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**Relationship between Openness and Inflation in Kenya: Testing Romer Hypothesis using  
Autoregressive Distributive Lag**

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Strathmore University

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## **Abstract**

Romer (1993) formulated the hypothesis that the relationship between inflation and openness is negative. The objectives of this paper are to determine if openness has any effect on inflation in Kenya and to establish the nature of the relationship between openness and inflation in Kenya. This paper contributes to the literature by examining the relationship between openness and inflation in Kenya by applying Autoregressive Distributed Lag (ARDL) to establish the long run relationship. The ADF test is conducted to determine the stationarity of the data while the ECT is used to determine the short run dynamics of the model and the deviation to equilibrium. . The other variables used in the study include: money supply, real interest rates and real GDP for the period of 1975- 2015. Based on the findings, there exist a negative relationship between inflation and openness in Kenya which supports the Romer (1993) hypothesis. However, this relationship is not significant. This implies that the closed economy explanation for the inflationary process remains valid.

## **List of abbreviations**

ARDL - Autoregressive distributive lag

BD – budget deficit

CPI- consumer price index

EAC- East Africa Community

ECM- Error Correctional Term

MENA - North Africa and Middle East countries.

MS – money supply

RGDP – real gross domestic product

RINT- real interest rates

# 1 INTRODUCTION

## 1.1 Background Information

In today's world, developing countries are opening up their economy structure in favor of global market integration. This has led to emerging economies adopting outward looking policies in order to take advantage of international trade and capital flows into their economy. Emerging economies are now more liberalized and globalization and openness are on the rise. Inflation is an important issue especially for policy makers such as the monetary policy committee in an economy and it is one of the major macroeconomic problems in an economy.

### Definition and causes of inflation

Inflation is the general increase in price level of goods and services over a period of time (Mishkin, 2004). Issues relating inflation have generated debates over the years. This has led to the different schools of thought coming up with the different definitions while others offer empirical evidence on the cause of inflation. Monetarists view as argued by Sedighi (2013) state that inflation is mainly influenced by how fast the money supply grows or falls, thus being a monetary phenomenon. If money supply grows faster than the total output of goods and services there will be more money chasing less goods. On the other hand, Keynesian economic theory identified demand push and cost pull factors as the main reasons for inflation.

The main causes of inflation are demand-pull and cost-push. According to Barth and Bennett (1975) demand pull inflation is caused by an increase in money demand or too much money chasing too few goods. This increase in money supply is due to monetary expansion. This disequilibrium causes the sellers to increase prices hence inflation. A good example is the German hyperinflation case. According to Barth and Bennett (1975) cost-push inflation is not caused by excess demand of goods and services but rather the market power of trade unions to demand higher wages for workers. The increase in wages increases the demand for goods and services therefore the prices increase.

A study carried out by Durevall and Sjö (2012) to evaluate the dynamics of inflation in Kenya and Ethiopia showed that the main drivers of inflation in Kenya are inflation inertia measured as lagged money growth and world food price, measured in domestic currency. An increase in world food prices leads to domestic inflation in the long run.

The inflation rate in Kenya has been volatile over the past decade. In 2010, inflation rate was at 4.0% and increased to 14.0% in 2011. In 2013 and 2014 it stood at 5.7% and 6.9% respectively. Last year the inflation rate closed at 6.6%.

2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
10.3	14.5	9.8	26.2	9.2	4.0	14.0	9.4	5.7	6.9	6.6

Source: The World Bank database - 2016

### *Table 1: Inflation in Kenya*

The Central bank of Kenya inflation target is set at 5% with a band of 2.5% through the monetary framework of Inflation Targeting Policy (ITP) in 2013. The purpose of the framework is to focus on bringing inflation to the midpoint of the target range (International Monetary Fund, 2015).

#### Consequences of inflation

Inflation has negative consequences to an economy such as distorting the function of the price mechanism. When the average price rises, the price mechanism cannot effectively fulfill its role. If the average price level rises continuously and the increases outweigh the decreases there will be a distortionary effect known as inflation noise. Evidence from various studies on developing countries suggests that relative prices tend to become more volatile as inflation rises even where indexation is prevalent, partly because governments attempt to protect certain segments of the population from inflation through selective price control measures (Ashra, 2002).

Inflation also leads to a redistribution of income and wealth within the economy. For instance when a bank makes a loan it charges the interest rates based on the expected future inflation. If the inflation increases borrowers are charged a higher interest rate thus borrowers will find it difficult taking the loan due to the high interest rates. Inflation also creates uncertainty. Businesses and investors are unsure about the future level of prices and costs, and thus of real interest rates, their willingness to take risk and invest reduces, especially in long-term projects, thus growth in the economy reduces.

### Definition of openness

Openness as defined by (Munir&Kiani, 2011) is phenomena of sharp economic integration between countries captured through trade liberalization, investment and capital flows, as well as technological changes. It is measured as  $(X+M)/GDP$  which is a comparison of exports and imports as a percentage of gross domestic product (Squalli& Wilson, 2006). These measures adopted by a government can either invite or restrict trade between its home country and other countries. Openness is important because imports and exports are important aspects of a successful economy. Openness is an enabler of economic growth, job creation, and innovation through international competition. Economic liberalization entails more than trade policy. Liberalization primarily involves a movement towards less control of factor markets, financial (including foreign exchange) markets and commodity markets (Ng'eno, 1990).

An open economy engages in exchange of goods domestically and internationally. This system is characterized by no barriers to free market activity such as tariffs. However, it is rare to find such an economy in practice. Most economies are regulated by the government or other authorized bodies. Kenya is an open economy. First, Kenya is a member of the East Africa Community and Kenya has to accept the policies put in place by the community. For instance a report by the East African Community (2006) suggested that the members adopt a non-tariff policy in order to realize the goal of the East African Community (EAC) Customs Union of liberalizing trade among the partner states so to promote the goal of East Africa being a single market. Secondly, Kenya is also a member of World Trade Organization. A report done by the community showed that Kenya is largest exporter is the European Union and biggest largest is India. In Africa, Uganda is the biggest trading partner with Kenya.

### The relationship between inflation and openness

The study by Romer (1993) based his research on the classic paper of Kydland and Prescott (1977) to demonstrate the relationship between inflation and the degree of openness. The study finds that there is a significant negative relationship between openness and inflation, confirming the prediction of the theory. The study also provides justification for the inverse relationship. First, that greater openness steepens the Philip curve by exposing a nation to larger negative terms of trade deficit generated by expansion of domestic output. Secondly, the more open the county is, the more revenue the country gets from the tariffs. As a result, inflation is low in more open

economies than less open economies. A study by (Lotfalipour et al., 2013) focused on Middle East and North Africa region MENA countries and finds a positive relationship between openness and inflation which is attributed to the fact that these countries have monopolistic power in external markets.

