outside the banking system, extended broad money and total money supply).

3.6.2 Target Population

The target population consisted the fiscal, trade and monetary factors that influence inflation in Kenya.

3.6.3 Sample Design and Sample Size

The sample in this study consisted of monthly time series data spanning of 132 months from January 2005 to December 2015 for the variables of inflation, fiscal factors of; total government expenditure, recurrent expenditure, development expenditure, total tax, excise duty, import duty, income tax, VAT, trade factors of; total exports, domestic exports, re-exports, total imports, commercial imports, government imports, monetary factors of; total money supply, M0 and M3 in Kenya.

3.7 Data Analysis and Presentation

The study conducted data analysis using descriptive and inferential data analysis techniques with results presented in using Tables and Figures. Oso and Onen (2011) explained that, inferential analysis is used to draw conclusions concerning the relationships and differences found in research results. The study employed analysis techniques which included descriptive statistics, correlation analysis, unit root stationarity tests, Johansen cointegration, Vector Error Correction Mechanism (VECM), impulse response, variance decomposition analysis and Granger causality test.

3.7.1 Descriptive Statistics

Descriptive statistics give initial indication of the suitability of variables that can be used in regression analysis giving summarized statistics on a variable (Johansen, 2011). The study established the distribution of each of the variables of inflation, government expenditure, taxation, exports, imports and money supply with their components. This was meant to establish whether the variables were suitable for analysis. A value of skewness between -3 and +3 indicates normal distribution and a positive kurtosis indicates too few cases in the tail (lighter tail) (Fasanya, 2013; Musau & Musau, 2011).

On the other hand, Jarque-Bera statistic of less than $\chi^2(2df) = 5.99147$ at 5% level of significance indicates normal distribution for the variable.

3.7.2 Correlation Analysis

The study conducted correlation analysis in identifying the existence of an association between; fiscal factors and inflation, trade factors and inflation, monetary factors and inflation in Kenya. This was done in line with the study objectives based on the null hypothesis of no correlation between inflation and each of the factors at 5% level of significance. Although correlation gives an initial indication of the direction of association, the technique only focuses on two variables and is not applicable to make joint prediction for more than two variables (Johansen, 2011).

3.7.3 Stationarity Test

The study having been based on time series data, it was necessary to examine whether the variables were stationary for the purposes of avoiding spurious results. To identify the time series property of stationarity for each of the variables, Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) unit root test were performed on levels and first differences by testing the null hypothesis that a unit root exists (time series non stationary) based on the following three models

$$\Delta x_t = \delta x_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta x_{t-i} + \varepsilon_t \tag{3.11}$$

$$\Delta x_t = \beta_1 + \delta x_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta x_{t-i} + \varepsilon_t \tag{3.12}$$

$$\Delta x_t = \beta_1 + \beta_2 t + \delta x_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta x_{t-i} + \varepsilon_t \quad (3.13)$$

Where ε_t is a pure white noise error term ($\varepsilon_t \sim IIDN(0, \sigma^2)$),

m = lag length

This study besides using the ADF and PP unit root tests also employed Kwiatkowski – Phillips-Schmidt-Shin (KPSS) to confirm the assumption of stationarity of the variables. According to Gujarati (2004), unlike the ADF which is a lower power test, PP and KPSS are higher power tests that take care of serial correlation in the error terms. The KPSS tested the null assumption of stationarity (Adu-Nti, Amoah, & Asuamah, 2014).

3.7.4 Cointegration Test

This study established long run relationship using the Johansen cointegration test. Johansen approach, which is a multivariate autoregressive approach based on the trace test and the maximum eigenvalue likelihood ratio tests, represents advancement over the single equation estimation technique, since it allows the possibility of dealing with more than one cointegrating vector (Njuru, 2012; Ssekuma, 2011; Gujarati, 2004). The Johansen model a VAR of order p was expressed as model (3.14) and reparameterized as model (3.15);

$$z_t = A_1 z_{t-1} + A_2 z_{t-2} + ... + A_p z_{t-p} + \mu_t \quad (3.14)$$

Where:

$z_t = n \times 1$ Vector of variables that are integrated of order one

$\mu_t = n \times 1$ Vector of innovations

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + ... + \Gamma_{p-1} \Delta z_{t-p+1} - \Pi z_{t-1} + \mu_t \quad (3.15)$$

Where: $\Pi = -\sum_{j=1}^{p} \left(I - A_j \right)$ and $\Gamma_i = -\sum_{j=i+1}^{p-1} A_j$

This analysis was based on the null hypothesis of no cointegration discussed in line with the objectives of the study.

3.7.5 Vector Error Correction Model (VECM)

An important issue in econometrics is the need to integrate short run dynamics with long run equilibrium. This study examined the adjustment of short run disequilibrium and validation of the long run relationship basing on the sign and magnitude of the error correction term.

3.7.5.1 VECM with Disaggregated Components of Fiscal, Trade and Monetary Factors

The VECM for the disaggregated components of fiscal, trade and monetary factors as in model (3.9) are specified by equations 3.16 to 3.28.

Model I: Error Correction Model with inflation as a dependent variable was specified as equation 3.16

$$\Delta INFM_t = \beta_{10} + \beta_{11}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{12}\sum_{m=1}^{p}\Delta CIMP_{t-m} + \beta_{13}\sum_{m=1}^{p}\Delta DEV_{t-m}$$
$$+ \beta_{14}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{15}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{16}\sum_{m=1}^{p}\Delta GIMP_{t-m} + \beta_{17}\sum_{m=1}^{p}\Delta ID_{t-m}$$
$$+ \beta_{18}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{19}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{110}\sum_{m=1}^{p}\Delta M3_{t-m} + \beta_{111}\sum_{m=1}^{p}\Delta REC_{t-m} \quad (3.16)$$
$$+ \beta_{112}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{113}\sum_{m=0}^{p}\Delta VAT_{t-m} + \beta_{114}\mu_{t-1} + \varepsilon_{1t}$$

Model II: Error Correction Model with commercial imports as a dependent variable was specified as equation 3.17

$$\Delta CIMP_t = \beta_{20} + \beta_{21}\sum_{m=1}^{p}\Delta CIMP_{t-m} + \beta_{22}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{23}\sum_{m=1}^{p}\Delta DEV_{t-m}$$
$$+ \beta_{24}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{25}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{26}\sum_{m=1}^{p}\Delta GIMP_{t-m} + \beta_{27}\sum_{m=1}^{p}\Delta ID_{t-m}$$
$$+ \beta_{28}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{29}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{210}\sum_{m=1}^{p}\Delta M3_{t-m} + \beta_{211}\sum_{m=1}^{p}\Delta REC_{t-m} \quad (3.17)$$
$$+ \beta_{212}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{213}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{214}\mu_{t-1} + \varepsilon_{2t}$$

Model III: Error Correction Model with development expenditure as a dependent variable was specified as equation 3.18

$$\Delta DEV_t = \beta_{30} + \beta_{31}\sum_{m=0}^{p}\Delta DEV_{t-m} + \beta_{32}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{33}\sum_{m=0}^{p}\Delta CIMP_{t-m}$$
$$+ \beta_{34}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{35}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{36}\sum_{m=1}^{p}\Delta GIMP_{t-m} + \beta_{37}\sum_{m=1}^{p}\Delta ID_{t-m}$$
$$+ \beta_{38}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{39}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{310}\sum_{m=1}^{p}\Delta M3_{t-m} + \beta_{311}\sum_{m=1}^{p}\Delta REC_{t-m} \quad (3.18)$$
$$+ \beta_{312}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{313}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{314}\mu_{t-1} + \varepsilon_{3t}$$

Model IV: Error Correction Model with domestic exports as a dependent variable was specified as equation 3.19

$$\begin{aligned}\Delta DEXP_t &= \beta_{40} + \beta_{41}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{42}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{43}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{44}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{45}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{46}\sum_{m=1}^{p}\Delta GIMP_{t-m} + \beta_{47}\sum_{m=1}^{p}\Delta ID_{t-m} \\ &+ \beta_{48}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{49}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{410}\sum_{m=1}^{p}\Delta M3_{t-m} + \beta_{411}\sum_{m=1}^{p}\Delta REC_{t-m} \\ &+ \beta_{412}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{413}\sum_{m=0}^{p}\Delta VAT_{t-m} + \beta_{414}\mu_{t-1} + \varepsilon_{4t}\end{aligned} \tag{3.19}$$

Model V: Error Correction Model with excise duty as a dependent variable was specified as equation 3.20

$$\begin{aligned}\Delta ED_t &= \beta_{50} + \beta_{51}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{52}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{53}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{54}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{55}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{56}\sum_{m=1}^{p}\Delta GIMP_{t-m} + \beta_{57}\sum_{m=1}^{p}\Delta ID_{t-m} \\ &+ \beta_{58}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{59}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{510}\sum_{m=1}^{p}\Delta M1_{t-m} + \beta_{511}\sum_{m=1}^{p}\Delta REC_{t-m} \\ &+ \beta_{512}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{513}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{514}\mu_{t-1} + \varepsilon_{5t}\end{aligned} \tag{3.20}$$

Model VI: Error Correction Model with government imports as a dependent variable was specified as equation 3.21

$$\begin{aligned}\Delta GIMP_t &= \beta_{60} + \beta_{61}\sum_{m=1}^{p}\Delta GIMP_{t-m} + \beta_{62}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{63}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{64}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{65}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{66}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{67}\sum_{m=1}^{p}\Delta ID_{t-m} \\ &+ \beta_{68}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{69}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{610}\sum_{m=1}^{p}\Delta M1_{t-m} + \beta_{611}\sum_{m=1}^{p}\Delta REC_{t-m} \\ &+ \beta_{612}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{613}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{614}\mu_{t-1} + \varepsilon_{6t}\end{aligned} \tag{3.21}$$

Model VI: Error Correction Model with import duty as a dependent variable was specified as equation 3.22

$$\begin{aligned}\Delta ID_t &= \beta_{70} + \beta_{71}\sum_{m=1}^{p}\Delta ID_{t-m} + \beta_{72}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{73}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{74}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{75}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{76}\sum_{m=0}^{p}\Delta ED_{t-m} + \beta_{77}\sum_{m=1}^{p}\Delta GIMP_{t-m} \\ &+ \beta_{78}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{79}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{710}\sum_{m=1}^{p}\Delta M3_{t-m} + \beta_{711}\sum_{m=1}^{p}\Delta REC_{t-m} \\ &+ \beta_{712}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{713}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{714}\mu_{t-1} + \varepsilon_{7t}\end{aligned} \tag{3.22}$$

Model VII: Error Correction Model with income tax as a dependent variable was specified as equation 3.23

$$\begin{aligned}\Delta IT_t &= \beta_{80} + \beta_{81}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{82}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{83}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{84}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{85}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{86}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{87}\sum_{m=1}^{p}\Delta GIMP_{t-m} \\ &+ \beta_{88}\sum_{m=1}^{p}\Delta ID_{t-m} + \beta_{89}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{810}\sum_{m=1}^{p}\Delta M3_{t-m} + \beta_{811}\sum_{m=1}^{p}\Delta REC_{t-m} \\ &+ \beta_{812}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{813}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{814}\mu_{t-1} + \varepsilon_{8t}\end{aligned} \tag{3.23}$$

Model VIII: Error Correction Model with currency outside banking system as a dependent variable was specified as equation 3.24

$$\begin{aligned}\Delta M0_t &= \beta_{90} + \beta_{91}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{92}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{93}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{94}\sum_{m=1}^{p}\Delta DEV_{t-m} + \alpha_{95}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \alpha_{96}\sum_{m=1}^{p}\Delta ED_{t-m} + \alpha_{97}\sum_{m=1}^{p}\Delta GIMP_{t-m} \\ &+ \alpha_{98}\sum_{m=1}^{p}\Delta ID_{t-m} + \beta_{99}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{910}\sum_{m=1}^{p}\Delta M3_{t-m} + \beta_{911}\sum_{m=1}^{p}\Delta REC_{t-m} \\ &+ \beta_{912}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{913}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{914}\mu_{t-1} + \varepsilon_{9t}\end{aligned} \tag{3.24}$$

Model IX: Error Correction Model with extended broad money as a dependent variable was specified as equation 3.25

$$\begin{aligned}\Delta M3_t &= \beta_{100} + \beta_{101}\sum_{m=1}^{p}\Delta M3_{t-m} + \beta_{102}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{103}\sum_{m=0}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{104}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{105}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{106}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{107}\sum_{m=1}^{p}\Delta GIMP_{t-m} \\ &+ \beta_{108}\sum_{m=1}^{p}\Delta ID_{t-m} + \beta_{109}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{1010}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{1011}\sum_{m=1}^{p}\Delta REC_{t-m} \\ &+ \beta_{1012}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{1013}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{1014}\mu_{t-1} + \varepsilon_{10t}\end{aligned} \tag{3.25}$$

Model X: Error Correction Model with recurrent expenditure as a dependent variable was specified as equation 3.26

$$\begin{aligned}\Delta REC_t &= \beta_{110} + \beta_{111}\sum_{m=0}^{p}\Delta REC_{t-m} + \beta_{112}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{113}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{114}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{115}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{116}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{117}\sum_{m=1}^{p}\Delta GIMP_{t-m} \\ &+ \beta_{118}\sum_{m=1}^{p}\Delta ID_{t-m} + \beta_{119}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{1110}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{1111}\sum_{m=1}^{p}\Delta M3_{t-m} \\ &+ \beta_{1112}\sum_{m=0}^{p}\Delta REEXP_{t-m} + \beta_{1113}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{1114}\mu_{t-1} + \varepsilon_{11t}\end{aligned} \tag{3.26}$$

Model XI: Error Correction Model with re-exports as a dependent variable was specified as equation 3.27

$$\begin{aligned}\Delta REEXP_t &= \beta_{120} + \beta_{121}\sum_{m=1}^{p}\Delta REEXP_{t-m} + \beta_{122}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{123}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{124}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{125}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{126}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{127}\sum_{m=1}^{p}\Delta GIMP_{t-m} \\ &+ \beta_{128}\sum_{m=1}^{p}\Delta ID_{t-m} + \beta_{129}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{1210}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{1211}\sum_{m=1}^{p}\Delta M3_{t-m} \\ &+ \beta_{1212}\sum_{m=1}^{p}\Delta REC_{t-m} + \beta_{1213}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{1214}\mu_{t-1} + \varepsilon_{12t}\end{aligned} \tag{3.27}$$

Model XII: Error Correction Model with value added tax as a dependent variable was specified as equation 3.28

$$\begin{aligned}\Delta VAT_t &= \beta_{130} + \beta_{131}\sum_{m=1}^{p}\Delta VAT_{t-m} + \beta_{132}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{133}\sum_{m=1}^{p}\Delta CIMP_{t-m} \\ &+ \beta_{134}\sum_{m=1}^{p}\Delta DEV_{t-m} + \beta_{135}\sum_{m=1}^{p}\Delta DEXP_{t-m} + \beta_{136}\sum_{m=1}^{p}\Delta ED_{t-m} + \beta_{137}\sum_{m=1}^{p}\Delta GIMP_{t-m} \\ &+ \beta_{138}\sum_{m=1}^{p}\Delta ID_{t-m} + \beta_{139}\sum_{m=1}^{p}\Delta IT_{t-m} + \beta_{1310}\sum_{m=1}^{p}\Delta M0_{t-m} + \beta_{1311}\sum_{m=1}^{p}\Delta M3_{t-m} \\ &+ \beta_{1312}\sum_{m=1}^{p}\Delta REC_{t-m} + \beta_{1313}\sum_{m=0}^{p}\Delta REEXP_{t-m} + \beta_{1314}\mu_{t-1} + \varepsilon_{13t}\end{aligned} \tag{3.28}$$

Where

$\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}, ..., \varepsilon_{12t}$ = white noise error terms,

p = lag length, μ_{t-1} = Error correction Term (ECT) that guides the dependent variables to come back to equilibrium.

β_i = Elasticity coefficients, β_{i0} = Constant

$\Delta =$ First difference operator

$INFM_t =$ Dependent variable (Inflation),

$REC_t, DEV_t =$ Recurrent and Development expenditure components respectively,

$REEXP_t, DEXP_t =$ Re-exports and Domestic exports components respectively,

$M0_t, M3_t =$ Currency outside the banking system and extended broad money components respectively,

$ED_t, ID_t, IT_t, VAT_t =$ Excise duty, Import duty, Income tax and Value Added Tax components respectively,

$CIMP_t, GIMP_t =$ Commercial and Government import components respectively,

3.7.5.2 VECM with Aggregated Components of Fiscal, Trade and Monetary Factors

The VECM for the aggregated components of fiscal, trade and monetary factors as in model (3.10) were specified by equations 3.29 to 3.34.

Model XIII: Error Correction Model with inflation as a dependent variable for aggregated components was specified as equation 3.29

$$\Delta INFM_t = \beta_{10} + \beta_{11}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{12}\sum_{m=1}^{p}\Delta MS_{t-m} + \beta_{13}\sum_{m=1}^{p}\Delta TEXP_{t-m}$$
$$+ \beta_{14}\sum_{m=1}^{p}\Delta TEXPEN_{t-m} + \beta_{15}\sum_{m=1}^{p}\Delta TIMP_{t-m} + \beta_{16}\sum_{m=1}^{p}\Delta TTAX_{t-m} + \beta_{17}\mu_{t-1} + \upsilon_{1t} \quad (3.29)$$

Model XIV: Error Correction Model with total money supply as a dependent variable for was specified as equation 3.30

$$\Delta MS_t = \beta_{20} + \beta_{21}\sum_{m=1}^{p}\Delta MS_{t-m} + \beta_{22}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{23}\sum_{m=1}^{p}\Delta TEXP_{t-m} + \beta_{24}\sum_{m=1}^{p}\Delta TEXPEN_{t-m} + \beta_{25}\sum_{m=1}^{p}\Delta TIMP_{t-m} + \beta_{26}\sum_{m=1}^{p}\Delta TTAX_{t-m} + \beta_{27}\mu_{t-1} + \upsilon_{2t} \quad (3.30)$$

Model XV: Error Correction Model with total exports as a dependent variable for was specified as equation 3.31

$$\Delta TEXP_t = \beta_{30} + \beta_{31}\sum_{m=0}^{p}\Delta TEXP_{t-m} + \beta_{32}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{33}\sum_{m=0}^{p}\Delta MS_{t-m} + \beta_{34}\sum_{m=1}^{p}\Delta TEXPEN_{t-m} + \beta_{35}\sum_{m=1}^{p}\Delta TIMP_{t-m} + \beta_{36}\sum_{m=1}^{p}\Delta TTAX_{t-m} + \beta_{37}\mu_{t-1} + \upsilon_{3t} \quad (3.31)$$

Model XVI: Error Correction Model with total government expenditure as a dependent variable for was specified as equation 3.32

$$\Delta TEXPEN_t = \beta_{40} + \beta_{41}\sum_{m=1}^{p}\Delta TEXPEN_{t-m} + \beta_{42}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{43}\sum_{m=1}^{p}\Delta MS_{t-m} + \beta_{44}\sum_{m=1}^{p}\Delta TEXP_{t-m} + \beta_{45}\sum_{m=1}^{p}\Delta TIMP_{t-m} + \beta_{46}\sum_{m=1}^{p}\Delta TTAX_{t-m} + \beta_{47}\mu_{t-1} + \upsilon_{4t} \quad (3.32)$$

Model XVII: Error Correction Model with total imports as a dependent variable for was specified as equation 3.33

$$\Delta TIMP_t = \beta_{50} + \beta_{45}\sum_{m=1}^{p}\Delta TIMP_{t-m} + \beta_{52}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{53}\sum_{m=1}^{p}\Delta MS_{t-m} + \beta_{54}\sum_{m=1}^{p}\Delta TEXP_{t-m} + \beta_{55}\sum_{m=1}^{p}\Delta TEXPEN_{t-m} + \beta_{56}\sum_{m=1}^{p}\Delta TTAX_{t-m} + \beta_{57}\mu_{t-1} + \upsilon_{5t} \quad (3.33)$$

Model XVII: Error Correction Model with total tax as a dependent variable for was specified as equation 3.34

$$\Delta TTAX_t = \beta_{60} + \beta_{61}\sum_{m=1}^{p}\Delta TTAX_{t-m} + \beta_{62}\sum_{m=1}^{p}\Delta INFM_{t-m} + \beta_{63}\sum_{m=1}^{p}\Delta MS_{t-m} + \beta_{64}\sum_{m=1}^{p}\Delta TEXP_{t-m} + \beta_{65}\sum_{m=1}^{p}\Delta TEXPEN_{t-m} + \beta_{66}\sum_{m=1}^{p}\Delta TIMP_{t-m} + \beta_{67}\mu_{t-1} + \upsilon_{6t} \quad (3.34)$$

Where; $\upsilon_{1t}, \upsilon_{2t}, \upsilon_{3t}, ..., \upsilon_{6t}$ = white noise error terms,

p = lag length, μ_{t-1} = Error correction Term (ECT) that guides the dependent variables to come back to equilibrium.

β_i = Elasticity coefficients, β_{i0} = Constant

Δ = First difference operator

$INFM_t$ = Dependent variable (Inflation),

$TEXPEN$= Total expenditure (Recurrent + Development expenditure)

$TEXP_t$ = Total exports (Re-exports + Domestic exports)

MS_t = Total money supply (M3+T),

$TTAX_t$ = Total tax (excise duty+ Import duty + Income tax +Value Added Tax)

$TIMP_t$ = Total imports (Commercial + Government imports)

3.7.6 VECM Diagnostic Tests

The study carried out various diagnostic tests to investigate the goodness of fit, specification and stability for the VAR models. The study also investigated relationship between residuals, the relationship between explanatory variables themselves and the constant variance of the residuals to establish whether the assumptions of classical regression analysis were satisfied.

3.7.6.1 Goodness of Fit for VECM

The coefficient of determination (R^2) and F-statistic were used to measure the goodness of fit for VAR models and the joint significance of the slope coefficients used in analysis. The coefficient of determination showed the variation in inflation due to the changes in the fiscal, trade and monetary factors for both disaggregate and aggregate analysis.

3.7.6.2 VECM Stability

To ascertain the stability of the VAR model estimated which is very important in the VAR model specification, the study established whether none of the inverse roots of Autoregressive (AR) characteristic polynomial lied outside the unit circle.

3.7.6.3 VAR Lag Length Determination

The information criteria are often used as a guide in model selection. The notion of an information criterion is to provide a measure of information that strikes a balance between the measure of goodness of fit and parsimonious specification of the model (Bashir *et al.*, 2011). Lag selection criterions of Akaike Information Criterion (AIC), Log likelihood ratio (LR) and Schwarz information criterion (SC) were employed in this study to establish the optimal lag length for the various autoregressive models. The rule of

thumb according to Gujarati (2004) is that a minimum value of AIC and SC yield the optimal lag while the lag with the highest LR yields the optimal lag model.

3.7.6.4 Economic a Priori Criterion

According to Kiganda (2015) economic a priori criteria is determined by the principle of economic theory and refers to the size and sign of the parameters of economic relationship. The aim was to confirm whether the parameter estimates conform to a priori expectation. Table 3.1 captured variables and expected signs of coefficients according to economic theory.

Table 3.1: Expected Signs of Variables

Variable	Expected sign
Inflation	Dependent variable and considered to be stochastic.
Government Expenditure	Positive. Tafti (2012)
Exports	Positive. Greenidge and DaCosta (2009)
Taxation	Positive. Greenidge and DaCosta (2009)
Imports	Negative. Greenidge and DaCosta (2009)
Money Supply	Positive. Okara (2015), Koyuncu (2014)
Error Correction Term	Negative. Gujarati (2004)

Note. Author's compilation from books and empirical studies

3.7.7 VECM Residual Diagnostic Tests

3.7.7.1 Multicollinearity

Multicollinearity refers to a case in which two or more explanatory variables in the regression model are highly correlated making it difficult to isolate their individual effects on the dependent variable (Gujarati, 2004; Kiganda, 2015). Detection was by

Variance Inflation Factors (VIF). Gujarati (2004) argues that the rule of thumb is that if Variance Inflation Factor (VIF) exceeds 10, that variable is said to be highly collinear.

3.7.7.2 Serial Correlation

Autocorrelation or serial correlation refers to the case in which the error term in one time period is correlated with the error term in any other time period with Classical linear regression assuming that such correlation does not exist (Gujarati, 2011; Kiganda, 2014). This study employed the Breusch-Godfrey (LM) test based on the null hypothesis of no serial correlation tested at 5% level of significance.

3.7.7.3 Heteroscedasticity

Heteroscedasticity occurs when the variance of the error term is not constant. The study employed White's General heteroscedasticity Test where Gujarati (2004) asserts that the general test of heteroscedasticity proposed by White does not rely on the normality assumption and is easy to implement. It was based on the null hypothesis of no heteroscedasticity tested at 5% level of significance.

3.7.7.4 Normality Test

Normality test was carried out to verify if the error terms are normally distributed by use of the Jacque-Bera (JB) test. As stated by Gujarati (2004), this test was based on the null hypothesis that the residuals are normally distributed.

3.7.8 Impulse Response and Variance Decomposition Analysis

The study involved generating impulse response and variance decomposition using the VAR results. The impulse response function according to Njuru (2012) enables as to trace the influence of a one standard deviation shock of innovations on each variable in

the VAR on inflation with variance decomposition determining the proportion of the variance in inflation that was due to own and each of the independent variables variations over time.

3.7.9 Granger Causality Test

The following pair of regressions were estimated to establish pair wise Granger causality where it was assumed that the error terms are uncorrelated;

$$\Delta INFM_t = \alpha_i \sum_{j=1}^{p} \Delta x_{t-j} + \beta_i \sum_{j=1}^{p} \Delta INFM_{t-j} + \varepsilon_{1t} \tag{3.35}$$

$$\Delta x_t = \alpha_i \sum_{j=1}^{p} \Delta x_{t-j} + \beta_i \sum_{j=1}^{p} \Delta INFM_{t-j} + \varepsilon_{1t} \tag{3.36}$$

The study tested the following hypothesis;

H_0 : No causality,

H_1 : Causality exists

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter of the study presents the results and discusses the findings of analysis which encompass descriptive statistics, correlation analysis, stationarity tests, cointegration, vector error correction mechanism, impulse response, variance decomposition and Granger causality test results. The results and discussion are based on disaggregate and aggregate analysis.

4.2 Descriptive Statistics

Descriptive statistics give initial indication of the suitability of variables that can be used in regression analysis giving summarized statistics on a variable (Johansen, 2011). The descriptive statistics summary for disaggregated data represented in Table 4.1 indicate that the mean values for the variables of development expenditure (DEV) and recurrent expenditure (REC) as Sh.96.2 billion and Sh.298.3 billion respectively. The maximum and minimum values for the variables were sh.511.8 billion - June 2015 and sh.177.0 million - July 2010 respectively for development expenditure (DEV), sh.1.1 trillion- June 2015 and sh.21.1 billion - July 2005 respectively for recurrent expenditure (REC). Table 4.2 results based on aggregate analysis indicate that the mean value for the variable of total government expenditure (TEXPEN) as Sh.394.0 billion, maximum and minimum values for the variable were sh.1.6 trillion - June 2015 and sh.24.7 billion- July 2005 respectively. This implies that development expenditure was approximately a third of recurrent expenditure and on average recurrent government expenditure (REC) was the

largest component of total government expenditure accounting for 75.6% with fluctuations in the variables noted for the study period.

The mean values for the variables of excise duty (ED), import duty (ID), income Tax (IT) and value added tax (VAT) were Sh.40.4 billion, Sh.24.97 billion, Sh.130.7 billion and Sh.82.5 billion respectively. The maximum and minimum values for the variables were sh.115.9 billion - June 2015 and sh.2.7 billion - July 2005 respectively for excise duty (ED), sh.84.5 billion - May 2014 and sh.987 million - July 2005 respectively for import duty (ID), sh.508.6 billion - June 2015 and sh.6.7 billion - July 2005 respectively for income tax (IT) and sh.259.7 billion - June 2015 and sh.3.8 billion - July 2005 respectively for value added tax (VAT). Table 4.2 results based on aggregate analysis indicate that the mean value for the variable of total tax (TTAX) was Sh.278.6 billion with maximum and minimum values of sh.958.2 billion - June 2015 and sh.14.2 billion - July 2005 respectively. This implies that on average income tax (IT) was the largest component of total tax accounting for 46.9% with wide fluctuations in taxation evident in the study period.

Table 4.1 shows that the mean values for the variables of domestic exports (DEXP) and re-exports (REEXP) of Sh.30.95 billion and Sh.3.20 billion respectively. The maximum and minimum values for the variables were sh.50.40 billion - July 2015 and sh.14.60 billion - January 2005 respectively for domestic exports (DEXP) and sh.10.30 billion - April 2014 and sh.742.0 million - June 2007 respectively for re-exports (REEXP). Table 4.2 results indicate that the mean value for the variable of total exports (TEXP) as Sh.34.9 billion with maximum and minimum values of sh.59.4 billion - July 2015 and

sh.17.2 billion - January 2006 respectively. This implies that re-exports was approximately a tenth of domestic exports and on average domestic exports (DEXP) was the largest component of total exports accounting for 90.6% with huge fluctuations in the variables noted for the study period.

The mean values for the variables of commercial imports (CIMP) and government imports (GIMP) as in Table 4.1 were Sh.85.3 billion and Sh.1.1 billion respectively with maximum and minimum values of sh. 159.7 billion - November 2015 and sh.27.95 - February 2005 respectively for commercial imports (CIMP) and sh.7.8 billion - June 2015 and sh.1 million - July 2005 respectively for government imports (GIMP). Similarly, Table 4.2 results indicate that the mean value for total imports (TIMP) was Sh.86.4 billion with maximum and minimum values of sh.162.9 billion - November 2015 and sh.28.9 billion - February 2005 respectively. This implied that on average commercial imports (CIMP) was the largest component of total imports accounting for 98.7% and there were high fluctuations in imports during the study period.

Table 4.1 results based on disaggregate analysis indicate that the mean values for the variables of currency outside banking system (M0) and extended broad money (M3) as Sh.111.95 billion and Sh. 1.3 trillion respectively. The maximum and minimum values were sh.191.3 billion - December 2015 and sh.58 billion - March 2005 respectively for currency outside banking system (M0) and sh.2.7 trillion - December 2015 and sh.508.5 billion - January 2005 respectively for extended broad money (M3). Table 4.2 results in based on aggregate analysis indicate that the mean value for total money supply (MS) was Sh.1.6 trillion with maximum and minimum values of sh. 3.4 trillion - December

2015 and sh.639.8 billion - January 2005 respectively. This indicate that on average extended broad money (M3) formed the largest component of total money supply accounting for 80% and there were high fluctuations in money supply during the study period.

The values of skewness, Jarque-Bera and sign of kurtosis for inflation, fiscal factors of government expenditure and taxation, trade factors of exports and imports and monetary factors of money supply laid within the acceptable range an indication of normal distribution at 5% level of significance. This implies that the variables were suitable to be used in autoregressive analysis.

Table 4.1: Descriptive Statistics for Disaggregated Analysis

	Mean	Median	Max	Min	Std Dev	Skewness	Kurtosis	Jarque-Bera	P-value	Obs
INFM	8.470758	6.695000	19.72000	1.850000	4.827912	0.093271	2.642799	0.893149	0.100049	132
CIMP	85306.98	78544.50	159671.0	27951.00	35559.85	0.185578	3.726904	3.663804	0.077939	132
DEV	96214.44	61617.50	511822.0	174.0000	96930.25	0.015488	2.797685	0.230400	0.069812	132
DEXP	30950.86	31542.50	50412.00	14570.00	9259.478	-0.19784	2.814336	1.050660	0.083616	132
ED	40449.42	37775.50	115872.0	2687.000	24706.05	0.038386	2.071516	4.773870	0.122478	132
GIMP	1138.561	733.0000	7799.000	1.000000	1266.885	0.044106	3.038213	0.050830	0.067901	132
ID	24966.54	21095.50	84512.00	987.0000	17736.78	0.06678	3.87199	4.280127	0.081603	132
IT	130700.3	99642.50	508581.0	6654.000	105084.9	0.021208	2.365069	2.227151	0.130000	132
M0	111954.9	102656.5	191251.0	58042.00	38165.95	0.315764	2.82654	2.359038	0.077570	132
M3	1307907.	1206071.	2650182.	508512.0	637199.7	0.052638	2.066026	4.858648	0.064311	132
REC	298330.9	244832.0	1075644.	21134.00	217353.8	0.007509	3.97075	5.184196	0.976010	132
REEXP	3216.606	2493.500	10249.00	742.0000	2147.773	0.088834	3.110082	0.240262	0.056321	132
VAT	82454.95	70182.00	259685.0	3826.000	56160.51	0.392887	3.32479	3.976111	0.072316	132

Source: Author (2017). Note that INFM in % while other variables (000,000)

Table 4.2: Descriptive Statistics for Aggregated Analysis

	Mean	Median	Max	Min	Std Dev	Skewness	Kurtosis	Jarque-Bera	P-value	Obs
MS	1634344.	1459315.	3383958.	639778.0	809775.0	0.058507	2.117771	4.356111	0.062724	132
TEXP	34149.64	33298.50	59405.00	17178.00	10355.87	0.036066	2.010055	5.418568	0.058799	132
TEXPEN	394412.8	306082.0	1587466.	24667.00	311849.4	0.327936	2.787348	2.614639	0.081342	132
TIMP	86445.50	79762.50	162942.0	28880.00	36155.56	0.195932	2.737714	4.608078	0.078197	132
TTAX	278571.2	232040.5	958186.0	14154.00	201647.4	0.059774	3.778362	3.410765	0.062101	132

Source: Author (2017). Note that INFM in % while other variables (000,000)

4.3 Correlation Analysis

The first objective of this study was to establish the influence of fiscal factors on inflation in Kenya. Results summarized in Tables 4.3 and 4.4 showed correlation coefficients and p-values of $r = -0.03$ (0.01), $r = -0.46$ (0.02) and $r = -0.48$ (0.03) for; development expenditure and inflation, recurrent expenditure and inflation and total government expenditure and inflation respectively. Taxation components had correlation coefficients of $r = 0.87$ (0.00), $r = 0.58$ (0.00), $r = 0.61$ (0.00), $r = 0.47$ (0.01), $r = -0.57$ (0.00) for; excise duty and inflation, import duty and inflation, total tax and inflation, value added tax and inflation, income tax and inflation respectively. All the correlation coefficients had p-values of less than 0.05.

