THE RELATIONSHIP BETWEEN OPENNESS, INFLATION AND ECONOMIC GROWTH IN ZAMBIA FROM 1965 TO 2015, AN ARDL BOUNDS APPROACH

By

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DECLARATION

This proposal is my own work has not previously been submitted for a degree at this or any other University;

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APPROVAL

This dissertation of Michael Bwalya Mulenga has been approved as partial fulfillment of the requirement for the award of the Master of Arts degree in Economics by the University of Zambia.

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ABSTRACT

Using ARDL Bounds approach to cointegration, the present study, examines the relationships between openness, growth and inflation in Zambia for the period 1965 to 2015. The study fails to validate Romer's hypothesis of a negative relationship between inflation and openness. It is found that the LR elasticity coefficient of inflation to openness is positive and weakly significant, at 6% level of significance. The positive relationship between inflation and openness is found to be more robust in the SR than LR. The results are consistent with cost push hypothesis (openness causes a faster rate of inflation). Additionally, the study finds a negative SR and LR relationship between inflation and economic growth and best explained by cost push theory of inflation. Lastly, a positive and highly statistically significant SR and LR relationship between openness and economic growth is found. Zambia being part of the global market, has benefitted from spillover of skilled labor; investments as well as technology to enhance production capacity. The results of this paper are consistent with classical theories of trade and many others' findings of positive relationship between openness and economic growth. The study recommends that the economic managers of Zambia's economy should adopt such policies that promote openness so that inflation can be controlled in the LR, also leading to economic growth.

Key words: Openness, inflation, economic growth, Romer's hypothesis, cointegration, ARDL-Bounds approach.

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ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey-Fuller UR Test
ARDL	Autoregressive Distributive Lag
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares Recursive Residuals
ECM	Error Correction Model
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IMF	International Monetary Fund
I (0)	Integrated of Order Zero
I (1)	Integrated of Order One
I (2)	Integrated of Order Two
KPSS	Kwiatkowski-Philips-Schmidt-Shin
LR	Long Run
OPEC	Oil Producing and Exporting Countries
PP	Phillips-Perron Test
R&D	Research and Development
SAPs	Structural Adjustment Programs
SBC	Schwarz Bayesian Criterion
SR	Short-Run
VECM	Vector Error Correction Model
WB	World Bank

CHAPTER ONE: INTRODUCTION

In the world of economic globalization; openness, Inflation and economic growth are the most talked about economic variables. The reason is very simple; very few economies in the whole world can survive in isolation. It could be that one country is endowed with raw materials or outsource cheap inputs that are efficiently used to produce a cheaper product that is exported to another country whose cost of production is relatively higher. Efficiency in production by one country would imply lower cost of production leading to lower prices to ultimate consumers. This on one hand could lead to lower inflation is the country that imports cheaper inputs and finished products, holding trade distortions such as tariffs and trade barriers constant. On the other hand, it could also be that, due to higher tariffs and quotas imposed on a cheaply produced good from one country will end up, expensive in another country. This could fuel inflation in the importing country. Zambia is not in isolation as it is endowed with copper and other raw materials, exported to other countries such as China while importing other inputs and finished products from countries like South Africa. Zambia as a country has undergone several regimes which came with different trade policies. The Opening of the Zambian economy to the world has impacted our general price levels as well as our economic growth, in one way or the other both in the SR and LR. Could it be that, since the independence of Zambia, openness has fueled inflation rate, or it has reduced the inflation rate and ultimately affect economic growth? It is good to note that, high rates of inflation could cause economic problems like poverty, asymmetrical distribution of wealth, market imperfections, insufficiency in balance of payments and unemployment as well as non-economic problems like smuggling and hoarding. To be precise, the volatility of inflation rate is a hindrance for future economic planning, project evaluation, and productive use of resources, which slows down economic growth and hurts the economy. Maintaining non-inflationary stable economic growth is necessary not only to uphold macroeconomic stability, but also to save the poor from unfavorable effects of inflation (Ashra, 2002). Trade openness has been pointed out to provide access to imported inputs, exemplify new technology, raise the returns on innovations of domestic producers by increasing the effective market share, and facilitate a country's specialization in research-intensive production, which leads to economic growth. The question is what is the LR and SR relationship between openness and inflation in Zambia? Does the Romer's hypothesis of a negative relationship between

inflation and openness hold in Zambia? This paper is aimed at empirically determining the short-run and long-run relationship among inflation, openness and Economic growth in Zambia using macroeconomic data between 1965 and 2015. The main key variables in this study is Openness and Inflation with Economic growth as a control variable. A Control variable is one, that you are not particularly interested in, yet it enters the regression the same way as an independent variable because it is related to the dependent variable.

1 Trade openness policy evolution in Zambia

Zambia as an economy, shortly after independence from 1964 to 1968, embraced free market orientation with little public sector participation in economic activity. According to (Macpherson 1977), Zambian economy had the highest export value per head in Africa. This meant that copper exports brought about a very healthy flow of money, the net public debt was low, and investments were relatively higher than government's indebtedness resulting in the average GDP growth rate of 2.4 per cent between 1965 and 1973. However, the booming economic growth was short lived as the country embarked on Policies, where the central government had to control a larger portion of the economy. Thus, by 1968, the government re-organized the economy from private capital to state capital by introducing what was termed as Mulungushi Economic Reforms, which included among other things, trade repressions policies. These policies were successfully implemented by heavy investments in import-substitution industries to facilitate the birth of local industries which would utilize local raw materials and labour, to have affordable local manufactures rather than expensive imported ones. The state managed to control the volume and composition of imports and exports through repression policies. The repression policies included for instance: firstly, imposing tariffs and duties on imports and exports (the import tariff structure was such that the rates were high, reaching over 100 per cent for some goods); secondly, quantitative controls (meant to restrict the importation of certain goods especially those goods competing with local manufacturing industries); and finally, the introduction of price controls of several consumption goods which were deemed "essential." The price controls discouraged local and international trading. However, the 1973 oil crisis, when the OPEC announced a massive 400 per cent oil price increase as explained by Seshamani (1992), had adverse effects on Zambia's foreign reserves which dwindled as she tried to cover its

oil import bills. To make matters worse, the oil crisis did not spare the countries which imported Zambia's copper and thus, the demand for copper declined leading to the plummeting of copper prices in 1975.Therefore, in the early 1980s, the Zambian government adopted the structural adjustment reforms to liberalize its trade. According to Mudenda and Ndulo (2004), not only exchange controls were reformed but also import licenses were made freely available while protection was now to be provided only through tariffs. The economy was further opened in 1991 when the government at that time with support from many stakeholders quickly adopted the IMF/WB economic reforms enshrined in the SAPs, that included the removal of quantitative controls on imports in 1992, which implied removal of export restrictions, introduction of countervailing duty and leaving of domestic and external trade to the private sector, except for trade in petroleum. Zambia adopted the Word Bank (WB) and International Monetary Fund (IMF) financial and trade reforms, from 1980 to 1995, with the view to achieving sustainable economic growth. Contrary to the expected results, Zambia's economy experienced reduced output, high inflation rates and increased poverty levels, goading food riots. According to Nafziger (1999), Zambia was re-classified from middle-income country to low income country because GDP growth rate fell from 6.2 per cent in 1981 to -2 per cent in 1983, while the average annual price index jumped from 37 per cent in 1984 to 52 per cent in 1985 and at 82 per cent in 1986. This compelled Zambian government to abandon the said reforms in 1987 by adopting the "growth from own resources" programme, which did not yield expected results as well because it came at time when copper prices declined, the country had mounting debt and broad based freeze on multilateral and bilateral aid, hence, the government had to readopt the IMF/WB structural adjustment reforms for the second time. Once Again, contrary to the expected results, the economy was plunged in another economic mayhem; the inflation rate rose to about 123 per cent in 1989 and 106 per cent in 1990. The GDP growth rates were saddening; in 1989 it grew at -1 per cent and -0.5 per cent in 1990, (Bwalya, 2001). Even with a liberalized financial and trade sectors in 1992, the real GDP growth rates were negative, and inflation was still very high for most part of the period 1990 to 1999. See the Trade as share of GDP in relation to inflation since 1965 in the Figure 1.1 and Figure 1.3:

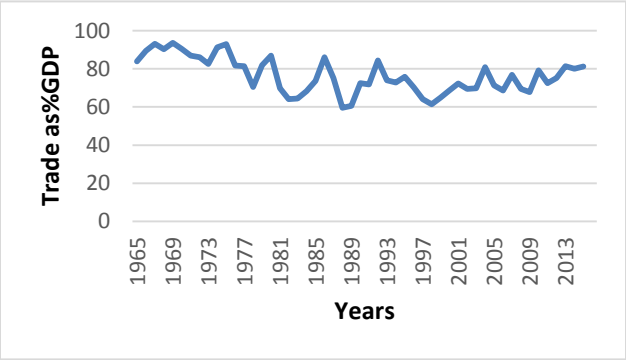


Figure 1.1: Trade as % of GDP

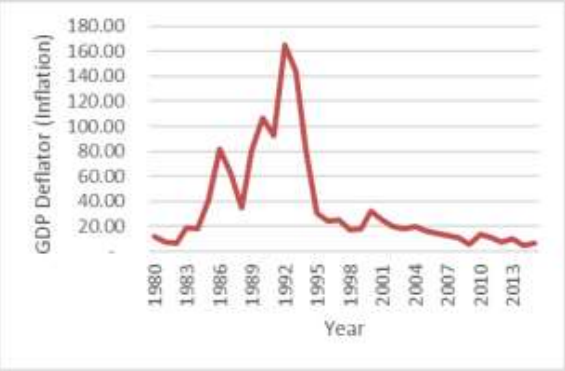


Figure 1.3: Inflation, GDP deflator (annual%)

Source: World Development Indicators, (2016)

And though Zambia has enjoyed growth rates in GDP from 2000 to date, we can no fully ascertain its relationship with Openness and inflation as shown in figure 1.2 below:

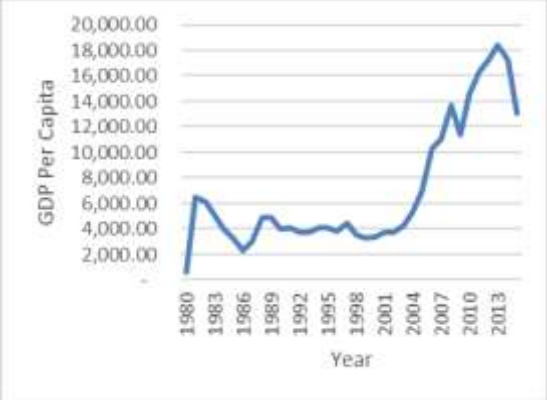


Figure 1.2: GDP per capita (Current US$)

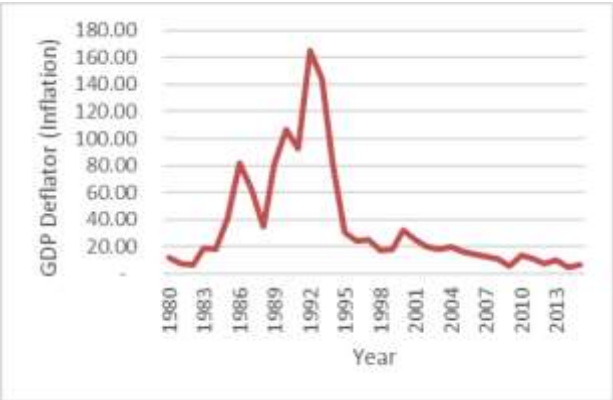


Figure 1.3: Inflation, GDP deflator (annual%)

Source: World Development Indictors, (2016)

Therefore, having established how the Key variables of this study in the Zambian context, could possibly relate to each other, it is very important now, to also understand how the contemporary world operate. The contemporary world now is a global village where Economic globalization is eminent. According to Alfaz et al (2013), Economic globalization is a development of growing the connectivity and interdependence of markets and business by doing away with restrictions and barriers on exchange of knowledge, products and commodities across the borders and regions. Hence, in this age of economic globalization, Trade openness and Inflation could be affected by economic growth. Economic theories and empirical reports stretch a variety of

conclusions about the nature of the relationship among openness, inflation and economic growth. There could be no relationship, a negative relationship or a positive relationship between openness and inflation with economic growth as a control variable to both.

1.1 Statement of the Problem

The argument on the relationship between openness and inflation with economic growth as a control variable to both, has led to the birth of diverse views. Romer hypothesis (1993) claims negative relationship between openness and inflation. He states that, relatively smaller, more open economies tend to have lower average inflation rate. Openness or trade integration affects inflation through "direct import price effects" and "indirect competition enhancement effects. The higher the share of these lower cost imports, the more the domestic prices will be driven down as a spillover effect. Also, indirectly, an increase in cheaper imports promotes price competition in importing countries that in turn narrowing markups and raising productivity and hence dampens the inflation. The Roomer oriented hypothesis differs with the Cost push hypothesis. Per the Cost push hypothesis, Openness causes a faster rate of inflation. The higher the share of higher cost imports such as oil and other raw materials for production, the more the domestic prices increase. Additionally, in literature, diverse views are held on the impact of inflation on economic growth. Fischer and Modigliani (1978) and Friedman (1977) claim an inverse and non-linear relationship between economic growth and rate of inflation. There is an inverse effect of extremely volatile Inflation rate on economic efficiency for two reasons. Firstly, increased volatility in Inflation causes long-term contracts more expensive because that the future value of dollar payments is more uncertain. Secondly, increased volatility in Inflation lowers the ability of markets to pass on the information to market participants about relative price movements. Greater Inflation reduces economic efficiency which increases the rate of unemployment in the short term and reduces Economic Growth. However, another school of thought argues that inflation is not bad. It is an indicator of what needs to be done in the economy. Mundell (1963) and Tobin (1965) claim a positive relationship between moderate inflation and economic growth. It whispered that sensible and stable Inflation rate boosts up the Economic Growth and hence development process of a country, in that, moderate Inflation increases returns to savers, enhances investment, and therefore, speeds up the Economic growth of the country. The controversy in literature concerning the exact nature and relationship among

inflation, openness and growth creates the need to establish the exact relationship among these variables in Zambia, since, Zambia is also one of the countries which have undergone several local regimes and policy directions, as part of the global market in economic globalization as indicated earlier. Despite all these random experiences in Zambia coupled with worldwide controversy on the nature and relationship between Openness and inflation with economic growth as a control variable to both, there has been no studies to determine the exact cumulative nature and relationship among the variables. Numerous empirical studies reviewed on the topic, employ cross-country data but the empirical literature based on country level time series data on the relationship between openness and inflation in Zambia is relatively scant. This paper will contribute to this worldwide argument by providing evidence from Zambia especially that, a good number of studies that have been done on this topic are cross country studies, since, this relationship is best explored in country specific case study. Hence, the need to investigate empirically, the short and long-run relationship among openness, inflation and economic growth in Zambia.

1.2 Objectives

1.2.1 General Objective

The main aim of this study is to empirically determine the short-run and long-run relationship between inflation, openness and economic growth and in Zambia using macroeconomic data between 1965 and 2015.

1.2.2 Specific Objectives

- To test the validity of Romer's (1993) Hypothesis of the existence of negative relationship between openness and inflation in small economies like Zambia.
- To empirically establish the short-run and long-run relationship between openness economic growth in Zambia.
- To empirically establish the short-run and long-run relationship between Inflation economic growth in Zambia.

1.3 Research Questions

1.3.1 Main Research Question

Is there any short run or long run relationship between openness and inflation with economic growth as a control variable to both?

1.3.2 Supplementary Research Questions

- Is there a negative relationship between openness and inflation in Zambia?
- Is there any Short run and Long Run between openness and economic growth?
- Is there any Short run and Long Run between Inflation and economic growth?

1.4 Hypothesis Statement

1. There is a negative relationship between openness and inflation in Zambia
2. There is no relationship between Openness and economic growth in Zambia.
3. There is no relationship between Inflation and economic growth in Zambia.

1.5 Rationale of Study

The basis of this study is the hypothesis that there could exists a linkage between trade openness and inflation, ultimately both being related to economic growth in Zambia. Economic theories and empirical reports stretch a variety of conclusions about the nature of the relationship among openness, economic growth and inflation. Studies on Openness and inflation further fail to reach agreement on the direction of relationship and its ultimate relationship with economic growth. This study had its significance in giving benefit to the Zambian researchers to explore the new channels through which general price level can be eased by more integration with the rest of the world and furthermore propel economic growth, especially with some recent skyrocketing of the Zambian general price levels. The key variables of interest in this study is Openness and Inflation with Economic growth being introduced as a control variable as it is related to both Inflation and Openness. This research work also differs from others in economic literature because it utilized a more robust cointegration technique known as ARDL approach to cointegration and its country specific as compared to a lot of cross country in literature. The

findings of this empirical work shall be helpful for Government of Zambia to establish the relationship between Openness and inflation, with the view to control inflation and eventually foster economic growth.