## **1.2 Problem statement**

Romer (1993) illustrated the negative relationship between openness and inflation holds for most types of economies such as developing economies. The study showed no evidence that the prediction of this theory holds for the highly developed economies. This was later studied by Kim (2005) by obtaining a positive relationship between openness and price level for advanced economies such as the U.S., Belgium, and Ireland while other countries, developed or developing, were in line with the Romer hypothesis. A study by Mukhtar (2010) further supports the results obtained by Romer (1993), demonstrating that there is a negative relationship between openness and inflation.

Most studies that try to formulate this relationship between openness and its impact on inflation have been done by combining different countries. Therefore, it is not appropriate to use the data to conclude the same relationship at a country level. In Kenya, the studies have not focused on the topic at hand but rather they have focused on other variables such as the impact of openness on the level of investment and the rate of economic growth in Kenya using annual time series data (Musila & Yiheyis, 2015). A study by Musila and Yiheyis (2015) illustrated that trade-policy induced openness is negatively related to investment and the rate of economic growth. Another study carried out by Bigsten and Durevall (2006) illustrated that changes in relative wages have primarily been driven by the degree of openness. The other factors such as the capital–labor ratio, educational attainment and the ratio between agricultural and manufacturing prices had no significant effect. The study concludes that market integration has a significant impact on inflation in Kenya.

Although there are many empirical studies about the relationship between openness and inflation, the effect of openness on inflation is still inconclusive and the issue is an empirical question in economic literature. This is because the theory differs from one country to other and it is difficult

to generalize the effect by simply taking one county's experience. Hence, this study aims to test the relationship of openness and inflation as stated by Romer (1993) in his hypothesis.

This study aims to contribute to the openness and inflation relationship literature through an empirical examination of this relationship in the Kenyan economy. The impact of openness on inflation will therefore, be important to study to be able to anticipate and mitigate extreme inflation and deflation. This can be done by the central bank adopting appropriate monetary policies depending on the openness ratio and other variables that affect inflation in order to achieve and maintain the inflation target.

### **1.3 Research objective**

The specific objectives of the study are:

1. To determine if openness has any effect on inflation in Kenya.
2. To establish the nature of the relationship between openness and inflation in Kenya.

### **1.4 Research questions:**

The research questions of this study are:

1. Does openness have any effect on the rate of inflation in Kenya?
2. What is the nature of the relationship between openness and inflation in Kenya?

### **1.5 Significance of the Study**

The benefits of a country opening its economy are numerous hence, openness is associated with decline in inflation is a celebrated hypothesis in the world of economics. However, this relationship is still debatable among economists. This relationship is yet to be examined in Kenya thus the purposes of this study is to clarify the effect of openness on inflation in Kenya. This study is expected to assist policy makers such as the central bank and fiscal authorities in decision making with regard to devising policies in combating inflation in Kenya. In addition to this, the study will pave the way for other researchers to advance their study on the topic.

## **2 LITERATURE REVIEW**

### **2.1 Introduction**

In this chapter, the study provides a general literature on the relationship between inflation and openness. Discussion of previous theoretical literature on inflation and openness, empirical literature of past studies, the research gap and the conceptual framework are covered in this section.

### **2.2 Theoretical framework**

#### **Economic theories underpinning this study**

##### Romer Hypothesis

The hypothesis and the relationship between inflation and openness was first formulated and proposed by Romer (1993). The study explained that openness affects key determinants of inflation under discretionary policy. An increase in imports increases openness and with this greater openness it reduces the benefit of increasing output above its natural rate hence, affecting inflation. In the analysis of data, the study formulated the hypothesis by using a Barro-Gorden type of model as used by Kydland & Prescott (1977) by regressing inflation on openness for 114 countries over the Post-Bretton Woods period with a stable and fixed exchange rate. The study assessed that there is a negative relationship between openness and inflation and the relationship is stronger for countries that are less politically stable and less dependent on the central bank. The study gave reasons for the existence of the inverse relationship. First, that greater openness steepens the Phillips curve by exposing a nation to larger negative terms of trade deficit generated by expansion of domestic output. Secondly, the more open the country is, the more revenue the country gets from tariffs. As a result inflation is low in more open economies than less open economies. The study also argued that the negative relationship between openness and inflation holds for all economies except for highly developed countries because inflation in these economies is low and unrelated to openness. In support of this, Kim (2005) obtained a positive relationship between openness and price level for advanced economies such as the United States of America, Belgium, and Ireland while in developing countries; the relationship was in line with Romer hypothesis

### Literature against the Romer Hypothesis

On the other hand, there are studies that contradict the Romer (1993) hypothesis and confirm a positive relationship between openness and inflation. For instance, Lotfalipour et al. (2013) focused on MENA countries, that is, North Africa and Middle East countries, which are among the oil top producing countries in the world. The study finds a positive relationship between openness and inflation which is attributed to the fact these countries have monopolistic power in internal markets in which they pay as foreign traders thus, have the power to influence price level especially the price level of oil.

Munir and Kiani (2011) study also found a positive relationship between openness and inflation. The study tried to understand the inflation-openness puzzle in Pakistan. The authors explained that in the short run, imports move inflation in Pakistan but in the long-run, exports reduce the inflationary pressure. Thus openness works as a good buffer in a small open economy but has a positive relationship with inflation.

The study by Evans (2007) finds that a higher degree of openness in a country is associated with a higher equilibrium inflation rate. This is because monetary authorities enjoy some monopolistic power in the international market as a foreign consumer hence having some degree of inelasticity in their demand for foreign goods (Evans, 2007).

### Phillips curve

Some studies have tried explaining this relationship by use of economic theories or relationships. For instance, Cooke (2004) argues that inflation decreases as openness increases. This is because openness alters the slope of the Phillips curve and demand for foreign goods and demand for domestic products and openness interact. The study explains that when an economy is more open, the Phillips curve steepens, increasing the cost of inflation and reducing the output gain from a shock. When the foreign demand is low the inverse relation holds because the terms of trade decrease.

A study by Syed and Zwick (2015) explained this relationship using a nonlinear Phillips curve approximated by the Cobb Douglas method. The study concluded that openness and inflation are inversely related. This is because increase openness in the presence of the convex Phillips curve increases the tendency to import goods thus decreasing the pressure on domestic inflation provided

that the unemployment rate is below the minimum unemployment rate. However, if the minimum rate of unemployment is below the natural rate then the Phillips curve turns this relationship into negative (Syed & Zwick, 2015).

### Game theory

Another approach was by Cavallari (2001) who introduces a game theory approach between wage setters and the central bank and how these two players alter the link between inflation and openness. The study evaluates a wage-based mechanism through which openness affects inflation. The study argued that due to trade unions in the economy there is an overall effect of openness on behavioral wages that eventually affect inflation. The study focused on the interaction between internal and external source of inflation distortion and argued that an economy inflationary bias reduces up to a certain threshold level of openness and beyond this threshold; openness triggers a wage behavior that increases inflation (Cavallari, 2001). An increase in nominal wage as demanded by the union for its members increases the nominal wage growth thus, pushing up the prices of domestic products due to an increase in demand hence, raising inflation.