This implies that there was a significant negative association between government expenditure and inflation, a significant positive association between; excise duty and inflation, import duty and inflation, total tax and inflation, a significant positive association between value added tax and inflation and a significant negative association between income tax and inflation in Kenya at 5% level of significance. That is government expenditure, income tax and inflation move in opposite directions while excise duty, import duty, value added tax, total tax and inflation in Kenya move in the one direction. The findings on government expenditure were consistent with Iya and Aminu (2014); Magazzino (2011) who investigated the determinants of inflation in Nigeria and Greece respectively while the findings on taxation were consistent with Patoli *et al.* (2012); Rizvi *et al*. (2012) and Bashir *et al*. (2011) who investigated the determinants of inflation in Pakistan. Kenya shares a commonality with the countries since they all are developing countries hence the similar results. The study therefore rejected the null hypothesis of no correlation between fiscal factors and inflation in Kenya at 5% level of significance.

The second objective of this study was to determine the influence of trade factors on inflation in Kenya. Tables 4.3 and 4.4 test results indicated correlation coefficients and p-values of $r = -0.32$ (0.01), $r = 0.74$ (0.03) and $r = 0.65$ (0.01) respectively for re-exports, domestic exports and total exports while correlation coefficients of $r = -0.53$ (0.03), $r = -0.54$ (0.049), $r = 0.05$ (0.55) were noted for commercial imports, total imports and government imports respectively. All the correlation coefficients had p-values of less than 0.05 except for government imports. This implied that there was a significant negative association between re-exports and inflation in Kenya, a significant positive association between; domestic exports and inflation, total exports and inflation in Kenya, a significant negative association between; commercial imports and inflation, total imports and inflation and no association between government imports and inflation in Kenya at 5% level of significance. That is re-exports, commercial imports, total imports and inflation do not move in the same direction while domestic exports, total exports and inflation move in the same direction in Kenya.

The results indicated that null hypothesis of no correlation between trade factors and inflation in Kenya was rejected for the association between re-exports, domestic exports, total exports, commercial imports and total imports with inflation but not rejected for the association between government imports and inflation in Kenya at 5% level of significance. The negative association between re-exports and inflation was consistent with the findings of Olatunji *et al*. (2010) who investigated the determinants of inflation in Nigeria while the findings of positive association between domestic exports and total exports with inflation in Kenya conformed to the findings of Venkadasalam (2015) who investigated the determinants of inflation in Malaysia. The findings of negative association for imports were consistent to Islam (2013); Joiya and Shahzad (2013)

while insignificant association for imports was consistent with Bari (2013) who investigated the determinants of inflation in Bangladesh, Pakistan and Turkey respectively. The similar results are based on the commonality fact of Kenya and the countries being developing countries.

The third objective of this study was to investigate the influence of monetary factors on inflation in Kenya. Tables 4.3 and 4.4 test results indicated correlation coefficients and p-values of $r = 0.88\ (0.00)$, $r = 0.78\ (0.00)$ and $r = 0.00\ (0.99)$ respectively for extended broad money (M3), total money supply (MS) and currency outside the banking system (M0). All coefficients had p-values of less than 0.05 except for currency outside the banking system. This implied that there was a significant strong positive association between extended broad money (M3) and total money supply (MS) with inflation in Kenya while currency outside the banking system exhibited an insignificant association with inflation in Kenya at 5% level of significance. That is an increase in extended broad money and total money supply causes an increase in inflation in Kenya but changes in M0 has no influence on inflation in Kenya. The results indicated that the null hypothesis of no correlation was rejected for the association between M3, total money supply with inflation in Kenya but accepted for the association between M0 and inflation in Kenya at 5% level of significance. The findings were consistent with those of Kirimi (2014), Kiganda (2014), Okara (2015) who established positive association between money supply and inflation in Kenya.

Table 4.3: Correlation Coefficients for Disaggregate Analysis

	INFM	CIMP	DEV	DEXP	ED	GIMP	ID	IT	M0	M3	REC	REEXP	VAT
INFM	1												
CIMP	-0.53*	1											
	(0.03)	-----											
DEV	-0.03*	-0.08*	1										
	(0.01)	(0.34)	-----										
DEXP	0.74*	0.35*	-0.18*	1									
	(0.03)	(0.00)	(0.04)	-----									
ED	0.87*	-0.02	0.01	0.04	1								
	(0.00)	(0.86)	(0.95)	(0.67)	-----								
GIMP	0.05	0.28*	0.02	0.14	-0.11	1							
	(0.55)	(0.00)	(0.83)	(0.12)	(0.22)	-----							
ID	0.58*	0.02	0.38*	-0.08	-0.07	0.32*	1						
	(0.00)	(0.86)	(0.00)	(0.33)	(0.43)	(0.00)	-----						
IT	-0.57*	-0.06	0.31*	-0.13	-0.06	0.25*	0.66*	1					
	(0.00)	(0.52)	(0.00)	(0.14)	(0.47)	(0.00)	(0.00)	-----					
M0	0.00	-0.17*	-0.03	-0.12	-0.01	0.01	0.00	-0.04	1				
	(0.99)	(0.06)	(0.76)	(0.16)	(0.90)	(0.93)	(0.96)	(0.67)	-----				
M3	0.88*	0.03	-0.11	0.09	-0.01	0.02	0.00	0.02	0.12	1			
	(0.00)	(0.73)	(0.19)	(0.29)	(0.90)	(0.81)	(0.99)	(0.85)	(0.16)	-----			
REC	-0.46*	-0.07	0.41*	-0.09	-0.05	0.24*	0.76*	0.74	-0.01	0.03	1		
	(0.02)	(0.42)	(0.00)	(0.32)	(0.58)	(0.01)	(0.00)	(0.00)	(0.95)	(0.73)	-----		
REEXP	-0.32*	0.02	-0.01	0.04	0.05	-0.01	-0.12	-0.18*	0.00	-0.08	-0.13	1	
	(0.01)	(0.81)	(0.89)	(0.66)	(0.55)	(0.95)	(0.17)	(0.04)	(0.98)	(0.39)	(0.14)	-----	
VAT	0.47*	-0.01	0.36*	-0.10	-0.06	0.31*	0.59*	0.76*	-0.03	0.02	0.67*	-0.13	1
	(0.01)	(0.90)	(0.00)	(0.23)	(0.47)	(0.00)	(0.00)	(0.00)	(0.77)	(0.85)	(0.00)	(0.14)	-----

*Source: Author, (2017). Note that values in parentheses ( ) indicate p-values and * significance at 5% level of significance.*

Table 4.4: Correlation Coefficients for Aggregate Analysis

	INFM	MS	TEXP	TEXPEN	TIMP	TTAX
INFM	1					

MS	0.78491*	1				
	(0.0001)	-----				
TEXP	0.64964*	0.05179	1			
	(0.0149)	(0.5584)	-----			
TEXPEN	-0.4821*	-0.08901	-0.19154*	1		
	(0.0331)	(0.3139)	(0.0290)	-----		
TIMP	-0.53775*	0.16758	0.36298*	-0.11933	1	
	(0.0498)	(0.0567)	(0.0000)	(0.1763)	-----	
TTAX	0.60705*	-0.09705	-0.19809	0.66248*	-0.06147	1
	(0.0000)	(0.2720)	(0.0239)	(0.0000)	(0.4872)	-----

*Source: Author, (2017). Note that values in parentheses ( ) indicate p-values and * significance at 5% level of significance.*

4.4 Stationarity Analysis

The results in Appendix II on stationarity tests based on ADF, PP and the power of KPSS test revealed that the series of inflation (INFM), fiscal factors of development expenditure (DEV), recurrent expenditure (REC) , total government expenditure (TEXPEN), excise duty (ED), import duty (ID), income tax (IT), VAT, total tax (TTAX), trade factors of domestic exports (DEXP), re-exports (REXP), total exports (TEXP), government imports (GIMP), commercial imports (CIMP), total imports (TIMP) and monetary factors of currency outside banking system (M0), extended broad money (M3) and total money supply (MS) were integrated of order one - I (1). This implied that the variables become stationary after first difference. The stationarity results meant that the null hypothesis of no stationarity for ADF and PP was rejected while the null hypothesis of stationarity for KPSS was accepted at 5% level of significance. This indicated that the time series variables were suitable to be subjected to cointegration analysis and other autoregressive tests.

4.5 Cointegration Test

The results in Appendix III on cointegration based on disaggregated analysis indicated that both the trace test and maximum eigenvalue test in the Johansen procedure each detected one cointegrating vector. Similarly, results in Appendix III on cointegration based on aggregate analysis indicated that both the trace test and maximum eigenvalue test in the Johansen procedure each detected six cointegrating vectors, thus the study rejected the null hypothesis of no cointegration at 5% level of significance. This implied that the fiscal factors (development expenditure, recurrent expenditure, total government expenditure, excise duty, import duty, VAT, income tax and total tax), the trade factors

(domestic exports, re-exports, total exports, commercial imports, government imports and total imports) and the monetary factors (currency outside the banking system, extended broad money and total money supply) had a long run influence on inflation in Kenya. Based on the Johansen procedure normalized cointegration results in Tables 4.5 and 4.6 for disaggregate and aggregate analysis respectively, the cointegrating equations were hence expressed as;

$$\begin{aligned} &INFM_t + \underset{[3.90436]}{0.528}CIMP_t + \underset{[2.74655]}{0.002}DEVEXP_t - \underset{[-5.29363]}{1.044}DEXP_t - \underset{[-4.72035]}{0.041}ED_t \\ &- \underset{[-3.96602]}{0.004}GIMP_t - \underset{[-3.47411]}{0.506}ID_t + \underset{[3.47334]}{0.573}IT_t + \underset{[1.61973]}{0.746}M0_t - \underset{[-2.29125]}{1.750}M3_t \\ &+ \underset{[2.86325]}{0.179}RECEXP_t + \underset{[4.30652]}{0.137}REEXP_t - \underset{[-2.61072]}{0.490}VAT_t = 0 \end{aligned} \tag{4.1}$$

Making $INFM_t$ the subject, equation (4.1) for disaggregate analysis becomes equation (4.2) with t-statistics in parentheses.

$$\begin{aligned} INFM_t &= \underset{[5.29363]}{1.044}DEXP_t - \underset{[-3.90436]}{0.528}CIMP_t - \underset{[-2.74655]}{0.002}DEV_t + \underset{[4.72035]}{0.041}ED_t \\ &+ \underset{[3.96602]}{0.004}GIMP_t + \underset{[3.47411]}{0.506}ID_t - \underset{[-3.47334]}{0.573}IT_t - \underset{[-1.61973]}{0.746}M0_t + \underset{[2.29125]}{1.751}M3_t \\ &- \underset{[-2.86325]}{0.179}REC_t - \underset{[-4.30652]}{0.137}REEXP_t + \underset{[2.61072]}{0.490}VAT_t \end{aligned} \tag{4.2}$$

$$\begin{aligned} &INFM_t - \underset{[-5.80947]}{1.627}MS_t - \underset{[-2.87314]}{1.390}TEXP_t + \underset{[2.62678]}{0.590}TEXPEN_t + \underset{[2.66964]}{0.859}TIMP_t \\ &- \underset{[-5.20540]}{1.377}TTAX_t = 0 \end{aligned} \tag{4.3}$$

Making $INFM_t$ the subject in model (4.3) for aggregate analysis we obtain model (4.4)

$$\begin{aligned} INFM_t &= \underset{[5.80947]}{1.627}MS_t + \underset{[2.87314]}{1.390}TEXP_t - \underset{[-2.62678]}{0.590}TEXPEN_t - \underset{[-2.66964]}{0.859}TIMP_t \\ &+ \underset{[5.20540]}{1.377}TTAX_t \end{aligned} \tag{4.4}$$

The discussion of the results in equations 4.2 and 4.4 as in Tables 4.5 and 4.6 respectively is captured in sections 4.5.1, 4.5.2 and 4.5.3 in line with the study objectives.

Table 4.5: Normalized Cointegration Coefficients for Disaggregate Analysis

INFM	CIMP	DEV	DEXP	ED	GIMP	ID	IT	M0	M3	REC	REEXP	VAT
1.000000	0.527986*	0.001593*	-1.043639*	-0.040831*	-0.004085*	-0.506317*	0.573101*	0.746031	-1.750632*	0.179268*	0.137378*	-0.490032*
	(0.13523)	(0.00058)	(0.19715)	(0.00865)	(0.00103)	(0.14574)	(0.16500)	(0.46059)	(0.76405)	(0.06261)	(0.03190)	(0.18770)
	[3.90436]	[2.74655]	[-5.29363]	[-4.72035]	[-3.96602]	[-3.47411]	[3.47334]	[1.61973]	[-2.29125]	[2.86325]	[4.30652]	[-2.61072]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 131, included 124 observation after adjustment with t-critical value 1.98 at 5% significance level. * indicate significant at 5% level of significance.*

Table 4.6: Normalized Cointegration Coefficients for Aggregate Analysis

INFM	MS	TEXP	TEXPEN	TIMP	TTAX
1.000000	-1.627465*	-1.39037*	0.590368*	0.859409*	-1.37714*
	(0.28014)	(0.48392)	(0.22475)	(0.32192)	(0.26456)
	[-5.80947]	[-2.87314]	[2.62678]	[2.66964]	[-5.20540]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 130, included 122 observation after adjustment with t-critical value 1.98 at 5% significance level. * indicate significant at 5% level of significance.*

4.5.1 Fiscal Factors and Inflation

The first objective of this study was to establish the influence of fiscal factors on inflation in Kenya. Results summarized in models 4.2 and 4.4 showed coefficients of -0.002, -0.179 and -0.590 for development expenditure, recurrent expenditure and total government expenditure respectively. Taxation components had coefficients of 0.041, 0.506, 0.490, -0.573 and 1.377 for excise duty, import duty, VAT, income tax and total tax respectively. The fiscal factors coefficients had t-statistics values of greater than 1.98 at 5% level of significance. This indicated that development expenditure, recurrent expenditure, total government expenditure and income tax had a significant negative long run influence on inflation in Kenya. Excise duty, import duty, VAT and total tax had a significant positive long run influence on inflation in Kenya.

The results on government expenditure implied that a percentage increase in level of development expenditure, recurrent expenditure and total government expenditure decreases inflation in Kenya by 0.002%, 0.179%, 0.590% respectively in the long run. Although the findings were inconsistent to a priori expectation as depicted in Appendix V and contradicted Magazzino (2011) for establishing no long run relationship for some Mediterranean countries like Cyprus, Malta, France and Spain which can be considered more developed as opposed to Kenya, the findings conformed to those of Iya and Aminu (2014) who established a negative long run relationship in Nigeria a developing country like Kenya; Ezirim *et al.* (2008) and Magazzino (2011) who established significant negative long run relationship in the United States of America and Portugal respectively. The findings may be attributed to policy inconsistency by the government towards spending and the fact that increased government expenditure was as a result of increased

infrustructural investment. This promotes the productive capacity by encouraging investment which Ahmad and Wajid (2013) argue leads to increased supply of goods and services hence lower prices in the long run.

The influence of taxation results implied that a percentage increase in the level of excise duty, import duty, VAT and total tax increases inflation in Kenya by 0.041%, 0.506%, 0.490% and 1.377% respectively while a percentage increase in income tax decreases inflation by 0.573% in the long run. This implied that although income tax had a negative long run influence on inflation in Kenya, the combined positive long run influence of excise duty, import duty and VAT on inflation determined the overall positive long run influence that total tax had on inflation in Kenya. The negative long run influence of income tax on inflation though inconsistent with a priori expectation conformed to Rehman and Khan (2015); Arif and Ali (2012); Bashir *et al*. (2011). The findings of positive long run influence of excise duty, import duty, VAT and total tax on inflation in Kenya conformed to a priori expectation as in Appendix V. This was consistent with the findings of Ahmed *et al*.(2014); Patoli *et al.* (2012); Rizvi *et al.* (2012) who investigated the determinants of inflation in Pakistan a country that shares commonality with Kenya of being a developing country.

The negative influence of income tax a direct tax on inflation as explained by Bashir *et al.* (2011) can be attributed to decrease in disposable income that lowers the purchasing power of citizens. This causes surplus supply hence lower prices. On the other hand, the positive influence of excise duty, import duty, VAT (indirect taxes) and total tax on inflation as argued by Bashir *et al.* (2011) may be as a result of an increase in the cost of

production emanating from increased prices of factors of production. This lowers aggregate supply leading to higher prices due to shortage of products in the country. Overally, this study established that on the fiscal factors front total tax had the greatest influence on inflation in Kenya compared to total government expenditure i.e its influence on inflation was more than twice the influence of government expenditure.

4.5.2 Trade Factors and Inflation

The second objective of this study was to determine the influence of trade factors on inflation in Kenya. Models 4.2 and 4.4 showed coefficients of 1.044, -0.137 and 1.390 for domestic exports, re-export and total exports respectively. Imports components had coefficients of 0.004, -0.528 and -0.859 for government imports, commercial imports and total imports respectively. All the trade factors coefficients had t-statistics values of greater than 1.98 at 5% level of significance. This indicated that re-exports, commercial imports and total imports had a significant negative long run influence on inflation in Kenya. On the other hand, domestic exports, government imports and total exports had a significant positive long run influence on inflation in Kenya.

The results on exports implied that a percentage increase in level of re-exports decreases inflation in Kenya by 0.137% while a percentage increase in domestic exports and total exports increases inflation in Kenya by 1.044% and 1.390% respectively. The negative long run influence of re-exports on inflation though inconsistent with a priori expectation as in Appendix V conformed to the findings of Ahmed *et al.* (2013) and Olatunji *et al.* (2010) who investigated the determinants of inflation in Pakistan and Nigeria respectively which are developing countries like Kenya. The findings of positive long run

influence of domestic exports and total exports on inflation in Kenya conformed to the findings of Venkadasalam (2015) and Jaradat *et al.* (2011) who investigated the determinants of inflation in Malaysia and Jordan respectively that share a commonality with Kenya as developing countries. This was also consistent to the a priori expectation of a positive relationship as in Appendix V.

The negative influence that re-exports had on inflation as explained by Ahmad and Wajid (2013) may be attributed to the fact that higher re-exports increases trade revenue which causes more investment, increased domestic production with firms enjoying economies of scale and reduction in production cost. This increases aggregate supply causing a reduction in prices. On the other hand, the positive influence that domestic exports and total exports had on inflation as argued by Joiya and Shahzad (2013) may be due to a shortage of food products in the country since the main exports for Kenya are agricultural products. High demand and reduced supply causes price to rise.

The imports results implied that a percentage increase in level of government imports increases inflation by 0.004% while a percentage increase in commercial imports and total imports decreases inflation in Kenya by 0.528% and 0.859% respectively. The positive influence of government imports had on inflation though inconsistent with a priori expectation conformed to the findings of Rizvi *et al.* (2012); Bashir *et al.* (2011) who investigated the determinants of inflation in Pakistan. It was also noted that the negative long run influence that commercial imports and total imports had on inflation in Kenya conformed to a priori expectation as in Appendix V and consistent with the

findings of Lim and Sek (2015); Joiya and Shahzad (2013) who investigated the factors determining inflation in high income countries and Pakistan respectively.

The positive influence that government imports had on inflation as explained by Bashir *et al.* (2011) may have decreased government income to invest in infrustructure development discouraging investment in some parts of the country. This decreased supply of goods and services causing prices to increase. On the other hand, the negative influence that commercial imports and total imports had on inflation may be attributed to the fact that, most of Kenyas imports are capital goods. As noted by Ahmad and Wajid (2013), increased import of capital goods causes an increase in production at the domestic level which increases aggregate supply hence a decline in prices. Overally, this study established that on trade factors front total exports had the greatest influence on inflation in Kenya compared to total imports i.e its influence on inflation was more than one and half times the influence of total imports.

4.5.3 Monetary Factors and Inflation

The third objective of this study was to investigate the influence of monetary factors on inflation in Kenya. Models 4.2 and 4.4 indicated coefficients of -0.746, 1.751 and 1.627 for currency outside the banking system (M0), extended broad money (M3) and total money supply (MS) respectively. All monetary factors had t-statistics values of greater than 1.98 at 5% level of significance except for M0. This indicated that extended broad money (M3) and total money supply had a significant positive long run relationship with inflation in Kenya. Currency outside the banking system (M0) had an insignificant negative long run relationship with inflation in Kenya which may be adduced to CBK's

monetary policy inconsistency in terms of the instruments used which might not be targeting M0.

The results on money supply influence on inflation implied that a percentage increase in level of extended broad money and total money supply increases inflation in Kenya by 1.750% and 1.627% respectively. Since currency outside the banking system had an insignificant long run influence on inflation in Kenya, the positive long run influence of total money supply on inflation in Kenya was highly influenced by extended broad money. The insignificant long run influence of M0 on inflation conformed to Khan and Gill (2010) findings in Pakistan. The positive long run influence of extended broad money and total money supply on inflation conformed to a priori expectation as in Appendix V. Although the findings were inconsistent with the findings of Akinbobola (2012) that established a negative relationship between money supply and inflation in Nigeria, it was consistent with the findings of Kirimi (2014), Yasmin *et al*. (2013) and Qayyum (2006) who conducted studies in Kenya and Pakistan.

The positive influence that extended broad money and total money supply had on inflation, as argued by Bashir *et al.* (2011) may be attributed to the fact that higher money supply imply more funds to invest in the economy. This generates more employment which in turn increases aggregate demand causing price levels to increase.

4.6 Vector Error Correction Model (VECM)

The study used VECM to analyze the influence of past values of fiscal, trade and monetary factors on inflation in Kenya in line with the objectives of study. The

discussion of the results for the influence of fiscal, trade and monetary factors on inflation are in sections 4.6.1, 4.6.2 and 4.6.3 respectively.

4.6.1 Fiscal Factors and Inflation

The first objective of this study was to establish the influence of fiscal factors on inflation in Kenya. The VECM results in Tables 4.7 and 4.8 as extracted from vector error correction mechanism results in Appendix IV indicated that in the short run past values of development expenditure, recurrent expenditure, income tax and total government expenditure had a significant positive influence on inflation in Kenya at 5% level of significance evident at lags 1 to 5, lag 1, lags 1 to 6 and lag 1 respectively for the variables. This implied that a percentage increase in development expenditure, recurrent expenditure, income tax and total government expenditure increased inflation in Kenya by approximately 0.001%, 0.05%, 0.20% and 0.13% respectively. It was also noted that in the short run the past values of excise duty, import duty, VAT and total tax had a significant negative influence on inflation in Kenya at 5% level of significance. This was evident at lag 6, lags 1 to 6, lags 1 to 2 and lags 1 to 7 for excise duty, import duty, VAT and total tax respectively. This implied that a percentage increase in excise duty, import duty, VAT and total tax decreased inflation in Kenya by approximately 0.05%, 0.1%, 0.2% and 0.3% respectively.

The findings of positive influence of government expenditure and inflation conformed to a priori expectation though inconsistent with the findings of Magazzino (2011) for establishing relationship for some Mediterranean countries like Cyprus, Malta, France and Spain. The positive short run influence for the past values of income tax on inflation

conformed to a priori expectation and consistent with the findings of Patoli *et al.* (2012); Rizvi *et al.* (2012) and Khan *et al.* (2007) while the findings of negative short run influence of excise duty, import duty, VAT and total tax on inflation in Kenya were inconsistent with a priori expectation but conformed to Arif and Ali (2012); Bashir *et al.* (2011) findings.

Table 4.7: VECM Results on Fiscal Factors and Inflation based on Disaggregate Analysis

DEPENDENT VARIABLE	INDEPENDENT VARIABLE LAG	D(DEV)	D(REC)	D(ED)	D(ID)	D(IT)	D(VAT)
D(INFM)	LAG (-1))	0.000594*	0.048370*	-0.010007	-0.140858*	0.189175*	-0.160824*
		(0.00014)	(0.01581)	(0.01894)	(0.03640)	(0.04798)	(0.04415)
		[4.09570]	[3.05967]	[-0.52840]	[-3.87004]	[3.94262]	[-3.64227]
D(INFM)	LAG (-2))	0.000572*	0.039837	0.013932	-0.123266*	0.165055*	-0.133715*
		(0.00018)	(0.02185)	(0.01954)	(0.03778)	(0.04893)	(0.05674)
		[3.25004]	[1.82302]	[0.71286]	[-3.26311]	[3.37354]	[-2.35668]
D(INFM)	LAG (-3)	0.000597*	0.036233	0.019554	-0.116847*	0.135212*	-0.091978
		(0.00020)	(0.02583)	(0.01702)	(0.03890)	(0.04471)	(0.05690)
		[3.03995]	[1.40299]	[1.14859]	[-3.00365]	[3.02420]	[-1.61641]
D(INFM)	LAG (-4)	0.000529*	0.032402	0.003009	-0.111339*	0.109891*	-0.055625
		(0.00019)	(0.02576)	(0.02021)	(0.03948)	(0.04117)	(0.05229)
		[2.71916]	[1.25795]	[0.14894]	[-2.82027]	[2.66888]	[-1.06376]
D(INFM)	LAG (-5)	0.000380*	0.023577	-0.034424	-0.090224*	0.073969*	-0.019014
		(0.00015)	(0.02176)	(0.01850)	(0.03479)	(0.02999)	(0.04178)
		[2.53658]	[1.08353]	[-1.86079]	[-2.59334]	[2.46628]	[-0.45508]
D(INFM)	LAG (-6)	0.000127	0.011766	-0.046954*	-0.052113*	0.033010*	0.006464
		(9.9E-05)	(0.01194)	(0.01957)	(0.02474)	(0.01574)	(0.02444)
		[1.28539]	[0.98567]	[-2.39946]	[-2.10658]	[2.09740]	[0.26455]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 131, included 124 observation after adjustment with t-critical value 2.000 at 5% significance level. * indicate significant at 5% level of significance.*

Table 4.8: VECM Results on Fiscal Factors and Inflation based on Aggregate Analysis

DEPENDENT VARIABLE	INDEPENDENT VARIABLE LAG	D(TEXPEN)	D(TTAX)
D(INFM)	LAG (-1))	0.133137*	-0.288658*
		(0.03203)	(0.07034)
		[4.15692]	[-4.10373]
D(INFM)	LAG (-2))	0.058845	-0.307188*
		(0.03552)	(0.06918)
		[1.65667]	[-4.44061]
D(INFM)	LAG (-3)	0.037425	-0.318339*
		(0.03835)	(0.06567)
		[0.97588]	[-4.84779]
D(INFM)	LAG (-4)	0.033150	-0.290653*
		(0.03669)	(0.05644)
		[0.90352]	[-5.14959]
D(INFM)	LAG (-5)	0.025642	-0.206645*
		(0.03009)	(0.04246)
		[0.85218]	[-4.86703]
D(INFM)	LAG (-6)	0.012326	-0.106099*
		(0.01939)	(0.02558)
		[0.63569]	[-4.14797]
		0.002855	-0.026568*
D(INFM)	LAG (-7)	(0.00759)	(0.00965)
		[0.38011]	[-2.75387]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 130, included 122 observation after adjustment with t-critical value 1.98 at 5% significance level. * indicate significant at 5% level of significance.*

4.6.2 Trade Factors and Inflation

The second objective of this study was to determine the influence of trade factors on inflation in Kenya. VECM results in Tables 4.9 and 4.10 as extracted from vector error correction mechanism results in Appendix IV indicated that in the short run past values of domestic exports, commercial imports, government imports, total imports and total exports had a significant negative influence on inflation in Kenya at 5% level of

significance. This was evident at lags 1 to 4, lags 1 to 6, lags 1 to 4, lags 1 to 2 and lags 1 to 4 respectively. The results implied that a percentage increase in domestic exports, commercial imports, government imports, total imports and total exports decreased inflation in Kenya by approximately 0.3%, 0.001%, 0.2%, 0.001%, 0.2% and 0.3% respectively. It was also noted that in the short run the past values of re-exports had a significant positive influence on inflation in Kenya at 5% level of significance for lags 1 to 2. This implied that a percentage increase in re-exports increased inflation in Kenya by approximately 0.04%.

It was noted that domestic exports influenced the negative short run influence that total exports had on inflation in Kenya. The negative influence though inconsistent with a priori expectation conformed to the findings of Olatunji *et al.* (2010) who investigated the determinants of inflation in Nigeria. The findings of positive short run influence by past values of re-exports on inflation in Kenya conformed to the findings of Venkadasalam (2015).

Table 4.9: VECM Results on Trade Factors and Inflation based on Disaggregate Analysis

DEPENDENT VARIABLE	INDEPENDENT VARIABLE LAG	D(DEXP)	D(REEXP)	D(CIMP)	D(GIMP)
D(INFM)	LAG (-1))	-0.324148*	0.039552*	-0.171658*	-0.001222*
		(0.07102)	(0.00977)	(0.03862)	(0.00030)
		[-4.56436]	[4.04953]	[-4.44475]	[-4.01621]
D(INFM)	LAG (-2))	-0.303879*	0.028464*	-0.181366*	-0.001008*
		(0.06717)	(0.01059)	(0.03994)	(0.00029)
		[-4.52426]	[2.68728]	[-4.54052]	[-3.48835]
D(INFM)	LAG (-3)	-0.253210*	0.014155	- 0.194880*	-0.000726*
		(0.06266)	(0.01052)	(0.04025)	(0.00026)
		[-4.04130]	[1.34583]	[-4.84157]	[-2.77389]
D(INFM)	LAG (-4)	-0.168743*	0.003666	-0.172588*	-0.000554*
		(0.05334)	(0.00886)	(0.03863)	(0.00022)
		[-3.16366]	[0.41386]	[- 4.46752]	[-2.51131]
D(INFM)	LAG (-5)	-0.058808	-0.000381	-0.108382*	-0.000351
		(0.03815)	(0.00626)	(0.02898)	(0.00018)
		[-1.54141]	[-0.06089]	[-3.73979]	[-1.98769]
D(INFM)	LAG (-6)	-0.010744	0.000537	-0.036245*	-0.000192*
		(0.01935)	(0.00298)	(0.01449)	(0.00009)
		[-0.55524]	[0.18029]	[- 2.50123]	[-2.04764]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 131, included 124 observation after adjustment with t-critical value 2.000 at 5% significance level. * indicate significant at 5% level of significance.*

Table 4.10: VECM Results on Trade Factors and Inflation based on Aggregate Analysis

DEPENDENT VARIABLE	INDEPENDENT VARIABLE LAG	D(TEXP)	D(TIMP)
D(INFM)	LAG (-1))	-0.272089*	-0.150913*
		(0.06849)	(0.04017)
		[-3.97250]	[-3.75704]
D(INFM)	LAG (-2))	-0.256963*	-0.108801*
		(0.06548)	(0.03729)
		[-3.92411]	[-2.91739]
D(INFM)	LAG (-3)	-0.224444*	-0.039874
		(0.06165)	(0.03560)
		[-3.64042]	[-1.11989]
D(INFM)	LAG (-4)	-0.167462*	0.021563
		(0.05609)	(0.03344)
		[-2.98544]	[0.64475]
D(INFM)	LAG (-5)	-0.077075	0.035883
		(0.04611)	(0.02751)
		[-1.67155]	[1.30458]
D(INFM)	LAG (-6)	-0.042271	0.021491
		(0.02965)	(0.01746)
		[-1.42591]	[1.23071]
D(INFM)	LAG (-7)	-0.010197	0.006340
		(0.01182)	(0.00682)
		[-0.86266]	[0.92936]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 130, included 122 observation after adjustment with t-critical value 1.98 at 5% significance level. * indicate significant at 5% level of significance.*

4.6.3 Monetary Factors and Inflation

The third objective of this study was to establish the influence of monetary factors on inflation in Kenya. Tables 4.11 and 4.12 results as extracted from vector error correction mechanism results in Appendix IV indicated that in the short run past values of currency outside the banking system (M0) had a significant positive influence on inflation in Kenya at 5% level of significance for lags 1, 2 and 6. The past values of extended broad

money (M3) and total money supply (MS) had a significant negative influence on inflation in Kenya at 5% level of significance for lags 1 to 2 and lags 1 to 3 respectively. This implied that a percentage increase in M0 increased inflation in Kenya by approximately 0.2% while a percentage increase in M3 and total money supply decreased inflation by approximately 0.5% and 0.3% respectively in the short run.

Given that the past values of currency outside the banking system had a positive short run influence on inflation in Kenya, the negative short run influence for the past values of total money supply on inflation in Kenya was highly influenced by the negative short run influence that past values of extended broad money had on inflation in Kenya. The positive short run influence by past values of M0 on inflation conformed to a priori expectation and were consistent with the findings of Undji and Kaulihowa (2015), Kirimi (2014), Sola and Peter (2013). The negative short run influence for the past values of M3 and total money supply on inflation in Kenya was consistent with the findings of Okara (2015) and Akinbobola (2012).

