IMPACT OF TRADE OPENNESS ON INFLATION AND UNEMPLOYMENT IN NIGERIA: 1986-2015

BY

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DECLARATION

I hereby declare that this Dissertation titled: **Impact of trade openness on inflation and unemployment in Nigeria: 1986-2015** was conducted by me **(Mahmood YAKUBU Moukhtar)** under the supervision of Dr. Aliyu Rafindadi Sanusi and Prof. Yahaya Zakari in the Department of Economics, Faculty of Social Sciences, Ahmadu Bello University, Zaria. The information derived from the literature has been duly acknowledged in text and a list of references is provided. No part of this Dissertation has been previously presented for the award of any certificate in any institution.

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CERTIFICATION

This thesis titled: **Impact of trade openness on inflation and unemployment in Nigeria: 1986-2015** meets the requirements for the award of Masters of Sciences in Economics of the Ahmadu Bello University, Zaria and is approved for its contributions to knowledge.

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DEDICATION

This research work is dedicated to my late granies (Haj. Mariya and Asma'u AKA Ýar Baba), late brother Mal. Bello Baba Abdullahi (aka Bello Gajere), Late Isah Tata Yusuf (AKA Tata Isa; Bababa) who could not live to see its completion, may their souls rest in perfect peace; "Ameen thumma Ameen". To my Parents and my mentor and guardian Prof Magaji Garba and also able supervisors Dr. Aliyu Sunusi Rafindadi and Prof. Yayaha Zakari; Thank you all.

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ABSTRACT

The short run relationship between inflation and unemployment was supported by the Phillips curve, the Rogoff's hypothesis, howerver in 1983 shows that given the degree of openness the correlation between inflation and unemployment can change. Also, monetary policy credibility model pioneered by Kydland and Prescott in 1977 and its later extensions with open-economy considerations identify the link between inflation and openness to be positive or negative depending on the slope of the aggregate supply curve as well as whether monetary policy is conducted by rule or discretion. Given these positions, this study uses the Break Least Squares Regression (BLSR), correlation, sacrifice ratio, granger causality and the Vector Autoregression (VAR) to empirically examine the above theoretical relationships in Nigeria between 1986 and 2015. The result identifies that there is a trade-off between inflation and unemployment within the various openness regimes with significant negative correlations within them and accross the entire research period. Hence, this supports the existance of a Phillips curve in the short run, which also presents the CBN with strong policy menu in line with the Keynesians model of aggregate demand-driven business cycle. This finding lends support to the dual mandate of the CBN of targetting both output and inflation via its monetary policy. Also, the result identifies causation from openness to both inflation and unemployment. Then, accumulated responses of inflation and unemployment to openness from the IRFs (impulse response functions) results were positive and negative respectively. Finally, the study recommends that authorities in Nigeria need to tread carefully in their reform efforts aiming to increase trade openness because it could exacerbate inflation and as well help reduce unemployment.

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CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

The maintenance of price stability and low unemployment rate are major macroeconomic challenges facing the Nigerian economy. Inflation and unemployment appear to be among the key macro-management problems Nigeria is facing. Inflation has been a problem hitting 2 digits until 2013 when it has been on the decline. Yet, recently it has been on the rise again from the first quater 2015. Unemployment has also been on the rise, and despite the recent changes in the methodology for computing the rate in Nigeria in 2009 which come to effect in 2014, new figures appear to show that unemployment rate is on the increase right from the last quater of 2014.

These two economic problems coexist amidst reasonably high level of economic growth in the Nigerian economy, which is adjudged to be the highest and longest so far achieved and sustained in the history of the country. The Real Gross Domestic Product (RGDP) grew by 6.99% in fourth quarter of 2012 as against 7.76 percent in the corresponding quarter of 2011 (NBS, 2013). In the year 2014 on an aggregate basis it grew 6.23% (NBS, 2015). Furthermore, coexisting with high economic growth, unemployment and higher inflation is also the rising importance of trade and foreign investment in the country. This is because evidence from Central Bank of Nigeria (CBN) statistical bulletin 2012 has shown that Nigeria is an importing country with heavy record trade deficits in the non oil trade balance. Large trade deficit in the non-oil sector implies that the labour intensive sector are net importers which in turn suggest that jobs are increasingly being exported, the consequence of which is rising unemployment. This means theoretically trade

openness can cause Nigeria to export more jobs and import inflation due to contact with higher inflation countries or due to depreciating exchange rate as argued by the cost push hypothesis theories (Jhingan, 2003; Majumder, 2006; Makochekanwa, 2007; Malik, 2007 and Hasan and Alogeel, 2008).