### Balance of payments

Other studies explained it from the balance of payments point of view. For instance, Munir et al. (2011) argued that openness affects inflation in two ways, first, through cheap imports. The flow of cheap imports reduces inflation in a high cost economy. As imports increase the domestic prices decrease. Wynne and Kersting (2007) also argued that inflation occurs due to the direct effect. Availability of cheaper imports lowers the domestic price level because the consumption bundle used to compute inflation includes imported goods and the share of imports increases. The degree of inflation depends on the fraction of these imports in the consumption bundle. Munir and Kiani (2011) argued that an increase in local demand due to foreign remittances creates an output gap thus a rise in price. This gap between demand and production is filled with imports therefore; domestic producers are forced to lower their prices in response to foreign competition.

Indirect competition in an economy also increases inflation. According to Munir et al. (2011) the price level in an economy reduces due to the direct and indirect price effect of cheap imports. This cheap flow of imports leads to price competition among the importing countries thus reducing inflation and eventually increasing productivity in the economy. Wynne and Kersting (2007) argue

that openness affects inflation indirectly. Increase in competition fosters greater domestic productivity this is because countries specialize in skills and the type of goods they prefer to produce or manufacture. This higher productivity enables firms to pay higher wages to workers thus, an increase in price as demand increases.

Jin (2000) argued that an economy can reduce inflation through the positive influence on outputs. Ojokoet.,al (2014) supported this “new theory” of Jin (2000) arguing that openness affects inflation through positive output by easing the pressure on prices. The study gave reasons for this: first, increased efficiency reduces costs such as production costs, imports and exports cost domestically and internationally. Second, increased openness could increase foreign investment in an economy hence, increasing output therefore reducing inflation.

### **2.3 Empirical literature**

#### Empirical literature based on econometrics models

Most of the studies that examined the relationship between openness and inflation have used a Vector Error Correction Model to analyze their data. Their empirical aspects are discussed below.

A study by Ojoko et al. (2014) used the VECM model with the following variables used: exchange rates, openness, inflation measured by consumer price index (CPI), the real growth domestic product (RGDP) and budget deficit (BD) covering the period from 1970-2010 to test the relationship between openness and inflation in Nigeria. The empirical findings from the Johansen cointegration test and VECM established that there exists a long- run negative relationship between openness and inflation in Nigeria. Other studies such as Sikdar et al.(2013) used the VECM model to test if there is a relationship between the inflation and openness in Bangladesh. The variables considered in this study were: exchange rate, real GDP, openness, money supply and financial market openness from the period 1976-2010. The empirical findings were that there exist a negative relationship between inflation and openness.

Mukhtar (2010) also used the VECM approach and considered the following variables: budget deficit, gross domestic product (GDP), exchange rate, consumer price index as a measure for inflation to answer the research question whether openness reduces inflation in Pakistan. The study used time series data that covered the period from 1960-2007. The empirical findings showed that

there is a long-run relationship between openness and inflation thus the existence of Romer hypothesis in Pakistan.

Another study by Munir and Kiani (2011) study applied the VECM and cointegrating approach to test the hypotheses of the negative relationship between openness and inflation in Pakistan. The study used time series data from period 1976-2010. The variables considered were real agriculture value added, real exchange rate, real gross domestic product, financial market openness, money and quasi money and used openness, import openness and export openness ratios. The study however revealed a positive relationship in the long-run hence rejecting the Romer hypothesis.

A study by Munir et al. (2011) examined whether the Romer hypothesis holds in Pakistan for the period 1970- 2009. Using an autoregressive distributive lag (ARDL approach to co-integration) and applying different measures of openness (ratio of exports to GDP, imports to GDP and net export as a measure of GDP) the empirical findings showed that the relationship is more significant in the short run compared to the long run. Another study by Samim et al. (2012) applied the Autoregressive distributed lags (ARDL) bound test in Iran. The study covered the period from 1970-2009 and used the following variables: GDP/capita, inflation, money growth, government size, openness and the globalization index. The empirical finding showed that openness has a negative and significant relationship with inflation in the short run and insignificant in the long run.

Some studies used panel data techniques for a cross-sectional study. For instance Cavallari (2001) used the panel data approaches for developed countries (2002). The study focused on 53 developing countries at different locations from 1975-2002 using Gaussian mixture models. The results indicated that openness does not have any effect on inflation if a country effects are controlled for, but the lag money growth has significant negative relationship.

A paper by Jin (2000) used Vector Auto regression (VAR) model and used quarterly data that covered from the period of 1960:1 (first quarter) to 1977:3 (third quarter). The variables used in the study were output, price level, money supply, real growth, foreign output and price shock. The empirical findings were that there exists a negative relationship between openness and inflation. Increased international competition due to openness may cause domestic investment to decline and its decrease would be greater than an increase in capital inflows from abroad. In this case, net investment falls, so does aggregate demand thus price level falls (Jin, 2000).

Another study by Aron and Muellbauer (2007) applied an innovative technique to establish the relationship between inflation and openness in South Africa. The data covered from period 1970-2000 and used the following variables: ratio of exports to GDP, imports to GDP, growth rate, exchange rate, movement in terms of trade and CPI as a measure of inflation. The results showed that there is a decrease in openness as inflation increases thus, depreciating the exchange rate.

#### Empirical literature based on time horizon

Some studies show that the effect of openness on inflation depends on the time period or time horizon (long-run or in the short-run). For example, Ahmad and Mahmood (2013) using an ARDL model tested whether the negative relationship between openness and inflation holds in Pakistan. The study used the following variables: inflation, exchange rate, GDP, real GDP, money supply, exports as a share of GDP and the tariff proxy from the period 1975-2011. The findings concluded that the negative relationship between inflation and openness is stronger in the long run than in the short run. The study argued that as an economy opens up, the fiscal and monetary authorities tend to have less power and ability to control inflation through their respective policies.

Munir et al.(2011)examined whether Romer hypothesis holds in Pakistan for the period 1970-2010. The study used panel data techniques with the following variables: GDP growth, interest rates, exchange rates, money and quasi money, agriculture value added, domestic credit, current account balance and claims on the central bank. Empirical findings showed that the relationship is more significant in the short run compared to the long run.

A study by Sachside and Mendonça (2015) formulated the relationship using panel data techniques in order to confirm Romer hypothesis. The study focused on 152 countries and divided them into categories, Asia, Africa, North and Central America, South America, Europe, Oceania and OCDE countries and tested the following variables: inflation, GDP and import openness (measure of imports as a percentage of GDP). The empirical finding showed that the negative relationship between openness and inflation exists however. It is not time specific nor is it specific to a group of countries. The study argued that relationship between openness and inflation is not specific to any group of countries or any period of time. Thus, countries that experienced an increase of openness also observed a reduction in their levels of inflation (Sachside & Mendonça, 2015).