Table 4.11: VECM Results on Monetary Factors and Inflation based on Disaggregate Analysis

DEPENDENT VARIABLE	INDEPENDENT VARIABLE LAG	D(M0)	D(M3)
D(INFM)	LAG (-1))	0.236041*	-0.497269*
		(0.08087)	(0.15132)
		[2.91867]	[-3.28632]
D(INFM)	LAG (-2))	0.237332*	-0.436573*
		(0.11315)	(0.19985)
		[2.09751]	[-2.18446]
D(INFM)	LAG (-3)	0.222630	-0.337793
		(0.11679)	(0.22834)
		[1.90631]	[-1.47937]
D(INFM)	LAG (-4)	0.163391	-0.066665
		(0.10191)	(0.20627)
		[1.60331]	[-0.32319]
D(INFM)	LAG (-5)	0.155430	0.079223
		(0.08097)	(0.17097)
		[1.91951]	[0.46337]
D(INFM)	LAG (-6)	0.141026*	0.035064
		(0.05283)	(0.10621)
		[2.66939]	[0.33015]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 131, included 124 observation after adjustment with t-critical value 2.000 at 5% significance level. * indicate significant at 5% level of significance.*

Table 4.12: VECM Results on Monetary Factors and Inflation based on Aggregate Analysis

DEPENDENT VARIABLE	INDEPENDENT VARIABLE LAG	D(MS)
D(INFM)	LAG (-1))	-0.310034*
		(0.07827)
		[-3.96108]
D(INFM)	LAG (-2))	-0.284639*
		(0.06583)
		[-4.32385]
D(INFM)	LAG (-3)	-0.340261*
		(0.10604)
		[-3.20880]
D(INFM)	LAG (-4)	-0.045623
		(0.49024)
		[-0.09306]
D(INFM)	LAG (-5)	-0.092794
		(0.35211)
		[-0.26354]
D(INFM)	LAG (-6)	-0.973483
		(1.21424)
		[-0.80172]
D(INFM)	LAG (-7)	-0.394719
		(0.29148)
		[-1.35419]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 130, included 122 observation after adjustment with t-critical value 1.98 at 5% significance level. * indicate significant at 5% level of significance.*

4.6.4 Error Correction Term (ECT)

This study examined the adjustment of short run disequilibrium and validation of the long run influence basing on the sign and magnitude of the error correction term (ECT) for the ECM having inflation as the dependent variable. The results summarized in Tables 4.13 and 4.14 as extracted from vector error correction mechanism results in Appendix IV indicated that inflation in Kenya based on both disaggregate and aggregate analysis was

significantly error correcting at 5% level of significance with an error correction term coefficient of approximately -0.30. This implied that any short run disequilibrium in inflation in Kenya is corrected at the rate of 30% in the following month. Further, it was noted that the signs for the error correction terms were negative implying that the long run influence that the time series variables of government expenditure, taxation, exports, imports and money supply had on inflation in Kenya was validated. These findings were consistent with the findings of Bashir *et al.* (2011) and Venkadasalam (2015) who established an error correction term with a negative sign.

Table 4.13: ECM for Disaggregate Analysis

Variable:	ECT	D(INFM(-1))	D(INFM(-2))	D(INFM(-3))	D(INFM(-4))	D(INFM(-5))	D(INFM(-6))
D(INFM)	-0.323787*	-0.487202	-0.570279	-0.308896	0.081511	0.415205	0.664278*
	(0.07356)	(0.31034)	(0.30635)	(0.27846)	(0.31208)	(0.30288)	(0.30382)
	[-4.40172]	[-1.56988]	[-1.86152]	[-1.10931]	[0.26119]	[1.37084]	[2.18642]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 131, included 124 observation after adjustment with t-critical value 2.000 at 5% significance level. * indicate significant at 5% level of significance.*

Table 4.14: ECM for Aggregate Analysis

Variable:	ECT	D(INFM(-1))	D(INFM(-2))	D(INFM(-3))	D(INFM(-4))	D(INFM(-5))	D(INFM(-6))	D(INFM(-7))
D(INFM)	-0.266452*	-1.132739	-0.602168	-0.250293	-0.078396	-0.421616	-0. 652431*	-0.063634
	(0.08093)	(1.00458)	(0.39809)	(0.15254)	(0.34425)	(0.31500)	(0.20294)	(0.09390)
	[-3.29238]	[-1.12757]	[-1.51264]	[-1.64084]	[-0.22773]	[-1.33846]	[-3.21490]	[-0.67767]

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 130, included 122 observation after adjustment with t-critical value 1.98 at 5% significance level. * indicate significant at 5% level of significance.*

4.7 VECM Diagnostic Tests

4.7.1 Goodness of Fit for VECM

The results on vector error correction mechanism results in Appendix IV based on disaggregate analysis showed that approximately 77% of variations in inflation in Kenya were significantly explained at 5 % level of significance by the changes in fiscal factors (development expenditure, recurrent expenditure, excise duty, import duty, income tax and VAT), trade factors (domestic exports, re-exports, commercial imports and government imports) and monetary factors (M0 and M3) in Kenya. This study established the statistical significance of R^2 by comparing the F-critical $(F_{79,44} = 1.37)$ and F-computed (1.8772) whereby F-calculated was greater than F-critical an indication of joint statistical significance for the slope coefficients.

Similarly, on vector error correction mechanism results in Appendix IV based on aggregate analysis indicated that approximately 81% of variations in inflation in Kenya were significantly explained by the changes in fiscal factors of total government expenditure and total tax, trade factors of total exports and total imports and monetary factors of total money supply at 5 % level of significance. The study established the statistical significance of R^2 by comparing the F-critical $(F_{43,78} = 1.47)$ and F-computed (7.6807) whereby F-calculated was greater than F-critical an indication of joint statistical significance for the slope coefficients. The slight variation between the coefficients of determination (R^2) for aggregate and disaggregate analysis was attributed to the study's failure to capture all components of money supply under disaggregate analysis such as narrow money (M1) and broad money supply (M2).

4.7.2 VECM Stability

Figures 4.1 and 4.2 indicated that none of the inverse roots lied outside the unit circle for both disaggregate and aggregate VAR models. This was an indication that the VAR models for both disaggregate and aggregated analysis were stable.

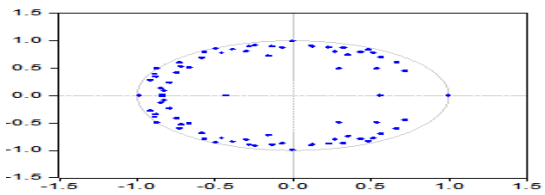

Figure 4.1. Inverse roots of VECM for disaggregate analysis

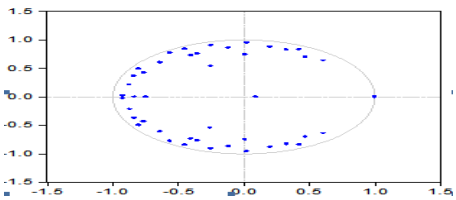

Figure 4.2. Inverse roots of VECM for aggregate analysis

4.7.3 VAR Lag Length Determination

Table 4.15 under disaggregate analysis indicated that lag 6 had the minimum value for AIC and SC and the maximum value of LR thus the optimal lag length. Similarly, the test results showed that the optimal lag length under aggregate analysis for AIC and LR was 7 but 2 for SC. The study therefore adopted 7 as the optimal lag length since most criterions established it as the optimal lag length.

Table 4.15: Lag Length Test Results

LAG	AIC		SC		LR	
	Disaggregate	Aggregate	Disaggregate	Aggregate	Disaggregate	Aggregate
1	-5.474354	-4.857801	-5.141818	-5.679549	368.0959	318.8993
2	-5.496438	-5.108557	-4.872557	-4.795025*	379.7721	338.3934
3	-5.424115	-5.241294	-4.505913	-4.791091	385.4313	350.2015
4	-5.42173	-5.234944	-4.206181	-4.646654	395.5690	353.184
5	-5.531208	-5.246045	-4.015232	-4.518231	412.7005	357.2548
6	-5.837324*	-5.484542	-4.017787*	-4.615737	441.9141*	375.2993
7	-5.163799	-5.650262*	-4.137513	-4.638976	422.0736	388.6660*
8	-	-5.514483	-	-4.359198	-	383.6262

Source: Author (2017). Note. * denotes optimal lag length with minimum AIC and SC values and Maximum LR value

4.7.4 Economic a Priori Criterion

Results in Appendix V indicated that the aggregate variables of total exports, total tax, total imports and total money supply had the correct sign hence conformed to economic a priori expectation while total government expenditure did not conform to a priori expectation. For the disaggregated components, although re-exports, income tax and government imports did not conform to a priori expectation, the variables of development expenditure, recurrent expenditure, domestic exports, excise duty, import duty, VAT, commercial imports, currency outside the banking system (M0) and extended broad money (M3) conformed to a priori expectation and they influenced the expected sign for the aggregate components.

4.7.5 VECM Residual Diagnostic Tests

4.7.5.1 Multicollinearity

Table 4.16 test results showed that for both disaggregated and aggregated analysis all the VIF values were less than 10. This implied that none of the explanatory variables used in the study was highly collinear hence the problem of multicollinearity was ruled out.

Table 4.16: Variance Inflation Factors

Variable	Disaggregate Components	Aggregate Components
	Centred VIF	Centred VIF
DEV	1.271974	-
REC	1.110963	-
DEXP	1.246365	-
REEXP	1.060423	-
ED	1.058058	-
ID	2.040403	-
IT	1.455194	-
VAT	5.125118	-

Note. The rule of thumb is that if VIF Exceeds 10, the variable is said to be highly collinear (Author, 2017).

Table 4.16: Variance Inflation Factors Cont…

Variable	Disaggregate Components Centred VIF	Aggregate Components Centred VIF
CIMP	1.238006	-
GIMP	1.321558	-
M0	1.721339	-
M3	1.060802	-
TEXPEN	-	1.204100
TEXP	-	1.256722
TTAX	-	1.443491
TIMP	-	1.447691
MS	-	1.041099

Note. The rule of thumb is that if VIF Exceeds 10, the variable is said to be highly collinear (Author, 2017).

4.7.5.2 Serial Correlation

The Vector Error Correction (VEC) serial correlation LM test results in Table 4.17 indicated LM- statistics with p-values of 0.1295 and 0.0604 for disaggregated and aggregated VAR analysis respectively. These values were greater than 0.05 indicating that the null hypothesis of no serial correlation was not rejected at 5% level of significance. This implied that the residuals were not correlated, hence ruling out the problem of autocorrelation.

Table 4.17: VEC Residual Serial Correlation LM Test Results

Analysis	Lags	LM-Statistic	Prob
Disaggregate	1	294.3367*	0.1295
Aggregate	1	50.0082*	0.0604

Note. * indicate accept null hypothesis of no serial correlation at 5% significance level (Author, 2017)

4.7.5.3 Heteroscedasticity

Table 4.18 VEC residual heteroscedasticity test results indicated p –values of 0.0895 and 0.8614 for disaggregated and aggregated VAR analysis which were greater than 0.05.

This implied that the null hypothesis of no heteroscedasticity at 5 % level of significance was accepted hence the residuals had a constant variance.

Table 4.18: VEC Residual Heteroscedasticity Test Results

Analysis	Chi-sq	Df	Prob
Disaggregate	1125.23*	1201	0.0895
Aggregate	1740.814*	1806	0.8614

Note. * indicate accept null hypothesis of no heteroscedasticity at 5% significance level (Author, 2017)

4.7.5.4 Normality Test

The Vector Error correction (VEC) residual normality test results in Table 4.19 indicated that the joint Jarque-Bera statistics had p- values of 0.0963 and 0.1117 for disaggregated and aggregated VAR analysis respectively. These p-values were greater than 0.05 implying that the null hypothesis of residuals being normally distributed at 5 % level of significance was accepted.

Table 4.19: VEC Residual Normality Test Results

Analysis	Component	Jarque-Bera	Prob
Disaggregate	Joint	138.1859*	0.0963
Aggregate	Joint	251.7308*	0.1117

Note. * indicate accept null hypothesis of normal distribution for residuals at 5% significance level (Author, 2017)

4.8 Impulse Response Analysis

The study traced the influence of a one standard deviation shock of innovations on each variable in the VAR on inflation over time. This was conducted in line with the study objectives and explained in sections 4.8.1, 4.8.2 and 4.8.3.

4.8.1 Fiscal Factors and Inflation

The first objective of this study was to establish the influence of fiscal factors on inflation in Kenya. The response to one standard deviation innovation to development expenditure as depicted in Figure 4.3 resulted in explosive effect on inflation up to the 15th month and

dampened by the 45th month after which the effect fizzled out. Figure 4.4 indicated that one standard deviation shock to recurrent expenditure had explosive negative effects that lasted for 45 months after which we had dampened effect with a stable negative path that never fizzled out. Total government expenditure as shown in Figure 4.5 also had explosive negative effects up to the 30th month after which the effect dampened with a stable negative path that never fizzled out.

Figures 4.6, 4.7 and 4.9 indicated that the response of inflation to one standard deviation innovation to excise duty, import duty and VAT resulted in explosive positive effect that dampened with a stable path after the 35th month. This positive effect did not fizzle out for the entire period. Figure 4.8 showed that income tax resulted in explosive negative effect on inflation in Kenya that dampened after the 28th month with a stable path that never fizzled. Figure 4.10 indicated that total tax had explosive positive effect on inflation in Kenya that dampened after the 20th month with a stable positive path that did not fizzle out for the period.

The findings implied that the null hypothesis of no influence of fiscal factors on inflation in Kenya was rejected. That is, an increase in development, recurrent, total government expenditure and income tax would lead to a decrease in inflation in Kenya while an increase in excise duty, import duty, VAT and total tax leads to an increase in inflation. The findings supported the cointegration results at 5% level of significance as in models (4.4) and (4.6) and conformed to the findings of Iya and Aminu (2014), Ezirim *et al.* (2008) and Magazzino (2011) who established a negative relationship between government expenditure and inflation in Nigeria, USA and Portugal respectively. On the

other hand, the taxation findings conformed to the results of Patoli *et al.* (2012), Rizvi *et al.* (2012) and Bashir *et al*. (2011) who investigated the determinants of inflation in Pakistan.

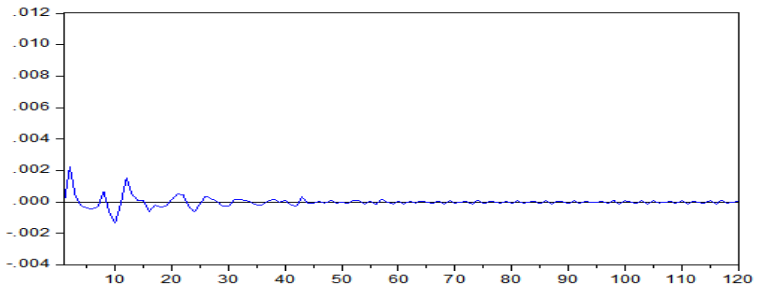

Figure 4.3. Response of inflation development expenditure (Author, 2017).

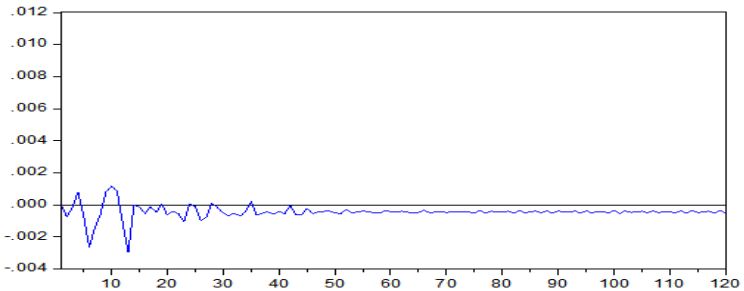

Figure 4.4. Response of inflation to recurrent expenditure (Author, 2017).

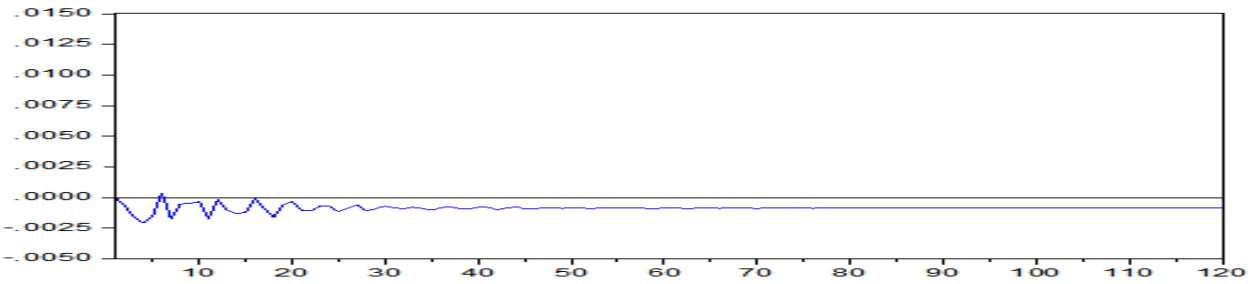

Figure 4.5. Response of inflation to total government expenditure (Author, 2017).

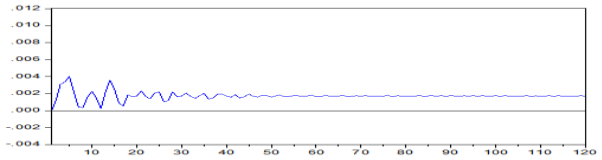

Figure 4.6. Response of inflation to excise duty (Author, 2017).

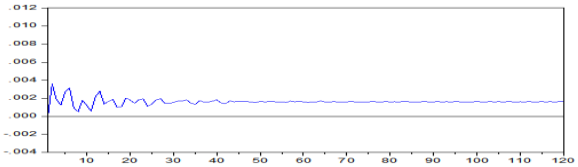

Figure 4.7. Response of inflation to import duty (Author, 2017).

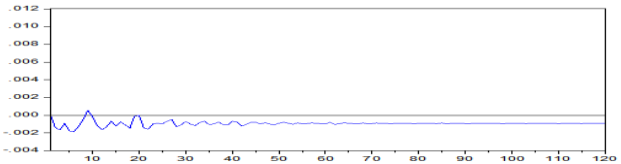

Figure 4.8. Response of inflation to income tax (Author, 2017).

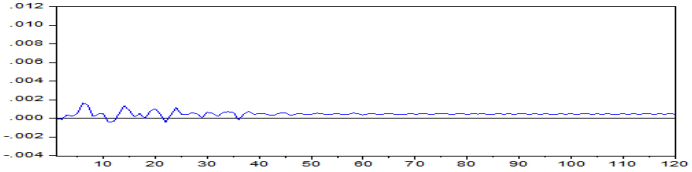

Figure 4.9. Response of inflation to VAT (Author, 2017).

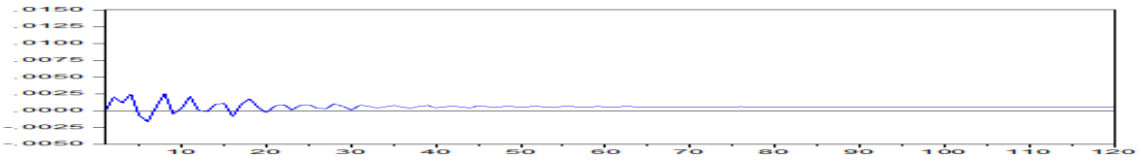

Figure 4.10. Response of inflation to total tax (Author, 2017).

4.8.2 Trade Factors and Inflation

The second objective of this study was to determine the influence of trade factors on inflation in Kenya. Figure 4.11 indicated that the response of inflation to one standard deviation innovation to domestic exports had a positive effect on inflation in Kenya that fizzled out after the `40th month. Re-exports had an explosive negative effect on inflation in Kenya up to the 30th month after which the effect dampened with a stable path that did not fizzle out as in Figure 4.12. Like domestic exports as depicted in Figure 4.13, total exports had an explosive positive effect on inflation up to the 25th month that dampened and fizzled out after the 44th month.

Figures 4.14 and 4.15 indicated that the response of inflation to one standard deviation innovation to commercial imports and government imports resulted in negative and positive effects on inflation respectively for most of the prediction time that fizzled out after the 35th and 22nd months. On the other hand, Figure 4.16 showed that total imports had an explosive negative effect on inflation in Kenya that dampened with a stable negative time path after the 20th month. The negative effect never fizzled out for the entire time period.

This implied that the null hypothesis of no influence of trade factors on inflation in Kenya was rejected such that an increase in domestic export, total exports and government imports increased inflation. An increase in re-exports, commercial imports and total imports led to a decrease in inflation in Kenya. The results corroborated the cointegration findings as in models (4.4) and (4.6) at 5% level of significance. Exports findings were consistent with of Olatunji *et al.* (2010) and Venkadasalam (2015) who

investigated the determinants of inflation in Nigeria and Malaysia respectively while the imports findings conformed with Bashir *et al.* (2011), Rizvi *et al.* (2012) and Bari (2013) who investigated the determinants of inflation in pakistan and Turkey.

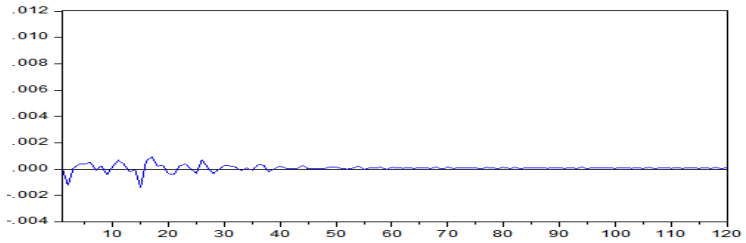

Figure 4.11. Response of inflation to domestic exports (Author, 2017).

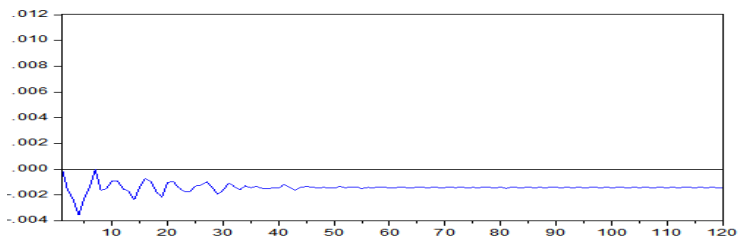

Figure 4.12. Response of inflation to re-exports (Author, 2017).

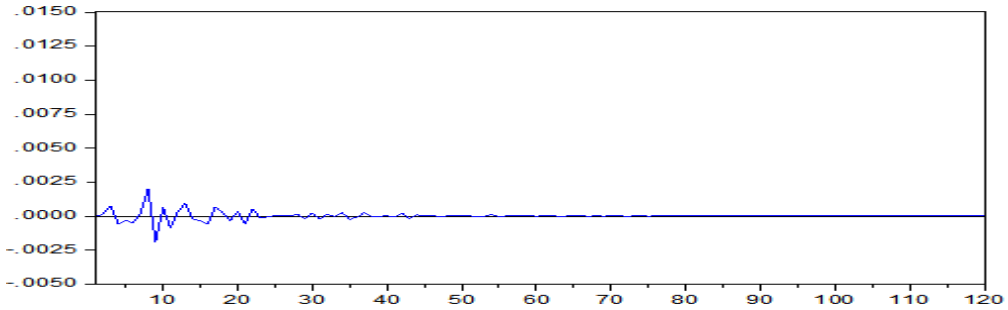

Figure 4.13. Response of inflation to total exports (Author, 2017).

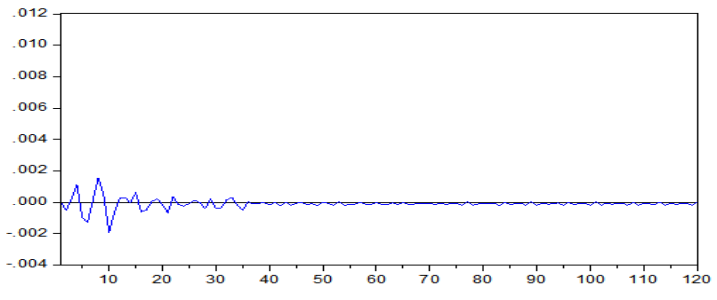

Figure 4.14. Response of inflation to commercial imports (Author, 2017).

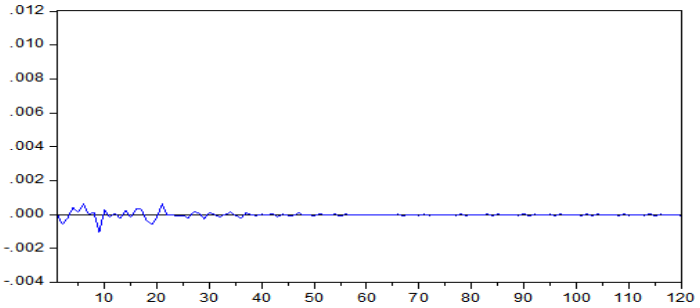

Figure 4.15. Response of inflation to government imports (Author, 2017).

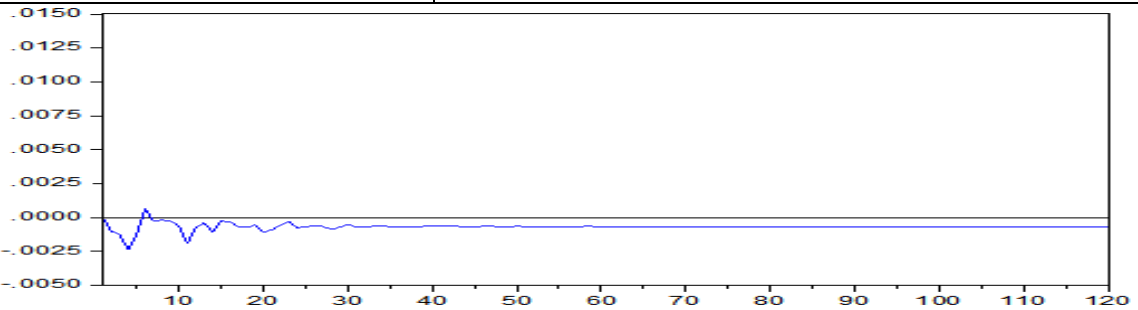

Figure 4.16. Response of inflation to total imports (Author, 2017).

4.8.3 Monetary Factors and Inflation

The third objective of this study was to investigate the influence of monetary factors on inflation in Kenya. Figure 4.17 indicated that the response of inflation to one standard deviation innovation to M0 resulted in a negative effect that fizzled out after the 30th month. Figure 4.18 showed that M3 had an explosive positive effect on inflation in Kenya that dampened after the 38th month with a stable positive path that never fizzled out. Figure 4.19 showed that total money supply also had very explosive positive effect on inflation in Kenya that dampened after the 25th month with a stable positive path that never fizzled out for the period.

The findings were an indication of the rejection of the null hypothesis of no influence of monetary factors on inflation in Kenya. This implied that an increase in M3 and total money supply led to an increase in inflation in Kenya that supported the cointegration results in models (4.4) and (4.6) at 5% level of significance. This was consistent with studies conducted by Kirimi (2014), Yasmin *et al*. (2013) and Qayyum (2006).

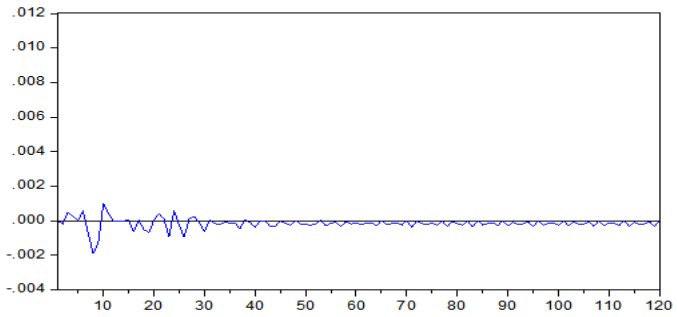

Figure 4.17. Response of inflation to M0 (Author, 2017).

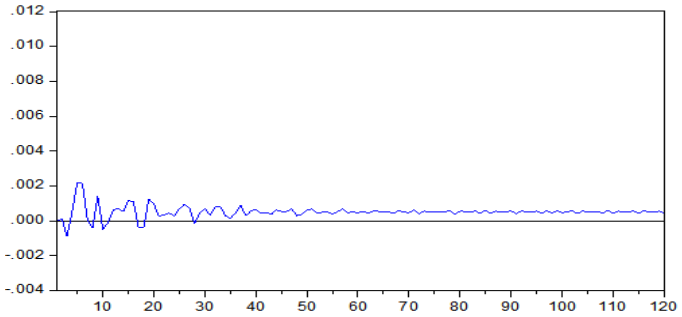

Figure 4.18. Response of inflation to M3 (Author, 2017).

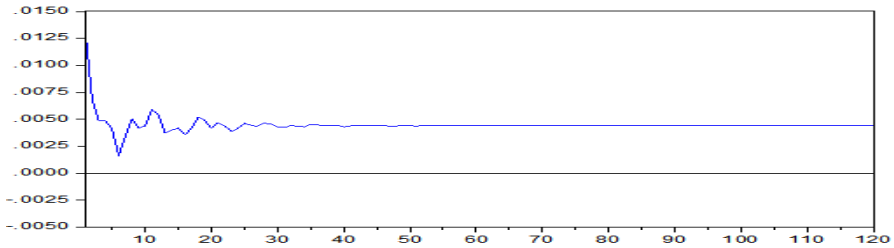

Figure 4.19. Response of inflation to total money supply (Author, 2017).

4.9 Variance Decomposition Analysis

The study employed variance decomposition to examine the proportion of the variance in inflation that was due to own and each of the independent variables variations over time in line with objectives of the study. This was discussed in sections 4.91, 4.9.2 and 4.9.3. It was noted that the larger proportion of variance in inflation was due to its own shock at 100% in the first month and reduced to 62.4% and 68.9% for disaggregate and aggregate analysis respectively by the 12^{th} month as depicted in Tables 4.20 and 4.21.

4.9.1 Fiscal Factors and Inflation

The first objective of this study was to establish the influence of fiscal factors on inflation in Kenya. Tables 4.20 and 4.21 test results indicated that in the first period the variation in inflation in Kenya resulting from fiscal factors of development expenditure, recurrent expenditure, total government expenditure, excise duty, import duty, income tax, VAT and total tax was 0%. The influence of development expenditure, recurrent expenditure and total government expenditure on variation in inflation in Kenya increased continuously with increase in forecasting time from the 2^{nd} period at 0.01%, 0.32% and 0.002% up to the 12^{th} period at 1.03%, 2.56% and 3.26% respectively.

The influence of excise duty, import duty, income tax and total tax on variation in inflation in Kenya increased continuously with increase in forecasting time. This was evident from the 2^{nd} period at 0.15% for excise duty, 0.87% for import duty, 1.44% for income tax and 0.95% for total tax up to the 12^{th} period at 1.86%, 9.02%, 6.12% and 4.41% for excise duty, import duty, income tax and total tax respectively. The influence of VAT on variation in inflation declined continuously with increase in forecasting time from 0.84% in the 2^{nd} period to 0.49% in the 12^{th} period. It was also noted that on

aggregate taxation had the greatest influence on inflation as compared to government expenditure corroborating cointegration results.

The findings implied that the fiscal factors of development expenditure, recurrent expenditure, total government expenditure, excise duty, import duty, income tax, VAT and total tax are determinants of inflation in Kenya. The study therefore rejected the null hypothesis of no influence of fiscal factors on inflation in Kenya. This conformed to the findings of Iya and Aminu (2014) who established that government expenditure was a determinant of inflation in Nigeria and Bashir *et al.* (2011) and Rizvi *et al.* (2012) who established that taxes were a determinant of inflation in Pakistan.

4.9.2 Trade Factors and Inflation

The second objective of this study was to determine the influence of trade factors on inflation in Kenya. Tables 4.20 and 4.21 test results indicated that in the first period the variation in inflation in Kenya resulting from trade factors of domestic exports, re-exports, total exports, commercial imports, government imports and total imports was 0%. The influence of re-exports and total exports on variation in inflation in Kenya increased continuously with increase in forecasting time. This was witnessed from the 2nd period at 0.20% and 2.42% up to the 12th period at 0.36% and 8.44% respectively. The influence of domestic exports on variation in inflation declined continuously with increase in forecasting time from 2.85% in the 2nd period to 1.80% in the 12th period.

It was also noted that the influence of commercial imports, government imports and total imports on variation of inflation in Kenya increased continuously with increase in forecasting time. This occurred from the 2nd period at 1.10% for commercial imports,

0.02% for government imports and 0.35% for total imports up to the 12th period at 3.07%, 1.28% and 5.77% for commercial imports, government imports and total imports respectively. On aggregate total exports had the greatest influence on inflation as compared to total imports supporting cointegration results.

This implied that the null hypothesis of no influence of trade factors on inflation in Kenya was rejected. Thus, trade factors of domestic exports, re-exports, total exports, commercial imports, government imports and total imports are determinants of inflation in Kenya. The exports findings were consistent with Olatunji *et al.* (2010) and Venkadasalam (2015) who investigated and established exports as a determinant of inflation in Nigeria and Malaysia respectively. Findings on imports were consistent with Lim and Sek (2015); Joiya and Shahzad (2013) who established that imports determined inflation in Pakistan.