CHAPTER TWO: LITERATURE REVIEW

This section of the paper presents review of related theories to the key variables of this study, namely Trade openness and Inflation followed by the review of empirical literature reviews.

2 Review of Theories

2.1 International Trade Theories

2.1.1 Trade Protectionism Theory

Mercantilism of the 17th and 18th century is one of the oldest theories of International Trade and the pioneer of the theory of protectionism. In its first argument, it stated that, the only way for a nation to become wealthier was for the government to stimulate the nation's exports and restrict imports (particularly the import of luxury consumption goods). In addition to this, according to Hamilton (1791), economies should be closed from international market based on the self-sufficient industry ideology, which states that an evolution of such a closed economy from the ground of infant industry should be ensured by the system of grants and subsidies. That is governments should ensure temporary protection of a domestic industry from foreign competition, and these industries may increase the volume of production and consequently produce as cheap as foreign competition. This was further supported by List (1841), who argued that, it is necessary to first build a large domestic market, in which the industry will achieve economies of scale, and thereafter, becomes more competitive and ready to open to foreign competition.

2.1.2 Classical Theories of International Trade

Since the proposition of opening of the economy to foreign trade, a lot of classical theories have been advanced as to what drives trade between nations, for instance, the Absolute advantage theory of Adam Smith (1776) which states that, a country should specialize in the good they are

efficient in production and import the good less efficient. This theory was refuted by Ricardo (1817), in that the theory can only explain a very small part of world trade between developed and developing countries. He advocated for comparative advantage as the cause of trade which was further supported by Salvatore (1983), who explains the law of comparative advantage by using the opportunity cost theory, that is, the opportunity cost of the commodity is the amount of the second commodity that must be given up to release just enough resources to produce an additional unit of the first commodity. Hence countries with relative lower opportunity cost should specialize in that good and import the one with relatively high opportunity cost. In this theory, both countries engaged in trade by export in a good with less opportunity cost and import a good with relative high opportunity cost are better off than be in autarky (a condition of no trade with each other).

The theory of comparative advantage in free trade was further integrated by, the factor intensity and factor abundance introduced by Heckscher (1919) and Ohlin (1933) who explained comparative advantage to be coming from relative factor endowments. Explicitly, a country should specialize in a good in which they are richly endowed with factors of production and import a good with scarcely endowed factors of production. Additionally, both countries, provided they produce all goods, but intensively produce the good or goods that use more of their endowments at constant returns to scale, they are going to be better off than in autarky (Markusen, 1995).

The basic conclusion of the classical theories of trade is that there are clear efficiency benefits from trade that results in more products, and not only more of the same products, but greater product variety. An even greater benefit may be more efficient investment spending that results from firms having access to a wider variety and quality of intermediate and capital inputs. By enhancing overall investment and facilitating innovation, trade can bring about sustained higher growth (Chibvalo,2014).

2.2 Inflation Theories

2.2.1 **Keynesian theory of Inflation**

The Keynesian theories are the works of the famous Economist by the name of John Maynard Keynes who played a pivotal role in establishing the foundation of Keynesianism and also the modern macroeconomics. Keynes and many of his followers connected inflation to economic growth, using the Aggregate Demand (AD) and Aggregate Supply (AS) structure and attribute inflation to the demand-pull phenomenon. According to demand-pull inflation theory of Keynes, a policy that reduces any constituent of total demand is successful in reducing the pressure of demand and inflation. For example, the decrease in government expenditure or tax increase and to control volume of money alone in total can be effective in dropping effective demand and inflation control. In difficult conditions, for example in times of hyperinflation, the control of volume of money or decrease in general expenditure may not be practical hence increase in tax can be used for control on demand (Keynes, 1936). Hence Keynesians believes in a positive relationship between output and price levels, that is, an increase in output is usually accompanied by rising prices, at least in the short run.

2.2.2 **Philips curve/Okun's law**

Alban William Phillips developed an economic concept called the Phillips Curve, which shows a fundamental relationship between unemployment and inflation. In his quest by investigating the United Kingdom's economic data of unemployment rates and inflation, he noted over business cycles (economic activities over a lengthy period), that wages increased at a slow rate when unemployment was high and faster when the unemployment rate dropped. That is, high inflation rates are accompanied by low unemployment, and in an economy with low unemployment, there is high economic growth. Furthermore, according to Okun's Law, accredited by the economist Arthur Okun in 1962, there is a negative relationship between the real Gross Domestic Product (GDP) and change of the unemployment rate. Okun found that for the US a one-percentage point change in unemployment was associated to a negative three percent change in output. Hence these theories support a positive relationship between inflation and economic growth.

Phillips Curve's theory was accepted at first. However, two economists by the names of Edmund Phillips and Milton Friedman countered Phillips' theory by proposing that earnings rise and fall according to the demand for labour. In their hypothesis, during stagflation of numerous

countries in 1970, Friedman and Edmund stated that employers' base decisions on purchasing power adjusted by inflation. Stagflation occur when the economy stalls, that is, sluggish economic growth and high unemployment, yet the prices rise. The failure of the Keynesians to explain stagflation which was experienced in the 1970s resulted in the birth of 'monetarism'.

2.2.3 Monetary theory of inflation

Monetarism refers to the supporters of Milton Friedman (1912-2006) or supporters of the Monetary Theory of Inflation also known as Quantity Theory of Money in modern economics. The Quantity Theory of Money traces its origin from economists like Simon Newcomb, Irving Fisher and Alferd de Foville during the second half of 19th century and the first half of 20th century. The Quantity Theory of Money looks at the positive relationship between the Quantity of money and the Nominal Value of the disbursements. An increase in the Money Supply will lead to an increase in inflation. This can be articulated as the conservation of the positive relationship of overall prices. Nevertheless, the post-Keynesian period saw the rebuilding of the theory by the famous economist Milton Friedman. Under this theory, Inflation is always and everywhere a monetary phenomenon because, it is and can only be produced by a more rapid increase in the quantity of money than in output (Friedman, 1970).

2.2.4 Friedman's k-percent rule

During the post-Keynesian period, the famous economist Milton Friedman came up with a K-percent rule in reaffirming the monetary theory of Inflation. He argued that the money supply should rise by a fixed k-percent each year. The rate of increase of money supply should depend on institutional factors and can be determined independently of policymakers. Friedman believed this rule would avoid the extremes of deflation (Falling money supply such as Great Depression) and inflation due to rising money supply. According to Friedman (1970), the rule would give businesses strong expectations of what would happen to money supply and inflation. He did not only predict an increase in the money supply would take about 9-12 months to lead to higher output, but also placed great emphasis on the role of price expectations. If there are expectations of higher inflation, it becomes self-fulfilling – workers demand higher wages to meet rising living costs. Firms put up prices to meet rising costs. Strict monetarist policies would help reduce

expectations. After another year, output will return to its initial equilibrium causing prices to rise to accommodate the rise in money supply.

Figure 2.1 on page 12 shows the Monetarist inflation in the Aggregate Demand (AD) and Aggregate Supply (AS) Model

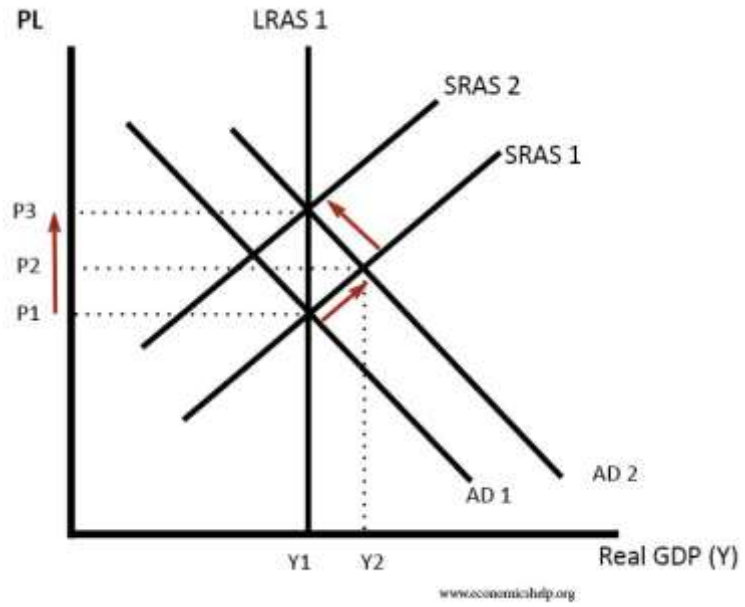


Figure 2.1: Aggregate Demand (AD) and Aggregate Supply (AS) Model

Source: **www.economicshelp.org**

A rise in the Money Supply, imply consumers have more money and therefore spend more money on goods and services; this would shift Aggregate Demand (AD) to the right. (From AD1 to AD2). Firms respond by increasing output along Short Run Aggregate Supply (SRAS) and Real output increases from Y1 to Y2. National output now exceeds the equilibrium level of output. Therefore, there is an inflationary gap. Firms, therefore, need to hire more workers. To entice more workers, wages rise leading to an increase in costs passed on into higher prices. At

first, workers would agree to work more hours because they have seen an increase in nominal wages. As prices rise, yet nominal money increase can buy less, there is a movement to the left along the new AD. Moreover, workers realize the increase in nominal wage is not a real wage increase. Consequently, workers also demand higher nominal wages to produce more output and to compensate them for rising prices, therefore SRAS shifts to the left. Eventually, the economy has returned to the equilibrium level of output (Y1), but at a higher price level (P3). Therefore, the rise in the Money Supply cause a rise in AD, but because the Long Run Aggregate Supply (LRAS) is inelastic, there is no increase in real output, but inflation rises. It is a form of demand-pull inflation (Pettinger, 2017).

In conclusion, because monetarists argue that real income or aggregate output remains stable at full employment level in the long-run due to flexibility of wages, any increase in nominal income brought about by the expansion in money supply and resultant increase in aggregate demand will cause a proportionate increase in the price level. On the other hand, in the short run when the economy is working at less than full employment, an expansionary monetary policy which leads to increase in nominal income partly induces expansion in real income and partly results in the price level increase. Therefore, like the Keynesians, monetarists view inflation as a demand-pull variety, which is positively related to economic growth and inflation in the short run (Francis, 2014)

2.2.5 Cost push theory of inflation

Over time, it has been observed that, even without an increase in aggregate demand, prices may still be increasing, usually when there is an increase in costs, leading to inflation. This is what is known as cost-push inflation. Abuja (2007) identifies main causes of cost-push inflation as namely; firstly wage-push inflation because of wage increases enforced by trade unions; secondly, profit-push inflation as due to an increase in profit margin by firms; and thirdly, rise in raw material prices or oil price shock and indirect effect of increase in oil prices or other raw material prices. The method by which cost-push inflation would affect both prices and output is during the shift in aggregate supply curve by holding other factors constant which leads to an instantaneous increase in prices and decrease in output. Therefore, this theory helps to conclude a negative relationship, between inflation and economic growth.

2.2.6 Structural theory of inflation

Structural theory of inflation by a renowned economist, Myrdal and Streeten is yet another explanation of inflation especially in developing countries. The theory argues that economies of developing countries are structurally underdeveloped as well as highly fragmented due to the existence of market imperfections and structural rigidities of different types. According to the Structuralism school of thought, the agricultural bottlenecks which in most developing countries limit the supply of food grains to increase adequately despite growing demand for food; resources gap or government's budget constraint which refers to lack of resources for financing economic development; foreign exchange bottleneck whereby developing countries face a shortage of foreign exchange for financing needed imports for development; and physical infrastructural bottlenecks, are embedded in the social, political and economic structure of these developing countries(Abuja, 2007) .Therefore, a broad based approach of development which aims to convey social, institutional and structural changes in these economies is needed so that economic growth can be achieved without inflation(Francis, 2014)

2.3 Empirical Review

In this age of economic globalization and unresolved controversy of the relationship between openness, inflation and economic growth, it is vital to have empirical understanding of the established relationship of trade openness and inflation with economic growth being introduced as a variable we are not so much interested in, in this study but incorporated because it is related to the two variables. A lot of scant empirical studies have been conducted and this paper presented some of them.

The first set of empirical studies showed a negative relationship between openness and inflation. One of the pioneers, Romer (1993), postulates the hypothesis that average inflation rate is lower in relatively smaller, more open economies. He uses cross country data for 114 countries. The findings of this study were significant for a wide range of countries except for a small group of developed economies in which inflation is lower and unrelated to openness. Romer (1993) argues, that more open economies have steeper Philips curve representing lower inflation. The negative relationship between inflation and openness was stronger in countries that were

politically less stable and had less independent central bank. Grossman and Helpman, (1991) identifies four channels such as transfer of technical knowledge, competition among firms to innovate, greater reward for successful innovation and specialization in dynamics sectors through which increased openness leads to faster productivity growth. Lane (1997); Campillo and Miron, (1997) also support, the Romer's, (1993) findings about inverse relationship between inflation and openness. Furthermore, Mcleod and Gruben, (2004) also found an inverse relationship between inflation and trade openness. They found this relationship to be stronger in the countries with floating exchange rate. Bowdler and Nunziata (2006) also find that, increased openness reduced the probability of inflation start. They used the variables such as high rates of real GDP growth, gap between inflation in US and domestic inflation and general elections take place in particular year caused the inflation start which had the negative relationship with trade openness. Farvaque and Sarfaraz (2009) postulate that inflation and openness relationship vary in Asian developing countries and developed OECD countries. The results from all these cross-country studies support the Romer's (1993) main result of the negative relationship between inflation and trade openness.

Additionally, Afzal et al (2013) employed ARDL approach to cointegration, did a study on openness , inflation and growth relationships in Pakistan to validate the Romer (1993) hypothesis, that is, the survival of the inverse connection between inflation and openness in Pakistan for the period of 1970-71 to 2008-09. They noted that, there are two alternative theoretical views in existence concerning the effect of openness (openness in a trade flow sense) on Inflation; Openness slows down the rate of inflation according to spillover hypothesis while according to the cost push hypothesis; openness causes a faster rate of inflation. However, in their study, a more robust inverse linkage between inflation and openness was noted in the short-run as compared to the long-run. Furthermore, a bidirectional causality running between inflation and openness is also found. The positive linkage between real GDP and inflation is observed that seems to be in line with the truth of Phillips curve and Okun's law. This is the key piece of empirical evidence that has fueled the desire to carry out this country specific study in Zambia.

Regarding economic growth being the control variable to both Inflation and Openness in this study, the paper explores, the empirical research findings on relationship between inflation and economic growth, which could be classified in two as follows: The first one shows a positive relationship between inflation and economic growth. It is believed that moderate inflation increases return to savers, enhances investment, and therefore, speed up the economic growth of the country. Mundell (1965) and Tobin (1965) explored a positive relationship between the rate of inflation and the rate of capital accumulation, which in turn, enhances the rate of economic growth. Secondly, Fischer and Modigliani (1978) suggest an inverse and non-linear relationship between economic growth and rate of inflation. They pointed out that inflation hampered economic growth by reducing the efficiency of investment rather than its level. Friedman (1977) also suggests a negative effect of a highly volatile inflation rate on economic efficiency because of two reasons, firstly, increased volatility in inflation causes long-term contracts more expensive because the future value of dollar payments is more uncertain and secondly, increased volatility in inflation reduces the ability of markets to convey information to market participants about relative price movements. Greater inflation reduces economic efficiency which increases the rate of unemployment for the short term and reduces economic growth. Another paper by Erbaykal and Okuyan (2008) study the relationship between inflation and economic growth in Turkey using data covering 1987:1-2006:2 periods. The existence of long-term relationship between these two variables was examined using Bound Test. Even though no statistically significant long-term relationship was detected within the Autoregressive Distributed Lagged (ARDL) model, a negative and statistically significant short-term relationship was found. Further, causality relationship between the two series was examined using the Toda Yamamoto methodology. Whereas no causality relationship was found from economic growth to inflation, causality relationship was found from inflation to economic growth.