#### Empirical literature based on categorization of countries

Studies have tried to gain insight on this hypothesis based on the categorization of countries. For instance, Cavallari(2001) examined the relationship between openness and inflation in a monopolistic production and market unionized economy. The study used a cross section of 19 OECD countries for the period 1973-1988 using panel data analysis. The study used inflation, wages, openness and GDP as the variables. The study concluded that openness affects inflation negatively and positively depending on level of concentration of wage bargain in the county. Countries with low wage bargaining concentration showed a significant and negative relationship between openness and inflation compared to countries with wage bargaining concentration (Cavallari, 2001).

A study by Ashra (2002) focused on 15 developing countries. Using a panel data approach the study considered the following variables: rate of money growth, agriculture output, and openness ratio, ratio of import to GDP and ratio of exports to GDP. The empirical findings were in line with Romer hypothesis. The study explained that developing economies are affected, to a lesser extent, by openness relative to large economies. However, the net effect of the rise in export and import (as a percent of GDP) is found to having reduced pressure on the inflation rate in both sets of economies (Ashra, 2002).

By using a Cobb-Douglas approach and focusing on openness, growth, exports and inflation as the variables Rajagopal (2007) confirms that the inverse relationship holds in Latin America: Argentina, Chile, Peru and Costa Rica. The study by Kurihara (2013) used panel data tools to examine whether international openness is related with inflation in Asian countries and the OECD countries. The variable tested include: inflation, GDP/capita and openness from the period 1990-2011. The empirical results show that there is generally a significant negative relationship between openness of the economy and inflation.

A study by Lotfalipour et al. (2013) focused on MENA countries, that is, North Africa and Middle East countries. These countries are among the top oil producing countries in the world hence, the study wanted to test if the hypotheses holds for oil producing countries or in oligopolistic markets. The study used a panel data equation and techniques covering the period 1990-2010. The study used inflation as the dependent variable and GDP/Capita, annual population growth and net exports as a percentage of GDP and openness as the independent variables. The two ways fixed

effect variables showed that there exists a negative relationship between openness and inflation for oil producing countries.

Terra (1998) argued that the negative relationship holds when severely indebted countries respond to the debt crisis. The study pooled data of 114 countries and categorized the countries depending on their indebtedness level. The study also considered two periods, that is, pre-debt crisis period from 1973-1981 and debt crisis period from 1982-1990. The findings of the study showed that a negative and significant relationship between openness and inflation was found for severely indebted countries and less significant for moderate and less indebted countries. This is because trade surpluses have to be generated to make debt repayments therefore, affecting an internal transfer. In many developing countries foreign debts are a large component of public sector liability, the public sector must raise resources by taxing the private sector, thereby effecting internal transfer (Terra, 1998). Comparing two countries with the same debt level the less open economy will have a higher inflation rate. This is because the economy has to devalue its exchange rate more than the open economy in order to generate trade surplus.

#### **2.4 Research gap**

Romer (1993) was the first to propose that there exists a negative relationship between openness and inflation. From the above literature, numerous studies such as Muellbauer (2007), Ashra (2002), Rajagopal (2007) and Terra (1998) have supported this proposed negative relationship between openness and inflation. However, another group of studies has found a positive relationship such as Lotfalipour et al. (2013) and Evan (2007). This has created a debate both empirically and theoretically and thus, leading to the effects of openness and inflation to remain uncertain. Despite the various studies discussed in the preceding literature, studies and literature on openness and inflation in Kenya is almost nonexistent.

In addition, most studies that try to formulate this relationship between openness and its impact on inflation have been done by combining different countries. Therefore, it is not appropriate to use the data to conclude the same relationship at a country level.

Hence, this study aims to contribute to the literature regarding openness and inflation relationship through an empirical examination of this relationship in the Kenyan economy. The objective of this study is to test if openness has any effect on inflation in Kenya as proposed by Romer (1993) in Kenya and the nature of this relationship. The impact of openness on inflation will therefore, be

important to study to be able to anticipate and mitigate extreme inflation and deflation. This can be done by the central bank adopting appropriate monetary policies depending on the openness ratio and other variables that affect inflation in order to achieve and maintain the inflation target

## **2.5 Conceptual framework**

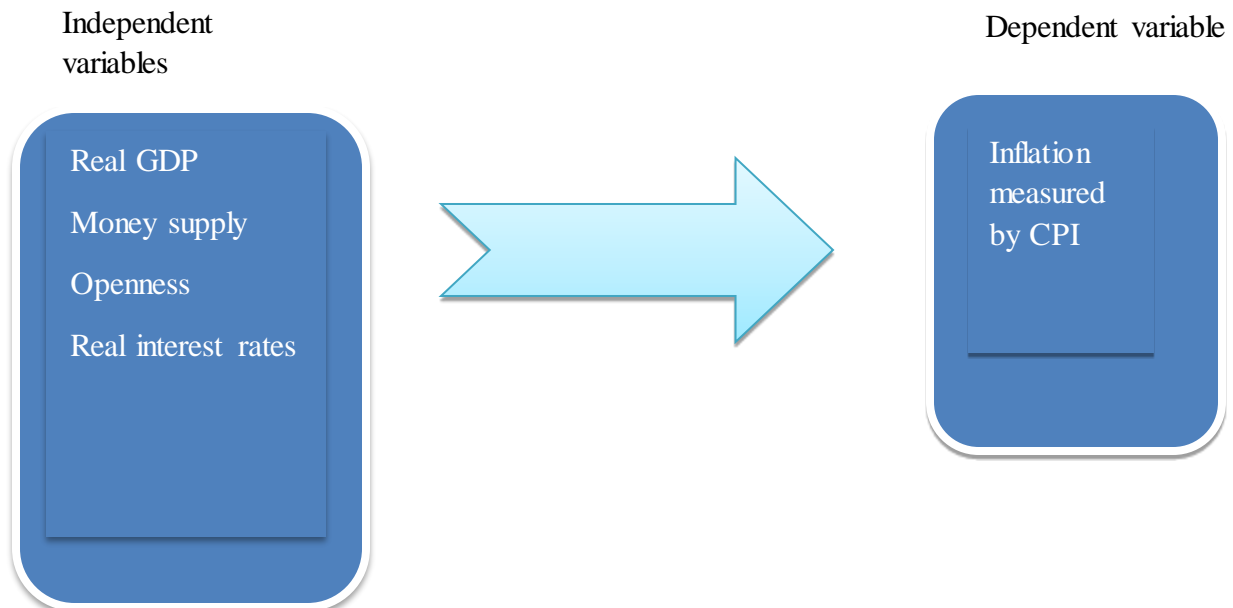
A conceptual framework is a tool of research intended to create awareness and clarify concepts and identify relationships for ease of communication.

This study focused on the relationship between openness and inflation in Kenya. In particular, the study sought to determine if openness has any effect on inflation in Kenya and establish the nature of this relationship. The hypothesis being tested here is the one proposed by Romer (1993) that openness and inflation have a significant negative relationship. Past studies as outlined in the literature have shown that there exists a negative relationship between openness and inflation. This study has used annual secondary data from the year 1975 to 2015. The dependent variable in this study is inflation represented and measured by consumer price index (CPI) which reflects the change in price of goods and services for a given fixed basket of goods and services.