4.9.3 Monetary Factors and Inflation

The third objective of this study was to investigate the influence of monetary factors on inflation in Kenya. It was evident that in the first period the variation in inflation in Kenya resulting from M0, M3 and total money supply as in Tables 4.20 and 4.21 test results was 0%. The influence of M0, M3 and total money supply on inflation variation in Kenya increased continuously with increase in forecasting time. This happened from the 2nd period at 0.01% for M0, 7.39% for M3 and 3.63% for total money supply up to the 12th period at 2.25%, 7.77% and 9.18% for M0, M3 and total money supply respectively.

As depicted in Table 4.21 it was noted that on aggregate money supply had the greatest influence on inflation as compared to fiscal and trade factors. This supported the cointegration results. The findings implied that monetary factors of M0, M3 and total money supply were determinants of inflation in Kenya hence the rejection of the null hypothesis of no influence of monetary factors on inflation in Kenya. This conformed to the findings of Durevall and Sjö (2012) and Kirimi (2014) who established that money supply was a determinant of inflation in Ethiopia and Kenya.

Table 4.20: Variance Decomposition of Inflation- Disaggregate Analysis

Period	S.E.	INFM	CIMP	DEV	DEXP	ED	GIMP	ID	IT	M0	M3	REC	REEXP	VAT
1	0.011508	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.013206	84.79425	1.100997	0.008488	2.851892	0.148669	0.022554	0.871341	1.444314	0.008327	7.394802	0.320364	0.195019	0.838980
3	0.015081	78.36274	2.065510	0.076067	2.264554	0.154356	0.123395	4.914063	3.431636	0.363982	7.197623	0.254503	0.165104	0.646464
4	0.017249	73.64066	2.152909	0.080435	1.750683	0.540982	0.113742	7.592227	6.873878	0.390909	6.021651	0.416904	0.162142	0.542873
5	0.018925	67.45121	2.393456	0.142206	1.489803	0.689225	0.114621	10.81495	7.155723	1.653118	7.003399	0.461759	0.158591	0.491940
6	0.020040	61.86444	2.979450	0.792507	1.378189	1.021978	0.162574	10.75854	6.825013	2.620487	8.725816	2.126898	0.233220	0.510887
7	0.020695	62.49347	3.171435	1.250703	1.309267	0.962084	0.265496	10.13029	6.399854	2.457757	8.381661	2.479192	0.218773	0.480014
8	0.021450	62.81500	2.999514	1.173218	1.316305	1.430972	1.028150	9.456016	6.543710	2.321501	7.861172	2.385232	0.207171	0.462042
9	0.022112	61.98980	2.887700	1.152690	1.333902	1.400416	1.302200	9.404003	6.617100	2.597686	8.051076	2.380852	0.414944	0.467632
10	0.022934	61.68705	2.692710	1.117178	1.580893	1.993388	1.392142	9.705035	6.297882	2.458036	7.758673	2.476284	0.399481	0.441250
11	0.023615	62.65522	2.774747	1.080566	1.492958	1.959875	1.351912	9.553718	6.077331	2.320480	7.378500	2.475657	0.379599	0.499434
12	0.024314	62.36789	3.070705	1.034557	1.804417	1.860379	1.275324	9.021945	6.123065	2.255364	7.771098	2.558349	0.359127	0.497785

Source: Author (2017)

Table 4.21: Variance Decomposition of Inflation- Aggregate Analysis

Period	S.E.	INFM	MS	TEXP	TEXPEN	TIMP	TTAX
1	0.012512	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.013322	92.62957	3.626385	2.418857	0.018595	0.354900	0.951693
3	0.013506	91.42194	3.824496	3.090403	0.343080	0.390869	0.929215
4	0.014120	84.65441	5.346513	5.860365	0.464721	1.473627	2.200366
5	0.014334	84.15639	5.331637	5.940785	0.492257	1.473349	2.605583
6	0.014910	78.08346	8.075448	6.686022	0.559270	4.118306	2.477499
7	0.015497	77.06787	8.134512	6.323398	0.540909	5.275541	2.657765
8	0.016243	73.97253	7.585101	8.231395	2.070859	5.025109	3.115008
9	0.016574	71.09838	9.555567	7.984066	3.283322	4.833807	3.244860
10	0.016760	70.35517	9.514587	7.852601	3.362052	5.473947	3.441639
11	0.017567	69.64649	9.348155	8.612182	3.289328	5.267309	3.836533
12	0.017751	68.93583	9.184346	8.435024	3.264436	5.773395	4.406968

Source: Author (2017)

4.10 Granger Causality Test

4.10.1 Fiscal Factors and Inflation

The first objective of this study was to establish the influence of fiscal factors on inflation in Kenya. Tables 4.22 and 4.23 indicated that there was unidirectional causality from development expenditure to inflation, recurrent expenditure to inflation, total government expenditure to inflation, excise duty to inflation, import duty to inflation, income tax to inflation, VAT to Inflation and total tax to inflation in Kenya at 5% level of significance. This was supported by the VECM results in Appendix IV that showed inflation as an independent variable had no influence on fiscal factors of development expenditure, recurrent expenditure, total expenditure, excise duty, import duty, income tax, VAT and total tax but the fiscal factors as independent variables had significant effect on inflation as shown in Tables 4.7 and 4.8.

The test results implied that the null hypothesis of no causality between fiscal factors and inflation in Kenya was rejected at 5% level of significance. This was an indication that the fiscal factors of government expenditure and taxation were determinants of inflation in Kenya. The findings contradicted Iya and Aminu (2014); Magazzino (2011) for establishing no causality between government expenditure and inflation in Nigeria and Portugal respectively. However, they conformed to Bashir *et al*. (2011) who investigated the determinants of inflation in Pakistan and Magazzino (2011) who assessed the empirical evidence of the nexus between public expenditure and inflation for the Mediterranean countries of Cyprus, Malta and Spain and established unidirectional causality from government expenditure to inflation. The taxation findings were consistent

to the results of Bashir *et al*. (2011) who investigated the determinants of inflation in Pakistan.

4.10.2 Trade Factors and Inflation

The second objective of this study was to determine the influence of trade factors on inflation in Kenya. Tables 4.22 and 4.23 indicated that there was unidirectional causality from domestic exports to inflation, re-exports to inflation, total exports to inflation, commercial imports to inflation, total imports to inflation while there was a bidirectional causality between government imports and inflation in Kenya at 5 % level of significance. The VECM results supported the finding whereby as shown in Appendix IV, inflation as an independent variable had no influence on domestic exports, re-exports, total exports, commercial imports and total imports but the trade factors of domestic exports, re-exports, total exports, commercial imports, government imports and total imports as independent variables had a significant influence on inflation as shown in Tables 4.9 and 4.10. Similarly, inflation as an independent variable had a significant influence on government imports.

The results implied that the null hypothesis of no causality between trade factors and inflation in Kenya was rejected at 5% level of significance an indication that trade factors of exports and imports determined inflation in Kenya. The finding on exports conformed to the results of Venkadasalam (2015) who investigated the determinants of inflation in Malaysia while the findings on imports conformed to Bashir *et al*. (2011) but contradicted Bari (2013) results of no causality in Turkey.

4.10.3 Money Supply and Inflation

The third objective of this study was to investigate the influence of monetary factors on inflation in Kenya. Tables 4.22 and 4.23 indicated that there was no causality from M0 to inflation, unidirectional causality from M3 to inflation and total money supply to inflation in Kenya at 5% level of significance. The VECM results supported the findings whereby in Appendix IV, inflation as an independent variable had an insignificant influence on M0, M3 and total money supply variables but M0, M3 and total money supply as independent variables had a significant influence on inflation as in Tables 4.11 and 4.12 an indication of short run unidirectional causality.

Results implied that the null hypothesis of no causality between monetary factors and inflation in Kenya was rejected at 5% level of significance. Thus, M3 and total money supply cause inflation in Kenya both in the short run and long run but M0 only causes inflation in the short run. This contradicted Venkadasalam (2015) finding of no causality between money supply and inflation in Malaysia but conformed to Iya and Aminu (2014); Kiganda (2014) and Okara (2015) who analyzed the determinants of inflation in Nigeria and Kenya respectively and established a uni-directional causality running from money supply to inflation.

Table 4.22: Granger Causality Results - Disaggregate Analysis

Pair wise Granger Causality Tests Null Hypothesis:	Obs	F-Statistic	Prob.
CIMP does not Granger Cause INFM	125	2.36437*	0.0145
INFM does not Granger Cause CIMP		0.35693	0.9045
DEV does not Granger Cause INFM	125	3.22562*	0.0477
INFM does not Granger Cause DEV		0.12873	0.9925
DEXP does not Granger Cause INFM	125	4.53705*	0.0191
INFM does not Granger Cause DEXP		0.71959	0.6346
ED does not Granger Cause INFM	125	3.15096*	0.0468
INFM does not Granger Cause ED		1.99973	0.0715
GIMP does not Granger Cause INFM	125	3.86615*	0.0222
INFM does not Granger Cause GIMP		2.26506*	0.0422
ID does not Granger Cause INFM	125	3.22994*	0.0361
INFM does not Granger Cause ID		0.28009	0.9453
IT does not Granger Cause INFM	125	3.17470*	0.0332
INFM does not Granger Cause IT		0.09417	0.9968
M0 does not Granger Cause INFM	125	0.13696	0.9912
INFM does not Granger Cause M0		0.57993	0.7457
M3 does not Granger Cause INFM	125	2.99465*	0.0325
INFM does not Granger Cause M3		0.70608	0.6453
REC does not Granger Cause INFM	125	3.14839*	0.0490
INFM does not Granger Cause REC		0.05087	0.9994
REEXP does not Granger Cause INFM	125	4.78984*	0.0297
INFM does not Granger Cause REEXP		1.23518	0.2937
VAT does not Granger Cause INFM	125	3.20871*	0.0334
INFM does not Granger Cause VAT		0.18941	0.9792

Note. * indicate significance at 5% level of significance (Author, 2017)

Table 4.23: Granger Causality Results - Aggregate Analysis

Pair wise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
MS does not Granger Cause INFM	123	4.77623*	0.0207
INFM does not Granger Cause MS		3.59224	0.0603
TEXP does not Granger Cause INFM	123	4.00193*	0.0250
INFM does not Granger Cause TEXP		0.58610	0.4454
TEXPEN does not Granger Cause INFM	123	4.12602*	0.0221
INFM does not Granger Cause TEXPEN		0.08380	0.7727
TIMP does not Granger Cause INFM	123	2.55328*	0.0326
INFM does not Granger Cause TIMP		1.51592	0.2205
TTAX does not Granger Cause INFM	123	4.90372*	0.0115
INFM does not Granger Cause TTAX		0.24729	0.6199

Note. * indicate significance at 5% level of significance (Author, 2017)

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter of the study provides a summary of the findings, conclusions and recommendations in line with the study objectives.

5.2 Summary of Findings

5.2.1 Fiscal Factors and Inflation

The first objective of this study was to establish the influence of fiscal factors on inflation in Kenya based on the null hypothesis of no influence of fiscal factors on inflation in Kenya tested at 5% level of significance. Results indicated a significant negative association between; development expenditure and inflation, recurrent expenditure and inflation, total expenditure and inflation, a significant positive correlation between excise duty, import duty, total tax and inflation, a significant positive association between VAT and inflation and a significant negative association between income tax and inflation in Kenya.

Development expenditure, recurrent expenditure, total government expenditure and income tax had a significant negative long run influence on inflation in Kenya. This indicated that an increase in these fiscal factors causes inflation to decrease in the long run. Excise duty, import duty, VAT and total tax had a significant positive long run influence on inflation. This implies that an increase in these fiscal factors causes inflation to increase in Kenya in the long run. In the short run past values of development

expenditure, recurrent expenditure, total government expenditure and income tax had a significant positive influence on inflation such that an increase in these fiscal factors leads to an increase in inflation in Kenya in the short run. On the other hand, significant negative short run influence was exhibited by the past values of excise duty, import duty, VAT, total tax on inflation whereby a percentage increase in these fiscal factors decreased inflation in Kenya in the short run.

The impulse and variance decomposition analysis indicates that fiscal factors of government expenditure and taxation influenced inflation in Kenya. An increase in the government expenditure and income tax led to a decrease in inflation while an increase in excise duty, import duty, VAT and total tax increased inflation in Kenya. There was also unidirectional causality from the fiscal factors to inflation in Kenya. From these results the study therefore rejected the null hypothesis of no influence of fiscal factors on inflation in Kenya at 5 % level of significance. Increased government expenditure promoted the productive capacity by encouraging investment through increased infrustructural investment. This led to increased supply of goods and services hence lower prices. Increased income tax a direct tax decreased disposable income lowering the purchasing power of citizens. This caused surplus supply hence lower prices. On the other hand, increase in indirect taxes of excise duty, import duty and VAT and increase in total tax increased the cost of production emanating from increased prices of factors of production. This reduced aggregate supply leading to higher prices due to shortage of products in the country.

5.2.2 Trade Factors and Inflation

The second objective of this study was to determine the influence of trade factors on inflation in Kenya anchored on the null hypothesis of no influence of trade factors on inflation in Kenya. Results showed a significant negative association between re-exports and inflation, a significant positive association between domestic exports and inflation, total exports and inflation, a significant negative correlation between commercial imports, total imports and inflation but an insignificant correlation between government imports and inflation in Kenya. Re-exports, commercial imports and total imports had a significant negative long run influence on inflation. This meant that an increase in these trade factors decreases inflation in Kenya in the long run. Domestic exports, total exports and government imports had a significant positive long run influence on inflation in Kenya. Thus, an increase in these trade factors increases inflation in Kenya in the long run.

In the short run, past values of re-exports had a significant positive influence on inflation in Kenya whereby an increase in re-exports increased inflation in Kenya. Past values of domestic exports, total exports, commercial imports, government imports and total imports had a significant negative influence on inflation. This implied that an increase in these trade factors decreased inflation in Kenya in the short run. Impulse and variance decomposition analysis indicated that the trade factors influenced inflation in Kenya where an increase in re-exports, commercial imports and total imports decreased inflation while an increase in domestic exports, total exports and government imports led to an increase in inflation in Kenya. Unidirectional causality was established from domestic exports to inflation, re-exports to inflation, total exports to inflation, commercial imports

to inflation and total imports to inflation in Kenya. However, there was bidirectional causality between government imports and inflation in Kenya.

The findings led to the rejection of the null hypothesis of no influence of trade factors on inflation in Kenya at 5 % level of significance. Higher re-exports increase trade revenue. This causes more investment and increased domestic production with firms enjoying economies of scale which increases aggregate supply causing a reduction in prices. On the other hand, increased domestic exports and total exports created a shortage of food products in the country since the main exports for Kenya are agricultural products. High demand and reduced supply causes prices for products to rise. Increased government imports decreases government income to invest in infrustructure development discouraging investment in some parts of the country thus decreased supply of goods and services that causes prices to increase. On the other hand, increased commercial imports and total imports implied increased imports of capital goods that leads to an increase in production at the domestic level. This increases aggregate supply hence a decline in prices.

5.2.3 Monetary Factors and Inflation

The third objective of this study was to investigate the influence of monetary factors on inflation in Kenya. It was based on the null hypothesis of no influence of monetary factors on inflation in Kenya. Results showed that there was a significant positive correlation between extended broad money (M3), total money supply and inflation but an insignificant negative correlation between currency outside banking system (M0) and inflation in Kenya. Extended broad money and total money supply had a significant

positive long run influence on inflation in Kenya. M0 had no influence on inflation in the long run. Thus, an increase in extended broad money and total money supply increases inflation in Kenya in the long run.

In the short run past values of currency outside the banking system (M0) had a significant positive influence on inflation in Kenya while past values of extended broad money and total money supply had a significant negative influence on inflation in Kenya. An increase in extended broad money and total money supply decreased inflation but currency outside banking system increased inflation in Kenya in the short run. Impulse and variance decomposition analysis indicated that an increase in extended broad money and total money supply led to an increase in inflation. Unidirectional causality was also established from currency outside banking system to inflation, extended broad money to inflation and total money supply to inflation in Kenya. The findings implied that the null hypothesis of no influence of monetary factors on inflation in Kenya was rejected at 5% level of significance. Higher money supply increased funds to invest in the economy which generated more employment. This increased aggregate demand causing price levels to increase.

5.3 Conclusions

The first objective was to establish the influence of fiscal factors on inflation in Kenya. Based on the VAR analysis test results, this study concluded that fiscal factors influence inflation in Kenya. On the disaggregate front it was noted that recurrent expenditure highly influenced total government expenditure's influence on inflation in Kenya. Indirect taxes of excise duty, import duty and VAT highly influenced total tax's influence

on inflation in Kenya. It was also noted that on aggregate taxation had the greatest influence on inflation in Kenya as compared to government expenditure.

The second objective of this study was to determine the influence of trade factors on inflation in Kenya. In conclusion, this study established that trade factors influence inflation in Kenya. Based on disaggregate analysis it was noted that domestic exports highly determined total export's influence on inflation in Kenya. On the other hand, commercial imports determined total imports influence on inflation in Kenya. Based on aggregate analysis, total exports had the greatest influence on inflation as compared to total imports.

The third objective of this study was to investigate the influence of monetary factors on inflation in Kenya. In conclusion the study established that extended broad money and total money supply influenced inflation in Kenya. It was noted that extended broad money highly influenced total money supply's influence on inflation in Kenya. Based on aggregate analysis monetary factors had the greatest influence on inflation as compared to fiscal and trade factors.

5.4 Recommendations

This study based on the results and conclusions indicated that fiscal, trade and monetary factors influenced inflation in Kenya. It is against these empirical findings that the study made the following recommendations. First, there should be concerted efforts by the government of Kenya to regulate inflation by controlling government expenditure. This can be achieved through the formulation and implementation of fiscal policies that curtail unnecessary recurrent expenditure and advocate for increased development expenditures

that will increase overall government expenditure hence reducing inflation in Kenya. This will improve the productive capacity of the economy by encouraging investment hence increased supply of products that will reduce prices.

Secondly, the government of Kenya to adopt a fiscal policy that aims at reducing excise duty, import duty, VAT that constitute indirect taxes and total tax in Kenya. This will lower the prices for various products occasioned by a decrease in production costs due to a fall in the prices of factors of production hence reducing inflation. Similarly to curtail the purchasing power of citizens, government may raise income tax a direct tax for citizens. This will lower demand resulting from reduced disposable income thus causing prices of products to decline. Reduction in total tax is therefore inevitable to reduce production costs for lower prices hence the achievement of low inflation.

Thirdly, the government of Kenya needs to advocate for a trade policy that strikes a balance between the local demand and the output for domestically produced products. This will ensure that only surplus is exported to reduce shortage of domestically produced commodities that may be brought about by curtailing unwarranted exports of domestically produced food products at the expense of local consumers. This will reduce domestic exports and hence a reduction in price for the products. The government should also consider providing incentives like tax rebate for re-exporters to encourage value addition to increase re-exports. This will generate more trade revenues that will be invested in the economy increasing aggregate supply of products hence reduced prices. A reduction in domestic exports and an increase in re-exports will lead to a balance and a reduction in total exports that will reduce inflation in Kenya.

Fourth, the government of Kenya needs to strive to adopt trade and fiscal policies that aim at striving to achieve a balance between exports and imports. This will encourage imports of capital goods to boost production capacity but discourage import of locally produced products to cut the balance of payments deficit which will increase aggregate supply hence a decline in prices. This can be achieved by reducing import duty for capital goods. Similarly, the government needs to reduce its expenditure on imports and redirect to investment in infrastructure development that will encourage investment in some parts of the country thus increasing supply of goods and services that may cause prices to decrease.

Lastly, the Central Bank of Kenya (CBK) needs to focus and target on reducing extended broad money (M3) in its monetary policy objective which will ensure CBK has a grip on controlling money supply and specifically reducing total money supply. This will curtail aggregate demand by reducing funds available to invest in the economy leading to a reduction in inflation in Kenya.

5.5 Research Contribution

The research findings form useful material of knowledge to academia by expanding on existing literature with regard to determinants of inflation from the Kenyan perspective. This includes providing information on how disaggregated components of government expenditure, taxation, exports, imports and money supply affect inflation. Further, the findings provide information to Central Bank of Kenya, treasury economists among other policy makers regarding the most influential factor for determining inflation in Kenya.

This is relevant in identifying which component to target hence adoption of an appropriate economic policy.

5.6 Limitations of the Study

This study although conducted both disaggregated and aggregated analysis, some variables like recurrent expenditure were not fully broken down into their components of wages and salaries, pensions, domestic interest and foreign interest. This made the influence of recurrent expenditure components on inflation to remain unknown.

5.7 Suggestions for Further Research

Given the shortcoming of the study of not breaking down recurrent expenditure into its components, the study therefore recommends that future studies for analyzing the factors influencing inflation in Kenya to consider the variables of wages and salaries, pensions, domestic interest and foreign interest which will generate knowledge on how the respective factors influence inflation in Kenya.

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APPENDICES

Appendix I: Raw Data

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
5-Jan	14,047	25,260	55,557	43,434	138,298	136,735	21,388	158,123	38,204	302	38,506	14,570	5,270	19,840	639,831	59,215	508,512	14.87
5-Feb	15,886	28,901	61,342	48,930	155,059	153,805	24,158	177,963	27,951	929	28,880	15,214	5,319	20,533	639,778	58,312	510,928	13.94
5-Mar	17,533	32,414	69,295	55,620	174,862	176,985	25,268	202,253	35,545	334	35,879	17,773	5,354	23,127	648,545	58,042	517,970	14.15
5-Apr	19,309	36,180	78,792	62,565	196,846	200,333	29,621	229,954	50,508	425	50,933	15,971	5,236	21,207	655,032	59,814	516,724	16.02
5-May	21,010	39,892	87,626	68,247	216,775	225,464	35,328	260,792	37,656	247	37,903	16,846	5,027	21,873	657,471	58,264	518,733	14.78
5-Jun	23,532	44,151	99,255	75,989	242,927	258,078	45,627	303,705	45,877	101	45,977	16,706	5,197	21,903	664,814	59,371	523,716	11.92
5-Jul	987	2,687	6,654	3,826	14,154	21,134	3,533	24,667	31,435	1	31,436	15,026	4,705	19,732	678,922	59,789	530,453	11.76
5-Aug	2,742	6,080	15,462	9,577	33,861	48,367	8,785	57,152	45,559	156	45,715	17,428	3,149	20,577	689,946	59,637	539,203	6.87
5-Sep	4,652	11,369	27,337	14,771	58,129	73,094	13,458	86,552	36,325	46	36,372	17,140	2,830	19,969	688,128	59,369	538,231	4.27
5-Oct	6,322	15,246	35,498	21,362	78,428	101,017	16,821	117,838	36,077	124	36,200	15,542	3,101	18,643	695,778	60,129	548,849	3.72
5-Nov	8,227	20,179	42,620	26,950	97,976	122,137	19,157	141,294	36,446	121	36,567	15,006	3,135	18,141	699,012	63,765	553,550	4.4
5-Dec	9,923	24,937	54,823	33,753	123,436	154,841	23,847	178,688	40,028	99	40,126	16,175	2,013	18,187	706,598	66,361	558,164	4.7
6-Jan	11,731	29,458	62,639	41,172	145,000	179,394	30,397	209,791	39,626	5	39,630	15,526	1,652	17,178	711,393	64,188	560,504	8.39
6-Feb	13,270	33,685	69,270	47,161	163,386	200,511	34,745	235,256	38,424	118	38,542	15,527	2,513	18,040	721,027	63,102	569,590	9.39
6-Mar	15,205	37,886	78,853	54,261	186,205	226,978	41,437	268,415	39,244	1,454	40,698	18,659	2,465	21,124	729,588	64,254	578,706	8.85
6-Apr	16,053	41,208	89,221	60,194	206,676	249,300	44,350	293,650	47,047	228	47,275	15,177	2,732	17,909	747,202	63,572	596,935	5.44
6-May	18,426	45,389	100,030	67,931	231,776	275,472	53,415	328,887	40,376	2,058	42,434	18,926	2,474	21,400	749,017	62,406	595,931	4.47
6-Jun	27,510	56,406	124,855	96,269	305,040	303,570	60,301	363,871	41,769	541	42,310	19,588	2,202	21,789	765,609	67,301	605,238	4.28
6-Jul	2,031	3,769	7,398	7,589	20,787	25,540	372	25,912	39,549	328	39,876	21,016	2,192	23,208	781,978	67,060	619,259	4.16
6-Aug	4,650	8,755	14,810	14,016	42,231	50,533	8,824	59,357	49,136	745	49,881	20,739	2,570	23,309	787,362	68,618	620,994	4.92
6-Sep	6,971	12,768	28,625	19,560	67,924	80,467	13,901	94,368	43,659	510	44,169	20,549	1,006	21,555	796,373	68,763	630,379	5.93
6-Oct	8,954	16,862	35,345	29,267	90,428	109,335	19,034	128,369	46,822	1,065	47,887	19,044	866	19,910	805,440	69,718	640,273	6.55
6-Nov	11,294	21,240	43,019	37,417	112,970	131,618	25,112	157,477	48,436	717	49,152	21,673	1,180	22,852	812,144	72,709	646,844	6.64
6-Dec	13,693	25,374	56,537	44,617	140,221	162,014	32,865	195,625	42,134	2,880	45,014	18,658	968	19,626	821,749	76,479	653,036	7.98

Appendix I: Raw Data Cont…

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
7-Jan	16,071	31,205	65,182	53,015	165,473	182,097	36,409	219,726	47,450	845	48,294	20,101	777	20,878	830,696	73,245	657,262	4.63
7-Feb	18,178	35,139	72,539	59,867	185,723	212,293	41,924	255,437	56,199	718	56,917	21,875	2,341	24,217	836,414	73,500	659,949	3.02
7-Mar	20,514	39,613	82,947	68,899	211,973	242,921	53,094	297,635	45,725	103	45,827	22,601	912	23,513	855,686	76,630	677,349	2.19
7-Apr	23,078	44,926	97,426	78,522	243,952	271,772	57,472	330,864	43,019	570	43,589	19,662	805	20,467	861,658	76,216	682,168	1.85
7-May	25,336	50,336	108,700	87,395	271,767	296,533	65,153	361,686	50,453	1,045	51,499	24,010	1,035	25,044	867,029	77,228	690,543	1.96
7-Jun	27,510	56,406	124,855	96,269	305,040	325,699	81,053	406,752	49,550	651	50,201	22,072	742	22,814	884,354	78,281	708,392	4.07
7-Jul	3,215	5,162	10,060	10,742	29,179	26,542	2,751	29,293	52,029	1,161	53,191	22,673	1,011	23,685	892,612	78,328	713,613	5.48
7-Aug	5,913	10,732	19,686	19,580	55,911	56,214	13,432	69,646	52,407	197	52,604	22,941	950	23,891	911,073	81,131	730,511	5.3
7-Sep	8,587	15,286	34,486	28,835	87,194	78,547	16,275	94,822	47,537	923	48,460	20,259	1,006	21,264	918,184	80,184	733,329	5.53
7-Oct	11,550	20,953	45,811	38,500	116,814	111,587	31,232	142,819	58,902	147	59,049	23,516	1,168	24,684	923,576	80,850	739,663	5.38
7-Nov	14,620	26,998	56,302	48,176	146,096	142,978	45,560	188,538	57,097	635	57,732	24,970	1,104	26,074	935,925	87,358	745,268	6.08
7-Dec	16,734	31,030	71,944	54,489	174,197	170,235	51,723	221,958	37,519	239	37,757	16,940	1,126	18,066	971,628	96,124	777,596	5.7
8-Jan	19,651	37,665	83,880	66,249	207,445	221,665	61,951	283,616	63,748	593	64,341	22,768	986	23,754	992,487	90,671	801,247	9.4
8-Feb	22,497	42,036	92,769	75,003	232,305	245,979	67,992	313,971	57,537	514	58,051	31,277	1,050	32,327	1,001,394	89,186	810,206	10.58
8-Mar	25,650	46,662	105,627	82,964	260,903	283,056	75,538	358,594	53,075	126	53,201	25,655	1,461	27,115	1,005,828	85,098	811,214	11.9
8-Apr	27,846	52,062	123,757	92,085	295,750	313,169	80,757	393,926	54,747	38	54,785	27,893	1,293	29,186	1,051,517	81,205	864,105	16.12
8-May	30,534	57,077	138,685	102,154	328,450	352,344	96,341	448,685	56,239	639	56,877	24,436	1,303	25,740	1,063,994	81,694	839,239	18.61
8-Jun	32,944	61,906	156,832	111,939	363,621	403,368	131,473	534,841	49,757	201	49,957	23,833	1,477	25,310	1,028,559	83,718	840,679	17.87
8-Jul	2,476	5,238	11,384	10,354	29,452	26,200	3,320	29,520	69,724	576	70,300	28,667	1,672	30,339	1,042,250	84,874	850,943	17.12
8-Aug	4,654	10,437	22,118	20,201	57,410	56,412	18,231	74,643	72,070	575	72,645	27,488	2,266	29,753	1,045,564	85,510	854,952	18.33
8-Sep	7,760	15,882	39,782	31,243	94,667	90,486	19,580	110,066	74,274	499	74,773	26,618	1,869	28,488	1,051,221	85,566	859,328	18.73
8-Oct	10,964	21,837	52,024	41,993	126,818	136,686	39,172	175,858	74,673	183	74,856	29,556	2,984	32,540	1,075,560	88,741	883,456	18.74
8-Nov	14,326	26,446	62,803	53,117	156,692	164,443	46,067	210,510	66,984	1,404	68,388	27,434	1,624	29,059	1,082,961	91,454	890,200	19.54
8-Dec	18,052	32,495	84,804	63,846	199,197	205,939	57,006	262,945	66,971	1,597	68,568	27,405	1,938	29,344	1,091,929	93,880	901,055	17.83

Source: Central Bank of Kenya (2016)

Appendix I: Raw Data Cont…

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
9-Jan	21,181	39,019	98,540	74,678	233,418	238,589	62,947	301,536	66,024	153	66,177	26,121	1,239	27,360	1,089,210	91,178	895,397	13.22
9-Feb	24,077	44,781	117,533	84,620	271,011	278,897	80,486	359,383	59,334	1,229	60,563	27,362	1,314	28,676	1,103,408	89,835	900,031	14.69
9-Mar	27,062	50,503	133,603	94,818	305,986	308,614	81,512	390,126	60,724	573	61,297	28,848	2,622	31,470	1,107,951	88,066	906,067	14.6
9-Apr	29,813	57,332	157,873	105,056	350,074	360,139	104,985	465,124	64,497	1,302	65,799	25,207	1,141	26,348	1,135,460	86,689	928,824	12.42
9-May	32,642	63,422	179,117	115,032	390,213	393,500	122,203	515,703	58,612	88	58,700	24,525	1,253	25,778	1,139,468	86,557	928,604	9.61
9-Jun	36,181	69,872	184,447	126,854	417,354	435,421	160,177	595,598	61,889	1,021	62,911	26,871	1,295	28,166	1,166,925	87,465	950,239	8.6
9-Jul	3,316	5,848	11,848	12,398	33,410	57,490	9,393	44,788	62,335	1,403	63,738	28,362	3,171	31,533	1,199,959	89,426	973,623	8.44
9-Aug	6,316	10,850	23,514	23,044	63,724	76,009	21,636	97,645	59,337	431	59,768	24,654	3,393	28,046	1,213,715	89,136	984,036	7.36
9-Sep	9,490	17,273	45,394	34,547	106,704	121,992	39,021	161,013	69,328	34	69,361	27,837	1,240	29,077	1,218,178	87,745	986,901	6.74
9-Oct	12,894	23,731	60,443	44,887	141,955	164,809	45,920	210,729	72,087	272	72,359	26,762	1,582	28,344	1,243,839	94,152	1,006,009	6.62
9-Nov	16,492	29,838	73,066	57,082	176,478	195,449	52,297	247,746	68,240	908	69,148	27,789	2,089	29,879	1,243,607	93,896	1,022,424	5
9-Dec	20,647	37,301	97,049	69,454	224,451	234,848	61,284	296,132	77,951	324	78,275	29,232	1,039	30,271	1,280,467	100,992	1,045,657	5.32
10-Jan	24,029	43,080	111,349	81,309	259,767	282,439	91,807	374,246	69,779	1,420	71,199	28,314	2,288	30,603	1,297,895	95,665	1,067,271	5.95
10-Feb	27,012	48,668	123,131	91,879	290,690	331,722	108,304	440,026	59,156	1,172	60,328	31,171	2,184	33,355	1,311,288	95,841	1,084,345	5.18
10-Mar	30,499	54,375	140,282	104,723	329,879	381,890	121,194	503,084	75,104	130	75,233	33,176	1,568	34,744	1,350,169	96,500	1,107,896	3.97
10-Apr	34,017	60,951	164,615	116,820	376,403	412,625	152,487	565,112	71,854	253	72,107	28,702	2,568	31,269	1,364,563	99,067	1,122,790	3.66
10-May	37,396	67,745	182,052	128,187	415,380	468,911	175,633	644,544	80,122	194	80,317	31,329	1,913	33,242	1,404,538	98,222	1,159,595	3.88
10-Jun	41,372	74,644	216,760	146,792	479,568	536,345	255,398	791,793	77,953	1,255	79,208	31,756	1,283	33,039	1,443,404	101,421	1,198,930	3.49
10-Jul	2,821	5,889	13,219	11,916	33,845	35,759	174	35,933	79,136	1,430	80,566	33,175	1,661	34,835	1,475,225	104,383	1,213,212	3.57
10-Aug	6,273	12,065	27,193	24,513	70,044	85,420	26,364	111,784	72,423	594	73,016	28,735	1,575	30,310	1,497,269	103,892	1,216,829	3.22
10-Sep	10,323	18,968	51,972	38,207	119,470	123,722	39,741	163,463	87,230	1,410	88,641	32,578	2,466	35,044	1,527,381	104,818	1,243,601	3.21
10-Oct	14,402	25,565	69,453	53,228	162,648	180,932	62,550	243,482	79,515	3,167	82,682	29,902	2,350	32,252	1,537,805	111,885	1,254,488	3.18
10-Nov	18,647	32,331	84,560	67,487	203,025	223,992	79,574	303,566	101,975	750	102,725	36,092	3,190	39,282	1,553,605	112,970	1,258,812	3.84
10-Dec	22,699	39,516	114,188	81,576	257,979	275,056	93,937	363,299	92,661	750	93,412	38,370	1,857	40,227	1,569,566	123,027	1,271,638	4.51