Not only studies in developed nations were reviewed in this paper, also some of those done in developing countries like African countries. One of the first African empirical study reviewed, was done in South Africa by Hodge (2002, cited by Francis (2014) who examined the relationship between inflation and economic growth over both the medium to long term and the short run. Two based models were employed to estimate these relationships the focus was on the direction and magnitude of the relationship in each case. The sample for the medium to long

term model comprised annual observations of the growth rate and the inflation rate, including other variables believed to influence growth over the longer-term (1950-2002). The results indicated that South Africa conforms to the wide-ranging finding of various large sample cross-section studies that, there is a significant negative relationship between inflation and economic growth over the medium to long term.

In addition to the above described African empirical studies, a related study by Chimobi (2010) also used cointegration method and Granger causality test to inspect the relationship between inflation and economic growth in Nigeria for the period 1970-2005.The study found no cointegrating relationship between inflation and economic growth in Nigeria within the period of the study. To prove beyond reasonable doubt, Granger causality test at the second and fourth lags was further used to analyze this view. The results obtained, still revealed unidirectional causality moving from inflation to economic growth.

In Zambia, no study has been done to simultaneously determine the relationship among openness, inflation and Economic growth using ARDL Bounds testing approach. However related studies such as the ones done by Francis (2014) and Chibvalo (2014) are helping up in the Zambian literature review on the current study of the relationship between Openness and inflation with economic growth as a control variable to the two key variables.

Chibvalo (2014) investigated the causal relationship among financial development, trade openness, and economic growth in Zambia from 1965 to 2011.Two measures of financial development were used, namely: broad money and domestic credit to the private sector, each as a ratio of gross domestic product (GDP) and two models were developed for each indicator. Johansen's test for cointegration indicated that the variables in each model had one cointegration relationship and hence, the vector error correction model (VECM) was employed to examine the short-run and long-run dynamics among the variables in each model. In the short run, using domestic credit to the private sector as an indicator of financial development, the results indicated that that economic growth and trade openness Granger cause financial development. However, using the same indicator of financial development, there was unidirectional relationship running from trade openness to financial development, though in a negative way.

When broad money as an indicator of financial development was used, no causal relationship among financial development, trade openness, and economic growth was found in the short run. When the author tested for the long run relationship among variables and firstly, using broad money as an indicator of financial development, it was found that financial development and trade openness cause economic growth. On the other hand, economic growth and trade openness cause financial development when domestic credit to the private sector was used as a measure of financial development. Therefore, according to Chibvalo (2014), Zambia's financial sector is still in its infancy stage and exhibiting some characteristics of financial repression, since the causal link was found to be weak and that, Zambia's trade policies thus far have not contributed much to economic growth. As seen in the paper, the focus was on financial development, trade policies (Openness) and economic growth. Therefore, there is need to carry out another study to argument this study such as the one proposed by this paper on openness, inflation and economic growth, using another methodology.

Francis (2014) also did a study in Zambia to ascertain the nature of the relationship between inflation and economic growth in Zambia. He focused on the short-run and long-run dynamics between inflation and economic growth as well as establishing the nature of causality. Time series analysis involving stationarity tests, cointegration tests, Granger causality tests and vector autoregressive analysis (VAR) were employed. Growth in the logarithm of the Consumer Price Index (CPI) was used to measure inflation and growth in real GDP as a measure of economic growth to scrutinize the relationship. The study covered a period from 1980 to 2011 and the data used was annual time series. The nonexistence of cointegration was found, which implies that there is no stable long-run equilibrium relationship between inflation and economic growth in Zambia. However, the VAR analysis revealed that inflation significantly and negatively impacts economic growth in the short-run. The study further revealed that there is unidirectional Granger causality running from inflation to economic growth. Therefore, there is need to revisit this aspect of relationship with another approach of using the recent time-series econometric methodology of Autoregressive Distributive Lag (ARDL) approach as well as using GDP deflator as the measure of inflation and ascertain if the findings will be the same. Furthermore, the study did not include the aspect of trade openness on which this paper is also focusing on also.

All in all, no country can keep itself away from the world markets. Therefore, there could be a relationship between inflation and Openness while both variables (inflation and Openness) being affected by economic growth. Although most of these empirical literatures are cross country data and are presented with diverse views on the nature of relationship, they give insight on the need to conduct a country specific study on the relationship between Trade openness, inflation and Economic growth in Zambia.

2.4 Theoretical Framework

This paper is aimed at empirically determining the short-run and long-run relationship among inflation, openness and Economic growth in Zambia using macroeconomic data between 1965 and 2015. The key variables of interest in this study is Openness and Inflation with Economic growth being introduced as a control variable as it is related to both Inflation and Openness. Exploring both empirical and theoretical studies that have been done, diverse and contradictory views emerge on the relationship between Inflation and Trade openness with economic Growth as a control variable. This paper will contribute to the debate by not only reviewing previous cross-country studies that have been done on the topic but also review the possible known relationship both in theory and literature. Theoretical framework shall focus on two key variables of interest, Openness and Inflation.

In the contemporary world, the word globalization is not a new concept. Globalization pronounces a practice by which national and regional economies, societies, and cultures have become joined through the global network of trade, communication, immigration and transportation. There is an increase in sharing of ideas and technology between countries. Globalization does not only primarily focus on the economic side, such as trade, foreign direct investment and international capital flows, but also expands to include a broader range of areas and activities such as culture, media, technology, socio-cultural, political, and even biological factors, e.g. climate change. Zambia for instance has recorded an increase in foreign direct investments since the opening of the economy in 1980s. Sausa and Fedec (2018), state that, Foreign Direct Investment in Zambia average 215.65 USD Million from 1998 until 2018, reaching an all-time high of 1335.70 USD Million in the third quarter of 2012 and a record low

of -281.90 USD Million in the first quarter of 2012. A sign that, Zambia is part of the global market. Therefore, both foreign direct investment (FDI) and global trade flows in almost all open economies are affected by the current globalization process. Nevertheless, the impact of globalization appears to be fluctuating from economy to economy, conditional upon the nature, structure and degree of openness of the economy. The degree in openness in this sense, looks at all the policies that encourage or discourage flow of transaction between economies. The practice of growing the connectivity and interdependence of markets and business by removing restrictions and barriers on exchange of knowledge, products and commodities across the borders and regions is called economic globalization or Openness. Economic globalization or openness does not only depend on over time human innovation and technological progress but also concerned with increasing integration of economies around the world, particularly through trade and finance flows; and movement of labour and technology across international borders. Therefore, Trade openness have become the major cause of the flows of the international capital and more productive utilization of the under employed resources. It is an extent of which a country partakes in the global trade and allow foreign firms to do business in its domestic market.

The relationship between trade openness and the inflation is still an empirical question or even a puzzle in the economic literature. The main theories that surrounds Openness illustrates that openness as part of the economic globalization helps in the efficient allocation and utilization of resources through comparative advantage, IMF 2006 (cited in Alfaz et al (2013). This assertion on efficient allocation and utilization of resources through comparative advantage can be confirmed from all the Classical theories of trade as reviewed in the literature review section of this paper, advocated by Salvatore (1983), further integrated by, the factor intensity and factor abundance introduced by Heckscher (1919) and Ohlin (1933) who explained comparative advantage to be coming from relative factor endowments. Explicitly, a country should specialize in a good in which they are richly endowed with factors of production and import a good with scarcely endowed factors of production and that in the end, such a nation is going to be better off than in autarky (Position of no trade with any nation).

There are two alternative theoretical views that exist on such increased trade openness between nations. The first theoretical View is that when a country specializes in a good in which they are richly endowed with factors of production and import a good with scarcely endowed factors of production, its domestic prices decelerates as per spillover hypothesis while per cost push hypothesis; such openness causes a faster rate of Inflation. All these views revolve around the effect of Trade openness on Inflation through "direct import price effects" and "indirect competition enhancement effects". Direct import price effect implies that, the flow of imports of finished or intermediate goods/services may directly affect the general price level of the economy. The higher the share of low-cost imports, the more the domestic prices will be driven down, holding trade distortions such as tariffs and quotas, constant. This is the spillover effect. However, if flow of high cost imports of finished or intermediate goods/services directly increases general price level of the economy, that is, now, the cost push hypothesis. Furthermore, by Indirect Competition enhancement effects, an increase in cheaper imports promotes price competition in importing countries that in turn narrowing markups and raising productivity and hence dampens the inflation, holding other trade distortions constant (Spillover Hypothesis). As the competition increases there will be faster domestic productivity growth and firms can pay high wages without shifting their cost in the form of high prices. An increase in the productivity for manufacturers through exposure to global competition in their export markets is another example of the "indirect competition enhancement effect" with the spillover effects. Increasing openness is likely to have either negative or positive effect on Inflation and output (Jin, 2006, cited in Alfal et al, 2013). Therefore, either directly or indirectly, trade openness may have a positive or negative relationship with inflation. This is very important to note for Zambia, especially that, it is an import dependent economy. This gives the impetus to investigate the relationship between openness and inflation. Empirical studies like one of the pioneers, Romer (1993), postulates the hypothesis that average inflation rate is lower in relatively smaller, more open economies. He uses cross country data for 114 countries. The findings of this study were significant for a wide range of countries except for a small group of developed economies in which inflation is lower and unrelated to openness. Romer (1993) argues, that more open economies have steeper Philips curve representing lower inflation. The negative relationship between inflation and openness was stronger in countries that were politically less stable and had less independent central bank. This is called the Romer Hypothesis. Lane (1997); Campillo and

Miron, (1997); Mcleod and Gruben, (2004); Bowdler and Nunziata (2006); Farvaque and Sarfaraz (2009); Afzal et al (2013),also support, the (Romer's, 1993) findings about inverse relationship between inflation and openness. However, since, most of these studies are cross country studies and Zambia is an import dependent economy. There is need to run a country specific study on Zambia and validate the Romer Hypothesis.

The relationship between Openness and Inflation, ultimately affects economic growth. Despite Economic growth not being the key variable in this study but rightly introduced as a control variable to both key variables. And as far as the empirical studies on relationship between trade openness on economic development and economic growth are concerned, it has been found that trade openness positively correlates with economic development/economic growth. The idea is that, trade openness is a tool of anti-monopoly as well as the means sharing of the new technology, ideas and managerial skills among nations. It also harmonizes or even unifies the monetary and fiscal policies as to enhance production capacity of nations. It cannot be overemphasized that, theoretical literature illustrates that openness is related with efficient allocation and utilization of resources through comparative advantage that, in turn, leads to increased Economic growth consistent with findings from studies by Sachs and Warner (1995), Frankel and Romer (1999, cited in UKEssays, 2013)) and Dollar and Kraay (2003, cited in UKEssays, 2013) and IMF 2006 (cited in Alfaz et al (2013. Zambia being part of the global market, it is prudent to embark on a country specific study on the relationship between Trade openness and economic growth.

The last component of this controversial study is the known relationship between Inflation and Economic growth. The Key variable in this study is Inflation as it relates to Openness. However, in the process, economic growth is affected too. It would be good to note that, high rates of inflation could cause economic problems like poverty, asymmetrical distribution of wealth, market imperfections, insufficiency in balance of payments and unemployment as well as non-economic problems like smuggling and hoarding. To be precise, the volatility of inflation rate is a hindrance for future economic planning, project evaluation, and productive use of resources, which slows down economic growth and hurts the economy. Hence maintain Inflation within acceptable limits could have a positive effect on economic growth. This has been another

controversial topic in literature. Since inflation is the key variable in this paper, there are two alternative Inflation theories as it can be noted from the theoretical review part of this paper. The first one is the Demand-pull inflation theory. Per this theory, both Keynes, (1936) and Milton Friedman (1912-2006), argue a positive relationship between output and price levels, despite explaining from different line of thought. Per Keynes, a policy that reduces any constituent of total demand is successful in reducing the pressure of demand and inflation. For example, the decrease in government expenditure or tax increase and to control volume of money alone in total can be effective in dropping effective demand and inflation control. In difficult conditions, such as in times of hyperinflation, the control of volume of money or decrease in general expenditure may not be practical hence increase in tax can be used for control on demand (Hence Keynesians believes that, an increase in output is usually accompanied by rising prices, at least in the short-run. Nevertheless, the failure of the Keynesians to explain stagflation which was experienced in the 1970s resulted in the birth of 'monetarism'. Stagflation occur when the economy stalls, that is, sluggish economic growth and high unemployment, yet the prices rise. The post-Keynesian period saw the rebuilding of the theory by the famous economist Milton Friedman. Under his theory of Monetarism, Inflation is always and everywhere a monetary phenomenon because, it is and can only be produced by a more rapid increase in the quantity of money than in output (Friedman, 1970). He explains that, because real income or aggregate output remains stable at full employment level in the long-run due to flexibility of wages, any increase in nominal income brought about by the expansion in money supply and resultant increase in aggregate demand will cause a proportionate increase in the price level. On the other hand, in the short run when the economy is working at less than full employment, an expansionary monetary policy which leads to increase in nominal income partly induces expansion in real income and partly results in the price level increase. Therefore, like the Keynesians, monetarists view inflation as a demand-pull variety, which is positively related to economic growth and inflation in the short run (Francis, 2014). It is believed that reasonable and stable Inflation rate boosts up the Economic Growth and hence development process of a country. Moderate Inflation increases returns to savers, enhances investment, and therefore, speeds up the Economic Growth of the country. Maintaining non-inflationary stable Economic Growth is inevitable not only to uphold macroeconomic stability but also to save the poor from unfavorable effects of inflation (Ashra, 2002). Secondly, Cost push Hypothesis is another

alternative theory explaining the relationship between inflation and Economic growth. This theory accomplishes a negative relationship, between inflation and economic growth. According to this theory, it has been observed that, even without an increase in aggregate demand, prices may over time still be increasing, usually when there is an increase in costs, leading to inflation. This is what is known as cost-push inflation. The following are the main causes of cost-push inflation: firstly, wage-push inflation, that is because of wage increases enforced by trade unions; Secondly, profit-push inflation as due to an increase in profit margin by firms; and thirdly, rise in raw material prices or oil price shock and indirect effect of increase in oil prices or other raw material prices. The method by which cost-push inflation would affect both prices and output are during the shift in aggregate supply curve by holding other factors constant which leads to an instantaneous increase in prices and decrease in output. (Ahuja (2007). Therefore, this theory helps to conclude a negative relationship, between inflation and economic growth. Additionally, Friedman (1977) found inverse effect of a highly volatile Inflation rate on economic efficiency because of two reasons. Firstly, increased volatility in Inflation causes long-term contracts more expensive because that the future value of dollar payments is more uncertain. Secondly, increased volatility in Inflation lowers the ability of markets to pass on the information to market participants about relative price movements. Greater Inflation reduces economic efficiency which increases the rate of unemployment in the short term and reduces Economic Growth. Hodge (2002, cited by Francis(2014); Erbaykal and Okuyan (2008 ; Samimi and Shahryar (2009); and (Afzal, 2013) also supported these results of a negative relationship between Inflation and Economic growth.

In conclusion, the two diverse views both in theoretical review and empirical Reviews on the relationship between inflation and trade openness with economic growth as a control variable, presents a stronger conceptual framework for understanding the nature of research problem, its basis and the analysis this paper has chosen to investigate the problem. This conceptual framework has assisted in perceiving, making sense of, and interpret the data on the relationship between inflation and trade openness using ARDL model.

CHAPTER THREE: METHODOLOGY

3 Introduction

In literature as guided by the theoretical framework above, it has been argued that, Trade openness eliminates the trade barriers and leads to a more integration among economies. If the economies are liberalized and markets are deregulated as postulated by classical trade theories, either directly or indirectly through direct import price effects" and "indirect competition enhancement effects would lead to spillover effect or cost push hypothesis effect in importing countries. Spillover effect would lead to reduction in inflation whereas Cost Push Hypothesis would lead to a higher Inflation rates in importing countries. These two effects due to trade openness would affect economic growth differently too. Higher Inflation could cause economic problems like poverty, asymmetrical distribution of wealth, market imperfections, insufficiency in balance of payments and unemployment as well as non-economic problems like smuggling and hoarding. To be precise, the volatility of inflation rate is a hindrance for future economic planning, project evaluation, and productive use of resources, which slows down economic growth and hurts the economy. Moderate inflation as an indicator of the performance of an economy, increases returns to savers, enhances investment, and therefore, speeds up the Economic Growth of the country. Besides this, Theoretical literature illustrates that openness as part of the economic globalization helps in the efficient allocation and utilization of resources through comparative advantage that, in turn, leads to increased Economic Growth. The diverse views on the nature and relationships discussed in literature, creates the significance of this country specific study. Therefore, this study was aimed at empirically determining the short-run and long-run relationship between inflation, growth and openness in Zambia using macroeconomic data between 1965 and 2015. The objective was achieved by employing, the annual time-series econometric methodology of Autoregressive Distributive Lag (ARDL) approach to analyze annual data for period between 1965 and 2015. This was done by first determining the Stationarity of the model using the ADF and the PP methods. Additionally, due to the possibility of structural breaks in the models employed in the study, Kwiatkowski-Philips-Schmidt-Shin (KPSS) test for Stationarity was also conducted to augment the results from ADF and PP tests for stationarity.