The independent variables are: Real interest rates, Real GDP, Money supply (money and quasi money) measured by M2 that is broad money and openness measured by net exports as a percentage of GDP.

According to Romer (1993), among various sources that explain movements of inflation, openness plays a major role in explaining inflation movements. However, there are other macroeconomic variables that affect the inflation such as ones mentioned above and will be considered in the study as independent variables. Previous studies have also considered the above variables such as Ojoko et al.(2014), Mukhtar(2010), Ahmad &Mahmood(2013) Sikdar et al.(2013) and Munir and Kiani(2011). In addition to, these variables are readily available and observable and were collected from the Kenya National Bureau of Statistics (KNBS) database, World Bank database, World Trade Organization database, the Global Economy database and The Central Bank of Kenya (CBK) database which are readily available.).

The relationship between the variables in the study is as depicted below:



*Figure 1: conceptualized econometric model variables*

### **3 METHODOLOGY**

#### **3.1 Introduction**

The objective of this paper was to formulate the relationship between openness and inflation in the Kenyan economy. This section discussed the techniques and procedures followed in carrying out the empirical analysis of the relationship between openness and inflation. The section also highlighted the data sources for the study, the scope of the study and gave the model specification. To do this time series analysis of the data was carried out which includes: unit root test for stationarity and ARDL bounds testing approach to cointegration. Econometric Views (Eviews) software was used to carry out all the tests and estimate the models used in this study.

### **3.2 Research design**

This study was casual in nature as it sought to determine the causal link between openness which is the independent variable and inflation the dependent variable. The design was selected based on previous studies that indicated openness has a negative relationship with inflation (Romer, 1993). The objective of this study is to determine if openness has any effect on inflation in Kenya and establish the nature of the relationship between openness and inflation in Kenya.

### **3.3 Target population**

The population of interest in this study is the Kenyan economy.

### **3.4 Sampling design and sample size**

The data used in this study is annual data and time series in nature that range from the year 1975 to 2015. The study will focus on five variables which are: inflation measured by CPI which is the dependent variable. The independent variables include: Money supply M2, Real Growth Domestic Product (RGDP), Real Interest rates (RINT) and openness measured by net imports as a percentage of GDP are interest rates that are adjusted for inflation effects in order to real cost of funding for lenders and borrowers and openness (net export ratio as a percentage of GDP). This period is significant because it also captures the financial crisis of 2008, which had a negative impact on emerging economies. Exports, capital inflow, foreign aid, remittances and output were all lower than the expected during this time (Dolphin and Chappell, 2010). In 2007/2008 when Kenya was hit by the post-election violence exports reduced greatly thus creating a deficit in the economy. For instance a study done by Ksoll (2009) showed that the conflict reduced Kenyan flower exports by 24% in 2008 therefore, the period from 1975-2015 is important to show if there exists a negative relationship between openness and inflation in Kenya.

### **3.5 Data collection**

The study used annual secondary data from 1975 to 2015. The secondary data was quantitative in nature and collected from the following bodies/authorities: from Kenya National Bureau of Statistics (KNBS) database consumer price index data was obtained, World Bank database provided data on real Gross Domestic Product and openness ratio, the Global Economy database

and The Central Bank of Kenya (CBK) database provided data on money supply and real interest rates.

### 3.6 Data analysis procedure

#### 3.6.1 The variables and econometric model

In this study the dependent variable is inflation measured by consumer price index. The independent variables used in the econometric study were: openness ratio, money supply, real Gross Domestic Product (GDP) and real interest rates. The variables were selected based on past studies and literature such as Ojoko et al. (2014), Mukhtar (2010), Ahmad and Mahmood (2013), Sikdar et al. (2013) and Munir and Kiani, (2011).

The econometrics model/equation below is used in determining the relationship between openness and inflation:

Equation 1:

$$LNCPI_t = \beta_0 + \beta_1 LNT O_t + \beta_2 LNMS_t + \beta_3 LNRGDP_t + \beta_4 RINT_t + \varepsilon_t$$
$$t = 1,2,3 \dots T$$

Where:

$CPI_t$  is Consumer Price Index the measure of inflation at time  $t$

$LNT O_t$ : Logarithm of openness ratio at time  $t$

$LNMS_t$ : Logarithm of money supply at time  $t$

$LNRGDP_t$ : Logarithm of real GDP at time  $t$

$RINT_t$ : Real interest rate at time  $t$

$\beta_0$ : Intercept

$\beta_1$ - $\beta_5$ : Parameters

$\varepsilon_t$ : Error term

The natural logs of the variables were used for estimation, just as in past studies on the determinants of inflation such studies include: Mukhtar (2010), Munir et al.(2011) and Munir and Kiani (2011). In addition, time series analysis this transformation is often considered to stabilize the variance of a series (Lutkepohl& Xu, 2009). Another advantage of transforming your variables into logs is the ability to interpret the variables as elasticities. However, interest rates are already interpreted as an elasticity and so there is no need of changing them into logs.

### 3.6.2 Empirical analysis

#### 3.6.2.1 Unit root testing

Following the standard practice, the empirical analysis started with a test of stationary of the data. This test was carried out to make sure that the data was stationary before estimating a regression and avoid non-stationary data because it may lead to a spurious regression. A spurious regression occurs when a regression portrays linear relationship in which variables are independent and non-stationary.

The study made use of Augmented Dickey Fuller (ADF) which is based on the t-ratio of a regression to test for the (non)stationary properties of the time series. ADF test include lagged term of dependent variable so as to eliminate autocorrelation. The test was carried out with a set of hypotheses which are:

$H_0$ : series is non-stationary

$H_1$ : Series is stationary

$$Y_t = \alpha Y_{t-1} + \varepsilon_t$$

The objective of this is to test if  $\alpha=1$

And regression equation is given by:

$$\Delta Y_t = \omega Y_{t-1} + \varepsilon_t$$

Where  $\omega = \alpha - 1$

$\varepsilon$  is the error term and it should be pure white noise process

$\Delta Y_t$  is the first difference of inflation.

$\alpha$  is a coefficient

T-test was carried out as follows:

T-test =  $\frac{\omega}{SE(\omega)}$ . If the t-statistic is less than the critical value, then fail to reject the null hypothesis.

Where SE is the standard error.

The presence of stationarity is a property of time series data (Gujarati, 2003). If a time series data is not stationary you can fix it through one of these approaches. First, through trend stationarity this is done by including a time series trend variable as an independent variable. This method is referred to as “detrending”. Another method of getting rid of non-stationarity is by difference stationarity. This is finding the first difference of the variables. The disadvantage of this method is that it changes the theoretical meaning of the differenced variable. An alternative to the first difference method is testing for cointegration.