Appendix I: Raw Data Cont…

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
11-Jan	26,830	47,177	130,250	98,612	302,869	320,202	113,900	434,102	90,058	469	90,528	33,792	1,665	35,458	1,589,266	112,910	1,285,452	5.42
11-Feb	29,881	54,186	144,295	111,427	339,789	355,502	133,862	489,364	85,089	469	85,558	36,561	2,223	38,784	1,612,061	112,568	1,306,395	6.54
11-Mar	34,032	60,879	164,961	125,497	385,369	401,008	154,676	555,684	109,191	542	109,733	41,341	2,535	43,876	1,637,357	114,376	1,324,685	9.19
11-Apr	37,105	66,528	195,385	139,887	438,905	460,563	168,499	631,061	85,537	1,451	86,988	37,537	1,881	39,417	1,649,312	117,916	1,334,898	12.05
11-May	41,112	73,371	221,026	154,226	489,735	498,267	188,283	687,625	115,375	1,455	116,830	38,835	1,940	40,775	1,671,644	115,215	1,351,392	12.95
11-Jun	46,072	80,567	258,651	171,881	557,171	582,523	234,566	817,089	103,682	623	104,305	41,374	2,441	43,814	1,720,572	119,060	1,380,732	14.48
11-Jul	3,248	5,104	14,653	13,748	36,753	38,404	5,315	43,719	100,558	2,340	102,898	40,924	3,742	44,666	1,743,306	124,422	1,412,702	15.53
11-Aug	7,888	11,159	31,470	27,934	78,451	78,401	17,480	95,881	135,429	694	136,123	44,038	2,232	46,271	1,771,954	124,358	1,436,877	16.67
11-Sep	12,426	17,760	63,008	42,711	135,905	136,475	43,150	179,625	120,334	3,367	123,701	43,480	2,777	46,258	1,808,533	123,872	1,484,198	17.32
11-Oct	16,356	22,853	84,523	55,660	179,392	188,570	59,731	248,301	114,725	1,012	115,738	43,246	2,023	45,269	1,863,885	129,990	1,513,656	18.91
11-Nov	20,513	30,073	103,651	70,910	225,147	243,685	76,384	320,069	122,945	3,372	126,317	42,450	2,080	44,529	1,837,681	131,338	1,489,751	19.72
11-Dec	25,055	37,011	141,448	86,161	289,675	315,933	114,993	430,926	115,286	1,651	116,937	39,364	2,556	41,920	1,854,928	137,103	1,514,152	18.93
12-Jan	28,585	44,380	159,089	100,782	332,835	371,865	137,336	509,200	99,412	2,247	101,659	40,476	1,889	42,365	1,864,439	127,612	1,505,764	18.31
12-Feb	32,455	50,627	178,098	114,489	375,669	426,035	160,518	586,551	96,733	5,328	102,062	41,744	2,336	44,081	1,901,276	126,672	1,504,776	16.69
12-Mar	36,587	57,999	203,053	128,633	426,272	479,430	190,752	670,182	121,112	3,510	124,622	41,434	2,929	43,770	1,917,160	129,410	1,517,126	15.61
12-Apr	40,539	64,504	240,871	142,939	488,853	545,816	202,878	748,694	101,726	1,039	102,765	35,938	4,101	38,275	1,920,469	127,438	1,536,287	13.06
12-May	45,558	71,926	268,833	157,690	544,007	594,653	231,574	826,227	126,409	2,367	128,776	39,383	2,984	42,367	1,942,809	127,429	1,561,573	12.22
12-Jun	51,712	78,884	312,463	183,386	626,445	639,069	276,819	915,888	111,563	495	112,058	38,826	2,438	41,264	1,971,120	127,047	1,595,059	10.05
12-Jul	3,974	5,625	17,973	12,822	40,395	40,144	9,889	50,032	122,104	1,311	123,414	40,374	2,527	42,902	1,992,159	128,636	1,613,069	7.74
12-Aug	8,933	11,459	41,991	27,186	89,569	107,864	38,321	146,185	115,247	856	116,102	40,367	3,517	43,884	2,022,661	131,612	1,638,708	6.09
12-Sep	13,138	18,301	78,107	41,516	151,062	168,072	64,220	232,292	106,662	806	107,468	39,396	2,431	41,827	2,061,649	130,689	1,671,318	5.32
12-Oct	18,528	26,308	103,101	53,056	200,992	227,765	80,695	308,459	110,148	777	110,925	43,340	5,204	48,544	2,097,748	135,073	1,703,001	4.14
12-Nov	23,489	33,209	126,569	72,556	255,823	303,129	99,938	403,067	128,910	985	129,895	42,225	3,832	46,058	2,137,718	141,548	1,740,657	3.25
12-Dec	28,213	40,532	168,398	87,566	324,709	385,482	120,930	506,412	114,645	2,413	117,058	36,202	3,950	40,152	2,130,549	147,893	1,727,686	3.2

Source: Central Bank of Kenya (2016)

Appendix I: Raw Data Cont…

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
13-Jan	33,537	49,387	192,827	105,042	380,793	438,387	151,162	589,549	130,275	490	130,765	42,971	4,146	47,116	2,132,657	142,257	1,729,897	3.67
13-Feb	37,906	56,523	214,701	119,700	428,830	501,040	159,151	660,191	115,739	679	116,418	43,146	3,556	46,702	2,151,136	149,001	1,747,890	4.45
13-Mar	42,459	63,088	243,592	134,455	483,594	576,416	197,661	774,077	108,095	721	108,816	38,155	2,362	40,517	2,180,650	150,135	1,755,742	4.11
13-Apr	47,145	69,984	290,336	189,158	596,623	660,002	218,170	878,172	118,200	464	118,664	38,775	3,813	42,588	2,239,916	144,738	1,802,280	4.14
13-May	52,380	77,496	326,853	168,795	625,524	737,470	248,052	985,521	113,552	149	113,702	39,825	3,814	43,639	2,273,120	146,385	1,823,398	4.05
13-Jun	61,484	91,810	370,600	216,000	739,894	819,651	443,721	1,263,372	96,796	265	97,061	35,871	2,773	38,644	2,278,286	148,113	1,820,879	4.91
13-Jul	6,701	7,947	25,209	15,257	55,113	49,751	175.35	49,926	123,976	232	124,207	39,455	2,071	41,527	2,310,734	148,556	1,835,803	6.03
13-Aug	16,071	18,250	52,563	34,215	121,100	121,313	7,281	128,594	117,052	2,592	119,644	36,006	4,805	40,811	2,341,820	152,276	1,849,974	6.67
13-Sep	23,326	29,002	98,914	51,549	202,790	193,419	38,125	231,545	111,802	515	112,318	36,221	5,080	41,301	2,405,817	146,438	1,885,780	8.29
13-Oct	31,775	31,871	131,457	71,974	267,076	260,342	59,078	319,420	131,791	415	132,206	36,428	2,818	39,247	2,428,776	153,716	1,900,194	7.76
13-Nov	39,722	40,836	159,185	91,187	330,930	319,999	86,160	406,160	113,451	2,574	116,025	37,360	6,941	44,301	2,480,134	160,441	1,953,621	7.36
13-Dec	47,493	48,050	210,699	110,723	416,966	379,422	110,801	490,223	117,988	994	118,982	35,852	4,456	40,308	2,523,227	163,359	1,996,241	7.15
14-Jan	55,873	57,045	239,412	132,020	484,350	456,061	124,806	580,867	128,942	1,174	130,116	37,962	5,100	43,062	2,558,555	157,400	2,026,568	7.21
14-Feb	62,548	64,686	264,211	149,385	540,830	495,884	158,806	654,690	106,449	623	107,072	36,432	6,216	42,648	2,560,076	156,469	2,030,488	6.86
14-Mar	69,518	72,452	298,242	168,100	608,312	545,445	172,085	717,530	107,895	96	107,990	41,012	7,820	48,833	2,592,542	156,905	2,060,313	6.27
14-Apr	76,878	81,086	351,630	188,092	697,686	606,173	209,479	815,652	138,498	786	139,285	38,746	10,249	48,995	2,650,157	156,967	2,100,610	6.41
14-May	84,512	90,420	389,249	210,202	774,383	681,807	237,985	919,792	149,691	786	150,478	38,873	8,993	47,866	2,701,272	159,889	2,147,479	7.3
14-Jun	67,555	102,029	449,590	232,630	851,804	989,883	291,280	1,281,163	112,904	786	113,690	37,854	6,307	44,160	2,718,338	158,334	2,152,132	7.39
14-Jul	4,564	7,615	31,331	17,885	61,395	47,130	2,460	49,590	148,475	265	148,740	34,911	8,090	43,001	2,812,444	161,323	2,190,076	7.67
14-Aug	10,180	14,894	62,135	37,505	124,714	129,121	11,949	141,070	142,777	1,186	143,962	39,842	4,120	43,962	2,880,190	164,247	2,253,316	8.36
14-Sep	16,633	24,673	116,250	58,708	216,264	228,016	33,100	261,116	155,766	4,170	159,936	37,836	2,637	40,473	2,871,152	158,024	2,251,762	6.6
14-Oct	22,466	37,500	150,356	80,398	290,720	300,272	73,236	373,508	155,776	1,626	157,402	37,499	6,641	44,140	2,880,013	163,393	2,260,023	6.43
14-Nov	28,172	47,378	180,321	101,527	357,398	372,356	117,740	490,097	121,006	594	121,600	36,720	6,173	42,893	2,923,816	167,213	2,295,147	6.09
14-Dec	35,092	56,506	239,202	122,888	453,687	467,469	146,496	613,965	132,128	6,055	138,183	36,841	4,316	41,157	2,949,057	173,505	2,329,979	6.02

Source: Central Bank of Kenya (2016)

Appendix I: Raw Data Cont…

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
15-Jan	41,882	66,833	272,458	147,620	528,793	567,975	196,861	764,836	125,669	1,978	127,647	36,364	4,799	41,163	2,983,725	170,292	2,350,802	5.53
15-Feb	47,364	74,537	303,066	166,771	591,738	651,298	212,886	864,184	111,779	1,364	113,143	38,215	4,431	42,646	3,032,404	171,884	2,407,825	5.61
15-Mar	53,242	83,762	342,207	187,640	666,851	757,722	375,413	1,133,135	113,843	1,020	114,862	40,647	7,060	47,707	3,034,642	171,578	2,398,762	6.31
15-Apr	59,202	94,354	398,095	210,855	762,506	865,241	399,084	1,264,325	128,446	1,396	129,842	34,361	5,520	39,881	3,098,440	174,323	2,464,482	7.08
15-May	65,321	104,866	442,490	233,155	845,831	927,559	420,084	1,347,643	141,484	2,556	144,039	37,821	8,145	45,966	3,140,021	175,396	2,501,589	6.87
15-Jun	74,048	115,872	508,581	259,685	958,186	1,075,644	511,822	1,587,466	126,495	1,673	128,168	41,681	5,848	47,530	3,196,867	175,483	2,552,995	7.03
15-Jul	5,853	9,416	36,490	21,898	73,656	51,827	5,156	56,983	136,354	7,799	144,153	50,412	8,993	59,405	3,234,067	181,537	2,548,981	6.62
15-Aug	12,676	19,812	69,280	44,334	146,102	129,545	29,773	159,317	123,673	2,023	125,696	46,849	8,226	55,075	3,252,042	179,527	2,569,877	5.84
15-Sep	19,422	30,104	126,754	69,409	245,689	212,983	41,219	254,202	134,441	4,302	138,743	42,334	7,607	49,941	3,231,613	175,119	2,556,048	5.97
15-Oct	26,231	41,111	162,203	91,825	321,369	339,200	57,472	396,673	124,617	2,027	126,644	46,378	5,753	52,131	3,271,394	182,034	2,567,353	6.72
15-Nov	32,734	51,809	197,437	115,133	397,113	450,391	159,565	609,956	159,671	3,271	162,942	40,490	8,168	48,658	3,320,364	182,620	2,593,050	7.32
15-Dec	39,170	64,705	262,184	138,036	504,095	576,153	193,029	769,182	119,361	5,089	124,451	42,723	8,175	50,898	3,383,958	191,251	2,650,182	8.01

Source: Central Bank of Kenya (2016)

KEY

INFM: Inflation **(%)**, **DEV**: Development expenditure **(000,000)**, **REC**: Recurrent expenditure **(000,000)**, **TEXPEN**: Total government expenditure **(000,000)**, **DEXP**: Domestic exports **(000,000)**, **REEXP**: Re-exports **(000,000)**, **TEXP**: Total exports **(000,000)**, **ED**: Excise duty **(000,000)**, **ID**: Import duty **(000,000)**, **IT**: Income tax **(000,000)**, **VAT**: Value Added Tax **(000,000)**, **TTAX**: Total tax **(000,000)**, **CIMP**: Commercial imports **(000,000)**, **GIMP**: Government imports **(000,000)**, **TIMP**: Total imports **(000,000) (000,000)**, **M0**: Currency outside the banking system **(000,000)**, **M3**: Extended broad money **(000,000)**, **MS**: Total money supply**(000,000)**

Appendix II: Stationarity Test Results

Unit Root Test Results for Disaggregated Components

Variable			ADF – Coeff	PP- Coeff	KPSS- Coeff	ADF P-value	PP P-value	KPSS- P-value	Inference
	Level	Intercept	-0.064353	-0.049284	0.084708	0.0633	0.0735	0.0000	-
		None	-0.017508	-0.016741	-	0.1329	0.1859	-	-
		I & T	-0.064277*	-0.047982	0.095074	0.0068	0.0632	0.0000	-
INFM									
	1st diff	Intercept	-0.580570*	-0.580570*	-0.000524*	0.0000	0.0000	0.6723	I(1)
		None	-0.579952*	-0.579952*	-	0.0000	0.0000	-	I(1)
		I & T	-	-0.581951*	-0.001905*	-	0.0000	0.4459	I(1)
	Level	Intercept	-2.025019*	-1.515333*	0.021624*	0.0000	0.0000	0.1398	I(0)
		None	-1.877070*	-1.486506*	-	0.0000	0.0000	-	I(0)
		I & T	-2.036869*	-1.516353*	0.033222*	0.0000	0.0000	0.2546	I(0)
CIMP									
	1st diff	Intercept	-3.132006*	-	31.45277*	0.0000	-	0.5543	I(1)
		None	-	-	-	-	-	-	-
		I & T	-3.984571*	-	-	0.0000	-	-	I(1)

Source: Author (2017), Note. * Implies stationary at 5% level of significance (p-value< 0.05 for ADF & PP and p-value > 0.05 for KPSS), I (0) indicate stationary at level and I (1) indicate integrated of order 1.

Unit Root Test Results for Disaggregated Components Cont…

Variable			ADF – Coeff	PP- Coeff	KPSS- Coeff	ADF P-value	PP P-value	KPSS- P-value	Inference
DEV	Level	Intercept	-0.373756*	-0.373756*	96214.44	0.0000	0.0000	0.0000	-
		None	-0.157703*	-0.182200*	-	0.0044	0.0006	-	I(0)
		I & T	-0.518914*	-0.518914*	8045.397*	0.0000	0.0000	0.5739	I(0)
	1st diff	Intercept	-	-	1310.237*	-	-	0.8585	I(1)
		None	-	-	-	-	-	-	-
		I & T	-	-	-	-	-	-	-
DEXP	Level	Intercept	-0.042877	-0.059909	30950.86	0.1162	0.4791	0.0000	-
		None	0.005279	0.001504	-	0.4938	0.8558	-	-
		I & T	-0.230951	-0.323051*	16463.23	0.0648	0.0000	0.0000	-
	1st diff	Intercept	-1.945852*	-1.397365*	214.9084*	0.0000	0.0000	0.4193	I(1)
		None	-1.914452*	-1.391080*	-	0.0000	0.0000	-	I(1)
		I & T	-1.947121*	-	322.0755*	0.0000	-	0.5486	I(1)

Source: Author (2017), Note. * Implies stationary at 5% level of significance (p-value< 0.05 for ADF & PP and p-value > 0.05 for KPSS), I (0) indicate stationary at level and I (1) indicate integrated of order 1.

Unit Root Test Results for Disaggregated Components Cont…

Variable			ADF – Coeff	PP- Coeff	KPSS- Coeff	ADF P-value	PP P-value	KPSS- P-value	Inference
ED	Level	Intercept	-0.398006*	-0.398006*	40449.42	0.0000	0.0000	0.0000	-
		None	-0.102831*	-0.102831*	-	0.0111	0.0344	-	I(0)
		I & T	-0.554556*	-0.474546*	23380.13	0.0000	0.0000	0.0000	-
	1st diff	Intercept	-	-	301.1069*			0.8764	I(1)
		None	-	-	-	-	-	-	-
		I & T	-	-	90.29055*	-	-	0.9816	I(1)
GIMP	Level	Intercept	-0.119541	-0.678031*	1138.561	0.4049	0.0000	0.0000	-
		None	0.160797*	-0.356122*	-	0.0254	0.0000	-	I(0)
		I & T	-0.363586	-0.864877*	130.2698*	0.6236	0.0000	0.5051	-
	1st diff	Intercept	-3.822876*	-	36.54198*	0.0000	-	0.7756	I(1)
		None	-	-	-	-	-	-	-
		I & T	-3.882480*	-	-	0.0000	-	-	I(1)

Source: Author (2017), Note. * Implies stationary at 5% level of significance (p-value< 0.05 for ADF & PP and p-value > 0.05 for KPSS), I (0) indicate stationary at level and I (1) indicate integrated of order 1.

Unit Root Test Results for Disaggregated Components Cont…

Variable			ADF – Coeff	PP- Coeff	KPSS- Coeff	ADF P-value	PP P-value	KPSS- P-value	Inference
ID	Level	Intercept	-0.288686*	-0.288686*	24966.54	0.0000	0.0000	0.0000	-
		None	-0.091951*	-0.091951	-	0.0165	0.0519	-	-
		I & T	-0.482357*	-0.408524*	8512.708	0.0000	0.0010	0.0013	-
	1st diff	Intercept	-	-	191.7786*	-	-	0.8713	I(1)
		None	-	-1.062702*	-	-	0.0000	-	I(1)
		I & T	-	-	115.4173*	-	-	0.9615	I(1)
IT	Level	Intercept	-0.304558*	-0.304558*	130700.3	0.0000	0.0000	0.0000	-
		None	-0.112441*	-0.112441*	-	0.0085	0.0245	-	I(0)
		I & T	-0.559240*	-0.477601*	22613.03*	0.0000	0.0000	0.1238	I(0)
	1st diff	Intercept	-	-	1577.305*	-	-	0.8269	I(1)
		None	-	-	-	-	-	-	-
		I & T	-	-	-	-	-	-	-

Source: Author (2017), Note. * Implies stationary at 5% level of significance (p-value< 0.05 for ADF & PP and p-value > 0.05 for KPSS), I (0) indicate stationary at level and I (1) indicate integrated of order 1.

Unit Root Test Results for Disaggregated Components Cont…

Variable			ADF – Coeff	PP- Coeff	KPSS- Coeff	ADF P-value	PP P-value	KPSS- P-value	Inference
M0	Level	Intercept	0.006779	0.005138	111954.9	0.4160	0.5361	0.0000	-
		None	0.010405	0.008653	-	1.0000	1.0000	-	-
		I & T	-0.129750	-0.148447	47527.87	0.2869	0.1085	0.0000	-
	1st diff	Intercept	-1.185765*	-1.185765*	1007.908*	0.0000	0.0000	0.0615	I(1)
		None	-1.098522*	-1.098522*	-	0.0000	0.0000	-	I(1)
		I & T	-1.193876*	-1.193876*	390.3971*	0.0000	0.0000	0.5320	I(1)
M3	Level	Intercept	0.011040	0.011040	1307907	1.0000	1.0000	0.0000	-
		None	0.012304	0.012304	-	1.0000	1.0000	-	-
		I & T	-0.006731	-0.006731	239126.6	0.5285	0.5285	0.0000	-
	1st diff	Intercept	-0.740337*	-0.885947*	16348.63*	0.0000	0.0000	0.4193	I(1)
		None	-0.254944*	-0.443759*	-	0.0018	0.0000	-	I(1)
		I & T	-1.076969*	-1.076969*	3724.970*	0.0000	0.0000	0.1694	I(1)

Source: Author (2017), Note. * Implies stationary at 5% level of significance (p-value< 0.05 for ADF & PP and p-value > 0.05 for KPSS), I (0) indicate stationary at level and I (1) indicate integrated of order 1.

Unit Root Test Results for Disaggregated Components Cont…

Variable			ADF – Coeff	PP- Coeff	KPSS- Coeff	ADF P-value	PP P-value	KPSS- P-value	Inference
REC	Level	Intercept	-0.357984*	-0.357984*	298330.9	0.0000	0.0000	0.0000	-
		None	-0.116869*	-0.116869*	-	0.0072	0.0211	-	I(0)
		I & T	-0.567177*	-0.500380*	99598.81	0.0000	0.0000	0.0022	-
	1st diff	Intercept	-	-	3354.336*	-	-	0.8355	I(1)
		None	-	-	-	-	-	-	-
		I & T	-	-	651.7192*	-	-	0.9841	I(1)
REEXP	Level	Intercept	-0.091086	-0.157404	3216.606	0.0739	0.0927	0.0000	-
		None	-0.018935	-0.043077	-	0.4870	0.1317	-	-
		I & T	-0.206433	-0.270811*	1073.990	0.0598	0.0000	0.0006	-
	1st diff	Intercept	-1.755380*	-1.397980*	22.17557*	0.0000	0.0000	0.8394	I(1)
		None	-1.754442*	-1.397540*	-	0.0000	0.0000	-	I(1)
		I & T	-1.783890*	-	-140.8701*	0.0000	-	0.5228	I(1)
VAT	Level	Intercept	0.068888	-0.351721*	82454.95	1.0000	0.0000	0.0000	-
		None	-0.105660*	-0.105660*	-	0.0102	0.0316	-	-
		I & T	-0.550445*	-0.483581*	32123.49	0.0000	0.0000	0.0002	-
	1st diff	Intercept	-1.137811*	-	722.1527*	0.0000	-	0.8614	I(1)
		None	-	-	-	-	-	-	I(1)
		I & T	-	-	337.0792*	-	-	0.9678	I(1)

Source: Author (2017), Note. * Implies stationary at 5% level of significance (p-value< 0.05 for ADF & PP and p-value > 0.05 for KPSS), I (0) indicate stationary at level and I (1) indicate integrated of order 1.

Unit Root Test Results for Aggregated Components

Variable			ADF – Coeff	PP- Coeff	KPSS- Coeff	ADF P-value	PP P-value	KPSS- P-value	Inference
MS	Level	Intercept	0.012302	0.012302	1634344	1.0000	1.0000	0.0000	-
		None	0.012802	0.012802	-	1.0000	1.0000	-	-
		I & T	-0.000633	-0.000633	282709.0	0.9399	0.9399	0.0000	-
	1st diff	Intercept	-0.738952*	-0.738952*	489.5923*	0.0000	0.0000	0.8148	I(1)
		None	-0.225440*	-0.332531*	-	0.0023	0.0000	-	I(1)
		I & T	-1.166692*	-0.994628*	3389.109*	0.0000	0.0000	0.2571	I(1)
TEXP	Level	Intercept	-0.030957	-0.050428	34149.64	0.2577	0.0779	0.0000	-
		None	0.006075	0.002191	-	0.4362	0.7915	-	-
		I & T	-0.427441*	-0.340597*	17536.41	0.0000	0.0000	0.0000	-
	1st diff	Intercept	-1.829700*	-1.379010*	237.0840*	0.0000	0.0000	0.4203	I(1)
		None	-1.803032*	-1.372771*	-	0.0000	0.0000	-	I(1)
		I & T	-	-	180.3760*	-	-	0.7612	I(1)
TEXPEN	Level	Intercept	-0.359939*	-0.359939*	394412.8	0.0000	0.0000	0.0000	-
		None	-0.131427*	-0.131427*	-	0.0041	0.0041	-	I(0)
		I & T	-0.505168*	-0.505168*	107524.5	0.0000	0.0000	0.0201	-
	1st diff	Intercept	-	-	4664.573*	-	-	0.8409	I(1)
		None	-	-	-	-	-	-	-
		I & T	-	-	1444.500*	-	-	0.9754	I(1)

Source: Author (2017), Note. * Implies stationary at 5% level of significance (p-value< 0.05 for ADF & PP and p-value > 0.05 for KPSS), I (0) indicate stationary at level and I (1) indicate integrated of order 1.

Unit Root Test Results for Aggregated Components Cont…

Variable			ADF – Coeff	PP- Coeff	KPSS- Coeff	ADF P-value	PP P-value	KPSS- P-value	Inference
TIMP	Level	Intercept	-0.036129	-0.075997	86445.50	0.2169	0.4691	0.0000	-
		None	0.007536	-0.004815	-	0.4979	0.7111	-	-
		I & T	-0.482303*	-0.700844*	27875.85	0.0008	0.0000	0.0000	-
	1st diff	Intercept	-2.090951*	-1.563872*	656.0687*	0.0000	0.0000	0.5887	I(1)
		None	-2.057124*	-1.557127*	-	0.0000	0.0000	-	I(1)
		I & T	-	-	887.0648*	-	-	0.7172	I(1)
TTAX	Level	Intercept	-0.328990*	-0.328990*	278571.2	0.0000	0.0000	0.0000	-
		None	-0.106705*	-0.106705*	-	0.0101	0.0318	-	I(0)
		I & T	-0.555482*	-0.476117*	86629.41	0.0000	0.0000	0.0035	-
	1st diff	Intercept	-	-	2792.344*	-	-	0.8459	I(1)
		None	-	-	-	-	-	-	-
		I & T	-	-	810.0038*	-	-	0.9777	I(1)

Source: Author (2017), Note. * Implies stationary at 5% level of significance (p-value< 0.05 for ADF & PP and p-value > 0.05 for KPSS), I (0) indicate stationary at level and I (1) indicate integrated of order 1.

Appendix III: Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace) - Disaggregate

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None	0.867312	1257.093	NA	NA
At most 1 *	0.795037	1006.643	334.9837	0.0000
At most 2	0.741401	810.1123	885.1425	0.0612
At most 3	0.725845	642.4053	739.2354	0.3405
At most 4	0.648519	481.9419	897.3709	0.7122

*Source: Author (2017). Trace test indicates 1cointegrating eqn (s) at 0.05 level, * denotes rejection of null hypothesis at the 0.05 level and* ** MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue) - Disaggregate

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.867312	250.4494	NA	NA
At most 1 *	0.795037	196.5310	76.57843	0.0000
At most 2	0.741401	167.7070	170.53513	0.0832
At most 3	0.725845	160.4634	264.50472	0.7142
At most 4	0.648519	129.6543	158.43354	0.0623

*Source: Author (2017). Max-eigenvalue test indicates 1cointegrating eqn (s) at 0.05 level, * denotes rejection of null hypothesis at the 0.05 level and* ** MacKinnon-Haug-Michelis (1999) p-values

Cointegration Rank Test (Trace) Results for Aggregate Analysis

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.595716	424.6110	95.75366	0.0001
At most 1 *	0.514713	314.1233	69.81889	0.0001
At most 2 *	0.496331	225.9155	47.85613	0.0001
At most 3 *	0.415005	142.2434	29.79707	0.0001
At most 4 *	0.338274	76.83298	15.49471	0.0000
At most 5 *	0.194969	26.45864	3.841466	0.0000

*Source: Author (2017). Trace test indicates 6cointegrating eqn (s) at 0.05 level, * denotes rejection of null hypothesis at the 0.05 level and* ** MacKinnon-Haug-Michelis (1999) p-values, *included 122 observation after adjustment.*

Cointegration Rank Test (Maximum Eigenvalue) Results for Aggregate Analysis

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.595716	110.4877	40.07757	0.0000
At most 1 *	0.514713	88.20788	33.87687	0.0000
At most 2 *	0.496331	83.67205	27.58434	0.0000
At most 3 *	0.415005	65.41044	21.13162	0.0000
At most 4 *	0.338274	50.37434	14.26460	0.0000
At most 5 *	0.194969	26.45864	3.841466	0.0000

*Source: Author (2017). Max-eigenvalue test indicates 6 cointegrating eqn (s) at 0.05 level, * denotes rejection of null hypothesis at the 0.05 level and ***
MacKinnon-Haug-Michelis (1999) p-values, *Sample 130, included 122 observation after adjustment.*

Appendix IV: Vector Error Correction Mechanism – Disaggregate Analysis

Variable:	D(INFM)	D(CIMP)	D(DEV)	D(DEXP)	D(ED)	D(GIMP)	D(ID)	D(IT)	D(M0)	D(M3)	D(REC)	D(REEXP)	D(VAT)
Error Correction Term	-0.323787*	-0.137252	-2.401716	1.161363	-0.586080*	3.140693	4.068420	3.548871	0.078138	0.098121	3.517478	-0.561591*	3.960476
	(0.07356)	(0.78519)	(1.26202)	(0.54208)	(0.11554)	(0.49223)	(1.88970)	(1.90470)	(0.17334)	(0.09884)	(2.09096)	(0.263936)	(1.74855)
	[-4.40172]	[-0.17480]	[-1.90308]	[2.14243]	[-5.07253]	[6.38049]	[2.15295]	[1.86322]	[0.45076]	[0.99272]	[1.68223]	[-2.12775]	[2.26501]
D(INFM(-1))	-0.487202	2.367915	-1.018224	-2.977074	-4.348245	-4.557083*	8.830893	9.968868	-1.015044	-0.771922	14.61847	17.48619	12.58961
	(0.31034)	(3.31270)	(5.32439)	(2.28700)	(4.87477)	(2.07671)	(7.97256)	(8.03585)	(0.73133)	(0.41700)	(8.82167)	(11.1353)	(7.37706)
	[-1.56988]	[0.71480]	[-0.19124]	[-1.30174]	[-0.89199]	[-2.19437]	[1.10766]	[1.24055]	[-1.38793]	[-1.85112]	[1.65711]	[1.57033]	[1.70659]
D(INFM(-2))	-0.570279	-6.302856	2.569569	-2.737920	-5.697558	-7.094291*	7.359038	6.412989	1.756624	-0.660507	12.64699	8.629823	3.846539
	(0.30635)	(3.27008)	(5.25589)	(2.25758)	(4.81206)	(2.05000)	(7.86999)	(7.93248)	(1.72193)	(0.41164)	(8.70818)	(10.9921)	(7.28215)
	[-1.86152]	[-1.92743]	[0.48889]	[-1.21277]	[-1.18402]	[-3.46063]	[0.93508]	[0.80845]	[1.02015]	[-1.60458]	[1.45231]	[0.78509]	[0.52821]
D(INFM(-3))	-0.308896	-3.168942	-2.155043	3.186524	-0.442365	-7.838513*	-6.020148	-4.456502	-0.555934	-0.165669	-1.198927	-2.200832	-3.564276
	(0.27846)	(2.97235)	(4.77736)	(2.05203)	(4.37394)	(1.86335)	(7.15346)	(7.21025)	(0.65620)	(0.37416)	(7.91533)	(9.99128)	(6.61914)
	[-1.10931]	[-1.06614]	[-0.45109]	[1.55286]	[-0.10114]	[-4.20667]	[-0.84157]	[-0.61808]	[-0.84721]	[-0.44278]	[-0.15147]	[-0.22028]	[-0.53848]
D(INFM(-4))	0.081511	-4.023527	3.072913	-1.546658	4.134057	-3.610061	2.225121	7.097987	0.747680	0.118799	12.70637	7.867387	8.196104
	(0.31208)	(3.33125)	(5.35422)	(2.29981)	(4.90208)	(2.08835)	(8.01722)	(8.08087)	(0.73543)	(0.41934)	(8.87109)	(11.1977)	(7.41838)
	[0.26119]	[-1.20781]	[0.57392]	[-0.67251]	[0.84333]	[-1.72867]	[0.27754]	[0.87837]	[1.01665]	[0.28330]	[1.43234]	[0.70259]	[1.10484]
D(INFM(-5))	0.415205	-2.261335	-91.26460	-0.419233	5.551417	-4.270229*	-8.413514	-8.188761	1.121640	-0.675842	-5.966767	16.19851	-11.70252
	(0.30288)	(3.23307)	(519.641)	(2.23203)	(4.75760)	(2.02680)	(7.78092)	(7.84269)	(0.71376)	(0.40698)	(8.60962)	(10.8677)	(7.19973)
	[1.37084]	[-0.69944]	[-0.17563]	[-0.18783]	[1.16685]	[-2.10689]	[-1.08130]	[-1.04413]	[1.57146]	[-1.66063]	[-0.69304]	[1.49052]	[-1.62541]
D(INFM(-6))	0.664278*	-1.42066	12.21386	-1.988234	13.24606	-6.737702*	-8.398216	-8.030108	1.289249	0.225107	-10.37440	-9.918180	-8.946064
	(0.30382)	(3.24307)	(7.21248)	(2.23893)	(7.77231)	(2.03306)	(7.80498)	(7.86695)	(0.71596)	(0.40824)	(8.63624)	(10.9013)	(7.22200)
	[2.18642]	[-0.43806]	[1.69343]	[-0.88803]	[1.70426]	[-3.31406]	[-1.07601]	[-1.02074]	[1.80072]	[0.55141]	[-1.20126]	[-0.90982]	[-1.23872]
D(CIMP(-1))	-0.171658*	-1.458681*	11.77909	-0.494538	3.053275*	-1.625981*	-2.326593*	-2.039386*	-0.040265	-0.042089	-1.877335	2.367920	-2.265580*
	(0.03862)	(0.41224)	(6.62588)	(0.28460)	(0.60664)	(2.58434)	(0.99214)	(1.00001)	(0.09101)	(0.05189)	(1.09780)	(1.38572)	(0.91803)