In the economic literature, Cointegration techniques such as Johansen (1988), Johansen-Juselius (1990) and Pesaran and Pesaran (2001 cited in Afzal, 2013) ARDL approach are utilized by many studies to empirically determine the relationship among the variables. The following are the advantages of ARDL over other cointegration approaches mentioned above: First, this ARDL technique is comparatively more robust in small or finite samples consisting of 30 to 80 observations. This study has 51 observations which fall within 30 to 80 observations mentioned. Secondly, ARDL Model can be employed irrespective of whether regressors are of I (0) or I (1) or mutually integrated. It is good to note, however, that ARDL procedure will be inefficient in the existence of I (2) or higher order time series. As we shall see later on, the ADF and PP Tests done exposed that GDP deflator, GDP per capita and broad were stationary at I(1) with intercept(constant) and Trade as share of GDP was stationary at its level, that is, I(0) with intercept. Hence, the most appropriate technique to analyze SR and LR relationships between the variables of interest was the ARDL cointegration technique. Thirdly, the ARDL Model applies general-to-specific modeling framework by taking sufficient number of lags to capture the data generating process. It estimates (p + 1) k number of regressions in order to obtain an optimal lag length for each variable, where p is the maximum lag to be used, and k is the number of variables in the equation. The model is selected based on different criteria like SBC and AIC. In addition to this, ARDL method can distinguish between dependent and explanatory variables and eradicate the problems that may arise due to the presence of autocorrelation and endogeneity of which traditional cointegration methods may fail to sort out the problems of endogeneity. Besides, ARDL model is not only based on a single equation framework but also estimates SR and LR relationship simultaneously and provide unbiased and efficient estimates. Furthermore, Error Correction Model (ECM) can also be drawn from by ARDL approach which allows drawing outcome for LR estimates while other traditional cointegration techniques do not provide such types of inferences. ECM joins together SR adjustments with LR equilibrium without losing LR information (Afzal et al, 2013). The above advantages of the ARDL technique over other standard cointegration techniques justify the application of ARDL approach.

3.1 Data and Definition of Variables

3.1.1 Data Description and Sources

This study used annual time series data on Inflation (Infl) and openness to trade (OT), for the span of 1965 to 2015 to examine the relationships between openness and inflation with GDP per capita (Yt) and Broad Money (Ms), as control variables among others. This period was chosen because; it coincided with when a lot of economic reforms implemented in Zambia. Data on GDP per capita (Yt), inflation (Infl) and openness to trade (OT); Broad Money (Ms) was collected from the World Bank's World Development Indicators (website) and International Monetary Fund's international financial statistics. Data analysis was done using Stata 12 and Eviews 9.

3.2 Definition of Variables

3.2.1 Openness to Trade (OTt)

Trade openness is a measure of economic policies that could either control or encourage trade between nations. There are two types of Trade openness, namely Revealed openness and Policy openness. Policy openness, as the name suggest, is measured in various ways such as 1) in terms of incidence measures of trade barriers; 2) trade flow measures adjusted for structural characteristics such as size and factor endowments; and 3) price distortions. However good these measures may sound; policy openness is difficult to measure, and all these measures discussed above have their limitations and reliability issues. No wonder most papers resort to the other type of Trade openness called Revealed Openness. The Revealed openness is measured in terms of ratio of total foreign trade to GDP, which is clearly defined and well measured; Although, use of prices (domestic or international) to value the trade ratio has been a cause of disagreement among economists, the ratio of trade to GDP (OT), as a traditional measure of openness has been used by many researchers such Hanif and Batool (2006); Bowdler and Malik(2005); Farvaque and Shah (2009) and Afzal et al., (2013).These studies that focus on revealed openness always attempt to understand the linkage between trade openness and economic performance. Which is the focus of this paper too. Hence, for the sake of this paper, trade openness shall be defined as share of trade to GDP. Per Word Bank Development indicators (2016), ratio of trade to GDP is

the sum of exports and imports of goods and services measured as a share of gross domestic product. The ratio of trade to GDP (OT), is a traditional measure of Trade openness.

3.2.2 GDP Deflator (Inflt)

Inflation is defined as the sustained general price level increase in any economy over a specified period. GDP deflator and Consumer Price Index (CPI) are the two common measures of Inflation in literature. The Consumer Price Index (CPI) is a measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food and medical care. Changes in the CPI are used to assess price changes associated with the cost of living. However, deflator is one of the most cardinal indicators of inflation and mostly used in studies. It's an economic metric that accounts for inflation by converting output measured at current prices into constant- kwacha GDP. According to Alfaro (2005), Rajagopal (2007) and Afzal et al., (2013), the GDP deflator has an advantage over the Consumer Price Index, firstly because, unlike Consumer Price Index, it isn't based on a fixed basket of goods and services; Secondly, because changes in consumption patterns or the introduction of new goods and services are automatically reflected in the deflator. Hence for the sake of this paper, inflation will be measured by GDP Deflator. GDP deflator as proxy for Inflation as measured by the annual growth rate of the GDP implicit deflator which displays the rate of price change in the economy. The GDP implicit deflator was the ratio of GDP in current local currency to GDP in constant local currency (World Bank indicators, 2016). This measure was also used by (Rajagopal 2007) and (Afzal et al., 2013).

3.2.3 GDP Per capita (Yt)

Economic growth is defined as an increase in the capacity of an economy to produce goods and services, compared from one period to another. In other words, Economic growth implies increased aggregate productivity. Often, but not necessarily, aggregate gains in productivity correlate with increased average marginal productivity. It can be measured in nominal or real terms, the latter of which is adjusted for inflation. Traditionally, aggregate economic growth is measured in terms of gross domestic product (GDP). In literature, there has been debate on the best measure of economic growth. Additionally, as far as the empirical studies on impact of trade liberalization on economic development are concerned, the measurement issues are highly

debated. The studies by Sachs and Warner (1995), Frankel and Romer (1999 cited in UKEessays) and Dollar and Kraay (2003, cited in UKEssays (2013) have been most influential. Sachs and Warner found that open economies experienced high GDP per capita (over the study period) and it promoted convergence in incomes in poor countries. Frankel and Romer analyzed differences in levels of development of 150 countries and found that 10% points increase in trade integration resulted in 20% points increase in income per person (Dollar and Kraay, 2001, cited in UKEssays, 2013). Hence for the sake of this paper, The GDP per capita Constant (LCU) proxy was used to measures the economic growth of an economy, which was GDP at purchaser's prices (the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products) divided by midyear population. Data are in constant local currency (World Bank Indicators, 2016). Since GDP per capita has been used to measure economic growth as a control variable, it best describes the welfare effect on the economy of the result of Trade openness and Inflation.

3.2.4 Money Supply (Ms)

Broad Money from International Monetary fund statistics, defined as the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits was used as a proxy of money supply. Broad money has been used in this paper because it is the most inclusive measure of Money supply and in fact the economic indicator used to determine an economy's liquidity. Unlike narrow money Supply, it includes fewer liquid assets such as certificates of deposits. This is another control Variable in the study of the relationship between Openness and inflation.

3.3 Model Specification

To determine the empirical relationships between inflation (Inft), GDP per capita (Yt), and openness to trade (OTit), various specifications were tested, according to Afzal et al.,(2013) and this study used ARDL Bounds Approach in the family of ARDL framework as follows:

$$\ln OTit = \beta_0 + \beta_1 \ln Yt + \beta_2 \ Inft + u_2 \quad (1)$$

$$Inft = \alpha_0 + \alpha_1 \ln Yt + \alpha_2 \ln OTit + \ln Ms \ u_1 \quad (2)$$

Where:

ln = Natural logarithm; Yt = GDP per capita – a proxy used to measure the Economic growth of an economy; Inft = GDP deflator is one of the most important indicators of inflation; OT = Trade as percentage of GDP measures of openness to trade; MS = Broad money as a measure of money supply

3.3.1 Estimation procedure of the Model specification

As earlier mentioned, the study adopted a developed autoregressive distributed lag (ARDL) framework by Pesaran and Shin (1997); Pesaran and Shin (1999); Pesaran and Shin (2001), to establish the direction of causation between variables (SR and LR), and a test on the existence relationship between variables in levels is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mixture of both. Therefore, the process involved estimating the conditional error correction (EC) version of the ARDL model for equation 1 and 2 as follows

$$\Delta(Inf)_t = \alpha_0 + \sum_{i=1}^{p} b_i \Delta(Inf)_{t-i} + \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta \ln(OTi)_{t-i} + \delta_1 (Inf)_{t-1} + \delta_2 \ln Y_{t-1} + \delta_3 \ln(OTi)_{t-1} + \upsilon_t \quad (3)$$

$$\Delta \ln(OTi)_t = \alpha_0 + \sum_{i=1}^{p} b_i \Delta \ln(OTi)_{t-i} + \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta(Inf)_{t-i} + \theta_1 \ln(OTi)_{t-1} + \theta_2 \ln(Y)_{t-1} + \theta_3 (Inf)_{t-1} + u_t \quad (4)$$

Where (Inf), ln(Y), and ln(OTi) are GDP deflator, GDP per Capita and Trade as share of GDP , in natural logarithm, respectively, Δ was first-difference operator and p was optimal lag length and α, b c and λ stand for Short Run Dynamics while δ and θ stand for Long Run dynamics.

If there was evidence of long-run relationship (cointegration) of the variables, a partial F test calculation on the first differenced part of Unrestricted Error Correction Model (UECM) of equation 3 and 4 was conducted as follows:

$$\Delta(Inf)_t = \alpha_0 + \sum_{i=1}^{p} b_i \Delta(Inf)_{t-i} + \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta \ln(OTi)_{t-i} \quad (5)$$

$$\Delta \ln(OTi)_t = \alpha_0 + \sum_{i=1}^{p} b_i \Delta \ln(OTi)_{t-i} + \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta(Inf)_{t-i} \quad (6)$$

For annual data, Pesaran, (1999) recommended choosing a maximum of 2 lags. The orders of the lags in the ARDL model were selected by the Schwarz Bayesian criterion (SBC. The first lag of the level of each variable was incorporated to equation (5) and (6) to create Error correction mechanism. Besides this, the short run dynamics in the ARDL specification will be derived from constructing an error correction model (ECM) of the following form:

$$\Delta(Inf)_t = \alpha_0 + \sum_{i=1}^{p} b_i \Delta(Inf)_{t-i} + \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta \ln(OTi)_{t-i} + \psi ECM_{t-1} + \vartheta_t \quad (7)$$

$$\Delta \ln(OTi)_t = \alpha_0 + \sum_{i=1}^{p} b_i \Delta \ln(OTi)_{t-i} + \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta(Inf)_{t-i} + \psi ECM_{t-1} + \vartheta_t \quad (8)$$

Where ψECM_{t-1} is the error correction term, defined as:

$$\psi ECM_{t-1} = \Delta \ln(OTi)_t - \alpha_0 - \sum_{i=1}^{p} b_i \Delta \ln(OTi)_{t-i} - \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} - \sum_{i=1}^{p} \lambda_i \Delta(Inf)_{t-i}$$

All coefficients of short-run equation are coefficients concerning to the short run dynamics of the model's convergence to equilibrium and ψ represent the speed of change.

3.4 Econometric Approach

3.4.1 Unit Root Tests (UR tests)

Prior to applying ARDL technique to cointegration it is very necessary to make sure that not a single time series variable under study here is of I(2) or higher order because the calculated F-statistic doesn't remain valid in the presence of I(2) or higher order lags (Ouattara, 2004) and (Afzal et al., 2013). Therefore, in this paper, stationarity of the variables was tested by the following methods: Augmented Dickey-Fuller UR Test (ADF), The Augmented Dickey – Fuller test is an extension of the Dickey – Fuller test (developed by Dickey and Fuller (1979 cited in Phillips and Perron (1988) which solely relies on the assumption that the disturbances in the

model are white noise. However, in practice it is cumbersome to make such an assumption hence the ADF test is usually used since it accommodates some forms of correlation. Phillips-Perron (PP) (1988) test is an alternative to the Augmented Dickey-Fuller. It is a non-parametric technique of eliminating high order serial correlation in a series and ensures that the generating process is a simple first order autoregressive, i.e. AR (1). Both ADF and PP tests are tailored towards the establishment of possible presence of unit roots; i.e. non-stationary variable.

Besides ADF and PP, KPSS Stationarity test, which is a one-sided LM statistics, was also done. KPPS is very instrumental to augment the findings from ADF and PP, if the data is suspected to have structural breaks. The only disadvantage of KPSS is that, it has the high rate of type one error (tending to reject the null hypothesis too often). Nevertheless, this problem was dealt with by combining with ADF and any other stationarity test.

3.4.2 Cointegration Tests

According to Johansen-Juselius, (1990) and Pesaran and Pesaran, (2001), Cointegration techniques such as Autoregressive Distributive Lag (ARDL) approach are utilized in the economic literature to empirically determine the relationship among the variables. Thus, as Hall and Henry (1989, cited in Afzal, 2013) noted, the cointegration tests enables us to ascertain the long-run equilibrium relationships among the variables, since the difference between them is constant**.** In this study to examine Short Run and Long Run linkage between Economic growth, Inflation and Openness, an ARDL bound approach was used. According to Pattichis, (1999) and Afzal et al., (2013); ARDL model has the following advantages over other cointegration approaches: Firstly, this technique is comparatively more robust in finite Samples consisting of 30 to 80 observations .Secondly, it can be utilized irrespective of whether regressors are of I(0) or I(1) or mutually integrated. Furthermore, unlike traditional cointegration methods, ARDL method can distinguish between dependent and explanatory variables and eradicate the problems that may arise due to the presence of autocorrelation and endogeneity. ARDL cointegration estimates SR and LR relationship simultaneously and provide Unbiased and efficient estimates(Harvey, 1981)and (Afzal et al., 2013). Error Correction Model (ECM) can also be drawn from by ARDL approach (Sezgin and Yildirim, 2003). Which allow drawing outcome for Long Run estimates while other traditional cointegration techniques do not provide such types of

inferences. Pesaran and Shin, (1999) stated that Error Correction Model (ECM) joins together Short Run adjustments with LR equilibrium without losing LR information.

The paper tested the null hypothesis of no cointegration against the alternative hypothesis that there exists cointegration between all variables by using F-statistic. According to Bahmani-Oskooee, (1999), this kind of a test is sensitive to the number of lags employed on each first differenced variable. In addition, Short Run and Long Run linkage was examined by using the error correction model (ECM). If the estimated F-statistic is higher than the upper bounds critical value, the null hypothesis of no cointegration was rejected. This establishes Long Run relationship among the GDP Per Capita (Y), Inflation (Infl) and Openness (OTi). If the calculated F-statistic is less than the lower bounds critical value, then the null hypothesis of no cointegration cannot be rejected, establishing no cointegartion. If the F-value falls in between lower and upper bounds critical values, the test statistic will be inconclusive. The F-value depends upon the number of explanatory variables, sample size, and constant and/or a trend of ARDL. Therefore, it is expected that, after establishing cointergration as described above, estimated LR Coefficients of Model 1 and 2 as well ECM representation for both models shall be either positive or negative.

Trade openness (OT) could have positive relationship (Positive sign) with inflation through a cost push hypothesis or a negative relationship (Negative sign) through the spillover hypothesis. Additionally, trade openness could be positively related to Economic growth (Positive sign) through efficient allocation and utilization of resources through comparative advantage and increased productivity. It is also expected that, inflation could be positively or negatively related to economic growth as guided by the theoretical framework. Therefore, due to the diverse views in theory, it is difficult to come up with a priori or expected signs between Inflation, openness and Economic growth.

CHAPTER FOUR: EMPIRICAL RESULTS

4 Introduction

This chapter presents the detailed analysis and presentation of empirical findings of the study. Firstly, by giving the overview of time series properties of data, which include descriptive statistics, unit root test and cointegration test. Furthermore, the presentation of diagnostic tests such as test for serial correlation, Heteroskedasticity and stability of the model among many others will also be presented here.

4.1 Time Series Properties of the Data

4.1.1 Descriptive Statistics

To understand the properties of the raw data to be used in this study, the basic descriptive statistics such as the mean, median, maximum, minimum, standard deviation, Jacque-Bera, Skewness and Kurtosis of the variables under discussion were presented. Below is the table of the descriptive data.