### 3.6.3 ARDL bounds testing approach

#### 3.6.4 Introduction

Introduced by Pesaran, Shin and Smith (2001) the study then applies the ARDL bounds testing approach. This test allows testing for cointegration in order to analyze the long run relationship among the variables. This method was chosen because of its power to analyze the cointegration of variables if they are integrated with mixed order of integration like I(0) or I(1) and also it yields better results for finite time series data sample.

ARDL version is modeled as follows:

$Y = \text{CPI}$

V, W, X, Z represent openness, real interest rates, money supply and real GDP respectively, then the model is as follows:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \dots + \beta_p Y_{t-p} + \alpha_t V_t + \alpha_1 V_{t-1} + \dots + \alpha_q V_{t-q} + \gamma_t W + \gamma_1 W_{t-1} + \dots + \gamma_m W_{t-m} + \delta_t X_t + \delta_1 X_{t-1} + \dots + \delta_n X_{t-n} + \theta_t Z_t + \theta_1 Z_{t-1} + \dots + \theta_j Z_{t-j}$$

### 3.6.5 Lag selection

The ARDL bounds testing approach calculates the number of regression which aid in lag selection.

### 3.6.6 Cointegration

To test for cointegration, the critical bounds, the upper critical bound(UCB) and the lower critical bound(LCB) formulated by Pesaran et al. (1999) are used.

The null hypothesis generated is  $H_0: \beta_t = \alpha_t = \gamma_t = \delta_t = \theta_t$  if it holds then no cointegration among the variables. There exists cointegration if the alternative hypothesis  $H_a: \beta_t \neq \alpha_t \neq \gamma_t \neq \delta_t \neq \theta_t$  is true. The upper critical bound (UCB) and the lower critical bound (LCB) are used in hypothesis testing. If the F-statistics calculated is greater than the upper critical bound (UCB) then reject the null hypothesis and accept the alternative hypothesis.

### 3.6.7 Error Correction Mechanism (ECM)

The study then employs Error Correction Mechanism (ECM) once the cointegration has been established. This model estimates the speed at which the exogenous variable Y, in our case CPI, returns to equilibrium after a change in endogenous variables/ independent variables. It also combines long run and short run relationship without dropping information regarding long run results since we are not using data in its first difference.

The equation of error correction model is as follows:

$$\Delta Y_t = \sum_{t=0}^p \beta_t \Delta Y_{t-1} + \sum_{t=0}^q \alpha_t \Delta V_{t-1} + \sum_{t=0}^m \gamma_t \Delta W_{t-1} + \sum_{t=0}^n \delta_t \Delta X_{t-1} + \sum_{t=0}^j \theta_t \Delta Z_{t-1} + \phi ECT + \varepsilon_t$$

ECT is error correction term indicating speed of adjustment from short run disequilibrium towards long run.

### 3.6.8 Diagnostic tests

The diagnostic tests are carried out to test the goodness of fit of autoregressive distributive lag model (ARDL). In diagnostic test, serial correlation between error terms, normality of residual term using the JarqueBera test and heteroskedasticity tests using Breush-Godfrey test.

## 4 DATA ANALYSIS

### 4.1 Unit root test

The unit root test used is Augmented Dickey-Fuller (ADF) test. The critical values are as follows:

1% critical value: -4.219

5% critical value: -3.533

10% critical value: -3.198

The null hypothesis is that there exist unit root

*Table 2: Unit Root Test*

<b>Variable</b>	<b>Unit root at level</b>	<b>Unit root at first difference</b>	<b>Decision</b>	<b>Order of integration</b>
<b>Inflation</b>	4.940512	-7.646478	Stationary at levels	$I(0)$
<b>Real interest rates</b>	4.051627	-7.838237	Stationary at level	$I(0)$
<b>Openness</b>	2.839708	-6.810744	Non stationary at level but stationary at first difference	$I(1)$
<b>Money supply</b>	0.457757	-9.680897	Non stationary at level but stationary at first difference	$I(1)$
<b>Real GDP</b>	0.363581	-4.823814	Non stationary at level but stationary at first difference	$I(1)$

Table 1 show that inflation is stationary at levels while real interest rates, openness, money supply and the real GDP are not stationary at levels but stationary at first difference. At levels, the absolute values of the ADF test statistics of inflation are greater than the critical value at the 1%, 5% and 10% levels of significance and therefore  $I(0)$ . At first difference, the absolute values of the ADF test statistics of real interest rates, openness, money supply and the real GDP are greater than the

critical values at the 1%, 5% and 10% levels of significance and therefore  $I(1)$ . The null hypothesis is rejected, which shows that the variables have no unit root.

## **4.2 ARDL Test**

ARDL bounds testing approach allows testing for cointegration in order to analyze the long run relationship among the variables. This method was chosen because of its power to analyze the cointegration of variables if they are integrated with mixed order of integration like  $I(0)$  or  $I(1)$  and also it yields better results for finite time series data sample. In the study inflation is  $I(0)$  and the other variables are  $I(1)$  hence, ARDL bounds testing approach is the appropriate test in this study.

The variables are represented by the following:

Lninflation- logarithm of inflation

Rint- real interest rates

Lnmoney- logarithm of Money supply

Lnrgdp- logarithm of Real GDP

Openness- Openness

### **4.2.1 Lag selection**

The first step is selection of lag order on the basis of Schwarz Information Criterion (SIC).

**Table 3: Lag Selection**

Dependent Variable: LNINFLATION  
 Method: ARDL  
 Date: 10/24/16 Time: 10:25  
 Sample (adjusted): 1978 2015  
 Included observations: 38 after adjustments  
 Maximum dependent lags: 4 (Automatic selection)  
 Model selection method: Schwarz criterion (SIC)  
 Dynamic regressors (4 lags, automatic): RINT OPENNESS LNMONEY  
 LNRGDP  
 Fixed regressors: C  
 Number of models evaluated: 2500  
 Selected Model: ARDL(1, 1, 2, 3, 1)  
 Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNINFLATION(-1)	-0.118899	0.165673	-0.717675	0.4796
RINT	-0.052138	0.014445	-3.609284	0.0013
RINT(-1)	-0.035170	0.015443	-2.277344	0.0316
OPENNESS	0.021884	0.015782	1.386625	0.1778
OPENNESS(-1)	-0.008815	0.016784	-0.525171	0.6041
OPENNESS(-2)	-0.051143	0.015832	-3.230441	0.0034
LNMONEY	-2.183072	1.324190	-1.648610	0.1117
LNMONEY(-1)	4.650321	1.876371	2.478360	0.0203
LNMONEY(-2)	-0.453247	1.919162	-0.236169	0.8152
LNMONEY(-3)	-2.149872	1.157087	-1.858003	0.0750
LNRGDP	-13.58335	3.340340	-4.066459	0.0004
LNRGDP(-1)	14.02088	3.770706	3.718369	0.0010
C	-1.293436	27.37221	-0.047254	0.9627
R-squared	0.746966	Mean dependent var		2.307521
Adjusted R-squared	0.625509	S.D. dependent var		0.697886
S.E. of regression	0.427076	Akaike info criterion		1.401790
Sum squared resid	4.559846	Schwarz criterion		1.962017
Log likelihood	-13.63402	Hannan-Quinn criter.		1.601115
F-statistic	6.150068	Durbin-Watson stat		2.057191
Prob(F-statistic)	0.000067			

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

The table above shows the lag selection criterion on the basis of Schwarz Information Criterion (SIC). The maximum lag selected was 4 but the model chose to use a lag of 2. The model selected was ARDL (1,1,2,3,1) which shows different lags for the variables. The number of lag for inflation, real GDP and real interest rate is 1, openness has 2 lags, and money supply have lag of 3.