	[-4.44475]	[-3.53839]	[1.77774]	[-1.73764]	[5.03313]	[-6.29166]	[-2.34504]	[-2.03936]	[-0.44242]	[-0.81106]	[-1.71009]	[1.70880]	[-2.46787]
D(CIMP(-2))	-0.181366*	-1.537075*	11.50234	-0.368163	3.185569*	-1.412368*	-2.694952*	-2.332862*	-0.026201	-0.009964	-2.315998*	2.222010	-2.614474*
	(0.03994)	(0.42637)	(6.85296)	(0.29436)	(0.62743)	(0.267291)	(1.02614)	(1.03428)	(0.09413)	(0.05367)	(1.13543)	(1.43321)	(0.94949)
	[-4.54052]	[-3.60500]	[1.67845]	[-1.25074]	[5.07720]	[-5.28400]	[-2.62630]	[-2.25553]	[-0.27835]	[-0.18565]	[-2.03976]	[1.55037]	[-2.75355]
D(CIMP(-3))	- 0.194880*	-1.327675*	10.72584	-0.132840	3.268791*	-1.123404*	-3.360503*	-3.073184*	-0.015048	0.036809	-3.089839*	1.822778	-3.222777*
	(0.04025)	(0.42966)	(6.90571)	(0.29662)	(0.63226)	(0.269349)	(1.03404)	(1.04225)	(0.09485)	(0.05409)	(1.14417)	(1.44425)	(0.95680)
	[-4.84157]	[-3.09009]	[1.55318]	[-0.44784]	[5.17004]	[-4.17081]	[-3.24989]	[-2.94862]	[-0.15864]	[0.68058]	[-2.70052]	[1.26210]	[-3.36828]
D(CIMP(-4))	-0.172588*	-1.044910*	12.21068	-0.039499	2.897116*	-0.708505*	-3.347603*	-3.335692*	0.005904	0.054658	-3.270060*	1.130259	-3.260443*
	(0.03863)	(0.41237)	(6.62784)	(0.28469)	(0.60682)	(0.258511)	(0.99243)	(1.00031)	(0.09104)	(0.05191)	(1.09813)	(1.38613)	(0.91830)
	[- 4.46752]	[-2.53393]	[1.84233]	[-0.13874]	[4.77429]	[-2.74071]	[-3.37314]	[-3.33466]	[0.06485]	[1.05297]	[-2.97785]	[0.81540]	[-3.55051]
D(CIMP(-5))	-0.108382*	-0.630821*	9.646947	0.027946	1.867210*	-0.378532	-2.046308*	-2.193325*	-0.014452	0.029278	-2.161424*	0.547011	-2.061673*
	(0.02898)	(0.30935)	(4.97206)	(0.21357)	(0.45522)	(0.193929)	(0.74450)	(0.75041)	(0.06829)	(0.03894)	(0.82379)	(1.03985)	(0.68889)
	[-3.73979]	[-2.03919]	[1.94023]	[0.13085]	[4.10177]	[-1.95191]	[-2.74857]	[-2.92283]	[-0.21162]	[0.75185]	[-2.62375]	[0.52605]	[-2.99275]
D(CIMP(-6))	-0.036245*	-0.308052	4.853899	-0.034907	0.690444*	-10.51493	-0.722588	-0.820182*	-0.021343	0.017160	-0.681962	-0.215293	-0.773613*
	(0.01449)	(0.15468)	(2.48612)	(0.10679)	(0.22762)	(9.69681)	(0.37226)	(0.37522)	(0.03415)	(0.01947)	(0.41191)	(0.51994)	(0.34446)
	[- 2.50123]	[-1.99155]	[1.95240]	[-0.32689]	[3.03335]	[-1.08437]	[-1.94107]	[-2.18588]	[-0.62501]	[0.88131]	[-1.65561]	[-0.41407]	[-2.24589]
D(DEV(-1))	0.000594*	0.000786	-1.010716*	-0.001118	0.010866*	-0.532959*	-0.003225	-0.002759	0.000112	-0.000101	-0.003503	0.011815*	-0.004320
	(0.00014)	(0.00155)	(0.24874)	(0.00107)	(0.00228)	(0.09702)	(0.00372)	(0.00375)	(0.00034)	(0.00019)	(0.00412)	(0.00520)	(0.00345)
	[4.09570]	[0.50767]	[-4.06341]	[-1.04671]	[4.77150]	[-5.49349]	[-0.86601]	[-0.73502]	[0.32843]	[-0.51949]	[-0.85002]	[2.27116]	[-1.25363]
D(DEV(-2))	0.000572*	0.000428	-1.095174*	-0.001643	0.011360*	-0.446076*	-0.004936	-0.004531	0.000497	-6.51E-05	-0.004830	0.012098	-0.006236
	(0.00018)	(0.00188)	(0.30206)	(0.00130)	(0.00277)	(0.11781)	(0.00452)	(0.00456)	(0.00041)	(0.00024)	(0.00500)	(0.00632)	(0.00419)
	[3.25004]	[0.22769]	[-3.62568]	[-1.26599]	[4.10787]	[-3.78624]	[-1.09132]	[-0.99383]	[1.19742]	[-0.27500]	[-0.96515]	[1.91503]	[-1.49008]
D(DEV(-3))	0.000597*	9.93E-05	-0.953357*	-0.000222	0.012259*	-0.448955*	-0.001680	-0.002693	0.000403	-0.000156	-0.000940	0.013509	-0.003716
	(0.00020)	(0.00210)	(0.33680)	(0.00145)	(0.00308)	(0.13136)	(0.00504)	(0.00508)	(0.00046)	(0.00026)	(0.00558)	(0.00704)	(0.00467)

	[3.03995]	[0.04740]	[-2.83067]	[-0.15325]	[3.97575]	[-3.41766]	[-0.33320]	[-0.52989]	[0.87111]	[-0.59245]	[-0.16849]	[1.91791]	[-0.79644]
D(DEV(-4))	0.000529*	-0.000521	-0.722757*	0.000914	0.010472*	-0.324245*	-0.002895	-0.003937	0.000687	-0.000198	-0.000315	0.004057	-0.004773
	(0.00019)	(0.00208)	(0.33405)	(0.00143)	(0.00306)	(0.13029)	(0.00500)	(0.00504)	(0.00046)	(0.00026)	(0.00553)	(0.00699)	(0.00463)
	[2.71916]	[-0.25082]	[-2.16362]	[0.63727]	[3.42409]	[-2.48860]	[-0.57883]	[-0.78097]	[1.49730]	[-0.75614]	[-0.05699]	[0.58068]	[-1.03133]
D(DEV(-5))	0.000380*	-7.26E-05	-0.489762	0.001548	0.006592*	-0.182458	-0.001237	-0.001715	0.000550	-0.000225	0.001092	0.002113	-0.002726
	(0.00015)	(0.00160)	(0.25704)	(0.00110)	(0.00235)	(0.10025)	(0.00385)	(0.00388)	(0.00035)	(0.00020)	(0.00426)	(0.00538)	(0.00356)
	[2.53658]	[-0.04537]	[-1.90540]	[1.40168]	[2.80105]	[-1.81994]	[-0.32147]	[-0.44206]	[1.55879]	[-1.11535]	[0.25639]	[0.39302]	[-0.76556]
D(DEV(-6))	0.000127	-0.001934	-0.173825	-0.000189	0.002474	-0.066395	-0.001722	-0.001782	0.000315	-0.000110	0.000341	-0.003951	-0.002254
	(9.9E-05)	(0.00106)	(0.16983)	(0.00073)	(0.00155)	(0.06624)	(0.00254)	(0.00256)	(0.00023)	(0.00013)	(0.00281)	(0.00355)	(0.00235)
	[1.28539]	[-1.83028]	[-1.02353]	[-0.25928]	[1.59105]	[-1.00235]	[-0.67715]	[-0.69511]	[1.34987]	[-0.82370]	[0.12118]	[-1.11237]	[-0.95803]
D(DEXP(-1))	-0.324148*	-0.176896	-2.050918	-0.641183	-5.676270*	2.811611*	5.694988*	4.754981*	0.050391	0.061730	4.643141*	-4.119510	5.049769*
	(0.07102)	(0.75806)	(1.21840)	(0.52334)	(1.11551)	(0.47522)	(1.82439)	(1.83887)	(0.16735)	(0.09542)	(2.01869)	(2.54814)	(1.68812)
	[-4.56436]	[-0.23335]	[-1.68329]	[-1.22517]	[-5.08849]	[5.91641]	[3.12159]	[2.58581]	[0.30110]	[0.64690]	[2.30007]	[-1.61667]	[2.99136]
D(DEXP(-2))	-0.303879*	-0.299162	-1.894443	-1.113564*	-4.997926*	2.171236*	6.137169*	4.934493*	-0.073819	0.049524	5.012754*	-2.484788	5.164742*
	(0.06717)	(0.71695)	(1.15234)	(0.49497)	(1.05503)	(0.44946)	(1.72547)	(1.73917)	(0.15828)	(0.09025)	(1.90924)	(2.40998)	(1.59659)
	[-4.52426]	[-0.41727]	[-1.64400]	[-2.24977]	[-4.73724]	[4.83081]	[3.55681]	[2.83727]	[-0.46638]	[0.54874]	[2.62552]	[-1.03104]	[3.23486]
D(DEXP(-3))	-0.253210*	-0.211819	-1.712570	-1.180008*	-3.884153*	1.452166*	6.591517*	5.452885*	-0.132807	0.022426	5.978580*	-1.008747	5.640159*
	(0.06266)	(0.66880)	(1.07495)	(0.46173)	(0.98417)	(0.41927)	(1.60959)	(1.62237)	(0.14765)	(0.08419)	(1.78102)	(2.24812)	(1.48936)
	[-4.04130]	[-0.31671]	[-1.59317]	[-2.55565]	[-3.94661]	[3.46356]	[4.09516]	[3.36107]	[-0.89947]	[0.26638]	[3.35684]	[-0.44871]	[3.78696]
D(DEXP(-4))	-0.168743*	0.164214	-14.62337	-0.953478*	-2.416934*	0.942511*	4.553773*	3.625820*	-0.112752	-0.004817	4.414479*	0.917075	3.579060*
	(0.05334)	(0.56934)	(9.15087)	(0.39306)	(0.83781)	(0.35692)	(1.37022)	(1.38110)	(0.12569)	(0.07167)	(1.51615)	(1.91380)	(1.26787)
	[-3.16366]	[0.28843]	[-1.59803]	[-2.42578]	[-2.88481]	[2.64069]	[3.32339]	[2.62532]	[-0.89705]	[-0.06721]	[2.91163]	[0.47919]	[2.82289]
D(DEXP(-5))	-0.058808	0.175387	-87.47079	-0.483332	-0.636723	30.30625	2.824268*	2.035263*	-0.066606	-0.008819	2.720574*	1.360281	1.708983
	(0.03815)	(0.40725)	(65.4553)	(0.28115)	(0.59928)	(25.5300)	(0.98010)	(0.98789)	(0.08991)	(0.05126)	(1.08449)	(1.36892)	(0.90690)
	[-1.54141]	[0.43067]	[-1.33634]	[-1.71911]	[-1.06248]	[1.18708]	[2.88160]	[2.06022]	[-0.74083]	[-0.17204]	[2.50862]	[0.99369]	[1.88443]

D(DEXP(-6))	-0.010744	0.154609	-21.86306	-0.070401	0.109637	-0.346339	0.684019	0.186608	-0.042059	-0.005885	0.534379	-0.085719	0.023464
	(0.01935)	(0.20654)	(33.1965)	(0.14259)	(0.30393)	(12.9479)	(0.49707)	(0.50102)	(0.04560)	(0.02600)	(0.55001)	(0.69427)	(0.45994)
	[-0.55524]	[0.74857]	[-0.65859]	[-0.49373]	[0.36073]	[-0.02675]	[1.37609]	[0.37246]	[-0.92241]	[-0.22635]	[0.97158]	[-0.12347]	[0.05101]
D(ED(-1))	-0.010007	-0.313171	-5.510593	0.137521	-0.395709	23.34730	-0.592918	-0.533629	0.035518	0.055692*	-0.877584	-1.283220	-0.679316
	(0.01894)	(0.20216)	(32.4927)	(0.13957)	(0.29749)	(12.6734)	(0.48653)	(0.49040)	(0.04463)	(0.02545)	(0.53835)	(0.67955)	(0.45019)
	[-0.52840]	[-1.54912]	[-0.16959]	[0.98534]	[-1.33017]	[1.84223]	[-1.21866]	[-1.08816]	[0.79583]	[2.18847]	[-1.63013]	[-1.88835]	[-1.50894]
D(ED(-2))	0.013932	0.460418*	-17.27821	0.054531	-0.122764	0.439525*	-0.449564	-0.167886	-0.124173*	0.037579			
	(0.01954)	(0.20862)	(33.5310)	(0.14403)	(0.30699)	(0.13078)	(0.50208)	(0.50607)	(0.04606)	(0.02626)	-0.499470	-0.809791	-0.073942
	[0.71286]	[2.20696]	[-0.51529]	[0.37862]	[-0.39989]	[3.36079]	[-0.89540]	[-0.33175]	[-2.69608]	[1.43095]	(0.55555)	(0.70126)	(0.46458)
D(ED(-3))	0.019554	0.096916	29.87447	-0.225397	0.007870	0.490005*	0.164223	0.223893	0.031850	0.008626	[-0.89905]	[-1.15477]	[-0.15916]
	(0.01702)	(0.18172)	(29.2071)	(0.12545)	(0.26741)	(0.11392)	(0.43734)	(0.44081)	(0.04012)	(0.02287)			
	[1.14859]	[0.53333]	[1.02285]	[-1.79665]	[0.02943]	[4.30131]	[0.37551]	[0.50791]	[0.79392]	[0.37708]	-0.102957	0.755865	0.026042
D(ED(-4))	0.003009	0.128010	-8.342454	0.091765	-0.075472	0.298204*	-0.538515	-0.808503	-0.070031	-0.013867	(0.48391)	(0.61083)	(0.40467)
	(0.02021)	(0.21568)	(34.6652)	(0.14890)	(0.31738)	(0.13521)	(0.51907)	(0.52319)	(0.04761)	(0.02715)	[-0.21276]	[1.23744]	[0.06435]
	[0.14894]	[0.59352]	[-0.24066]	[0.61629]	[-0.23780]	[2.20548]	[-1.03747]	[-1.54534]	[-1.47079]	[-0.51076]			
D(ED(-5))	-0.034424	0.148822	0.343289	-0.021095	-0.461728	0.320989*	0.489059	0.438894	-0.059577	0.029044	-1.150051	-0.258730	-0.830060
	(0.01850)	(0.19747)	(31.7393)	(0.13633)	(0.29059)	(0.12380)	(0.47525)	(0.47903)	(0.04360)	(0.02486)	(0.57435)	(0.72498)	(0.48029)
	[-1.86079]	[0.75363]	[0.01082]	[-0.15474]	[-1.58893]	[2.59280]	[1.02905]	[0.91622]	[-1.36658]	[1.16839]	[-2.00236]	[-0.35688]	[-1.72823]
D(ED(-6))	-0.046954*	0.916490*	-10.50024*	0.067201	-0.929930*	0.401878*	0.553165	0.530911	-0.060153	-0.023089			
	(0.01957)	(0.20888)	(3.35728)	(0.14421)	(0.30738)	(0.13095)	(0.50271)	(0.50670)	(0.04611)	(0.02629)	0.184464	-0.080220	0.620396
	[-2.39946]	[4.38761]	[-3.12760]	[0.46600]	[-3.02536]	[3.06894]	[1.10037]	[1.04778]	[-1.30444]	[-0.87811]	(0.52587)	(0.66379)	(0.43975)
D(GIMP(-1))	-0.001222*	-0.002572	-0.628790	0.002987	-0.021018*	-0.299527	0.011130	0.009466	0.000514	0.000678	0.008604	-0.021224	0.012877
	(0.00030)	(0.00325)	(0.52191)	(0.00224)	(0.00478)	(0.20356)	(0.00781)	(0.00788)	(0.00072)	(0.00041)	(0.00865)	(0.01092)	(0.00723)

	[-4.01621]	[-0.79205]	[-1.20479]	[1.33235]	[-4.39860]	[-1.47141]	[1.42416]	[1.20176]	[0.71751]	[1.65847]	[0.99500]	[-1.94443]	[1.78082]
D(GIMP(-2))	-0.001008*	-0.000104	-0.521317	0.001493	-0.017287*	-0.602540*	0.007108	0.006782	4.24E-06	0.000695	0.007001	-0.018277	0.010635
	(0.00029)	(0.00308)	(0.49557)	(0.00213)	(0.00454)	(0.19329)	(0.00742)	(0.00748)	(0.00068)	(0.00039)	(0.00821)	(0.01036)	(0.00687)
	[-3.48835]	[-0.03373]	[-1.05195]	[0.70125]	[-3.81006]	[-3.11725]	[0.95785]	[0.90672]	[0.00622]	[1.79145]	[0.85270]	[-1.76342]	[1.54883]
D(GIMP(-3))	-0.000726*	-0.001782	0.167456	-0.001078	-0.012187*	-0.712405*	0.006390	0.006614	0.000144	0.000774*	0.009579	-0.013018	0.009762
	(0.00026)	(0.00279)	(0.44878)	(0.00193)	(0.00411)	(0.17504)	(0.00672)	(0.00677)	(0.00062)	(0.00035)	(0.00744)	(0.00939)	(0.00622)
	[-2.77389]	[-0.63814]	[0.37313]	[-0.55904]	[-2.96595]	[-4.06989]	[0.95089]	[0.97649]	[0.23312]	[2.20328]	[1.28831]	[-1.38697]	[1.56998]
D(GIMP(-4))	-0.000554*	-0.000974	0.319917	-1.16E-05	-0.009275*	-0.664950*	0.004305	0.003595	9.89E-05	0.000534	0.006460	-0.008896	0.007279
	(0.00022)	(0.00235)	(0.37843)	(0.00163)	(0.00346)	(0.14760)	(0.00567)	(0.00571)	(0.00052)	(0.00030)	(0.00627)	(0.00791)	(0.00524)
	[-2.51131]	[-0.41371]	[0.84538]	[-0.00712]	[-2.67706]	[-4.50502]	[0.75967]	[0.62942]	[0.19018]	[1.80159]	[1.03033]	[-1.12399]	[1.38829]
D(GIMP(-5))	-0.000351	-0.001229	0.290421	-0.000756	-0.006083*	-0.473637	0.002695	0.002568	1.64E-05	0.000450	0.006579	-0.007647	0.005644
	(0.00018)	(0.00189)	(0.30325)	(0.00130)	(0.00278)	(0.11828)	(0.00454)	(0.00458)	(0.00042)	(0.00024)	(0.00502)	(0.00634)	(0.00420)
	[-1.98769]	[-0.65145]	[0.95770]	[-0.58027]	[-2.19105]	[-4.00444]	[0.59351]	[0.56117]	[0.03932]	[1.89307]	[1.30939]	[-1.20577]	[1.34320]
D(GIMP(-6))	-0.000192*	0.000702	0.032822	-0.001172	-0.003801*	-0.185261*	0.004177	0.004604	0.000101	0.000155	0.006150*	-0.004181	0.005414*
	(9.4E-05)	(0.00100)	(0.16057)	(0.00069)	(0.00147)	(0.06263)	(0.00240)	(0.00242)	(0.00022)	(0.00013)	(0.00266)	(0.00336)	(0.00222)
	[-2.04764]	[0.70272]	[0.20441]	[-1.69892]	[-2.58540]	[-2.95809]	[1.73741]	[1.89971]	[0.45894]	[1.23026]	[2.31180]	[-1.24496]	[2.43333]
D(ID(-1))	-0.140858*	-0.199001	-7.671172	0.569021*	-2.474697*	1.610248*	1.016346	2.304585*	0.039925	0.052759	2.488837*	-1.202855	2.437889*
	(0.03640)	(0.38851)	(6.24443)	(0.26822)	(0.57171)	(0.24356)	(0.93502)	(0.94244)	(0.08577)	(0.04891)	(1.03460)	(1.30595)	(0.86518)
	[-3.87004]	[-0.51221]	[-1.22848]	[2.12148]	[-4.32857]	[6.61130]	[1.08698]	[2.44533]	[0.46549]	[1.07879]	[2.40560]	[-0.92106]	[2.81778]
D(ID(-2))	-0.123266*	-0.468172	-47.58561	0.369129	-1.987742*	1.483795*	0.538108	1.700361	0.040515	-0.001019	1.774529	-0.833621	1.906714*
	(0.03778)	(0.40323)	(64.8093)	(0.27838)	(0.59337)	(0.25278)	(0.97043)	(0.97814)	(0.08902)	(0.05076)	(1.07379)	(1.35541)	(0.89795)
	[-3.26311]	[-1.16106]	[-0.73424]	[1.32600]	[-3.34995]	[5.86990]	[0.55450]	[1.73837]	[0.45512]	[-0.02008]	[1.65259]	[-0.61503]	[2.12341]
D(ID(-3))	-0.116847*	-0.612592	-12.75625	0.073526	-1.655482*	1.238984*	1.449841	2.487591*	0.040251	-0.054315	2.173460	0.465779	2.442936*
	(0.03890)	(0.41525)	(66.7415)	(0.28668)	(0.61106)	(0.26032)	(0.99936)	(1.00730)	(0.09167)	(0.05227)	(1.10580)	(1.39582)	(0.92472)

	[-3.00365]	[-1.47524]	[-0.19113]	[0.25648]	[-2.70922]	[4.75946]	[1.45076]	[2.46957]	[0.43908]	[-1.03910]	[1.96551]	[0.33370]	[2.64182]
D(ID(-4))	-0.111339*	-0.476338	-54.20984	0.122745	-1.512304*	0.912476*	1.518594	2.411539*	-0.023258	-0.078413	1.951422	0.196302	2.222388*
	(0.03948)	(0.42140)	(67.7307)	(0.29093)	(0.62011)	(0.26418)	(1.01418)	(1.02223)	(0.09303)	(0.05305)	(1.12219)	(1.41651)	(0.93842)
	[-2.82027]	[-1.13036]	[-0.80037]	[0.42191]	[-2.43876]	[3.45399]	[1.49737]	[2.35910]	[-0.25000]	[-1.47821]	[1.73894]	[0.13858]	[2.36821]
D(ID(-5))	-0.090224*	-0.437475	-44.39044	0.184401	-1.356506*	0.619120*	0.987548	1.723990	-0.011709	-0.053976	1.404397	-0.681988	1.729286*
	(0.03479)	(0.37136)	(59.6881)	(0.25638)	(0.54648)	(0.23281)	(0.89375)	(0.90085)	(0.08199)	(0.04675)	(0.98894)	(1.24831)	(0.82699)
	[-2.59334]	[-1.17802]	[-0.74371]	[0.71925]	[-2.48227]	[2.65934]	[1.10495]	[1.91375]	[-0.14282]	[-1.15463]	[1.42011]	[-0.54633]	[2.09106]
D(ID(-6))	-0.052113*	-0.131562	-24.61079	0.206285	-0.873728*	0.360363*	-0.359549	0.124685	0.001881	-0.020245	-0.260004	2.010178*	0.278011
	(0.02474)	(0.26406)	(42.4420)	(0.18230)	(0.38858)	(0.16554)	(0.63551)	(0.64056)	(0.05830)	(0.03324)	(0.70320)	(0.88762)	(0.58804)
	[-2.10658]	[-0.49822]	[-0.57987]	[1.13155]	[-2.24852]	[2.17689]	[-0.56576]	[0.19465]	[0.03227]	[-0.60904]	[-0.36975]	[2.26467]	[0.47277]
D(IT(-1))	0.189175*	0.171499	10.55729	-0.824717*	3.312384*	-1.872279*	-1.006913	-2.151708	0.011346	-0.054629	-0.789245	1.499988	-1.175704
	(0.04798)	(0.51217)	(8.23200)	(0.35359)	(0.75369)	(0.32108)	(1.23263)	(1.24242)	(0.11307)	(0.06447)	(1.36391)	(1.72163)	(1.14056)
	[3.94262]	[0.33484]	[1.28247]	[-2.33240]	[4.39492]	[-5.83120]	[-0.81688]	[-1.73187]	[0.10034]	[-0.84732]	[-0.57866]	[0.87126]	[-1.03081]
D(IT(-2))	0.165055*	0.214267	10.10218	-0.888935*	2.667381*	-1.687916*	0.618417	-0.395421	0.080964	-0.025449	1.479799	-0.221631	0.292585
	(0.04893)	(0.52225)	(8.39400)	(0.36055)	(0.76852)	(0.32740)	(1.25689)	(1.26687)	(0.11530)	(0.06574)	(1.39075)	(1.75551)	(1.16301)
	[3.37354]	[0.41027]	[1.20350]	[-2.46550]	[3.47081]	[-5.15552]	[0.49202]	[-0.31212]	[0.70223]	[-0.38711]	[1.06403]	[-0.12625]	[0.25158]
D(IT(-3))	0.135212*	-0.311722	10.40847	-0.654130	2.008750*	-1.362241*	1.002946	-0.041900	0.117947	-0.021517	1.917725	-0.938585	0.891651
	(0.04471)	(0.47725)	(7.67063)	(0.32948)	(0.70229)	(0.29918)	(1.14857)	(1.15769)	(0.10536)	(0.06008)	(1.27090)	(1.60422)	(1.06278)
	[3.02420]	[-0.65317]	[1.35692]	[-1.98535]	[2.86029]	[-4.55325]	[0.87321]	[-0.03619]	[1.11946]	[-0.35816]	[1.50895]	[-0.58507]	[0.83898]
D(IT(-4))	0.109891*	-0.643352	10.50919	-0.759493*	1.575184*	-0.986239*	1.614364	0.856180	0.139109	-0.020441	2.758752*	-2.776227	1.396103
	(0.04117)	(0.43951)	(7.06414)	(0.30343)	(0.64676)	(0.27553)	(1.05776)	(1.06616)	(0.09703)	(0.05533)	(1.17042)	(1.47738)	(0.97875)
	[2.66888]	[-1.46379]	[1.48768]	[-2.50304]	[2.43550]	[-3.57945]	[1.52621]	[0.80305]	[1.43367]	[-0.36947]	[2.35707]	[-1.87915]	[1.42641]
D(IT(-5))	0.073969*	-0.203186	8.837535	-0.494241*	1.105959*	-0.637617	2.220404*	1.691859*	0.050880	-0.049991	2.843137*	-1.510791	1.643728*
	(0.02999)	(0.32014)	(5.14557)	(0.22102)	(0.47111)	(0.20070)	(0.77048)	(0.77660)	(0.07068)	(0.04030)	(0.85254)	(1.07614)	(0.71293)

	[2.46628]	[-0.63467]	[1.71750]	[-2.23619]	[2.34758]	[-3.17700]	[2.88184]	[2.17855]	[0.71990]	[-1.24047]	[3.33490]	[-1.40390]	[2.30559]
D(IT(-6))	0.033010*	-0.322211	4.567244	-0.195774	0.466128	-0.329925*	1.646920*	1.302316*	0.010106	-0.040345	1.825848*	-1.553699*	1.314701*
	(0.01574)	(0.16800)	(2.70019)	(0.11598)	(0.24722)	(0.10532)	(0.40432)	(0.40753)	(0.03709)	(0.02115)	(0.44738)	(0.56471)	(0.37412)
	[2.09740]	[-1.91794]	[1.69145]	[-1.68797]	[1.88550]	[-3.13260]	[4.07334]	[3.19565]	[0.27249]	[-1.90776]	[4.08122]	[-2.75131]	[3.51414]
D(M0(-1))	0.236041*	0.566440	3.259930*	-1.343558*	3.933324*	-2.438324*	-0.988942	-0.108472	-1.374242*	-0.022576	0.524373	3.988739	-0.564510
	(0.08087)	(0.86326)	(1.38749)	(0.59597)	(1.27033)	(0.54118)	(2.07758)	(2.09408)	(0.19058)	(0.10867)	(2.29885)	(2.90178)	(1.92240)
	[2.91867]	[0.65616]	[2.34951]	[-2.25439]	[3.09631]	[-4.50557]	[-0.47601]	[-0.05180]	[-7.21084]	[-0.20775]	[0.22810]	[1.37459]	[-0.29365]
D(M0(-2))	0.237332*	3.912178*	4.220894*	-0.123576	4.875075*	-2.397806*	0.361118	1.347421	-1.359640*	-0.013434	0.559615	11.11797*	-0.141059
	(0.11315)	(1.20779)	(1.94124)	(0.83383)	(1.77731)	(0.75716)	(2.90675)	(2.92983)	(0.26664)	(0.15204)	(3.21633)	(4.05988)	(2.68963)
	[2.09751]	[3.23912]	[2.17433]	[-0.14820]	[2.74295]	[-3.16684]	[0.12423]	[0.45990]	[-5.09915]	[-0.08836]	[0.17399]	[2.73850]	[-0.05245]
D(M0(-3))	0.222630	4.115902*	2.883442	0.326103	5.303217*	-2.851580*	0.609008	1.799626	-1.111460*	0.030835	1.773266	11.46548*	-0.266931*
	(0.11679)	(1.24661)	(2.00363)	(0.86063)	(1.83443)	(0.78149)	(3.00017)	(3.02399)	(0.27521)	(0.15692)	(3.31970)	(4.19036)	(2.77607)
	[1.90631]	[3.30169]	[1.43911]	[0.37891]	[2.89093]	[-3.64890]	[0.20299]	[0.59512]	[-4.03859]	[0.19650]	[0.53416]	[2.73616]	[-0.09615]
D(M0(-4))	0.163391	2.895974*	2.273952	0.091636	4.028579*	-2.274354*	1.163242	1.929744	-0.756508*	-0.056914	2.871843	7.229464	0.397030
	(0.10191)	(1.08780)	(1.74838)	(0.75099)	(1.60074)	(0.68194)	(2.61797)	(2.63875)	(0.24015)	(0.13693)	(2.89679)	(3.65654)	(2.42242)
	[1.60331]	[2.66224]	[1.30060]	[0.12202]	[2.51670]	[-3.33512]	[0.44433]	[0.73131]	[-3.15015]	[-0.41563]	[0.99139]	[1.97713]	[0.16390]
D(M0(-5))	0.155430	2.406479*	1.787920	0.239036	3.137886*	-1.817691*	1.985215	2.482670	-0.414847*	-0.064342	3.173377	6.641334*	1.030980
	(0.08097)	(0.86433)	(1.38922)	(0.59671)	(1.27191)	(0.54185)	(2.08017)	(2.09668)	(0.19082)	(0.10880)	(2.30171)	(2.90538)	(1.92479)
	[1.91951]	[2.78420]	[1.28700]	[0.40059]	[2.46707]	[-3.35460]	[0.95435]	[1.18409]	[-2.17406]	[-0.59137]	[1.37870]	[2.28587]	[0.53563]
D(M0(-6))	0.141026*	0.794193	17.08070	-0.196924	2.751795*	-1.123030*	5.403821*	5.631600*	-0.275779*	-0.000464	5.800290*	1.935857	4.111902*
	(0.05283)	(0.56393)	(9.06388)	(0.38932)	(0.82985)	(0.35353)	(1.35719)	(1.36797)	(0.12450)	(0.07099)	(1.50174)	(1.89560)	(1.25582)
	[2.66939]	[1.40832]	[1.88448]	[-0.50581]	[3.31602]	[-3.17662]	[3.98161]	[4.11676]	[-2.21513]	[-0.00653]	[3.86238]	[1.02124]	[3.27428]
D(M3(-1))	-0.497269*	-1.487556	-5.924980*	3.609264*	-8.831433*	4.625842*	2.432668	1.918857	-0.117692	-1.197846*	0.574464	-11.91045	1.848915
	(0.15132)	(1.61518)	(2.59603)	(1.11508)	(2.37681)	(1.01255)	(3.88721)	(3.91807)	(0.35658)	(0.20332)	(4.30121)	(5.42929)	(3.59685)