Name of the Variable	***Inflation (GDP deflator)***	***Money Supply (Broad Money)***	***Economic Growth (GDP per Capita)***	***Openness (Trade%GDP)***
Symbol	Infl	MS	YT	OT
Mean	27.99738	4.97E+09	6058.982	7667.934
Median	16.90687	24736400	5893.063	7515.906
Maximum	165.5340	4.73E+10	8269.624	9364.826
Minimum	-14.16990	107530.0	4277.341	5947.442
Std. Dev.	36.21695	1.03E+10	1260.342	939.9820
Skewness	2.148575	2.500098	0.122719	0.122273
Kurtosis	7.445098	8.834743	1.521041	1.968114
Jarque-Bera	81.22683	125.4732	4.776065	2.389757
Probability	0.000000	0.000000	0.091810	0.302741
Observations	51	51	51	51

Table 4.1: Descriptive Statistics of the Data Source: Author's own calculations.

The total observations in our analysis are 51, representing the sample size as shown in the Table 4.1. It is observed that, GDP deflator and broad Money have a long right tail (Positive Skewness) and a positive Kurtosis implying a peaked curve with higher values than sample mean. As for GDP, per Capita and trade as share of GDP have a normal Skewness and platykurtic (Negative Kurtosis or Flatted curve). The general observation of the data can further be affirmed by Jarque-Bera test Statistic which measures the difference of the Skewness and Kurtosis of the series with those from normal distribution. For GDP deflator (Inflation) and broad Money (Money Supply) we reject the null hypothesis of Normal distribution while for GDP per Capita (Economic Growth) and trade as share of GDP (Openness), we fail to reject the null hypothesis of Normal distribution at 5% critical value.

4.2 Unit Root Analysis

In this study, as earlier alluded to, Stationarity of the variables was tested by the Augmented Dickey-Fuller UR Test (ADF) and Phillips-Perron (PP) test. Furthermore, due to the presence of structural breaks in the models, Kwiatkowski-Philips-Schmidt-Shin (KPSS) test for Stationarity was also conducted.

4.2.1 Dickey-Fuller UR Test (ADF) and Phillips-Perron (PP) test

The results were as presented in Table 4.2 below.

Variables	ADF		PP	
	Intercept	Intercept& Trend	Intercept	Intercept& Trend
Infl	-2.229 (0.1989)	2.173 (0.493)	-2.286 (0.1803)	-2.226 (0.4654)
Δ Infl	-6.839* (0.000)		-6.8394* (0.000)	
ln_yt	-1.753 (0.398)	0.4429 (0.998)	-1.349 (0.5994)	0.47933 (0.999)
Δ ln_yt	-2.6624***	-7.8157*	-6.6985*	

	(0.088)	(0.000)	(0.000)	
ln_ms	-0.5959	-3.0915	0.6918	-2.9844
	(0.8618)	(0.1195)	(0.8393)	(0.1467)
Δ ln_ms	-7.755*		-11.0769*	
	(0.000)		(0.000)	
ln_ot	-2.993**		-2.898***	-3.336***
	(0.0424)		(0.0526)	(0.072)
Δ ln_ot	-6.3931*		-10.536*	
	(0.000)		(0.000)	

Table 4.2 Stationarity for all the variables using ADF and PP Tests

Source: Author's own calculations. **Notes:** *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

The null hypothesis for the ADF and PP test for Stationality was that any series under consideration was not stationary. Therefore, from the table 4.2, we reject the null hypothesis if P-value is less than the Critical Values (1% and 5%). Inflation, log of GDP per capita, log of money supply are integrated of order one (I1), which is, they are not stationary in levels but at first difference. However, log of share of trade to GDP according to ADF and PP are stationary at level (Integrated of order (I0)).

4.2.2 Kwiatkowski-Philips-Schmidt-Shin (KPSS) Test

According to KPSS, Stationarity test was derived by one-sided LM statistics. The Null Hypothesis in this test was that, Data was Stationary, and the alternative was that data is non-Stationary. If the LM Statistics was greater than the Critical Value, then the null hypothesis is rejected, and the series was non-stationary. This is the opposite of the ADF and PP test. Below are the results from KPSS test.

Variables	KPSS	
	Intercept	Linear Trend
Infl	28.066	0.1724*
	(0.000)	(0.6169)

Δ Infl	-0.7857* (0.9801)	
ln_yt	8.6877 (0.000)	-0.004998 (0.0110)
Δ ln_yt	-0.0014* (0.8207)	0.001458* (0.8240)
ln_ms	17.99675 (0.000)	0.3081 (0.0000)
Δ ln_ms	0.2598* (0.1940)	0.000419* (0.9759)
ln_ot	-0.2754 (0.000)	-0.003945 (0.0004)
Δ ln_ot	-0.000673* (0.9607)	0.000407* (0.6702)

Table 4.3 Stationarity Test for all the variables using KPSS Test

Source: Author's own calculations. **Notes**: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

4.2.3 Summary of the order of integration for each variable

The Table 4.4 below shows the summary of the order of integration for each variable

Variable	*ADF*	*PP*	*KPSS*
Infl	I (1)	I (1)	I (0)
ln_yt	I (1)	I (1)	I (1)
ln_ms	I (1)	I (1)	I (1)
ln_ot	I (0)	I (0)	I (1)

Table 4.4 Summary of Order of Integration

The ADF and PP Tests exposed that Infl and ln_yt and ln_ms were stationary at I (1) with intercept (constant) and ln_ot was stationary at its level, that is, I(0) with intercept. Additionally, KPSS validated that, not a single annual time series variable under study here is of I (2) or higher order as observed on table 4.3 and 4.4. KPSS test shows that, ln_yt ln_ot and ln_ms were

stationary at I(1) and Infl was stationary at its level. Hence, the most appropriate technique to analyze SR and LR relationships between the variables of interest was the ARDL cointegration technique.

4.3 Structural Breakpoint Test Analysis

The study consisted of the annual time series (1965-2015) of more than two regimes in Zambia. And such, there was need to check if the variables under study were sensitive to structural breaks or sudden change in the annual time series. This is very important in that, instability in parameters may lead towards misrepresentation of the results. Firstly, the study established the existence of structural breaks using multiple breakpoint tests. Multiple breakpoint test was used because, we did not know the number of structural breaks as well as when they occurred in the data. Then later, used Zivot Andews Test, to ensure that none of the variables were integrated of order two as the condition for using ARDL bound test approach to cointergration. The multiple breakpoint test (Bai-perron test of L +1 vs L sequentially breaks) showed that Model 1 had one sequentially F-statistic determined break in 1981 whereas Model 2 had two sequentially F-statistic determined breaks in 1981 and 1994, significant at 5%. Therefore, a dummy variable was later added to the models to control for the structural breaks. It's worth to note that only significant dummy variables must be added to the models.

Furthermore, the sensitivity of the data under study to structural breaks as shown by Zivot Andews Test was presented in the Table 4.5 below. The Zivot Andews Test was interpreted as ADF and PP is interpreted, where the null hypothesis of Unit root is rejected if the minimum statistic is greater than the critical value of 5%

Variable	***Min t****	***Optimal breakpoint***	***Lag included***	***Critical Values***
Infl	-4.314	1994	0	1%: -5.57, 5%: -5.08, 10%: -4.82
Δ Infl	-8.867	1993	1	1%: -5.57, 5%: -5.08, 10%: -4.82
ln_yt	-4.658	1994	0	1%: -5.57, 5%: -5.08, 10%: -4.82
Δ ln_yt	-17.847	2008	0	1%: -5.57, 5%: -5.08, 10%: -4.82
ln_ms	-3.907	2001	2	1%: -5.57, 5%: -5.08, 10%: -4.82

Δ ln_ms	-9.963	2003	1	1%: -5.57, 5%: -5.08, 10%: -4.82
ln_ot	-5.351	1981	0	1%: -5.57, 5%: -5.08, 10%: -4.82
Δ ln_ot	-7.550	1984	1	1%: -5.57, 5%: -5.08, 10%: -4.82

Table 4.5: Zivot-Andrews unit root test, allowing for break in both intercept and trend: Lag selection via BIC

Source: Author's own calculations. **Notes**: *Min t is minimum statistics calculated. 5% critical value is considered for interpretation

The results showed that Infl and ln_yt and ln_ms were stationary at I(1) allowing for break in both intercept and trend while and ln_ot was stationary at its level, that is, I(0) allowing for breaks in both intercept and trend. Hence none of the variable after allowing for breaks in both intercept and trend was I (2).

4.4 Cointegration Test

Cointegration techniques such as Autoregressive Distributive Lag (ARDL) approach are utilized in the economic literature to empirically determine the relationship among the variables. In this paper, to check the cointegration status among Inflation (Infl), GDP Per Capita (Yt), and openness to trade (OT), the familiar F-test was applied. Two models were also used, namely model 1 and model 2 and the results of ARDL were as follows:

Model 1

ARDL (1 0 0)

Regressors	Coefficients (P-value)
ln_ot	0.4501* (0.0005)
Infl	0.000813*** (0.0588)
ln_yt	0 .2796* (0.0002)
Constant	-2.60355* (0.0002)

Diagnostic test Statistics:	
R^2	0.58
Serial Correlation (LM)	1.52
	(0.228),
Heteroscedasticity (LM)	0.30
	(0.827)
Ramsey's RESET test	1.12
	(0.295)
Normality test	1.36
	(0.505)

Table 4.6: Dynamic ARDL Model 1 Based on SBC - (Dependent Variable = ln *ot*)

Source: Author's own calculations; **Notes**: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

Having obtained the results from the ARDL using the general to specific methodology as shown in Table 4.6 above, study proceeded to test for the presence of the long run relationship between the variables. To achieve this, the bounds test methodology suggested by Pesaran et al. (2001) was employed. These tests rely on ascertaining whether the variables lagged by one are simultaneously equal to zero as shown below. The F – statistic obtained is then compared with the critical values of the Pesaran et al. (2001) tables.

F-statistics	7.2676	
	Critical Value Bounds	
Significance	I0 Bounds (Lower bounds)	I1 Bounds (upper bounds)
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Table 4.7 ARDL bound test: to know long run relation (Model 1)

Source: E-views Output H0: no levels relationship

The value of the F-statistic is 7.2676, and (k + 1) = 3 variables in the above model. So, when observing the Bounds Test tables of critical values, a value of k = 2 is found. And since the intercept of the model was not constrained, and there was no linear trend term included in the error correction, Table CI (ii) on p.300 of Pesaran et al. (2001) is the relevant table for use here. The lower and upper bounds for the F-test statistic at the 10%, 5%, and 1% significance levels are as shown the Table 4.7 above.

Based on the results obtained above, the estimated F-statistic was higher than the upper bounds critical values at 1%, 5% and 10% levels of significance, the null hypothesis of no cointegration was rejected. This establishes Long Run relationship between the variables (Inflation, Openness and economic growth).

4.5 Diagnostic Test for ARDL Model 1 based on SBC

The diagnostic test presented in Table 4.6 indicate that, the R^2 is 0.58 or 58%. R^2 also known as coefficient of determination, is the statistical measure that shows how close the data is to the fitted regression line. It looks at how well the model fits the data. Normally, there are two extremes that are considered, that is 0% and 100%. The former explains that, the model explains none of the variability of response data around the mean and the latter, explains that, the model explains all the variability of response data around its mean. The higher the percentage the better and preferably above 50%. In this case, ARDL Model 1 explains 58% variability of response data around its mean. Which is acceptable and above 50%. Secondly, ARDL model 1, also shows Serial correlation (LM) as 1.52(0.228). Serial correlation test (In this case Breutch-Godfrey test), checks the presence of serial correlation that has not been included in a proposed model structure and which if present, would mean that incorrect conclusions would be drawn from the tests. The null hypothesis for this test is no serial correlation. We reject the null hypothesis if P- value is less than the Critical Values (1% and 5%) and therefore accept the alternative hypothesis that, there is serial correlation. For ARDL Model 1 test for serial correlation (LM) presented as 1.52(0.228), we fail to reject the null hypothesis of no serial correlation. Additionally, ARDL model also passes the Heteroscedasticity (LM) test. Like serial correlation test, the null hypothesis is no Heteroscedasticity (or Homoscedasticity). The acceptable outcome is that the model should show homoscedasticity. Given Heteroscedasticity

(LM) test of 0.30(0.827), we fail to reject the null-hypothesis because the P-value is greater than the critical value at 5% (0.05). Hence there is no Heteroscedasticity in the ARDL model 1. Furthermore, Ramsey's RESET test for ARDL Model 1 shows that there is no omitted variable, or it is correctly specified. Given Ramsey's RESET test as 1.12(0.295) and the null hypothesis of No omitted variables in the model, we still fail to reject the null hypothesis at critical value at 5% (0.05) and accept that the model is correctly specified

Therefore, it evident that the model 1 presented above has passed the diagnostic test and the assessment of the stability of the model, the "Cumulative Sum of Recursive Residuals (CUSUM)" and "Cumulative Sum of Squares Recursive Residuals (CUSUMSQ)" as depicted in the figures below,shows that model 1(one) was stable. This is because the CUSUM AND CUSUMSQ is within the 5% limits.

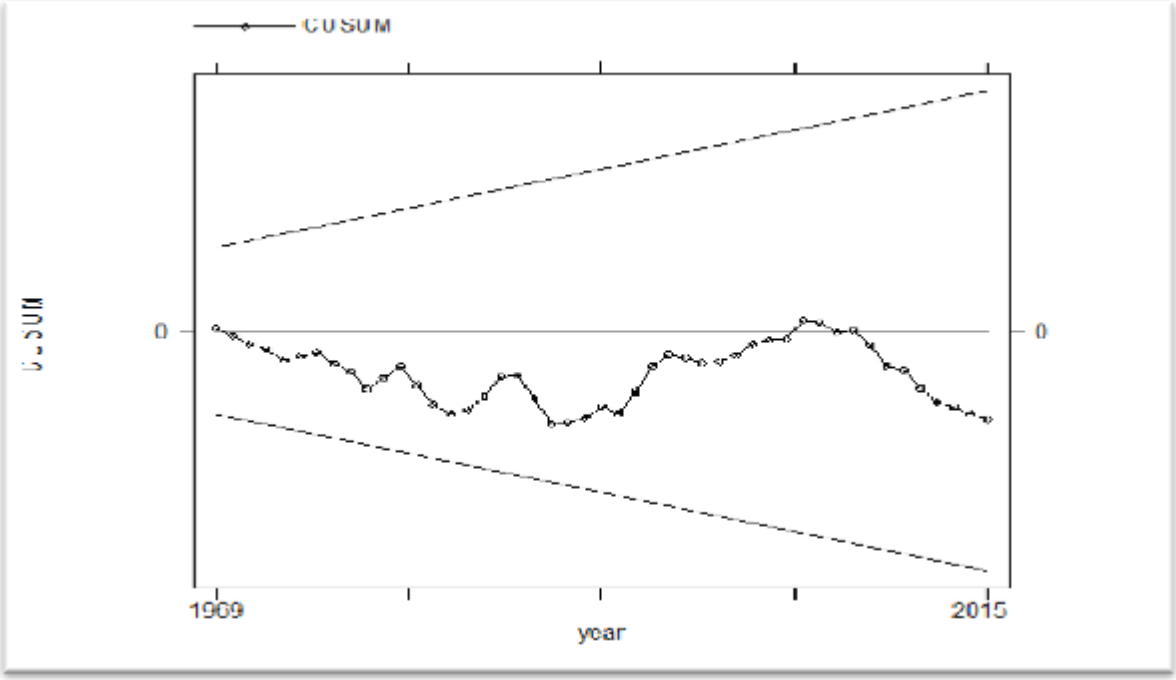


Figure 4.1: plot of Cumulative Sum of Recursive Residuals

Source: E-views Output

Note: the straight lines represent critical bounds at 5% significant level in both figures above

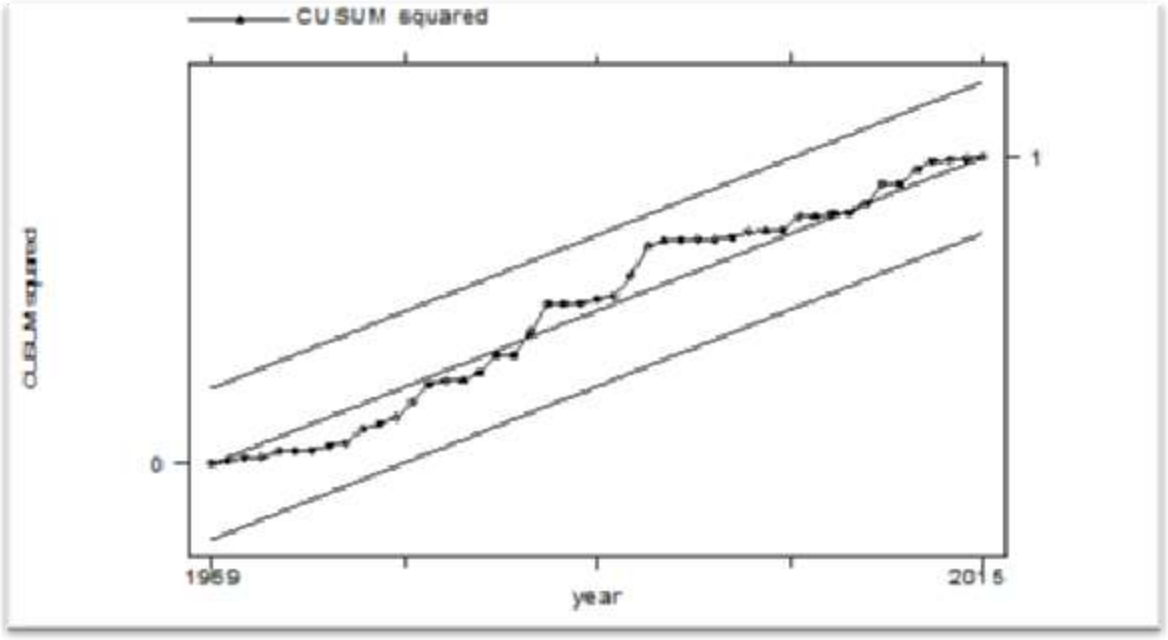


Figure 4.2 plot of Cumulative Sum of squares Recursive Residuals

Source: E-views Output; **Note:** the straight lines represent critical bounds at 5% significant level in both figures above

After assessing the stability of the model, the results of the long Run Relationship were presented in Table 4.8.