#### 4.2.2 Cointegration

To test for long run cointegration, the ARDL bound testing is carried out and the F-statistic is obtained, which is compared to the critical value of the Pesaran, et al. (1999) bound testing table.

The Pesaran et al. (1999) 5% confidence interval, the upper bound critical value is 4.01 and the lower bound critical value is 2.86. In the table below the F-statistic is 13.47257, which is higher than the upper level bound value of 4.52. Therefore, the null hypothesis of no co-integration among the variables is rejected and this indicates that there is a long-run relationship among the variables.

**Table 4: Cointegration**

ARDL Bounds Test  
 Date: 10/24/16 Time: 10:33  
 Sample: 1978 2015  
 Included observations: 38  
 Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	13.47257	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

The bound testing also obtained coefficients for the various variables as shown in the following table and equation:

**Table 5: Coefficients**

Cointeq = LNINFLATION - (-0.0780*RINT -0.0340*OPENNESS -0.1214 *LNMONEY + 0.3910*LNRGDP -1.1560 )				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RINT	-0.078030	0.017380	-4.489668	0.0001
OPENNESS	-0.034028	0.021963	-1.549346	0.1339
LNMONEY	-0.121432	0.294228	-0.412713	0.6833
LNRGDP	0.391028	1.315270	0.297299	0.7687
C	-1.155990	24.425174	-0.047328	0.9626

$$LNCPI_t = -1.155990 - 0.034028Openness_t - 0.121432LNMS_t + 0.391028LNRGDP_t - 0.078030RINT_t$$

The coefficients of all the logarithmic variables may be interpreted in terms of elasticity. Thus, we can state that a 1% increase in real interest rates is associated with a 0.078030% decrease in CPI in Kenya. Since the coefficient estimate for real interest rates is significant, it implies that there is a significant long-run relationship between inflation and the real interest rates.

There is a positive relationship between the CPI and real GDP such that a 1% increase in the real GDP is associated with a 0.391028% increase in GDP. However, the relationship is not significant as the p-value is 0.7687 therefore we fail to reject the null hypothesis that this coefficient is different from zero.

The coefficient of money supply is negative implying that there is a negative relationship between money supply and inflation. This argues against the monetarists' theory, which states that money is the main determinant of an inflationary process. However, the relationship is not significant as the p-value is 0.6833 therefore we fail to reject the null hypothesis that this coefficient is different from zero.

The coefficient of openness carries a negative sign which shows that a 1% increase in openness brings about 0.0340280% decrease in the inflation rate. This finding is supported by the empirical results of Romer (1993), Kim and Beladi (2004), Ashra (2002) and Muktar (2010). This finding confirms that Romer's hypothesis of a negative relationship between inflation and openness does hold in Kenya. However, the relationship is not significant as the p-value is 0.1339. This implies that the traditional closed economy explanation for the inflationary process remains valid, and adding openness variable to the analysis is not an important component to the empirical analysis of these macroeconomic phenomena because it is insignificant.

#### **4.2.3 Error Correctional Term (ECT)**

Error Correctional Term (ECT) is then carried out to adjust to both short run changes in variables and deviations from equilibrium. Since inflation is stationary at levels and the other variables are stationary at first difference, the error correction term rests on the properties of the residual from the regression.

*Table 6: ECT*

Dependent Variable: D(LNINFLATION)  
Method: Least Squares  
Date: 10/24/16 Time: 10:45  
Sample (adjusted): 1979 2015  
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.039838	44.69513	0.045639	0.9641
D(LNINFLATION(-1))	-0.288387	0.363304	-0.793789	0.4366
D(LNINFLATION(-2))	-0.158948	0.227257	-0.699417	0.4923
D(LNRGDP(-1))	-6.260651	12.03474	-0.520215	0.6086
D(LNRGDP(-2))	10.21646	6.400670	1.596155	0.1261
D(LNMONEY(-1))	3.495781	2.366848	1.476977	0.1553
D(LNMONEY(-2))	0.258217	3.201493	0.080655	0.9365
D(OPENNESS(-1))	0.044856	0.048537	0.924151	0.3664
D(OPENNESS(-2))	-0.026325	0.042031	-0.626305	0.5382
D(RINT(-1))	-0.024377	0.039669	-0.614513	0.5458
D(RINT(-2))	-0.013261	0.022937	-0.578128	0.5696
LNINFLATION(-1)	-0.828506	0.940274	-0.881132	0.3887
RINT(-1)	-0.013973	0.073114	-0.191118	0.8504
OPENNESS(-1)	-0.037185	0.044501	-0.835596	0.4133
LNRGDP(-1)	0.258315	2.437846	0.105960	0.9167
LNMONEY(-1)	-0.182373	0.549644	-0.331803	0.7435
ECT(-1)	0.311069	0.873234	0.356227	0.7254
R-squared	0.731721	Mean dependent var	-0.025535	
Adjusted R-squared	0.517098	S.D. dependent var	0.882271	
S.E. of regression	0.613101	Akaike info criterion	2.163158	
Sum squared resid	7.517848	Schwarz criterion	2.903309	
Log likelihood	-23.01842	Hannan-Quinn criter.	2.424096	
F-statistic	3.409326	Durbin-Watson stat	2.055907	
Prob(F-statistic)	0.005412			

The ECT (-1) represent the speed of adjustment towards long run equilibrium which is 31.1069%. However, ECT (-1) is not significant therefore the whole system cannot get back to equilibrium at a speed of 31.1069% in the long-run.

#### 4.2.4 Short run causality

To establish the short run relationship between inflation and openness the Wald test was carried out to determine the p-values.

**Table 7: Short run causality**

Wald Test:  
Equation: ECT\_STABILITY\_TABLE

Test Statistic	Value	df	Probability
F-statistic	4.225847	(2, 20)	0.0295
Chi-square	8.451695	2	0.0146

Null Hypothesis: C(8)=C(9)=0  
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(8)	0.044856	0.048537
C(9)	-0.026325	0.042031

Restrictions are linear in coefficients.

C (8) and C(9) represent openness from the Error Correctional Term table.

The null hypothesis:  $C(8)=C(9)=0$

The Chi-square probability is less than 5% therefore; openness causes inflation at the 5% significance level.