	[-3.28632]	[-0.92098]	[-2.28232]	[3.23678]	[-3.71567]	[4.56851]	[0.62581]	[0.48975]	[-0.33006]	[-5.89145]	[0.13356]	[-2.19374]	[0.51404]
D(M3(-2))	-0.436573*	-2.493252	-454.3991	4.300290*	-7.518282*	3.181821*	0.009925	1.690052	-0.173253	-1.193436*	-0.519771	-19.58222*	0.952968
	(0.19985)	(2.13330)	(342.878)	(1.47277)	(3.13924)	(1.33735)	(5.13414)	(5.17490)	(0.47096)	(0.26854)	(5.68094)	(7.17088)	(4.75065)
	[-2.18446]	[-1.16873]	[-1.32525]	[2.91986]	[-2.39494]	[2.37919]	[0.00193]	[0.32659]	[-0.36787]	[-4.44417]	[-0.09149]	[-2.73080]	[0.20060]
D(M3(-3))	-0.337793	-1.518663	-163.4026	4.627357*	-6.330670	2.639553	-6.602808	-4.846707	-0.081373	-1.088826	-7.906660	-10.78341	-4.628632
	(0.22834)	(2.43732)	(391.742)	(1.68266)	(3.58661)	(1.52794)	(5.86581)	(5.91238)	(0.53808)	(0.30681)	(6.49054)	(8.19282)	(5.42767)
	[-1.47937]	[-0.62309]	[-0.41712]	[2.75002]	[-1.76508]	[1.72752]	[-1.12564]	[-0.81976]	[-0.15123]	[-3.54886]	[-1.21818]	[-1.31620]	[-0.85278]
D(M3(-4))	-0.066665	-2.676170	-128.7404	3.377520*	-2.339944	0.744017	-4.930705	-3.952494	-0.116109	-0.723217*	-6.091106	-9.515620	-4.851629
	(0.20627)	(2.20181)	(353.890)	(1.52008)	(3.24006)	(1.38031)	(5.29903)	(5.34110)	(0.48609)	(0.27716)	(5.86340)	(7.40119)	(4.90323)
	[-0.32319]	[-1.21544]	[-0.36379]	[2.22194]	[-0.72219]	[0.53902]	[-0.93049]	[-0.74001]	[-0.23886]	[-2.60934]	[-1.03884]	[-1.28569]	[-0.98948]
D(M3(-5))	0.079223	-0.128642	35.79355	1.914023	0.108544	0.133948	-1.949486	-1.048258	0.188818	-0.463839*	-2.071466	-14.50201*	-2.693567
	(0.17097)	(1.82501)	(293.328)	(1.25994)	(2.68558)	(1.14409)	(4.39218)	(4.42705)	(0.40290)	(0.22973)	(4.85997)	(6.13460)	(4.06412)
	[0.46337]	[-0.07049]	[0.12203]	[1.51914]	[0.04042]	[0.11708]	[-0.44385]	[-0.23678]	[0.46865]	[-2.01904]	[-0.42623]	[-2.36397]	[-0.66277]
D(M3(-6))	0.035064	1.831914	-42.39591	1.242561	-0.091527	33.29132	-1.136006	-0.247289	0.267303	-0.149859	-2.525485	-2.304243	-1.317362
	(0.10621)	(1.13368)	(182.213)	(0.78267)	(1.66826)	(71.0701)	(2.72840)	(2.75006)	(0.25028)	(0.14271)	(3.01898)	(3.81077)	(2.52460)
	[0.33015]	[1.61590]	[-0.23267]	[1.58760]	[-0.05486]	[0.46843]	[-0.41636]	[-0.08992]	[1.06802]	[-1.05011]	[-0.83654]	[-0.60467]	[-0.52181]
D(REC(-1))	0.048370*	0.092589	37.74932	-0.415910*	0.893293*	-0.458381*	-0.617154	-0.511969	-0.012162	-0.018900	-1.967868*	1.299987*	-0.513764
	(0.01581)	(0.16875)	(27.1225)	(0.11650)	(0.24832)	(0.10579)	(0.40612)	(0.40935)	(0.03725)	(0.02124)	(0.44938)	(0.56724)	(0.37579)
	[3.05967]	[0.54868]	[1.39181]	[-3.57004]	[3.59732]	[-4.33293]	[-1.51962]	[-1.25070]	[-0.32647]	[-0.88973]	[-4.37911]	[2.29180]	[-1.36716]
D(REC(-2))	0.039837	0.127898	32.93065	-0.454232*	0.828641*	-0.441675*	-0.103297	-0.264870	-0.057492	-0.027946	-1.668740*	2.138902*	-0.097338
	(0.02185)	(0.23326)	(37.4904)	(0.16103)	(0.34325)	(0.14623)	(0.56137)	(0.56582)	(0.05150)	(0.02936)	(0.62116)	(0.78407)	(0.51944)
	[1.82302]	[0.54832]	[0.87838]	[-2.82073]	[2.41414]	[-3.02041]	[-0.18401]	[-0.46811]	[-1.11645]	[-0.95176]	[-2.68651]	[2.72796]	[-0.18739]
D(REC(-3))	0.036233	0.286445	19.90205	-0.425845*	0.795508	-0.370984*	0.228230	-0.109848	-0.068960	-0.005230	-1.036277	2.195187	0.187639
	(0.02583)	(0.27567)	(44.3068)	(0.19031)	(0.40565)	(0.17281)	(0.66344)	(0.66870)	(0.06086)	(0.03470)	(0.73409)	(0.92662)	(0.61388)

	[1.40299]	[1.03911]	[0.44919]	[-2.23761]	[1.96105]	[-2.14677]	[0.34401]	[-0.16427]	[-1.13314]	[-0.15073]	[-1.41164]	[2.36901]	[0.30566]
D(REC(-4))	0.032402	0.396001	6.235472	-0.337696	0.636612	-20.57888	0.428718	0.024919	-0.053722	0.001522	-0.536289	2.897606*	0.282485
	(0.02576)	(0.27494)	(44.1909)	(0.18981)	(0.40459)	(17.2361)	(0.66170)	(0.66695)	(0.06070)	(0.03461)	(0.73217)	(0.92420)	(0.61227)
	[1.25795]	[1.44030]	[0.14110]	[-1.77908]	[1.57347]	[-1.19394]	[0.64790]	[0.03736]	[-0.88506]	[0.04397]	[-0.73246]	[3.13526]	[0.46137]
D(REC(-5))	0.023577	0.122457	-1.593219	-0.247362	0.321609	-15.71341	0.240194	-0.163259	-0.012545	0.001362	-0.271176	1.466454	0.025773
	(0.02176)	(0.23227)	(37.3314)	(0.16035)	(0.34179)	(14.5607)	(0.55899)	(0.56343)	(0.05128)	(0.02924)	(0.61852)	(0.78074)	(0.51723)
	[1.08353]	[0.52723]	[-0.04268]	[-1.54263]	[0.94096]	[-1.07917]	[0.42969]	[-0.28976]	[-0.24464]	[0.04658]	[-0.43843]	[1.87828]	[0.04983]
D(REC(-6))	0.011766	0.006509	5.217276	-0.021929	0.136882	-7.257822	0.095530	-0.121220	0.009636	0.019155	-0.144399	0.479626	-0.076009
	(0.01194)	(0.12742)	(20.4793)	(0.08797)	(0.18750)	(7.98772)	(0.30665)	(0.30908)	(0.02813)	(0.01604)	(0.33931)	(0.42830)	(0.28375)
	[0.98567]	[0.05108]	[0.25476]	[-0.24929]	[0.73004]	[-0.90862]	[0.31153]	[-0.39219]	[0.34257]	[1.19429]	[-0.42557]	[1.11983]	[-0.26788]
D(REEXP(-1))	0.039552*	0.023587	4.018574*	-0.132042	0.650515*	-0.397454*	-0.458443	-0.328447	-0.009928	-0.008053	-0.412189	-0.724487*	-0.369230
	(0.00977)	(0.10426)	(1.67568)	(0.07198)	(0.15342)	(0.06536)	(0.25091)	(0.25290)	(0.02302)	(0.01312)	(0.27763)	(0.35045)	(0.23217)
	[4.04953]	[0.22624]	[2.39818]	[-1.83453]	[4.24016]	[-6.08100]	[-1.82712]	[-1.29871]	[-0.43135]	[-0.61365]	[-1.48466]	[-2.06732]	[-1.59035]
D(REEXP(-2))	0.028464*	0.043735	4.217904*	-0.127763	0.484303*	-0.312397*	-0.388142*	-0.252175*	-0.010774	-0.007196	-0.447542	-0.940911*	-0.264687
	(0.01059)	(0.11306)	(1.81723)	(0.07806)	(0.16638)	(0.07088)	(0.27211)	(0.27427)	(0.02496)	(0.01423)	(0.30109)	(0.38005)	(0.25178)
	[2.68728]	[0.38682]	[2.32106]	[-1.63681]	[2.91087]	[-4.40741]	[-1.42644]	[-0.91945]	[-0.43163]	[-0.50561]	[-1.48643]	[-2.47574]	[-1.05126]
D(REEXP(-3))	0.014155	0.118556	31.62779	-0.108206	0.286346	-0.211611*	-0.271043	-0.183877	-0.021295	-0.008352	-0.417744	-0.829219*	-0.153531
	(0.01052)	(0.11227)	(18.0446)	(0.07751)	(0.16521)	(0.07038)	(0.27019)	(0.27234)	(0.02479)	(0.01413)	(0.29897)	(0.37738)	(0.25001)
	[1.34583]	[1.05601]	[1.75276]	[-1.39607]	[1.73324]	[-3.00669]	[-1.00315]	[-0.67518]	[-0.85918]	[-0.59095]	[-1.39728]	[-2.19730]	[-0.61410]
D(REEXP(-4))	0.003666	0.162338	20.82821	-0.097559	0.137705	-0.126930*	-0.064435	-0.030214	-0.022334	-0.007797	-0.210451	-0.514151	0.002915
	(0.00886)	(0.09455)	(15.1967)	(0.06527)	(0.13913)	(0.05927)	(0.22755)	(0.22936)	(0.02087)	(0.01190)	(0.25178)	(0.31782)	(0.21055)
	[0.41386]	[1.71696]	[1.37058]	[-1.49459]	[0.98973]	[-2.14156]	[-0.28317]	[-0.13174]	[-1.06995]	[-0.65509]	[-0.83584]	[-1.61774]	[0.01384]
D(REEXP(-5))	-0.000381	0.158656*	8.508804	-0.042894	0.040628	-6.654672	-0.020101	-0.045021	-0.016760	-0.009144	-0.171138	-0.217639	-0.006534
	(0.00626)	(0.06686)	(10.7463)	(0.04616)	(0.09839)	(4.19146)	(0.16091)	(0.16219)	(0.01476)	(0.00842)	(0.17805)	(0.22475)	(0.14889)

	[-0.06089]	[2.37294]	[0.79179]	[-0.92927]	[0.41294]	[-1.58768]	[-0.12492]	[-0.27759]	[-1.13546]	[-1.08645]	[-0.96119]	[-0.96838]	[-0.04388]
D(REEXP(-6))	0.000537	0.070582*	1.547519	-0.005328	0.037009	-3.587274	-0.016131	-0.044161	-0.010004	-0.002995	-0.109057	-0.064346	-0.008102
	(0.00298)	(0.03181)	(5.11228)	(0.02196)	(0.04681)	(1.99398)	(0.07655)	(0.07716)	(0.00702)	(0.00400)	(0.08470)	(0.10692)	(0.07083)
	[0.18029]	[2.21906]	[0.30271]	[-0.24265]	[0.79069]	[-1.79905]	[-0.21073]	[-0.57235]	[-1.42463]	[-0.74800]	[-1.28754]	[-0.60183]	[-0.11438]
D(VAT(-1))	-0.160824*	-0.160485	-117.5315	0.977446*	-2.948324*	1.319701*	0.163487	-0.038483	-0.031691	0.045533	-0.347209	-2.977917	-1.165546
	(0.04415)	(0.47132)	(75.7539)	(0.32539)	(0.69357)	(0.29547)	(1.13431)	(1.14332)	(0.10405)	(0.05933)	(1.25512)	(1.58430)	(1.04959)
	[-3.64227]	[-0.34050]	[-1.55149]	[3.00394]	[-4.25095]	[4.46645]	[0.14413]	[-0.03366]	[-0.30457]	[0.76745]	[-0.27663]	[-1.87964]	[-1.11048]
D(VAT(-2))	-0.133715*	0.007543	-125.6500	1.263596*	-2.494968*	1.133722*	-2.031901	-1.982813	-0.037602	0.081520	-2.777821	-1.944750	-2.932793*
	(0.05674)	(0.60564)	(97.3432)	(0.41812)	(0.89123)	(0.37968)	(1.45758)	(1.46916)	(0.13371)	(0.07624)	(1.61282)	(2.03582)	(1.34871)
	[-2.35668]	[0.01246]	[-1.29079]	[3.02208]	[-2.79946]	[2.98599]	[-1.39402]	[-1.34963]	[-0.28123]	[1.06928]	[-1.72234]	[-0.95527]	[-2.17452]
D(VAT(-3))	-0.091978	0.510878	-160.9297	1.175183*	-1.818199*	0.815938*	-3.818329*	-3.483120*	-0.054596	0.098785	-4.575959*	-2.322781	-4.499897*
	(0.05690)	(0.60740)	(97.6248)	(0.41933)	(0.89381)	(0.38077)	(1.46180)	(1.47341)	(0.13409)	(0.07646)	(1.61749)	(2.04171)	(1.35261)
	[-1.61641]	[0.84110]	[-1.64845]	[2.80252]	[-2.03421]	[2.14286]	[-2.61207]	[-2.36399]	[-0.40715]	[1.29199]	[-2.82905]	[-1.13767]	[-3.32682]
D(VAT(-4))	-0.055625	0.542153	-97.88188	0.965562*	-1.111815	43.85520	-4.449546*	-4.167669*	-0.030668	0.115068	-5.307056*	-0.810356	-4.672828*
	(0.05229)	(0.55817)	(89.7135)	(0.38535)	(0.82138)	(34.9917)	(1.34334)	(1.35400)	(0.12323)	(0.07026)	(1.48641)	(1.87625)	(1.24300)
	[-1.06376]	[0.97130]	[-1.09105]	[2.50568]	[-1.35360]	[1.25330]	[-3.31230]	[-3.07803]	[-0.24887]	[1.63767]	[-3.57039]	[-0.43190]	[-3.75932]
D(VAT(-5))	-0.019014	0.299426	-65.23699	0.574295	-0.285554	22.02813	-4.116136*	-4.022106*	-0.037589	0.108100	-4.883518*	0.586023	-3.919026*
	(0.04178)	(0.44599)	(71.6829)	(0.30790)	(0.65630)	(27.9591)	(1.07336)	(1.08188)	(0.09846)	(0.05614)	(1.18767)	(1.49916)	(0.99318)
	[-0.45508]	[0.67137]	[-0.91008]	[1.86519]	[-0.43510]	[0.78787]	[-3.83483]	[-3.71771]	[-0.38177]	[1.92548]	[-4.11184]	[0.39090]	[-3.94593]
D(VAT(-6))	0.006464	0.170331	-33.91274	-0.013148	0.209234	3.975453	-1.752239*	-1.753957*	-0.022701	0.046663	-1.848505*	-1.375293	-1.740001*
	(0.02444)	(0.26084)	(41.9234)	(0.18007)	(0.38383)	(16.3517)	(0.62775)	(0.63273)	(0.05758)	(0.03283)	(0.69460)	(0.87678)	(0.58086)
	[0.26455]	[0.65302]	[-0.80892]	[-0.07302]	[0.54512]	[0.24312]	[-2.79132]	[-2.77205]	[-0.39422]	[1.42118]	[-2.66124]	[-1.56858]	[-2.99557]
C	0.000104	0.000999	0.202079	-0.000336	0.004491	-0.505666	0.004706	0.005326	-0.000127	-0.000151	0.006814	-0.002710	0.005594
	(0.00104)	(0.01113)	(1.78880)	(0.00768)	(0.01638)	(0.69770)	(0.02678)	(0.02700)	(0.00246)	(0.00140)	(0.02964)	(0.03741)	(0.02478)

	[0.10010]	[0.08975]	[0.11297]	[-0.04370]	[0.27423]	[-0.72476]	[0.17570]	[0.19727]	[-0.05186]	[-0.10788]	[0.22991]	[-0.07243]	[0.22572]
R-squared	0.771190*	0.978237*	0.885495*	0.974489*	0.784005*	0.980154*	0.981031*	0.976561*	0.962080*	0.911938*	0.978744*	0.965774*	0.981592*
Adj. R-squared	0.660373	0.939161	0.679906	0.928685	0.396195	0.944523	0.946972	0.934476	0.893997	0.753826	0.940580	0.904324	0.948540
Sum sq. resids	0.005827	0.663938	17151.58	0.316444	1.437716	2609.264	3.845560	3.906864	0.032359	0.010521	4.708314	7.501884	3.292535
S.E. equation	0.011508	0.122839	19.74357	0.084805	0.180763	7.700743	0.295633	0.297980	0.027119	0.015463	0.327119	0.412913	0.273551
F-statistic	1.877210	25.03467	4.307111	21.27532	2.021624	27.50786	28.80421	23.20479	14.13091	5.767671	25.64564	15.71624	29.69900
Log likelihood	441.9141	148.3022	-481.5813	194.2468	100.3996	-364.8340	39.40008	38.41951	335.6223	405.2829	26.85063	-2.030482	49.02629
Akaike AIC	-5.837324	-1.101649	9.057763	-1.842691	-0.329026	7.174741	0.654837	0.670653	-4.122941	-5.246498	0.857248	1.323072	0.499576
Schwarz SC	-4.017787	0.717887	10.87730	-0.023154	1.490510	8.994278	2.474374	2.490190	-2.303405	-3.426961	2.676784	3.142609	2.319112
Mean dependent	0.000450	-0.010467	-0.032063	-0.000632	0.008871	-1.258452	-0.022480	-0.017306	0.000432	6.77E-05	-0.018188	-0.001475	-0.020223
S.D. dependent	0.014389	0.498021	34.89689	0.317565	0.232628	32.69451	1.283811	1.164094	0.083294	0.031165	1.341960	1.334923	1.205884

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 131, included 124 observation after adjustment with t-critical value 2.000 at 5% significance level. * indicate significant at 5% level of significance.*

Error Correction Mechanism – Aggregate Analysis

Variable:	D(INFM)	D(MS)	D(TEXP)	D(TEXPEN)	D(TIMP)	D(TTAX)
Error Correction Term	-0.266452*	0.158855	0.307958	1.058387	1.928781	8.952553
	(0.08093)	(0.06255)	(0.52715)	(0.27358)	(0.68115)	(2.24726)
	[-3.29238]	[2.53959]	[0.58420]	[3.86866]	[2.83166]	[3.98376]
D(INFM(-1))	-1.132739	-0.140214	-3.119065	-7.464652	-1.672882	-5.380631
	(1.00458)	(0.12425)	(2.04712)	(5.43425)	(1.35302)	(4.46393)
	[-1.12757]	[-1.12847]	[-1.52364]	[-1.37363]	[-1.23641]	[-1.20536]
D(INFM(-2))	-0.602168	-0.212634	-3.933425	-4.401557	-3.484913	-2.245107
	(0.39809)	(0.17487)	(2.47372)	(7.64821)	(1.90426)	(6.28257)
	[-1.51264]	[-1.21593]	[-1.59008]	[-0.57550]	[-1.83006]	[-0.35736]
D(INFM(-3))	-0.250293	-0.080772	-4.136607	-4.489274	-5.051264	-2.311186
	(0.15254)	(0.18867)	(5.59000)	(8.25166)	(6.05451)	(6.77827)
	[-1.64084]	[-0.42811]	[-0.74000]	[-0.54404]	[-0.83430]	[-0.34097]
D(INFM(-4))	-0.078396	-0.147707	-2.529415	-4.780627	-4.567475	-2.453974
	(0.34425)	(0.19847)	(1.67259)	(8.68030)	(3.56123)	(7.13037)
	[-0.22773]	[-0.74423]	[-1.51227]	[-0.55074]	[-1.28254]	[-0.34416]
D(INFM(-5))	-0.421616	-0.262320	-0.601226	-4.482396	-4.876266	-1.122620
	(0.31500)	(0.18600)	(1.56751)	(8.13497)	(3.02545)	(6.68242)
	[-1.33846]	[-1.41030]	[-0.38355]	[-0.55100]	[-1.61175]	[-0.16800]
D(INFM(-6))	-0. 652431*	-0.186026	-1.084769	-2.746221	-2.819560	1.028610
	(0.20294)	(0.16221)	(1.36697)	(7.09422)	(1.76632)	(5.82750)
	[-3.21490]	[-1.14685]	[-0.79356]	[-0.38711]	[-1.59629]	[0.17651]
D(INFM(-7))	-0.063634	-0.197971	-0.228175	-1.257056	-0.556623	0.919788
	(0.09390)	(0.11614)	(0.97879)	(5.07967)	(1.26474)	(4.17266)
	[-0.67767]	[-1.70453]	[-0.23312]	[-0.24747]	[-0.44011]	[0.22043]

D(MS(-1))	-0.310034*	0.470848	4.040953	1.662778*	2.965193*	1.393943*
	(0.07827)	(0.96804)	(8.15808)	(0.42338)	(1.05414)	(0.34778)
	[-3.96108]	[0.48639]	[0.49533]	[3.92739]	[2.81290]	[4.00812]
D(MS(-2))	-0.284639*	-0.414146	3.433565	1.508123*	2.611879*	1.258140*
	(0.06583)	(0.86890)	(7.32259)	(0.38002)	(0.94618)	(0.31217)
	[-4.32385]	[-0.47663]	[0.46890]	[3.96854]	[2.76045]	[4.03030]
D(MS(-3))	-0.340261*	-0.864930	2.356988	1.239346*	2.008638*	1.015895*
	(0.10604)	(0.74959)	(6.31710)	(0.32784)	(0.81626)	(0.26930)
	[-3.20880]	[-1.15387]	[0.37311]	[3.78034]	[2.46078]	[3.77235]
D(MS(-4))	-0.045623	-0.858908	1.278652	0.884754*	1.254540	0.723241*
	(0.49024)	(0.60636)	(5.11003)	(0.26520)	(0.66029)	(0.21784)
	[-0.09306]	[-1.41650]	[0.25022]	[3.33618]	[1.89998]	[3.32006]
D(MS(-5))	-0.092794	-0.640461	0.003355	0.518710	8.581538	0.427195*
	(0.35211)	(0.43551)	(3.67022)	(0.19048)	(4.74246)	(0.15646)
	[-0.26354]	[-1.47060]	[0.00091]	[2.72317]	[1.80951]	[2.73038]
D(MS(-6))	-0.973483	-0.300106	-1.558965	0.227055	4.735017	0.192181*
	(1.21424)	(0.26498)	(2.23309)	(0.11589)	(2.88547)	(0.09520)
	[-0.80172]	[-1.13256]	[-0.69812]	[1.95923]	[1.64098]	[2.01871]
D(MS(-7))	-0.394719	-0.083175	-1.307096	5.138291	2.013959	4.655433
	(0.29148)	(0.11314)	(0.95349)	(4.94838)	(1.23205)	(4.06481)
	[-1.35419]	[-0.73514]	[-1.37085]	[1.03838]	[1.63464]	[1.14530]
D(TEXP(-1))	-0.272089*	0.227037*	-2.038825*	1.507441*	2.378830*	0.128461*
	(0.06849)	(0.08472)	(0.71394)	(0.37052)	(0.92251)	(0.03044)
	[-3.97250]	[2.67997]	[-2.85574]	[4.06845]	[2.57865]	[4.22014]

D(TEXP(-2))	-0.256963*	0.224082*	-3.322340*	1.533780*	1.587326	0.132284*
	(0.06548)	(0.08099)	(0.68256)	(0.35423)	(0.88197)	(0.02910)
	[-3.92411]	[2.76666]	[-4.86744]	[4.32990]	[1.79975]	[4.54584]
D(TEXP(-3))	-0.224444*	0.199899*	-3.898669*	1.559555*	0.525270	0.137698*
	(0.06165)	(0.07626)	(0.64264)	(0.33352)	(0.83039)	(0.02740)
	[-3.64042]	[2.62140]	[-6.06661]	[4.67605]	[0.63256]	[5.02547]
D(TEXP(-4))	-0.167462*	0.162544*	-3.557106*	1.342527*	-0.229798	0.122535*
	(0.05609)	(0.06938)	(0.58468)	(0.30344)	(0.75549)	(0.02493)
	[-2.98544]	[2.34284]	[-6.08383]	[4.42436]	[-0.30417]	[4.91516]
D(TEXP(-5))	-0.077075	0.105431	-2.436085*	0.848054*	-0.476799	0.081208*
	(0.04611)	(0.05704)	(0.48066)	(0.24945)	(0.62109)	(0.02049)
	[-1.67155]	[1.84850]	[-5.06817]	[3.39970]	[-0.76768]	[3.96330]
D(TEXP(-6))	-0.042271	0.052042	-1.091119*	0.331575*	-0.100650	0.034070*
	(0.02965)	(0.03667)	(0.30901)	(0.16037)	(0.39928)	(0.01317)
	[-1.42591]	[1.41932]	[-3.53105]	[2.06756]	[-0.25208]	[2.58694]
D(TEXP(-7))	-0.010197	0.013527	-0.262141*	0.676388	-0.077456	0.755509
	(0.01182)	(0.01462)	(0.12321)	(0.63940)	(0.15920)	(0.52523)
	[-0.86266]	[0.92524]	[-2.12767]	[1.05784]	[-0.48654]	[1.43843]
D(TEXPEN(-1))	0.133137*	-0.105036*	-0.216243	-7.776868*	-0.929732*	-4.695270*
	(0.03203)	(0.03961)	(0.33384)	(1.73255)	(0.43137)	(1.42319)
	[4.15692]	[-2.65150]	[-0.64774]	[-4.48869]	[-2.15529]	[-3.29912]
D(TEXPEN(-2))	0.058845	-0.112645*	-0.252743	-7.051797*	-0.772740	-3.585934*
	(0.03552)	(0.04393)	(0.37025)	(1.92151)	(0.47842)	(1.57841)

	[1.65667]	[-2.56393]	[-0.68262]	[-3.66992]	[-1.61519]	[-2.27186]
D(TEXPEN(-3))	0.037425	-0.101004*	-0.129379	-5.241666*	-0.398766	-2.185436
	(0.03835)	(0.04744)	(0.39977)	(2.07472)	(0.51656)	(1.70426)
	[0.97588]	[-2.12920]	[-0.32363]	[-2.52645]	[-0.77196]	[-1.28234]
D(TEXPEN(-4))	0.033150	-0.069538	0.147138	-3.740780	-0.041790	-1.383674
	(0.03669)	(0.04538)	(0.38247)	(1.98493)	(0.49421)	(1.63051)
	[0.90352]	[-1.53221]	[0.38470]	[-1.88459]	[-0.08456]	[-0.84862]
D(TEXPEN(-5))	0.025642	-0.040680	0.329639	-2.648014	0.148339	-1.064779
	(0.03009)	(0.03722)	(0.31364)	(1.62773)	(0.40527)	(1.33709)
	[0.85218]	[-1.09304]	[1.05100]	[-1.62681]	[0.36602]	[-0.79634]
D(TEXPEN(-6))	0.012326	-0.014427	0.355461	-1.894710	0.218906	-1.005979
	(0.01939)	(0.02399)	(0.20216)	(1.04917)	(0.26122)	(0.86184)
	[0.63569]	[-0.60141]	[1.75829]	[-1.80591]	[0.83800]	[-1.16725]
D(TEXPEN(-7))	0.002855	-0.006298	0.167848*	-0.836684*	0.144841	-0.544034
	(0.00759)	(0.00939)	(0.07913)	(0.41068)	(0.10225)	(0.33735)
	[0.38011]	[-0.67073]	[2.12109]	[-2.03732]	[1.41653]	[-1.61268]
D(TIMP(-1))	-0.150913*	0.110733*	0.439785	8.910286*	-0.606776	7.498417*
	(0.04017)	(0.04968)	(0.41869)	(2.17290)	(0.54101)	(1.78491)
	[-3.75704]	[2.22882]	[1.05038]	[4.10065]	[-1.12156]	[4.20100]
D(TIMP(-2))	-0.108801*	0.077283	0.617936	7.467836*	-1.665252*	6.149093*
	(0.03729)	(0.04613)	(0.38874)	(2.01743)	(0.50230)	(1.65720)
	[-2.91739]	[1.67543]	[1.58961]	[3.70166]	[-3.31524]	[3.71052]
D(TIMP(-3))	-0.039874	0.059525	0.924453*	4.588994*	-1.966255*	3.542828*

	(0.03560)	(0.04404)	(0.37113)	(1.92606)	(0.47955)	(1.58215)
	[-1.11989]	[1.35166]	[2.49092]	[2.38258]	[-4.10019]	[2.23925]
D(TIMP(-4))	0.021563	0.047772	1.180329*	1.350287	-1.609028*	0.585268
	(0.03344)	(0.04137)	(0.34861)	(1.80918)	(0.45045)	(1.48614)
	[0.64475]	[1.15485]	[3.38584]	[0.74635]	[-3.57204]	[0.39382]
D(TIMP(-5))	0.035883	0.024530	1.101930*	-0.221014	-1.111071*	-0.813266
	(0.02751)	(0.03402)	(0.28670)	(1.48790)	(0.37046)	(1.22223)
	[1.30458]	[0.72105]	[3.84348]	[-0.14854]	[-2.99917]	[-0.66540]
D(TIMP(-6))	0.021491	0.005508	0.723792*	-0.503011	-0.565368*	-0.874392
	(0.01746)	(0.02160)	(0.18202)	(0.94462)	(0.23519)	(0.77595)
	[1.23071]	[0.25504]	[3.97650]	[-0.53250]	[-2.40385]	[-1.12686]
D(TIMP(-7))	0.006340	-0.000578	0.247428	-0.253998	-0.204736	-0.362173
	(0.00682)	(0.00844)	(0.07111)	(0.36906)	(0.09189)	(0.30316)
	[0.92936]	[-0.06851]	[3.47934]	[-0.68823]	[-2.22808]	[-1.19465]
D(TTAX(-1))	-0.288658*	0.224770*	0.445338	1.332508*	2.341782*	9.241414*
	(0.07034)	(0.08700)	(0.73319)	(0.38051)	(0.94739)	(3.12566)
	[-4.10373]	[2.58352]	[0.60740]	[3.50190]	[2.47182]	[2.95663]
D(TTAX(-2))	-0.307188*	0.215873	0.398599	1.085241*	2.022689*	6.754595*
	(0.06918)	(0.08556)	(0.72107)	(0.37422)	(0.93172)	(3.07396)
	[-4.44061]	[2.52298]	[0.55279]	[2.90000]	[2.17091]	[2.19736]
D(TTAX(-3))	-0.318339*	0.178592	0.105260	0.773541*	1.296219	4.394580
	(0.06567)	(0.08122)	(0.68448)	(0.35523)	(0.88445)	(2.91798)
	[-4.84779]	[2.19885]	[0.15378]	[2.17758]	[1.46557]	[1.50603]
D(TTAX(-4))	-0.290653*	0.122704	-0.324634	0.537151	0.651046	2.978792
	(0.05644)	(0.06981)	(0.58832)	(0.30533)	(0.76020)	(2.50807)
	[-5.14959]	[1.75766]	[-0.55179]	[1.75925]	[0.85641]	[1.18768]

D(TTAX(-5))	-0.206645*	0.071405	-0.511495	0.363227	0.203459	2.117569
	(0.04246)	(0.05251)	(0.44256)	(0.22968)	(0.57186)	(1.88668)
	[-4.86703]	[1.35970]	[-1.15575]	[1.58145]	[0.35579]	[1.12238]
D(TTAX(-6))	-0.106099*	0.027176	-0.453470	0.243212	-0.088040	1.594624
	(0.02558)	(0.03164)	(0.26662)	(0.13837)	(0.34451)	(1.13661)
	[-4.14797]	[0.85900]	[-1.70082]	[1.75769]	[-0.25555]	[1.40296]
D(TTAX(-7))	-0.026568*	0.009767	-0.161596	0.102203	-0.114048	0.751965
	(0.00965)	(0.01193)	(0.10056)	(0.05219)	(0.12994)	(0.42871)
	[-2.75387]	[0.81849]	[-1.60692]	[1.95829]	[-0.87769]	[1.75403]
C	0.002424	-0.001671	-0.005936	-0.145264*	-0.026055	-0.118634
	(0.00130)	(0.00161)	(0.01360)	(0.07057)	(0.01757)	(0.05797)
	[1.85814]	[-1.03557]	[-0.43654]	[-2.05844]	[-1.48290]	[-2.04649]
R-squared	0.808949*	0.925937*	0.965885*	0.964055*	0.976333*	0.955268*
Adj. R-squared	0.703627	0.885107	0.947078	0.944239	0.963285	0.930609
Sum sq. resids	0.012211	0.018680	1.326705	35.73257	2.215114	24.11121
S.E. equation	0.012512	0.015476	0.130419	0.676838	0.168520	0.555984
F-statistic	7.680672	22.67806	51.35798	48.65092	74.82993	38.73797
Log likelihood	388.6660	362.7316	102.6902	-98.20503	71.42125	-74.20850
Akaike AIC	-5.650262	-5.225108	-0.962134	2.331230	-0.449529	1.937844
Schwarz SC	-4.638976	-4.213821	0.049152	3.342516	0.561758	2.949131
Mean dependent	-0.000161	-0.000255	0.001538	-0.007405	-0.014384	-0.001657
S.D. dependent	0.022983	0.045656	0.566921	2.866295	0.879490	2.110617