	Model 1 *ARDL (1 0 0)*
Regressors	Coefficients (P-value)
Infl	0.001478*** (0.0543)
ln_yt	0.508525* (0.0002)
Constant	-4.7346* (0.0001)

TABLE 4.8: Estimated LR Coefficients of Model 1 Based on ARDL Model 1 and SBC

(Dependent Variable = ln *Ot*)

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

The LR elasticity coefficient of real GDP in ARDL model 1 as shown in Table 4.8 was positive and highly statistically significant. This implied that an increase in GDP per capita leads to openness in the long run. Additionally, estimated LR elasticity coefficient of openness to inflation was positive and weakly significant at 6% level of significance. This further implied that increase in inflation leads to increase in openness in the LR.

	Model 1 *ARDL (1 0 0)*
Regressors	Coefficients (P-value)
Infl	0.000813** (0.0414)
ln_yt	0.2796* (0.0019)
Constant	-2.6036* (0.0014)
ECM(-1)	-0.5499* (0.0001)
ECM= lnOt- (0.5085 lnYt +0.0015 Infl)	
***Diagnostic test Statistics**:*	
Number of obs	50
DW- Statistic	1.84
R^2	0.58,
F-statistic	21.13
Serial Correlation (LM)	1.52 (0.228),

Table 4.9: ECM Representation for Selected ARDL Model 1 Based on SBC

(Dependent Variable = ln Ot)

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

Notice that the coefficient of the error-correction term, ECM (-1), was negative and highly significant at least at 1 percent level. This is what we would expect if there was cointegration among ln_yt, ln_ot and infl. Coefficient of ECM (–1) indicated the speed of adjustment back to LR equilibrium after a SR shock. The magnitude of this coefficient implied that nearly 54% of any disequilibrium among ln_yt, ln_ot and infl is corrected within one period (year). Hence the movement back to equilibrium is very fast. It can be noted that, the (ECM (–1)) was highly significant with the correct negative sign, indicating the establishment of cointegration and LR causality (LR causality runs from ln_yt to ln_ot) among Inf, GDP per capita and openness when ln_ot is the dependent variable. Additionally, short-run relationship running among Inflation, openness and Economic growth was consistent with the long run relationship. The SR coefficient of GDP per Capita in ARDL model 1 as shown in Table 4.9 was positive and highly statistically significant. This implied that an increase in GDP per capita leads to openness in the Short Run as well. Similarly, estimated SR coefficient of openness to inflation was positive and strongly significant at 5% level of significance. This further implied that increase in inflation leads to increase in openness, as strongly observed in the SR.

To examine the effect of Openness (ln_ot), Money Supply (ln_ms) and Economic growth (ln_yt) on inflation (Infl), ARDL Model 2 was estimated. Note that model two had included Money supply (ln_ms) as one of the explanatory variables. And because of the presence of structural breaks as reviewed by multiple structural break test done in Eviews 9, model 2 had included one significant dummy variable as dummy 1 to deal with the issue of structural breaks. The outcomes of dynamic ARDL model 2 for the variable Infl are given in Table 4.10.

Model 2

ARDL (1 0 0 0 0)

Regressors	Coefficients (P-value)
Infl (-1)	0.5274* (0.0000)
ln_ot	38.8190 (0.3804)

ln_yt	-56.7947**
	(0.0348)
ln_ms	4.8387**
	(0.0300)
Dummy1	-58.8180*
	(0.0044
Constant	455.4036**
	(0.0406)
Diagnostic test Statistics:	
R^2	0.78
Serial Correlation (LM)	0.841
	(0.427)
Heteroscedasticity LM) =	(6.683
	(0.0001),
Ramsey's RESET test	1.32
	(0.2883),

Table 4.10: Dynamic ARDL Model 2 Based on SBC - (Dependent Variable = Infl)

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

Per the bonds test methodology suggested by Pesaran et al. (2001), the value of F-statistic is 6.7197, and we have (k + 1) = 5 variable in our model 2 as shown in the Table 4.11 below.

F-statistics	6.7197	
	Critical Value Bounds	
Significance	I0 Bounds (Lower bounds)	I1 Bounds (upper bounds)
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Table 4.11 ARDL bound test: to know long run relation (Model 2) **Source**: E-views Output

So, the Bounds Test tables of critical values, of k = 4 was employed on Table CI (iii) on p.300 of Pesaran et al. (2001). The lower and upper bounds for the F-test statistic at the 10%, 5%, and 1% significance levels are [2.45, 3.52], [2.86, 4.01], and [3.74, 5.06] respectively. More to the point, the estimated F-statistic (6.7197) was higher than the upper bounds critical values at 1%, 5% and 10% levels of significance, the study concluded that there was evidence of a long-run relationship among infl, ln_ms, ln_yt ln_ot, and dummy1.

4.6 Diagnostic Test for ARDL Model 2 based on SBC

After establishing that there is a long run relationship among the variables in model 2, the study focused on the diagnostic test as presented in Table 4.10. The R^2 which looks at how well the model fits the data is 0.78 or 78%. As easier indicated with Model 1, the higher the percentage the better and preferably above 50%. In this case, ARDL Model 2 explains 78% variability of response data around its mean. Secondly, ARDL model 1, also shows Serial correlation (LM) as 0.841(0.427). And since the null hypothesis for this test is no serial correlation, we, again, reject the null hypothesis of no serial correlation. Additionally, ARDL model 2 has failed to pass the Heteroscedasticity (LM) test of no Heteroscedasticity (or Homoscedasticity) despite correctly specified per Ramsey's RESET test for ARDL Model 2. Given Heteroscedasticity (LM) test of 6.683(0.001), we reject the null-hypothesis because the P-value is less than the critical value at 5% (0.05). Nevertheless, Ramsey's RESET test for ARDL Model 2 and Serial Correlation test gives confidence to present data as it is. Ramsey's RESET test for ARDL Model 2 shows that there is no omitted variable, or it is correctly specified. Given Ramsey's RESET test as 1.32(0.28883) and the null hypothesis of no omitted variables in the model, we fail to reject the null hypothesis at critical value at 5% (0.05) and accept that the model is correctly specified. These results coupled with other diagnostic test such as Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares Recursive Residuals (CUSUMSQ) to prove stability of the LR and SR in model 2, gives confidence to believe that correct conclusions shall be drawn from Model 2. As shown in figures below, model 2 was equally stable and within the limits also.

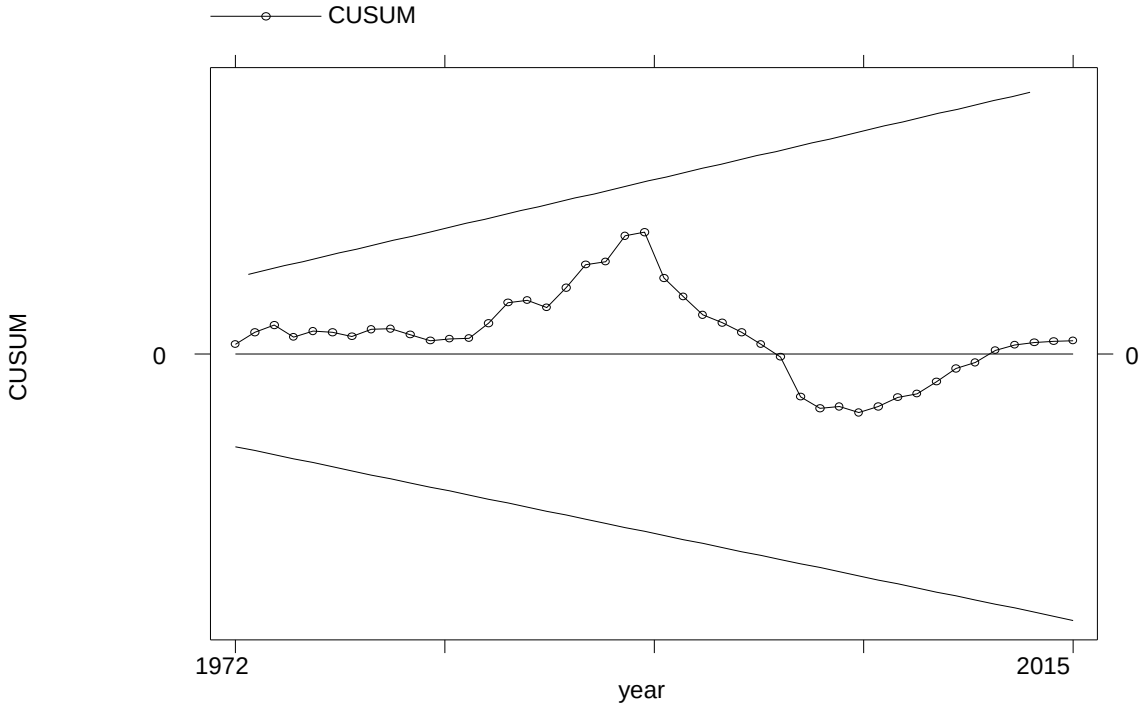
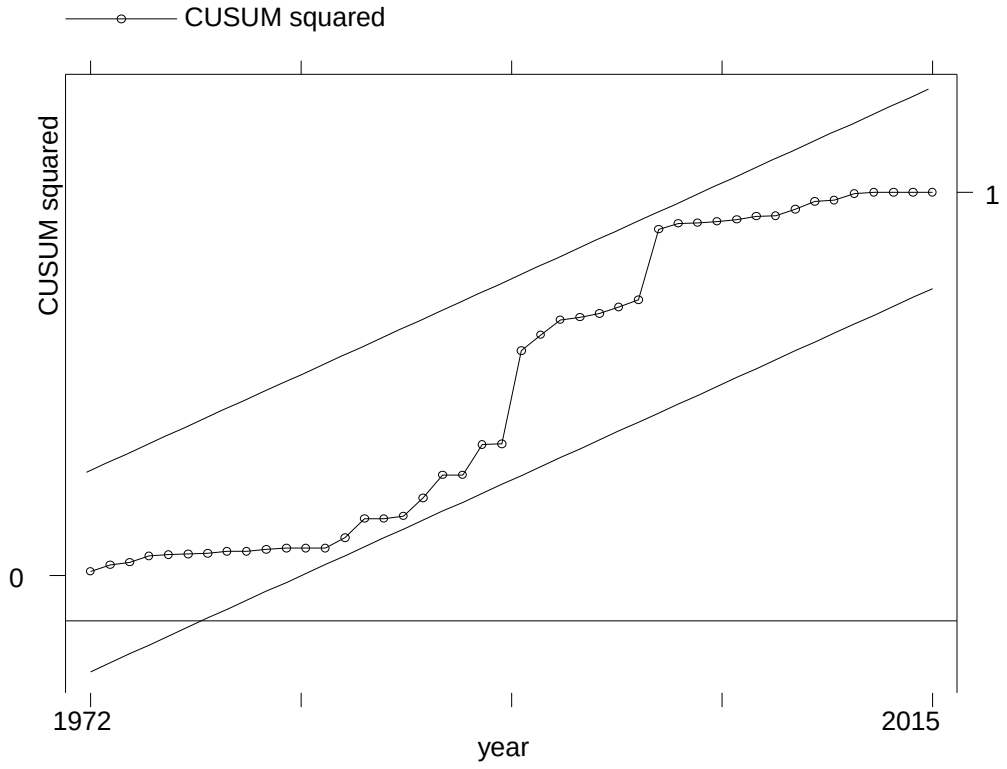


Figure 4.3 Plot of Cumulative Sum of Recursive Residuals (Model 2) and Figure 4.4: Plot of Cumulative Sum of Squared Recursive Residuals (Model)

Note: the straight lines represent critical bounds at 5% significant level in both figures above



After assessing the stability of the model, the results of the long Run Relationship was presented in Table 4.12.

	Model 1 *ARDL (1 0 0 0 0)*
Regressors	Coefficients (P-value)
ln_ot	82.1348 (0.347)
ln_yt	-120.174* (0.0073)
ln_ms	10.2378* (0.0045)
Dummy 1	-124.451* (0.00000)

Table 4.12: Estimated LR Coefficients of Model 2 Based on ARDL Model 1 and SBC (Dependent Variable = lnfl

The LR elasticity coefficient of Openness to inflation in ARDL model 2 as shown in Table 4.12 was positive and not statistically significant. However, estimated LR elasticity coefficient of GDP per capita to inflation was negative and highly significant at 5% level of significance. This implied that an increase in GDP per capita leads to a decline in Inflation in the long run. Additionally, the LR elasticity coefficient of Money Supply to inflation is positive and highly significant at 5% level of significance. This means that an increase in Money supply leads to increase in Inflation in the long run of Zambia's economy.

	Model 1 *ARDL (1 0 0 0 0)*
Regressors	Coefficients (P-value)
ln_ot	0.38.8189 (0.1885)
ln_yt	-56.7974* (0.0089)
ln_ms	4.8380* (0.0005)
Dummy1	-58.8186* (0.00000)
Constant	455.4036* (0.0185)
ECM(-1)	-0.4726* (0.0000)
ECM= Infl- (82.13 ln_ot -120.17 ln_yt +10.23 ln_ms-124.45dummy1)	
***Diagnostic test Statistics**:*	
Number of obs	50
R^2	0.78,
F-statistic	32.13
DW- Statistic	1.96
Serial Correlation (LM)=	0.874 (0.427),

Table 4.13 ECM Representations for Selected ARDL Model 2 Based on SBC (Dependent Variable = Infl

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

The coefficient of the Error-Correction Term, ECM (-1), in model 2, is also negative and highly significant at least at 1 percent level. This is what the study would expect if there was cointegration among ln_yt, ln_ot ln_ms and infl. The magnitude of this coefficient implied that nearly 47% of any disequilibrium among ln_yt, ln_ot ln_ms and infl was corrected within one period (year). As for the short-run relationship running among the variables (ln_yt, ln_ot ln_ms and infl), model 2, reveal that ,the SR coefficient of GDP per capita to inflation in ARDL as shown in Table 4.13 is negative and highly statistically significant. This implies that an increase in GDP per capita leads to a reduction in inflation in the Short Run as well. The estimated SR coefficient of openness to inflation is positive and but statistically insignificant. This is consistent with the findings of model 2 in the LR. As for the SR coefficient of Money supply to inflation is positive and highly statistically significant. Increase in money supply equally leads to increased inflation in the short run.

As earlier mentioned, a negative and highly significant ECM (-1) established LR causal effect and cointergration. Additionally, a negative sign of coefficient of ECM (-1) established stability of the model. Here the coefficients of ECM (-1) were negative and highly significant both in model 1 and Model 2, which implied stability and LR causality. There was LR causality (running from openness), and cointergration among inflation, openness, and economic growth, when Openness (lnot) was a dependent variable. Also, there was LR causality (running from GDP per capita to inflation) and cointergration established among inflation, openness, money supply and economic growth. In both cases of model 1 and Model 2, the short run relationships between the variables under discussion are consistent with the LR findings.