Inflation situation in Nigeria from 1986 to 2012 was characterized by 2 digit fluctuation in the rate of inflation with only 7 different years (1986, 1990, 1998, 1999, 2000, 2006 and 2007) recording single digit. Inflation in Nigeria within that period recorded its highest rate of 72.9% in 1995, then sharply declined to 8.2% in 1997 (CBN, 2012). In 2001, the inflation rate rose to 18.9% and by 2012 inflation rate of 12% was observed and after wards the single digit of 8.5% and 8.1% in 2013 and 2014, respectively (CBN, 2014). Yet, the first half of 2015 recorded a persistent rise in the inflation rate averaging 8.7% (CBN, 2015). On the other hand, unemployment record in Nigeria was in the single digit from 1986 to 1999. But in 2000 it rises to 18.1%, and since then it has been in the double digit fluctuating around 13% to 15%. In 2009 unemployment significantly rose to 19.7% and has been on the rise again recording 23.9% in 2011 and 25% in 2014 (NBS, 2015).

Moreover, theoretically there are some arguments which suggest that inflation and trade openness connection is conditional as the theories suggest that higher degree of openness can lead to higher inflation or otherwise (Romer, 1993; Rogoff, 2003; Gruben and Macleod, 2004 and Jin, 2006). Whereas a high unemployment rate in the case of developing economies like Nigeria can be associated with rising openness to trade (Davis, 1998; Davidson and Matusz, 2004 and Trefler, 2004). Also the intuition that the slope of the Phillips curve (the sacrifice ratio) is related to openness is based on models of small open economies with nominal rigidities (See Romer, 1993). It is against this background that this study seek to investigates the relationship

between inflation and unemployment and their relative sacrifice ratio within the trade openness regimes in Nigeria, the impact of trade openness on inflation and unemployment, and also the relative magnitude of the effect of trade openness on inflation and unemployment.

1.2 Statement of problem

Inflation and unemployment appear to be among the persistent key macroeconomic problems Nigeria is facing. Inflation has been a problem with the central bank facing a many difficulties in bringing the rate to single digit over a long term. Inflation has been a mererly 2 digits rate in Nigeria until 2013 when it has been on the decline but recently it has started to rise again in the first half of 2015 (CBN, 2015). On the other hand unemployment has also been on the rise, as the figures appear to show that unemployment is on the increase (NBS, 2015).

These two economic problems coexist despite the reasonable high level of economic growth that the Nigerian economy has been recording recently. Furthermore, coexisting with high economic growth, unemployment and higher inflation is also the rising trade openness in the economy. On the othe hand, the theoretical literature illustrates that openness can help in the efficient allocation and utilization of resources through comparative advantage that, in turn, leads to increased Economic growth (IMF, 2006). Trade openness can be a tool of anti-monopoly and it can also harmonize or even unify the monetary and fiscal policies in an economy (IMF, 2006).

But the problem here is that theoretically there are arguments which suggest that rising level of openness to trade can be associated with high inflation and unemployment even though the economy might be growing. This theoretical position can mean that the inflation and unemployment situations in Nigeria are attributable to the rising openness to trade among other factors as explained by the arguments of Davis (1998), Terra (1998), Davidson and Matusz

(2004) and Trefler (2004) and also the arguments of Jin (2006) and Gruben and Macleod (2004). Strand of these theories suggests that the higher the level of openness to trade can cause an increase in imports which in turn replaces domestic production. Also, that increase in openness can translate to increase in domestic consumption by both individual consumers and producers which will lead to an increase in exchange rate depreciation and the finally resulting to higher inflation (Rogoff, 2003 and Romer, 1993).

Finally, this thesis investigates the extent to which the high level of inflation and unemployment are linked and caused by the rising openness to trade in Nigeria. Thus, fundamental question that arise from the above problem and which this research seeks to answer is: to what extent are the high rate of inflation and unemployment in Nigeria are associated with the rising level of trade openness? Specifically, the study seeks to answer the following research questions:

i. What is the impact of openness on inflation and unemployment in Nigeria?

ii. What is the relative magnitude of the effect of openness on inflation and unemployment in Nigeria?

iii. What is the correlation of inflation and unemployment within the trade openness regimes in Nigeria between 1986-2015?

iv. What is the trade-off (sacrifice ratio) between inflation and unemployment in Nigeria within the identified trade openness regimes between 1986-2015?

v. Does openness cause inflation and unemployment in Nigeria?