### 4.3 Diagnostics Checking

#### 4.3.1 Goodness of fit

From Table 2 the R-squared is 74.6966% which indicates that the model explains 74.6966% of the variability of the response data around its mean. The higher the R-squared, the better the model fits your data.

#### 4.3.2 Serial correlation

**Table 8: Serial Correlation**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.692770	Prob. F(4,21)	0.6052
Obs*R-squared	4.429798	Prob. Chi-Square(4)	0.3510

The null hypothesis: No serial correlation

Using Breusch-Godfrey, the observed R-squared probability Chi-Square is 0.3510 which is greater than 0.05. Therefore, reject the null hypothesis hence; there exists no serial correlation in the data.

#### 4.4.4 Heteroskedaticity

*Table 9: Heteroskedaticity*

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.855281	Prob. F(16,20)	0.6203
Obs*R-squared	15.03144	Prob. Chi-Square(16)	0.5223
Scaled explained SS	2.822031	Prob. Chi-Square(16)	0.9999

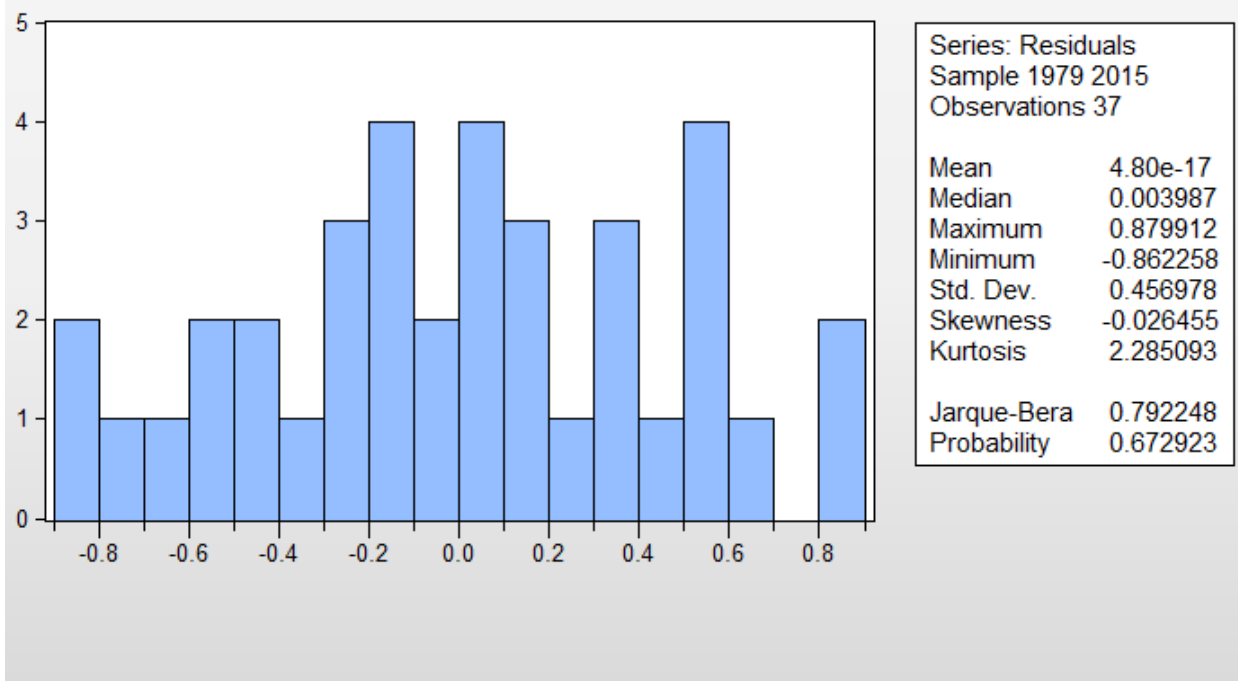
The null hypothesis  $H_0$ : Homoskedaticity, the variance of residual is constant

Using Breusch-Godfrey the observed R-squared probability of chi-square (16) is 0.5223 which is greater than 0.05. Therefore, fail to reject the null hypothesis and hence; there exists no heteroskedaticity in the data.

#### 4.4.5 Normality of the residuals

The null hypothesis  $H_0$ : Normal distribution

Using Jarque Bera probability which is 0.6729 and more than 0.05 then fails to reject the null hypothesis at the 5% significance level and therefore, the residuals are normally distributed.



*Figure 2: Normality Graph*

## **5 Conclusion, recommendation and limitations**

### **5.1 Conclusion**

The objectives of this paper were to determine if openness has effects on inflation and the nature of the relationship between the two variables in Kenya as proposed by Romer (1993). The study used annual time series data for the period 1975 to 2015. The study first determined unit root tests. The study also carried out ARDL Bound Testing to determine cointegration and the coefficients of explanatory variables. The test indicated that there is a long-run relationship among the variables. ECT was carried out to determine the adjustment to long run equilibrium and deviation from equilibrium. The adjustment towards long run equilibrium was 31.1069%. However, ECT is not significant therefore the whole system cannot get back to equilibrium at a speed of 31.1069% in the long-run.

The coefficient of openness carries a negative sign which shows that a 1% increase in openness brings about 0.0340280% decrease in the inflation rate. This finding is supported by the empirical results of Romer (1993), Kim and Beladi (2004), Ashra (2002) and Muktar (2010). This finding confirmed that Romer's hypothesis of a negative relationship between inflation and openness does hold in Kenya.

However, the relationship is not significant as the p-value is 0.1339. This implies that the traditional closed economy explanation for the inflationary process remains valid, and adding openness variable to the analysis is not an important component to the empirical analysis of this macroeconomic phenomenon because it is insignificant.

### **5.2 Recommendation**

Inflation is a major macroeconomic factor that facilitates the development for a country. Stable inflation level is desirable and from the analysis the relationship between inflation and openness is insignificant thus inflation should be controlled by monetary measures such as controlling the level of unemployment. Fiscal measures such as increasing taxes thus cutting expenses and reducing aggregate demand thus inflation decreases.

The government can also exploit the negative relationship between real interest rates and inflation. If the government focus is to reduce inflation, an increase in real interest rates is recommended. Increasing real interest rates leads to low borrowing by households; spending decreases thus

reducing inflation. However, this measure leads to slow economic growth because borrowing reduces and thus investments reduce.

### **5.1 Limitation of the study**

The main limitation of the study is the data time interval. The study used annual data moreover, monthly data and quarterly data is more accurate. Since the study time period was from 1975-2015, only annual data was found in most variables such as money supply, openness and real GDP especially for the period of 1975 to 2000.

### **5.2 Suggestion for future studies**

Future studies can use data with different time interval such as monthly and quarterly data since the study used annual data this will increase accuracy of the results.

A panel data analysis can be done in African countries. A comparison among the countries is important in order to establish if openness has any effects on inflation since trade integration is increasing in Africa and such studies are minimal.

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