CHAPTER FIVE: DISCUSSION OF MAIN FINDINGS AND CONCLUSION

5 Introduction

The chapter gives a summary of the discussion of the findings, conclusion and limitation of the study. In addition, provides outline on the Policy implications, and recommendations of the study.

5.1 Main discussion of the findings of the study

The main objective of this study was to empirically determine the short-run and long-run relationship between inflation, economic growth and openness in Zambia using annual time series data between 1965 and 2015. The key variables of interest in this study is Openness and Inflation with Economic growth being introduced as a control variable as it is related to both Inflation and Openness. The main objective was divided into three specific objectives as follows: first, to test the validity of Romer's (1993) Hypothesis of the existence of negative relationship between openness and inflation in small economies like Zambia. Secondly, was to empirically establish the short-run and long-run relationship between inflation and economic growth in Zambia. And lastly, to empirically establish the short-run and long-run relationship between economic growth and openness in Zambia. The methodology used was an Autoregressive Distributive Lag (ARDL) bound approach. The ratio of trade to GDP, GDP deflator, Broad money and GDP per capita Constant (LCU), were used as proxies to measures the traditional measure of openness, inflation Money Supply and economic growth in Zambia, respectively. Annual time series data was collected from the World Bank's World Development Indicators (website) and International Monetary Fund's international financial statistics. Since the annual time series under consideration in this study was from more than two regimes, this study did not only carry out a structural break sensitivity test but also stationarity test. The former revealed that all the variables were integrated of order one although the models had two structural breaks. Therefore, one significant dummy variable was later incorporated into model 2 to solve the structural break problem. The Stationarity tests carried out using Augmented Dickey-Fuller UR Test (ADF), and Phillips-Perron (PP) test, exposed that GDP deflator (inflation) and GDP per capita and Broad money (Money supply) were stationary at first difference, that is, I (1) with

intercept (constant), while trade as share of GDP was stationary at its level, that is, I (0) with intercept. Kwiatkowski-Philips-Schmidt-Shin (KPSS) test was also instrumental to augment the findings from ADF and PP, since the annual time series data was found to have structural breaks. This test eliminated the possibility failing to detect the stationarity of the data by PP and ADF tests due to structural breaks. Although the results were different from ADF and PP test, KPSS also revealed that, none of the single time series variables under study were of integrated of order two or higher order, which validated the ARDL cointegration technique as the most appropriate technique to analyze SR and LR relationships between them.

The first finding of this study was that there was an established Long Run relationship between inflation, openness and economic growth. Results showed that, the estimated F-statistic was higher than the upper bounds critical values at 1%, 5% and 10% levels of significance, and the null hypothesis of no cointegration was rejected.

Secondly, when considering the relationship between the key variables of this study, that is openness (Ratio of Trade to GDP) and Inflation (GDP deflator), the results indicated that, LR elasticity coefficient of inflation (GDP Deflator) to openness (Ratio of Trade to GDP) was positive and weakly significant at 6% level of significance. However, estimated SR coefficient of openness to inflation was found to be positive and strongly significant at 5% level of significance. This means that, the positive relationship between inflation and openness is more robust in the SR than in the LR. This established the positive LR and SR relationship, was contrary to the Romer hypothesis of a negative relationship between inflation and openness. Hence Romer hypothesis of a negative relationship between inflation and openness does not hold in Zambia. The results are consistent with classical theories of trade where country should specialize in a good in which they are richly endowed with factors of production and import a good with scarcely endowed factors of production and that in the end, such a nation is going to be better off than in autarky (Position of no trade with any nation). In the process of a country specializing in a good in which they are richly endowed with factors of production or cheaply produce and import a good with scarcely endowed factors of production, its domestic prices accelerate as per cost push hypothesis. All these views on cost push hypothesis, revolves around the effect of Trade openness on Inflation through “direct import price effects” and “indirect

competition enhancement effects". This is very important to note for Zambia, especially that, it is an import dependent economy. According to Simoes, Landry and Hidalgo (2016), Zambia, in 2016, imported $3.95B, making it the 136th largest importer in the world. Its top imports are Refined Petroleum, Other Cast Iron Products, Excavation Machinery, Delivery Trucks and Packaged Medicaments. The Refined Petroleum represent 4.19% of the total imports of Zambia as at 2016, followed by Other Cast Iron Products, which account for 3.94%. These imports originate from South Africa China, India, the United States and Zimbabwe. Therefore, as we open the Zambian economy, through "direct import price effects" and "indirect competition enhancement effects", the higher the share of high cost imports, the more the domestic prices (inflation) increases. Since the results shows a more robust SR than in LR, effect, the impact of openness is felt more in the SR than LR. Besides this, globalization also expose Zambia to more expensive raw materials for production such as Crude oil and refined petroleum, expensive imported finished goods as well as services such as technology-oriented services as we import more technocrats to work in Zambia. Petroleum for example being a major input into Zambian production, this trickles down to increase the general Prices more in SR than in the LR. By Indirect Competition enhancement effects, such an increase in costly imports dampen down price competition in importing countries that in turn widening markups and reducing productivity and hence increases the inflation more in the SR than in the LR. However, the consolation is that the effect of openness on inflation is only short term and mostly outweighed by the general benefits of globalization and balancing the terms of trade in the LR and eventually leading to economic growth. This was evident by a weakly LR positive relationship between inflation and openness, running side by side with a positive and strong relationship between openness and economic growth.

Thirdly, the results indicate that, the SR coefficient and LR elasticity coefficient of GDP per capita was positive and highly statistically significant. Remember that, economic growth is not the key variable in this study but rightly introduced as a control variable to both Inflation and Openness, Therefore, established positive SR and LR relationship between openness and economic Growth in Zambia, confirms the theoretical literature that illustrates that Trade openness as part of the economic globalization helps in the efficient allocation and utilization of resources through comparative advantage that, in turn, leads to increased Economic Growth or increased general welfare, IMF 2006 (cited in Alfaz et al (2013). The idea is that, trade openness

is a tool of anti-monopoly as well as the means sharing of the new technology, ideas and managerial skills among nations. It also harmonizes or even unifies the monetary and fiscal policies as to enhance production capacity of nations or the so-called economic growth. A country that engages in international trade is better off than being in no trade state. Zambia being part of the global market, expose it to the benefits of globalization and eventually leads to increased production capacities of the nation. According to Zaidi et al (2010), during the socialist regime of the Zambian economy, the country experienced deep poverty. Zambia stagnated way up to late 1990 because successive governments devised limited trade reform measure. Nevertheless, the year 2007 for example, recorded the 9th consecutive year of the country's economic growth and progress in Zambia's trade. In 2003, non-metal export increased by 25% and accounted for 38% of the export earnings, from the previous 35%. Copper and nickel are Zambia's top metallic export goods and the government has been granting licenses to sources abroad for more exploration of these and other metals, including tin and uranium. On the other hand, the Manufacturing sector is one in which developing nations like Zambia can blossom due to openness, since wages and production costs are lower. However, without appropriate infrastructure and stability, this is not the case. The manufacturing situation has led many in Zambia to question the structural adjustment policies suggested by the World Bank and IMF. Even if trade liberalization is shown to help GDP growth overall, those in the manufacturing sector may see only the losses. This may be one example of the ways in which broad policies may not be applicable in every location, depending on existing industry and regional situation. All in all, Zambia following increased openness can do more construction of shopping malls, revamping of the agriculture sector by diversifying in other crops as well as construction of roads with the help of the exposure to foreign trained professional such as Chinese and many others, new ideas and enhanced investment opportunities. Zambia after embracing trade openness, a tool of anti-monopoly as well as the means sharing of the new technology, ideas and managerial skills among nations, has indeed, recorded an increase in foreign direct investments since 1980s. Sausa and Fedec (2018), state that, Foreign Direct Investment in Zambia average 215.65 USD Million from 1998 until 2018, reaching an all-time high of 1335.70 USD Million in the third quarter of 2012 and a record low of -281.90 USD Million in the first quarter of 2012. A sign that, Zambia being part of the global market, has benefitted from spillover of skilled labor; investments as well as technology to enhance production capacity. The results of this paper are

consistent with classical theories of trade and (Afzal, Malik, Butt, & Fatima, 2013) and many others' findings of positive relationship between openness and economic growth.

The fourth finding of this study was that, the estimated SR and LR elasticity coefficient of economic growth (GDP per capita) to inflation (GDP deflator) was negative and highly significant at 5% level of significance. This is an indication of a negative relationship between Inflation and economic growth in Zambia. The more the economy grows, the more likely Zambia would experience a decline in Inflation, both in the SR and LR. This is consistent with Afzal, Malik, Butt, & Fatima, 2013), Erbaykal and Okuyan (2008), and Hodge (2002, cited in Francis., (2014)) findings of negative relationship between inflation and economic growth. The findings are best explained by cost push theory of inflation. Both in theory and empirical review, it has been observed that, even without an increase in aggregate demand, prices may still be increasing, usually when there is an increase in costs, leading to inflation. Increased inflation in turn is a hindrance for future economic planning, project evaluation, and productive use of resources, which slows down economic growth and hurts the economy. The main causes of cost-push inflation are many including, wage-push inflation which comes about due to wage increases advocated by trade unions. The Zambian government has been employing a lot of policies such as wage freeze to keep associated cost and inflation within acceptable limits. In 2015 budget for instance, the debate to lift the wage freeze was analyzed in the context wage push inflation. According to Mwansa (2014), World Bank in 2011, observed that Zambia's public sector wage burden was on the rise, both in absolute terms and as a proportion of domestic revenues and remained a concern over the medium term. On average nominal wages for public employees have been increasing at a faster rate than inflation. In principle, public sector wage bill should be between 5 to 20 percent of the national budget. This is to ensure that the economy remains stable, competitive and furthermore sustain production capacity of an economy. Clearly, the wage freeze is the only temporary measure to free fiscal space for investment in infrastructure, education and health. Therefore, keeping wage within acceptable limit, reduces inflation which in turn has sustained lower cost of production which enhance economic growth recorded in the past years. Secondly, rise in raw material prices or oil price shock and indirect effect of increase in oil prices or other raw material prices is another form of cost push inflation. Inflation will increase by the increase in prices of raw materials used in the production of firms in the country.

This makes it difficult for firms to plan about future contracts. First, Increased volatility in Inflation causes long-term contracts more expensive because that the future value of dollar payments is more uncertain. Secondly, increased volatility in Inflation lowers the ability of markets to pass on the information to market participants about relative price movements. Overall, reducing economic efficiency among firms which increases the rate of unemployment in the short term and reduces Economic Growth (Abuja (2007). Hodge (2002) ; Erbaykal and Okuyan (2008 ; Samimi and Shahryar (2009); and (Afzal, 2013) also supported these results of a negative relationship between Inflation and Economic growth.

Besides this analysis focusing on the core variables of the study, the introduction of Money Supply in model 2, deserves a brief analysis in relation to the Zambian economy. The money supply was introduced as a control variable to correctly specify model 2, where inflation was a dependent variable. Both SR and LR elasticity coefficient of Money Supply to inflation was positive and highly significant at 5% level of significance. Meaning an increase in the Money Supply will lead to an increase in inflation of the Zambian economy both in SR and LR. This can be articulated as the conservation of the positive relationship of overall prices by the theory of famous economist Milton Friedman. Under his theory, Inflation is always and everywhere a monetary phenomenon because, it is and can only be produced by a more rapid increase in the quantity of money than in output (Friedman, 1970). He argued that the money supply should rise by a fixed k-percent each year. The rate of increase of money supply should depend on institutional factors and can be determined independently of policymakers. The rule advocated by Friedman would give businesses strong expectations of what would happen to money supply and inflation. He did not only predict an increase in the money supply would take about 9-12 months to lead to higher output, but also placed great emphasis on the role of price expectations. If there are expectations of higher inflation, it becomes self-fulfilling – workers demand higher wages to meet rising living costs. Firms also put up prices to meet rising costs. At this point, only Strict monetarist policies would help reduce expectations. (In case of the Zambian Economy, Bank of Zambia is responsible to manage a relevant monetary policy to determine the amount of money supply into the economy each year.) If not well managed, after another year, output will return to its initial equilibrium causing prices to rise to accommodate the rise in money supply. Furthermore, a rise in the Money Supply, imply consumers have more money to

spend on goods and services; (the increase willingness and ability to purchase). Firms respond by increasing output based on peoples' preferences. If that demand is not met, there exist an inflationary gap. Firms, therefore, need to hire more workers to catch up with increased demand. To entice more workers, wages rise leading to an increase in costs passed on into higher prices. At first, workers would agree to work more hours because they have seen an increase in nominal wages. As prices rise, yet the purchasing power of money remains the same, workers realize the increase in nominal wage is not a real wage increase. Consequently, workers also demand higher nominal wages to produce more output and to compensate them for rising prices, Hence the role of price expectations in future that is based on public information on the money supply as well as the rise in actual Money supply in the economy has a positive effect on the general price levels (Inflation) of the Zambian economy both in the SR and LR. Per Bank of Zambia monetary policy committee Statement of February 2018, the Bank of Zambia governor stated that inflation had trended downwards since March 2016 following significant tightening of the of the monetary policy in November 2015. This is a sure way to safely conclude that, tight monetary policy aimed at reduced Money supply leads to lower inflation rate in the Zambian economy and consistent to the findings of this study. As seen on the relationship among inflation, Trade openness and economic growth, lower inflation would lead to higher economic growth or increased productivity and ultimately leading to increased openness to tap into external markets provided by neighboring countries. Failing to manage a suitable monetary policy, regulating Money supply would lead to higher inflation rates and lower productivity and economic growth.

Furthermore, this study also found, a negative and highly significant ECM (-1) which did not only establish LR causal effect and cointergration but also stability of the models which was also backed by the CUSSUM AND CUSSUMSQ being within 5% limits. Hence, according to Afzal et al, 2013), recommendation of a negative and highly significant ECM (-) establishing causality, the paper concluded the following:

1. First, there was a LR causality running from Economic growth (GDP per capita) to openness (Ratio of Trade to GDP) among Inflation, GDP per capita and openness when openness was the dependent variable. Therefore, the Zambian economic growth causes and fuels Openness in the LR. The more we grow the economic growth in Zambia, the more we benefit from openness.

2. Secondly, there was weakly LR causality (running from inflation to openness) established among inflation, openness, and economic growth. The inflation in Zambia weakly and positively causes openness in Zambia. The higher the inflation rates in Zambia, the more Zambians open to international markets for goods and services.
3. Lastly, there was a LR causality (running from GDP per capita to inflation) among inflation, openness, money supply and economic growth, when Inflation was the dependent variable. This means that Zambian economic growth causes a lower inflation over time. Hence the more we grow the economy, the more we reduce the inflation rate over time.

5.2 Limitations and scope of the study and recommendations for future research

This paper's aim and scope was to empirically determine the short-run and long-run relationship among inflation, openness and Economic growth in Zambia using macroeconomic data between 1965 and 2015. The key variables of interest in this study are Openness and Inflation with Economic growth being introduced as a control variable as it is related to both Inflation and Openness. It is worthy to note that this study had rewardingly determined, the Short Run and Long run relationship between Openness and inflation with economic growth as a control variable in Zambia from 1965 to 2015. This is evident in the attempt to changing the measures of inflation to CPI, and Economic growth to Real GDP and still produced similar results as indicated in the Appendix A attached to this paper. Nevertheless, this had not been done without limitations. Firstly, data for some variables that could have been included such as Effective Exchange Rate was only available for a few years. The model was valid based methodology used. Therefore, future research should consider adopting other models, methodologies, proxies and include more variables and probably add granger causality to repeat the estimation process and check the robustness of the results.

5.3 Conclusion and Policy Recommendations

In conclusion, Romer's hypothesis does not hold in Zambia. The study points to a weakly positive relationship between openness and inflation in the Long-Run as compared to the short Run, which was found to be a strong positive relationship. The Study also established a positive relationship between Openness and economic growth both in the Long Run (LR) and Short Run

(SR). And finally, the study also revealed a negative relationship between inflation and economic growth.

Zambia has managed to transform the benefits of openness into tangible economic growth. However, it's very cardinal to pay attention to the strong positive relationship between openness on inflation in the SR, considering that Zambia is an import dependent economy. The results of a positive relationship between openness and inflation best explained by the cost push hypothesis strongly points imported raw material, new technology and finished goods that enter the economy at higher prices. This led to a sustained increase in the general prices levels in the economy in the SR. The findings of this study are consistent with literature reviewed such as (Friedman, 1977), Afzal et al, 2013), Erbaykal and Okuyan (2008), and many others reviewed in this paper but contrary to Romer hypothesis of a negative relationship between openness and economic growth.