*Source: Author (2017). Standard error and t-statistics in parentheses ( ) and [ ] respectively, Sample 130, included 122 observation after adjustment with t-critical value 1.98 at 5% significance level. * indicate significant at 5% level of significance.*

Appendix V: Economic A Priori

Economic a Priori Criteria Test Results

Variable	Sign	Expected Sign	Inference
Development expenditure	Negative	Positive	Does not conform
Recurrent expenditure	Negative	Positive	Does not conform
Total expenditure	Negative	Positive	Does not conform
Domestic exports	Positive	Positive	Conform
Re-exports	Negative	Positive	Does not conform
Total exports	Positive	Positive	Conform
Excise duty	Positive	Positive	Conform
Import duty	Positive	Positive	Conform
Income tax	Negative	Positive	Does not conform
VAT	Positive	Positive	Conform
Total tax	Positive	Positive	Conform
Commercial imports	Negative	Negative	Conform
Government imports	Positive	Negative	Does not conform
Total imports	Negative	Negative	Conform
M0	Positive	Positive	Conform
M3	Positive	Positive	Conform
Total money supply	Positive	Positive	Conform

Source: Author (2017)

Appendix VI: Transformed Data

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
5-Feb	0.130918	0.144141	0.104127	0.126537	0.121195	0.12484	0.129512	0.125472	-0.26838	2.076159	-0.24999	0.0442	0.009298	0.034929	-8.3E-05	-0.01525	0.004751	0.1394
5-Mar	0.103676	0.47	0.12965	0.136726	0.127713	0.15071	0.045948	0.136489	0.27169	-0.64047	0.242348	0.1682	0.00658	0.126333	0.013703	-0.00463	0.013783	0.1415
5-Apr	0.101295	0.69	0.137052	0.124865	0.125722	0.131921	0.172273	0.136962	0.420959	0.272455	0.419577	-0.10139	-0.02204	-0.08302	0.010002	0.03053	-0.00241	0.1602
5-May	0.088094	0.85	0.112118	0.090818	0.101242	0.125446	0.192667	0.134105	-0.25445	-0.41882	-0.25583	0.054787	-0.03992	0.031405	0.003723	-0.02591	0.003888	0.1478
5-Jun	0.120038	0.49	0.132712	0.113441	0.120641	0.144653	0.291525	0.164549	0.218318	-0.59109	0.213017	-0.00831	0.033817	0.001372	0.011169	0.019	0.009606	0.1192
5-Jul	-0.95806	0.24	-0.93296	-0.94965	-0.94174	-0.91811	-0.92257	-0.91878	-0.3148	-0.9901	-0.31627	-0.10056	-0.09467	-0.09912	0.021221	0.00704	0.012864	0.1176
5-Aug	1.778116	-0.81	1.323715	1.503136	1.392327	1.288587	1.486555	1.316942	0.449308	155	0.454224	0.159856	-0.33071	0.042824	0.016238	-0.00254	0.016495	0.0687
5-Sep	0.696572	-1.29	0.768012	0.542341	0.716695	0.511237	0.531929	0.514418	-0.20268	-0.70513	-0.20437	-0.01653	-0.1013	-0.02955	-0.00263	-0.00449	-0.0018	0.0427
5-Oct	0.358985	-1.25	0.298533	0.446212	0.349206	0.382015	0.249889	0.361471	-0.00683	1.695652	-0.00473	-0.09323	0.09576	-0.0664	0.011117	0.012801	0.019728	0.0372
5-Nov	0.301329	-1.1	0.200631	0.261586	0.249248	0.209074	0.138874	0.199053	0.010228	-0.02419	0.010138	-0.03449	0.010964	-0.02693	0.004648	0.06047	0.008565	0.044
5-Dec	0.20615	-1.02	0.286321	0.25243	0.25986	0.267765	0.244819	0.264654	0.098282	-0.18182	0.097328	0.077902	-0.35789	0.002536	0.010852	0.040712	0.008335	0.047
6-Jan	0.182203	-0.51	0.142568	0.219803	0.174698	0.158569	0.274668	0.174063	-0.01004	-0.94949	-0.01236	-0.04012	-0.17933	-0.05548	0.006786	-0.03275	0.004192	0.0839
6-Feb	0.131191	-0.35	0.105861	0.145463	0.1268	0.117713	0.14304	0.121383	-0.03033	22.6	-0.02745	6.44E-05	0.521186	0.05018	0.013542	-0.01692	0.01621	0.0939
6-Mar	0.145818	-0.4	0.138343	0.150548	0.139663	0.131998	0.192603	0.140949	0.021341	11.32203	0.055939	0.201713	-0.0191	0.170953	0.011873	0.018256	0.016004	0.0885
6-Apr	0.055771	-0.84	0.131485	0.109342	0.109938	0.098344	0.070299	0.094015	0.198833	-0.84319	0.161605	-0.18661	0.108316	-0.1522	0.024142	-0.01061	0.0315	0.0544
6-May	0.147823	-0.82	0.121149	0.128534	0.121446	0.104982	0.204397	0.119997	-0.14179	8.026316	-0.1024	0.247019	-0.09444	0.19493	0.002429	-0.01834	-0.00168	0.0447
6-Jun	0.492999	-0.62	0.248176	0.417159	0.316098	0.101999	0.128915	0.106371	0.034501	-0.73712	-0.00292	0.034978	-0.10994	0.018178	0.022152	0.078438	0.015618	0.0428
6-Jul	-0.92617	-0.6	-0.94075	-0.92117	-0.93185	-0.91587	-0.99383	-0.92879	-0.05315	-0.39372	-0.05753	0.072902	-0.00454	0.065125	0.02138	-0.00358	0.023166	0.0416
6-Aug	1.289513	-0.16	1.001892	0.846884	1.031606	0.978583	22.72043	1.290715	0.242408	1.271341	0.250903	-0.01318	0.172445	0.004352	0.006885	0.023233	0.002802	0.0492
6-Sep	0.49914	0.13	0.932816	0.395548	0.608392	0.592365	0.575363	0.589838	-0.11147	-0.31544	-0.11451	-0.00916	-0.60856	-0.07525	0.011445	0.002113	0.015113	0.0593
6-Oct	0.284464	0.24	0.23476	0.496268	0.331311	0.358756	0.369254	0.360302	0.072448	1.088235	0.084177	-0.07324	-0.13917	-0.07632	0.011385	0.013888	0.015695	0.0655
6-Nov	0.261336	0.18	0.217117	0.278471	0.249281	0.203805	0.319323	0.226753	0.034471	-0.32676	0.026416	0.138049	0.362587	0.147765	0.008323	0.042901	0.010263	0.0664
6-Dec	0.212414	0.27	0.314233	0.192426	0.241223	0.230941	0.308737	0.242245	-0.13011	3.016736	-0.08419	-0.13911	-0.17966	-0.14117	0.011827	0.051851	0.009573	0.0798

Source: author (2017) transformation

Appendix VI: Transformed Data

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
7-Jan	0.173665	-0.31	0.152909	0.188224	0.180087	0.123958	0.107835	0.1232	0.126169	-0.7066	0.072866	0.077339	-0.19731	0.063793	0.010888	-0.04229	0.006471	0.0463
7-Feb	0.131106	-0.53	0.112869	0.129246	0.122376	0.165824	0.151474	0.162525	0.184384	-0.1503	0.178552	0.088254	2.01287	0.159929	0.006883	0.003481	0.004088	0.0302
7-Mar	0.128507	-0.56	0.143481	0.150868	0.14134	0.144272	0.266435	0.165199	-0.18637	-0.85655	-0.19485	0.033189	-0.61042	-0.02907	0.023041	0.042585	0.026366	0.0219
7-Apr	0.124988	-0.3	0.174557	0.139668	0.150864	0.118767	0.082458	0.111643	-0.05918	4.533981	-0.04884	-0.13004	-0.11732	-0.12955	0.006979	-0.0054	0.007115	0.0185
7-May	0.097842	-0.22	0.115719	0.113	0.114018	0.091109	0.133648	0.093156	0.172807	0.833333	0.181468	0.221137	0.285714	0.223628	0.006233	0.013278	0.012277	0.0196
7-Jun	0.085807	-0.01	0.14862	0.101539	0.122432	0.098357	0.244041	0.1246	-0.0179	-0.37703	-0.0252	-0.08072	-0.28309	-0.08904	0.019982	0.013635	0.025848	0.0407
7-Jul	-0.88313	0.11	-0.91943	-0.88842	-0.90434	-0.91851	-0.96606	-0.92798	0.05003	0.78341	0.059561	0.027229	0.362534	0.038178	0.009338	0.0006	0.00737	0.0548
7-Aug	0.839191	0.03	0.956859	0.822752	0.916138	1.117926	3.882588	1.377565	0.007265	-0.83032	-0.01104	0.01182	-0.06034	0.008697	0.020682	0.035785	0.02368	0.053
7-Sep	0.452224	-0.03	0.751803	0.472676	0.559514	0.397285	0.211659	0.361485	-0.09293	3.685279	-0.07878	-0.11691	0.058947	-0.10996	0.007805	-0.01167	0.003858	0.0553
7-Oct	0.345056	-0.09	0.328394	0.335183	0.339702	0.42064	0.919017	0.50618	0.239077	-0.84074	0.21851	0.160768	0.161034	0.160835	0.005872	0.008306	0.008637	0.0538
7-Nov	0.265801	-0.03	0.229006	0.251325	0.250672	0.281314	0.45876	0.320118	-0.03064	3.319728	-0.0223	0.06183	-0.05479	0.056312	0.013371	0.080495	0.007578	0.0608
7-Dec	0.144596	-0.18	0.277823	0.13104	0.192346	0.190638	0.135272	0.177259	-0.34289	-0.62362	-0.346	-0.32159	0.019928	-0.30713	0.038147	0.100346	0.043378	0.057
8-Jan	0.174316	0.42	0.165907	0.215823	0.190864	0.302112	0.197746	0.277791	0.699086	1.481172	0.704081	0.344038	-0.12433	0.314846	0.021468	-0.05673	0.030416	0.094
8-Feb	0.144827	0.63	0.105973	0.132138	0.119839	0.109688	0.097513	0.107029	-0.09743	-0.13322	-0.09776	0.373726	0.064909	0.360908	0.008974	-0.01638	0.011181	0.1058
8-Mar	0.140152	0.81	0.138602	0.106142	0.123105	0.150732	0.110984	0.142125	-0.07755	-0.75486	-0.08355	-0.17975	0.391429	-0.16123	0.004428	-0.04584	0.001244	0.119
8-Apr	0.085614	1.19	0.171642	0.109939	0.133563	0.106385	0.069091	0.098529	0.031503	-0.69841	0.029774	0.087234	-0.11499	0.076378	0.045424	-0.04575	0.0652	0.1612
8-May	0.096531	1.38	0.120623	0.109345	0.110566	0.125092	0.192974	0.139008	0.027253	15.81579	0.038186	-0.12394	0.007734	-0.11807	0.011866	0.006022	-0.02878	0.1861
8-Jun	0.078928	1.16	0.13085	0.095787	0.107082	0.144813	0.364663	0.192019	-0.11526	-0.68545	-0.12167	-0.02468	0.133538	-0.01671	-0.0333	0.024775	0.001716	0.1787
8-Jul	-0.92484	0.97	-0.92741	-0.9075	-0.919	-0.93505	-0.97475	-0.94481	0.40129	1.865672	0.40721	0.202828	0.132024	0.198696	0.013311	0.013808	0.012209	0.1712
8-Aug	0.879645	1.09	0.942902	0.951033	0.949273	1.15313	4.491265	1.528557	0.033647	-0.00174	0.033357	-0.04113	0.355263	-0.01932	0.00318	0.007493	0.004711	0.1833
8-Sep	0.667383	1.1	0.798626	0.546607	0.648964	0.60402	0.073995	0.474566	0.030581	-0.13217	0.029293	-0.03165	-0.1752	-0.04252	0.00541	0.000655	0.005118	0.1873
8-Oct	0.412887	1.11	0.307727	0.344077	0.339622	0.510576	1.000613	0.59775	0.005372	-0.63327	0.00111	0.110376	0.596576	0.142235	0.023153	0.037106	0.028078	0.1874
8-Nov	0.30664	1.12	0.207193	0.264901	0.235566	0.203071	0.176019	0.197045	-0.10297	6.672131	-0.08641	-0.0718	-0.45576	-0.10698	0.006881	0.030572	0.007634	0.1954
8-Dec	0.260087	1.02	0.350318	0.201988	0.271265	0.252343	0.237458	0.249086	-0.00019	0.137464	0.002632	-0.00106	0.19335	0.009808	0.008281	0.026527	0.012194	0.1783

Source: author (2017) transformation

Appendix VI: Transformed Data

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
9-Jan	0.173333	0.29	0.161973	0.169658	0.171795	0.158542	0.104217	0.146765	-0.01414	-0.9042	-0.03487	-0.04685	-0.36068	-0.06761	-0.00249	-0.02878	-0.00628	0.1322
9-Feb	0.136726	0.31	0.192744	0.133132	0.161054	0.168943	0.278631	0.191841	-0.10133	7.03268	-0.08483	0.04751	0.060533	0.048099	0.013035	-0.01473	0.005175	0.1469
9-Mar	0.123977	0.2	0.136728	0.120515	0.129054	0.106552	0.012748	0.085544	0.023427	-0.53377	0.01212	0.054309	0.995434	0.097433	0.004117	-0.01969	0.006706	0.146
9-Apr	0.101655	-0.35	0.181658	0.107975	0.144085	0.166956	0.28797	0.19224	0.062134	1.272251	0.073446	-0.12621	-0.56484	-0.16276	0.024829	-0.01564	0.025116	0.1242
9-May	0.094891	-0.79	0.134564	0.094959	0.114659	0.092634	0.164004	0.108743	-0.09124	-0.93241	-0.10789	-0.02706	0.09816	-0.02163	0.00353	-0.00152	-0.00024	0.0961
9-Jun	0.108419	-0.82	0.029757	0.102771	0.069554	0.106534	0.310745	0.154924	0.05591	10.60227	0.071738	0.095657	0.03352	0.092637	0.024096	0.01049	0.023298	0.086
9-Jul	-0.90835	-0.76	-0.93576	-0.90227	-0.91995	-0.86797	-0.94136	-0.9248	0.007206	0.374143	0.013146	0.055487	1.448649	0.119541	0.028309	0.02242	0.024609	0.0844
9-Aug	0.904704	-0.93	0.984639	0.858687	0.907333	0.322126	1.303417	1.18016	-0.04809	-0.6928	-0.06229	-0.13074	0.070009	-0.11058	0.011464	-0.00324	0.010695	0.0736
9-Sep	0.502533	-1.01	0.930509	0.499175	0.674471	0.604968	0.803522	0.648963	0.168377	-0.92111	0.160504	0.129107	-0.63454	0.036761	0.003677	-0.01561	0.002911	0.0674
9-Oct	0.358693	-0.99	0.33152	0.299302	0.330362	0.350982	0.176802	0.30877	0.039796	7	0.043223	-0.03862	0.275806	-0.02521	0.021065	0.073018	0.019362	0.0662
9-Nov	0.279045	-1.18	0.208841	0.271682	0.243197	0.185912	0.138872	0.175662	-0.05337	2.338235	-0.04438	0.038375	0.32048	0.054156	-0.00019	-0.00272	0.016317	0.05
9-Dec	0.25194	-1	0.328237	0.216741	0.271836	0.201582	0.171845	0.195305	0.142307	-0.64317	0.131992	0.051927	-0.50263	0.01312	0.02964	0.075573	0.022723	0.0532
10-Jan	0.163801	-0.6	0.147348	0.170689	0.157344	0.202646	0.498058	0.263781	-0.10484	3.382716	-0.0904	-0.0314	1.202117	0.010968	0.013611	-0.05275	0.02067	0.0595
10-Feb	0.124142	-0.76	0.105811	0.129998	0.119041	0.174491	0.179692	0.175767	-0.15224	-0.17465	-0.15268	0.100904	-0.04545	0.089926	0.010319	0.00184	0.015998	0.0518
10-Mar	0.129091	-0.85	0.139291	0.139793	0.134814	0.151235	0.119017	0.143305	0.269592	-0.88908	0.247066	0.064323	-0.28205	0.041643	0.029651	0.006876	0.021719	0.0397
10-Apr	0.115348	-0.71	0.173458	0.115514	0.141034	0.080481	0.258206	0.123296	-0.04327	0.946154	-0.04155	-0.13486	0.637755	-0.10002	0.010661	0.026601	0.013444	0.0366
10-May	0.099333	-0.47	0.105926	0.097304	0.103551	0.13641	0.15179	0.14056	0.115067	-0.2332	0.113859	0.091527	-0.25506	0.063098	0.029295	-0.00853	0.03278	0.0388
10-Jun	0.106322	-0.42	0.190649	0.14514	0.154528	0.14381	0.454157	0.228455	-0.02707	5.469072	-0.01381	0.01363	-0.32933	-0.00611	0.027672	0.032569	0.033921	0.0349
10-Jul	-0.93181	-0.4	-0.93902	-0.91882	-0.92943	-0.93333	-0.99932	-0.95462	0.015176	0.139442	0.017145	0.044684	0.294622	0.05436	0.022046	0.029205	0.011912	0.0357
10-Aug	1.22368	-0.34	1.057115	1.05715	1.069552	1.388769	150.5172	2.110901	-0.08483	-0.58462	-0.09371	-0.13384	-0.05178	-0.1299	0.014943	-0.0047	0.002981	0.0322
10-Sep	0.645624	-0.29	0.911227	0.558642	0.705642	0.448396	0.507396	0.462311	0.204452	1.373737	0.213994	0.133739	0.565714	0.156186	0.020111	0.008913	0.022001	0.0321
10-Oct	0.395137	-0.28	0.336354	0.393148	0.361413	0.462408	0.573941	0.489524	-0.08844	1.246099	-0.06723	-0.08214	-0.04704	-0.07967	0.006825	0.067422	0.008754	0.0318
10-Nov	0.294751	-0.1	0.217514	0.267885	0.248248	0.23799	0.272166	0.24677	0.282462	-0.76318	0.242411	0.20701	0.357447	0.217971	0.010274	0.009697	0.003447	0.0384
10-Dec	0.2173	-0.06	0.350378	0.208766	0.270676	0.227972	0.180499	0.196771	-0.09134	0	-0.09066	0.063116	-0.41787	0.024057	0.010274	0.089024	0.010189	0.0451

Source: author (2017) transformation

Appendix VI: Transformed Data

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
11-Jan	0.18199	-0.03	0.140663	0.208836	0.174006	0.164134	0.212515	0.194889	-0.02809	-0.37467	-0.03087	-0.11931	-0.10339	-0.11855	0.012551	-0.08223	0.010863	0.0542
11-Feb	0.113716	0.12	0.107831	0.129954	0.121901	0.110243	0.175259	0.127302	-0.05518	0	-0.0549	0.081942	0.335135	0.093801	0.014343	-0.00303	0.016292	0.0654
11-Mar	0.138918	0.44	0.14322	0.126271	0.134142	0.128005	0.155488	0.135523	0.283256	0.15565	0.282557	0.13074	0.140351	0.131291	0.015692	0.016061	0.014	0.0919
11-Apr	0.090297	0.71	0.184431	0.114664	0.138921	0.148513	0.089367	0.135647	-0.21663	1.677122	-0.20728	-0.09202	-0.25799	-0.10163	0.007301	0.030951	0.00771	0.1205
11-May	0.107991	0.76	0.131233	0.102504	0.115811	0.081865	0.117413	0.089633	0.348831	0.002757	0.343059	0.034579	0.031366	0.034452	0.01354	-0.02291	0.012356	0.1295
11-Jun	0.120646	0.92	0.170229	0.114475	0.137699	0.169098	0.245816	0.188277	-0.10135	-0.57182	-0.10721	0.065379	0.258247	0.074531	0.029269	0.033372	0.021711	0.1448
11-Jul	-0.9295	1	-0.94335	-0.92001	-0.93404	-0.93407	-0.97734	-0.94649	-0.03013	2.756019	-0.01349	-0.01088	0.532978	0.019446	0.013213	0.045036	0.023154	0.1553
11-Aug	1.428571	1.12	1.147683	1.031859	1.134547	1.04148	2.288805	1.19312	0.346775	-0.70342	0.322893	0.076092	-0.40353	0.035933	0.016433	-0.00051	0.017113	0.1667
11-Sep	0.575304	1.18	1.002161	0.528997	0.732355	0.74073	1.468535	0.873416	-0.11146	3.851585	-0.09126	-0.01267	0.244176	-0.00028	0.020643	-0.00391	0.032933	0.1732
11-Oct	0.316272	1.31	0.341465	0.303177	0.319981	0.381718	0.384264	0.38233	-0.04661	-0.69944	-0.06437	-0.00538	-0.27152	-0.02138	0.030606	0.04939	0.019848	0.1891
11-Nov	0.254157	1.33	0.226305	0.273985	0.255056	0.292279	0.2788	0.289036	0.07165	2.332016	0.091405	-0.01841	0.028176	-0.01635	-0.01406	0.01037	-0.01579	0.1972
11-Dec	0.221421	1.2	0.364656	0.215075	0.286604	0.296481	0.505459	0.346353	-0.0623	-0.51038	-0.07426	-0.0727	0.228846	-0.05859	0.009385	0.043894	0.016379	0.1893
12-Jan	0.14089	1.08	0.124717	0.169694	0.148995	0.177038	0.194299	0.181641	-0.13769	0.360993	-0.13065	0.028249	-0.26095	0.010615	0.005127	-0.06923	-0.00554	0.1831
12-Feb	0.135386	0.83	0.119487	0.136006	0.128694	0.145671	0.168798	0.151907	-0.02695	1.371162	0.003964	0.031327	0.236633	0.040505	0.019758	-0.00737	-0.00066	0.1669
12-Mar	0.127315	0.52	0.140119	0.12354	0.134701	0.12533	0.188353	0.142581	0.252024	-0.34122	0.221042	-0.00743	0.253853	-0.00706	0.008354	0.021615	0.008207	0.1561
12-Apr	0.108017	0.05	0.186247	0.111216	0.14681	0.138469	0.063569	0.11715	-0.16007	-0.70399	-0.17539	-0.13264	0.400137	-0.12554	0.001726	-0.01524	0.01263	0.1306
12-May	0.123807	-0.1	0.116087	0.103198	0.112823	0.089475	0.141445	0.103558	0.242642	1.278152	0.253111	0.09586	-0.27237	0.106911	0.011633	-7.1E-05	0.016459	0.1222
12-Jun	0.135081	-0.43	0.162294	0.162953	0.151538	0.074692	0.19538	0.108519	-0.11744	-0.79087	-0.12982	-0.01414	-0.18298	-0.02603	0.014572	-0.003	0.021444	0.1005
12-Jul	-0.92315	-0.7	-0.94248	-0.93008	-0.93552	-0.93718	-0.96428	-0.94537	0.094485	1.648485	0.10134	0.03987	0.036505	0.039696	0.010674	0.012507	0.011291	0.0774
12-Aug	1.247861	-0.94	1.336338	1.120262	1.217329	1.686927	2.875114	1.92183	-0.05616	-0.34706	-0.05925	-0.00017	0.391769	0.022889	0.015311	0.023135	0.015895	0.0609
12-Sep	0.470727	-1.04	0.860089	0.52711	0.686543	0.558184	0.675844	0.589028	-0.07449	-0.05841	-0.07437	-0.02405	-0.30879	-0.04687	0.019276	-0.00701	0.0199	0.0532
12-Oct	0.41026	-1.25	0.319997	0.277965	0.330527	0.355163	0.25654	0.327893	0.032683	-0.03598	0.032168	0.100112	1.140683	0.16059	0.01751	0.033545	0.018957	0.0414
12-Nov	0.267757	-1.37	0.227621	0.367536	0.272802	0.330885	0.238466	0.306712	0.170334	0.267696	0.171016	-0.02573	-0.26364	-0.05121	0.019054	0.047937	0.022112	0.0325
12-Dec	0.201115	-1.29	0.330484	0.206875	0.269272	0.271676	0.21005	0.256397	-0.11066	1.449746	-0.09883	-0.14264	0.030793	-0.12823	-0.00335	0.044826	-0.00745	0.032

Source: author (2017) transformation

Appendix VI: Transformed Data

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
13-Jan	0.188707	-1.18	0.145067	0.199575	0.172721	0.137244	0.249996	0.164169	0.136334	-0.79693	0.117096	0.186979	0.04962	0.173441	0.000989	-0.03811	0.00128	0.0367
13-Feb	0.130274	-0.96	0.113438	0.139544	0.12615	0.142917	0.052851	0.119824	-0.11158	0.385714	-0.10972	0.004073	-0.14231	-0.00879	0.008665	0.047407	0.010401	0.0445
13-Mar	0.120113	-0.91	0.134564	0.123266	0.127706	0.150439	0.241971	0.172505	-0.06605	0.061856	-0.0653	-0.11568	-0.33577	-0.13244	0.01372	0.007611	0.004492	0.0411
13-Apr	0.110365	-0.72	0.191895	0.40685	0.233727	0.14501	0.103758	0.134476	0.093483	-0.35645	0.090501	0.01625	0.61431	0.051114	0.027178	-0.03595	0.026506	0.0414
13-May	0.11104	-0.65	0.125775	-0.10765	0.048441	0.117375	0.136967	0.122241	-0.03932	-0.67888	-0.04182	0.027079	0.000262	0.024678	0.014824	0.011379	0.011717	0.0405
13-Jun	0.173807	-0.4	0.133843	0.279659	0.182839	0.111436	0.788823	0.281933	-0.14756	0.778523	-0.14636	-0.09928	-0.27294	-0.11446	0.002273	0.011804	-0.00138	0.0491
13-Jul	-0.89101	-0.12	-0.93198	-0.92937	-0.92551	-0.9393	-0.9996	-0.96048	0.280797	-0.12453	0.27968	0.099914	-0.25316	0.074604	0.014242	0.002991	0.008196	0.0603
13-Aug	1.398299	0.06	1.085089	1.242577	1.197304	1.438403	40.52267	1.575692	-0.05585	10.17241	-0.03674	-0.08742	1.320135	-0.01724	0.013453	0.025041	0.007719	0.0667
13-Sep	0.451434	0.25	0.881818	0.50662	0.674566	0.59438	4.236231	0.800589	-0.04485	-0.80131	-0.06123	0.005971	0.057232	0.012007	0.027328	-0.03834	0.019355	0.0829
13-Oct	0.362214	0.3	0.329003	0.396225	0.317008	0.346	0.549587	0.379516	0.178789	-0.19417	0.177069	0.005715	-0.44528	-0.04973	0.009543	0.0497	0.007644	0.0776
13-Nov	0.250102	0.34	0.210928	0.266944	0.239086	0.229149	0.458411	0.271555	-0.13916	5.20241	-0.12239	0.025585	1.463094	0.128774	0.021146	0.04375	0.028117	0.0736
13-Dec	0.195635	0.33	0.323611	0.214241	0.259982	0.185697	0.285991	0.20697	0.039991	-0.61383	0.025486	-0.04036	-0.35802	-0.09013	0.017375	0.018187	0.021816	0.0715
14-Jan	0.176447	0.29	0.136275	0.192345	0.161606	0.201989	0.126398	0.184904	0.09284	0.181087	0.093577	0.058853	0.144524	0.068324	0.014001	-0.03648	0.015192	0.0721
14-Feb	0.119467	0.2	0.103583	0.131533	0.11661	0.087319	0.272423	0.127091	-0.17444	-0.46934	-0.1771	-0.0403	0.218824	-0.00961	0.000594	-0.00591	0.001934	0.0686
14-Mar	0.111434	0.18	0.128802	0.12528	0.124775	0.099945	0.083618	0.095984	0.013584	-0.84591	0.008574	0.125714	0.258044	0.145024	0.012682	0.002786	0.014689	0.0627
14-Apr	0.105872	0.19	0.179009	0.118929	0.146921	0.111337	0.2173	0.13675	0.283637	7.1875	0.289795	-0.05525	0.310614	0.003317	0.022223	0.000395	0.019559	0.0641
14-May	0.0993	0.27	0.106985	0.117549	0.109931	0.124773	0.13608	0.127677	0.080817	0	0.08036	0.003278	-0.12255	-0.02304	0.019288	0.018615	0.022312	0.073
14-Jun	-0.20065	0.2	0.155019	0.106697	0.099978	0.451852	0.223943	0.392883	-0.24575	0	-0.24447	-0.02621	-0.29868	-0.07742	0.006318	-0.00973	0.002167	0.0739
14-Jul	-0.93244	0.14	-0.93031	-0.92312	-0.92792	-0.95239	-0.99155	-0.96129	0.315055	-0.66285	0.308294	-0.07775	0.282702	-0.02625	0.034619	0.018878	0.017631	0.0767
14-Aug	1.2305	0.14	0.98318	1.097009	1.031338	1.739677	3.857317	1.844727	-0.03838	3.475472	-0.03212	0.141245	-0.49073	0.022348	0.024088	0.018125	0.028876	0.0836
14-Sep	0.63389	-0.14	0.870926	0.565338	0.73408	0.765909	1.770106	0.850968	0.090974	2.51602	0.11096	-0.05035	-0.35995	-0.07936	-0.00314	-0.03789	-0.00069	0.066
14-Oct	0.350688	-0.11	0.293385	0.369456	0.344283	0.31689	1.212568	0.430429	6.42E-05	-0.61007	-0.01584	-0.00891	1.518392	0.090604	0.003086	0.033976	0.003669	0.0643
14-Nov	0.253984	-0.11	0.199294	0.262805	0.229355	0.240062	0.607679	0.312146	-0.22321	-0.63469	-0.22746	-0.02077	-0.07047	-0.02825	0.015209	0.023379	0.015541	0.0609
14-Dec	0.245634	-0.09	0.326534	0.210397	0.269417	0.255436	0.244233	0.252742	0.091913	9.193603	0.136373	0.003295	-0.30083	-0.04047	0.008633	0.037629	0.015176	0.0602

Source: author (2017) transformation

Appendix VI: Transformed Data

MONTH	ID	ED	IT	VAT	TTAX	REC	DEV	TEXPEN	CIMP	GIMP	TIMP	DEXP	REEXP	TEXP	MS	M0	M3	INFM
15-Jan	0.193491	-0.14	0.139029	0.201256	0.165546	0.215	0.343798	0.245732	-0.04888	-0.67333	-0.07625	-0.01295	0.111909	0.000146	0.011756	-0.01852	0.008937	0.0553
15-Feb	0.130892	-0.11	0.11234	0.129732	0.119035	0.146702	0.081403	0.129895	-0.11053	-0.31041	-0.11363	0.050902	-0.07668	0.036028	0.016315	0.009349	0.024257	0.0561
15-Mar	0.124103	0	0.12915	0.125136	0.126936	0.163403	0.763446	0.31122	0.018465	-0.2522	0.015193	0.06364	0.59332	0.118675	0.000738	-0.00178	-0.00376	0.0631
15-Apr	0.111942	0.06	0.163316	0.123721	0.143443	0.141898	0.063053	0.115776	0.128273	0.368627	0.130417	-0.15465	-0.21813	-0.16404	0.021023	0.015999	0.027397	0.0708
15-May	0.103358	-0.04	0.111519	0.10576	0.109278	0.072024	0.052621	0.065899	0.101506	0.830946	0.109341	0.100696	0.475543	0.152579	0.01342	0.006155	0.015057	0.0687
15-Jun	0.133602	-0.02	0.149362	0.113787	0.132834	0.15965	0.21838	0.177957	-0.10594	-0.34546	-0.11019	0.10206	-0.28201	0.034025	0.018104	0.000496	0.020549	0.0703
15-Jul	-0.92096	-0.09	-0.92825	-0.91567	-0.92313	-0.95182	-0.98993	-0.9641	0.07794	3.661686	0.124719	0.209472	0.537791	0.249842	0.011636	0.034499	-0.00157	0.0662
15-Aug	1.165727	-0.2	0.898602	1.024568	0.983572	1.499566	4.774438	1.795869	-0.093	-0.74061	-0.12804	-0.07068	-0.08529	-0.07289	0.005558	-0.01107	0.008198	0.0584
15-Sep	0.532187	-0.05	0.82959	0.565593	0.681627	0.644085	0.384442	0.595574	0.087068	1.126545	0.103798	-0.09637	-0.07525	-0.09322	-0.00628	-0.02455	-0.00538	0.0597
15-Oct	0.350582	0.02	0.279668	0.322955	0.308032	0.592615	0.394308	0.560464	-0.07307	-0.52882	-0.0872	0.095526	-0.24372	0.043852	0.01231	0.039487	0.004423	0.0672
15-Nov	0.247913	0.11	0.217222	0.253831	0.235692	0.327804	1.776395	0.53768	0.281294	0.613715	0.286614	-0.12696	0.419781	-0.06662	0.014969	0.003219	0.010009	0.0732
15-Dec	0.196615	0.16	0.327938	0.198926	0.269399	0.279228	0.20972	0.261045	-0.25246	0.555793	-0.23623	0.055149	0.000857	0.046036	0.019153	0.047262	0.022033	0.0801

Source: author (2017) transformation

Data was transformed to obtain percentage change by $\%\Delta X_t = \frac{X_t - X_{t-1}}{X_{t-1}}$ where $\%\Delta X_t$ is monthly percentage change in time series variable, X_t is current month's value and X_{t-1} is previous month's value

Appendix VII: Map of Kenya

Map No. 4187 Rev. 1 UNITED NATIONS
January 2004

Department of Peacekeeping Operations
Cartographic Section

Source: Japan International Cooperation Agency (2007)