The study, therefore, recommends that policy makers and other stakeholders should come up with policies that should create an enabling environment that will:

1. Improve export base from traditional copper, to compete with international industries and help reduce the effect of inflation and openness in the SR and further fuel economic growth. This is since opening of Zambian economy to international market will eventually lead to economic growth and lower inflation in the LR.
2. Reduce the double marginalization that surrounds most of the production inputs e.g. fuel(oil) from abroad as this might directly reduce the impact of openness on inflation in the short run. As noted in the finding of this study, the positive relationship between inflation and openness is strongly observed in the SR as compared to the LR.
3. Government should give Economic growth a primary focus which will eventually reduce inflation. This recommendation is consistent with the findings that, there is LR causality (running from GDP per capita to inflation) as well as LR causality (running from GDP per capita to openness). Hence, economic growth in Zambia influences the reduced inflation and increased openness in the LR. The more our Zambian economy grows, the more it would open to international markets for more diversified products and services.

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APPENDIX

APPENDIX A:

Description: Establishing the relationship between Openness and Inflation with Economic growth using Trade as share of GDP, Consumer Price Index (CPI) and Real GDP growth.

Model Specification

The key variables in the study are Inflation and Openness while economic variable is used as a control variable, as it is related to both. Therefore, if there is cointegration among the variables, the process involved estimating the conditional error correction (EC) version of the ARDL model for equation 1 and 2 as follows

$$\Delta \ln(OTi)_t = \alpha_0 + \sum_{i=1}^{p} b_i \Delta \ln(OTi)_{t-i} + \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta(\ln \inf)_{t-i} + \psi ECM_{t-1} + \vartheta_t \quad (1)$$

$$\Delta(\ln nf)_t = \alpha_0 + \sum_{i=1}^{p} b_i \Delta(\ln \inf)_{t-i} + \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta \ln(OTi)_{t-i} + \psi ECM_{t-1} + \vartheta_t \quad (2)$$

Where ψECM_{t-1} is the error correction term, defined as:

$$\psi ECM_{t-1} = \Delta \ln(OTi)_t - \alpha_0 - \sum_{i=1}^{p} b_i \Delta \ln(OTi)_{t-i} - \sum_{i=1}^{p} c_i \Delta \ln(Y)_{t-i} - \sum_{i=1}^{p} \lambda_i \Delta(\ln \inf)_{t-i}$$

Time Series Properties of the Data

Descriptive Statistics

Appendix A1: Descriptive Statistics of the Data

Name of the Variable	***Inflation (CPI)***	***Money Supply (Broad Money)***	***Economic Growth (Real GDP growth)***	***Openness(Trade% GDP)***
Symbol	Infl	MS	OT	OT
Mean	37.90588	4.97E+09	2.7301	7667.934
Median	25.40000	24736400	1.4300	7515.906
Maximum	183.3000	4.73E+10	1.1412	9364.826
Minimum	6.400000	107530.0	8.6211	5947.442
Std. Dev.	37.72331	1.03E+10	3.5714	939.9820
Skewness	2.303020	2.500098	0.8500	0.122273
Kurtosis	8.226488	8.834743	2.1718	1.968114
Jarque-Bera	103.1300	125.4732	7.611682	2.389757
Probability	0.000000	0.000000	0.022240	0.302741
Observations	51	51	51	51

Source: Author's own calculations.

The general observation of the data by Jarque-Bera test Statistic is that, Inflation (CPI), Real GDP growth (Economic Growth) and broad Money (Money Supply) are not Normally distributed while trade as share of GDP (Openness), is Normal distribution at 5% critical value.

Unit Root Analysis

Variable	*T-statistic in levels*	*T-statistic in first difference*	*Decision*
Lncpi	-0.140	-6.323*	**I (1)**
Lrgdpg	0.5449	-7.760*	**I (1)**
ln_ms	-0.5959	-2.966**	**I (1)**
ln_ot	-2.955**	-6.3931*	**I (0)**

Appendix A2: Stationarity for all the variables using ADF Tests

Source: Author's own calculations.

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

The ADF Tests exposed that inflation (lncpi) Real GDP growth (lrgdp) and lnms were stationary at I(1) with intercept(constant) and lnot and was stationary at its level, that is, I(0) with intercept. With these findings ARDL model can be estimated, by first beginning with establishing the correct optimal lag length required.

Optimal Lag Selection

The optimal lag length for each variable in model 1 where Openness (lnot) is the dependent variable has been chosen to be 1 as seen by all the selection criteria in the **Appendix A3: Results of optimal lag selection-Model 1** below.

VAR Lag Order Selection Criteria
Endogenous variables: LNOT
Exogenous variables: C LNRGDP LNCPI
:
Sample: 1965 2015
Included observations: 47

Lag	LogL	LR	FPE	AIC	SC	HQ
0	38.28766	NA	0.013046	-1.501603	-1.383508	-1.457163
1	47.41599	16.70289*	0.009233*	-1.847489*	-1.690030*	-1.788236*
2	47.75585	0.607418	0.009500	-1.819398	-1.622574	-1.745332
3	48.33078	1.003071	0.009679	-1.801310	-1.565121	-1.712430
4	48.43118	0.170886	0.010065	-1.763029	-1.487475	-1.659336

For the sake of this analysis we shall focus on Schwarz Information Criterion for lag selection.

Structural Break Test

Since the current study consisted of the annual time series (1965-2015) of more than two regimes in Zambia, a multiple breakpoint tests done on model 1 and 2. Multiple breakpoint test indicated structural break date of 1981 and 1994 for Model 1 and Model 2 respectively. One significant dummy variable was added to each model.

ARDL (Short Run) AND BOUNDS COINTERGRATIONN TEST FOR MODEL 1

	Model 1 *ARDL (1 0 0 0)*
Regressors	Coefficients (P-value)
ln_ot	0.3409** (0.0121)
In_cpi	0.0258 (0.2412)
ln_rdgp	0 .1154** (0.0324)
D1	-0.1748 (0.00003)
Constant	3.089*** (0.0553)
Diagnostic test Statistics:	
R^2	0.57
Serial Correlation (LM)	2.37 (0.305)
Heteroscedasticity (LM)	2.189 (0.701)
Ramsey's RESET test	0.685 (0.407)
Normality test	0.637 (0.726)

Appendix A4: Dynamic ARDL Model 1 Based on SBC - (Dependent Variable = ln ot)

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

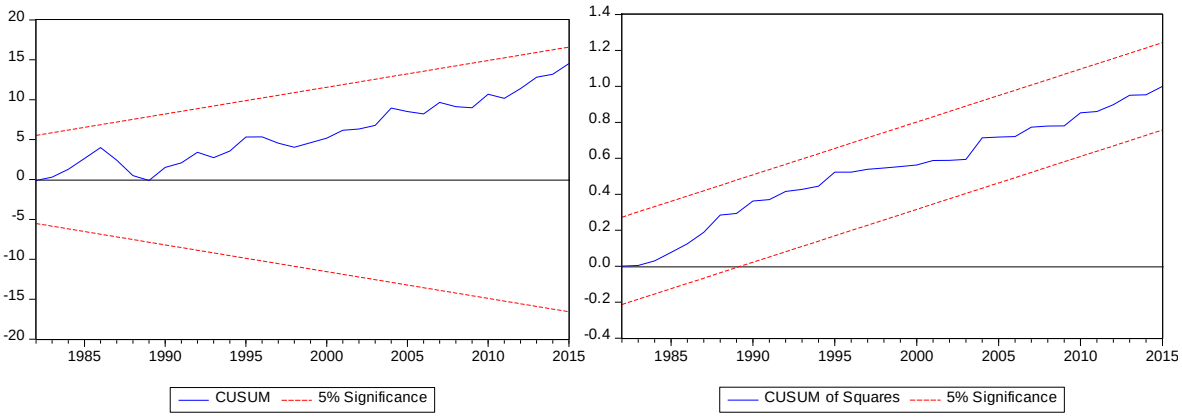
Having performed the ARDL (Short run Model) above, proceed to perform the Bounds cointegration test and the results are as follows:

F-statistics	6.694	
	Critical Value Bounds	
Significance	I0 Bounds(Lower bounds)	I1 Bounds(upper bounds)
10%	2.72	3.77
5%	3.25	4.35
1%	4.29	5.61

Appendix A5: ARDL bound test: to know long run relation (Model 1-lnot as dependent variable)

Based on the results obtained above for Model 1, the estimated F-statistic is higher than the upper bounds critical values at 1%, 5% and 10% levels of significance; the null hypothesis of no cointegration was rejected. This establishes Long Run relationship between the variables (Consumer Price Index(Inflation), and trade as share of GDP and Real GDP growth).

From Appendix A4, the dynamic ARDL Model 1 Based on SBC - (Dependent Variable = ln ot), it evident that the model 1 presented above has passed the diagnostic test and the assessment of the stability of the model, show that model 1(one) was stable because the CUSUM AND CUSUMSQ is within the 5% limits.



After assessing the stability of the model, the results of the long Run Relationship were presented in **Appendix A6**

	Model 1 *ARDL (1 0 0 0)*
Regressors	Coefficients (P-value)
Ln_cpi	0.0329 (0.245)
ln_rgdp	0.175** (0.0320)
Constant	3.089* (0.000)
ECM(-1)	-0.659* (0.000)
ECM= lnOt - (0.1752lnrgdp + 0.0392 Incpi - 0.2652 D1)	
***Diagnostic test Statistics**:*	
Number of obs	50
DW- Statistic	1.75
R^2	0.57,
F-statistic	28.56
Serial Correlation (LM)	2.37 (0.305)

Appendix A6: Estimated LR Coefficients and ECM Based on ARDL Model 1 and SBC (Dependent Variable = ln *Ot*)

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

Short-run relationship running among Inflation, openness and Economic growth as shown in Appendix A4 was consistent with the long run relationship shown in Appendix A6 above. The SR and LR coefficient of Real GDP in ARDL model 1 was positive and highly statistically significant at 5% level of significance while estimated SR and LR coefficient of openness to inflation was positive and insignificant.

The coefficient of the Error-Correction Term, ECM (-1), was negative and highly significant at least at 1 percent level. This is what we would expect if there is cointegration among lncpi, lnot and Inrgdp. Coefficient of ECM (–1) indicated the speed of adjustment back to LR equilibrium after a SR shock. The magnitude of this coefficient implied that nearly 65.9% of any disequilibrium among lncpi, lnot and Inrgdp is corrected within one period (year).

ARDL (Short Run) and bounds Cointergration Test for Model 2

To examine the exact relationship between lncpi, and lnot with Money Supply (ln_ms) and Economic growth (lnrgdp) as control variables were estimated in ARDL Model 2.

	Model 1 *ARDL (1 0 0 0 0)*
Regressors	Coefficients (P-value)
lncpi	0.3677* (0.0018)
Inms	0.271* (0.0001)
ln_rdgp	-1.781* (0.0001)
D1	-1.772* (0.0002)
Constant	39.82* (0.000)
Diagnostic test Statistics:	
R^2	0.85
Serial Correlation (LM)	0.561 (0.4536)
Heteroscedasticity (LM)	8.119 (0.1498)
Ramsey's RESET test	0.239 (0.6245)

Appendix A7: Dynamic ARDL Model 2 Based on SBC - (Dependent Variable = lncpi)

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

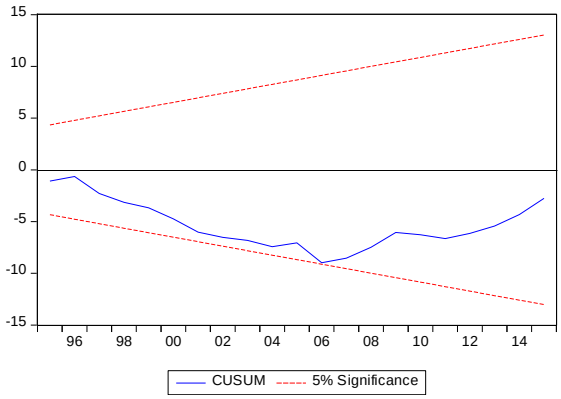
The SR coefficient of Real GDP in ARDL model 2 was negative and highly statistically significant at 5% level of significance while that of Money Supply was positive and highly significant too.

F-statistics	7.520	
	Critical Value Bounds	
Significance	I0 Bounds (Lower bounds)	I1 Bounds (upper bounds)
10%	2.45	3.52
5%	2.86	4.49
1%	3.74	5.06

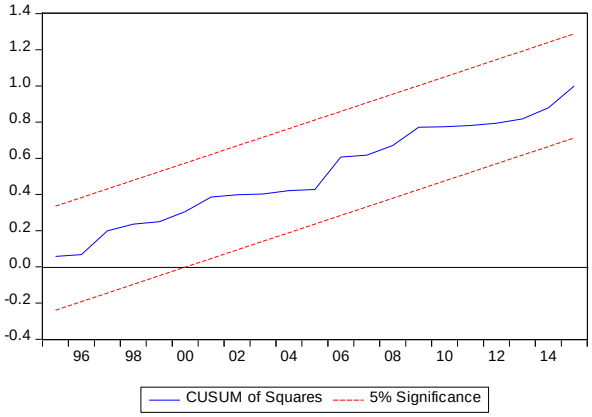
Appendix A8: ARDL Short Run and bound test: to know long run relation (Model 2-lncpi as dependent

Equally, the estimated F-statistic for Model 2 is higher than the upper bounds critical values at1%, 5% and 10% levels of significance, establishing Long Run relationship between the variables (Consumer Price Index(Inflation), and trade as share of GDP and Real GDP growth)).

Model 2 also as presented in Appendix A7 above has passed the diagnostic test and the assessment of the stability of the model, the as depicted in the figures below, shows that model 2



was stable too.



Model 1
ARDL (1 0 0 0)

Regressors	Coefficients (P-value)
Lnms	0.4298* (0.000)
ln_rgdp	-2.816* (0.000)

Constant	39.8234* (0.000)
ECM (-1)	-0.632* (0.000)
ECM= lncpi - (0.3454lnot-2.816lnrgdp + 0.4299 Inms – 2.802D2)	
***Diagnostic test Statistics**:*	
Number of obs	50
DW- Statistic	2
R^2	0.48,
F-statistic	50.7
Serial Correlation (LM)	0.561 (0.4536)

Appendix A9: Estimated LR Coefficients and ECM Based on ARDL Model 2 and SBC (Dependent Variable = lncpi)

Notes: *, **, and *** indicate level of significance at 1%, 5% and 10% respectively

The LR elasticity coefficient of Openness(lnot) to inflation(lncpi) in ARDL model 2 as shown in Table 2.9 was not statistically significant. However, estimated LR elasticity coefficient of real GDP(lnrgdp) to inflation(lncpi) was negative and highly significant at 5% level of significance. Additionally, the LR elasticity coefficient of Money Supply(lnms) to inflation (lncpi) is positive and highly significant at 5% level of significance.

The Coefficient of ECM (–1) indicated the speed of adjustment back to LR equilibrium after a SR shock. The magnitude of this coefficient implied that nearly 63.2% of any disequilibrium among lncpi, lnot and Inrgdp is corrected within one period (year). The coefficient of the Error-

Correction Term, ECM (-1), was equally negative and highly significant at least at 1 percent level as we would expect if there is cointegration among lncpi, lnot and Inrgdp.

Summary of the Findings

A. When Using CPI for Inflation and Real GDP growth for Economic growth

1. A positive and highly statistically significant SR and LR relationship between openness and economic growth and is found.
2. Estimated SR and LR elasticity coefficient of real GDP(lnrgdp) to inflation(lncpi) was negative and highly significant at 5% level of significance
3. Lastly, the study fails to validate Romer's hypothesis of a negative relationship between inflation and openness. It is found that the estimated SR and LR coefficient of openness(lnot) to inflation(lncpi) was positive and insignificant.

B. When Using GDP Deflator for Inflation and GDP per capita for Economic growth

1. A positive and highly statistically significant SR and LR relationship between openness (ln ot) and economic growth(lnyt) was found.
2. Additionally, the study a finds a negative SR and LR relationship between inflation (Infl) and economic growth(lnyt)
3. Lastly, the study fails to validate Romer's hypothesis of a negative relationship between inflation and openness. It is found that the LR elasticity coefficient of inflation to openness is positive and weakly significant, at 6% level of significance.