1.3 Objectives of study

The major objective of this research is to find the extent which trade openness causes both inflation and unemployment in Nigeria, and the specific objectives of the research are;

i. To assess the impact of openness on inflation and unemployment in Nigeria.

ii. To find the relative magnitude of the effect of openness on inflation and unemployment in Nigeria.

iii. To determine the correlation of inflation and unemployment within the trade openness regimes in Nigeria between 1986 and2015.

iv. To determine the trade-off (sacrifice ratio) of inflation and unemployment in Nigeria within the identified trade openness regimes between 1986 and 2015.

v. To find if openness causes inflation and unemplyment in Nigeria.

1.4 Justification for the study

The need for this study is born out of both theoretical and practical challenges in academics and in the real aspect of economic mangement by policy makers. On the other hand, in the dual problems, inflation and unemployment have been at the centre of public discourse in Nigeria. Achieving a low and sustainable rate of inflation in Nigeria has proved to be difficult for the monetary authority. In addition, the rising poverty which has been linked to the level of unemployment in Nigeria, which has also remained high and appears to be persistenly rising. Given the political and welfare implications of the two problems, an empirical evidence that shed more light on openness as a key factor among those that generate these two problems (inflation and unemployment) would be of interest to both monetary and fiscal authorities.

The study goes a long way in providing a working policy ideas within which the CBN on the prevailing situation can make a prudential judgments in its decision on the inflation problem and also that of unemployment. Since the CBN just recently in 2014 begin to capture the unemployment problem in its policy decision sitting variables. This would shape our understanding of the economic problems of inflation and unemployment in Nigeria and of course

their nexus with the trade openness reality in the economy. Furthermore, the fiscal authorities are also going to be best informed on the basics that needs be looked at in their decision making with regards to the importation and exportation policies so as to avoid worsening the inflation or unemployment problems in Nigeria.

1.5 Scope of the study

The scope of this work covers the period 1986 to 2015 (a period of 30 years); and annual time series data on the variables would be used for the study. The research work intends to analyse the impact of trade openness on inflation and unemployment in the Nigerian economy.

1.6 Organization of the study

This study is organized in five (5) chapters which are as follows: General introduction, statement of problem, research objectives, justification and the scope of study and organization of chapters constitute the first chapter. Chapter two reviews the relevant conceptual, theoretical and empirical literature. In chapter three we present the research methodology used to attain the objectives of the study. Results presentation, analysis and interpretation is contained in the fourth chapter. While summary, conclusions and recommendations are presented in chapter five. After which the references and appendix.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Literature

2.1.1 Inflation

Inflation is a sustained increase in the general price level of goods and services in an economy over a period of time. Inflation is defined as a continuing rise in prices as measured by an index such as the consumer price index (CPI) or by the implicit price deflator for Gross National Product (GNP) (Jhingan, 2002). A chief measure of price inflation is the inflation rate, the annualized percentage change in a general price index (normally the consumer price index) over time (Mankiw, 2001; pp. 22–32).

Inflation is derived from consumer's price index (CPI) in Nigeria. The Consumer's Price Index (CPI) which is regarded as direct measure of inflation is used to measure inflation rates in Nigeria and it is easily and currently available on monthly, quarterly and annual basis CBN (2010). The computation of this index which is reported monthly is done by the National Bureau of Statistics (NBS). The average level of retail prices of goods and services consumed by all households in the country is measured by the composite CPI. This would be the definition to be adopted for this study. The consumer price index which measures the changes in the price level of consumer goods is calculated as:

$$\text{CPI} = \frac{\text{Current year price index}}{\text{Base year price index}} \times \frac{100}{1}$$

Although GDP implicit deflator is also used to measure inflation, it is less preferable because it excludes the prices of imported goods, which the CPI captures and are important consideration in the present study.

2.1.2 Unemployment

There seem to be a consensus on the definition and usage of the concept, unemployment. According to Udu and Agu (2005), unemployment is "a situation in which persons capable and willing to work are unable to find suitable paid employment". As defined by the International Labour Organisation (2007), unemployed workers are those who are currently not working but are willing and able to work for pay, currently available to work and have actively search for work. Furthermore, unemployment can be defined as the difference between the amount of employment demanded and supplied at each real wage or as the difference between actual and equilibrium employment (Barro, 1997).

No matter how unemployment is defined, the underlying philosophies are that those who are willing to work and are indeed not working. Although there seems to be convergence on this concept, its applications have been bedeviled with series of problems across countries. Most published unemployment rates are recorded open unemployment. People's attitude on this varies from country to country. In the same vein, an operational definition of unemployment for this work will be the unemployment that occurs when people who are able and willing to work are without jobs, or cannot find work to do which is also known as the level of unemployment in a nation and is measured by calculating the unemployment rate, which is given as:

$$\text{Unemployment Rate (U)} = \frac{\text{Number of people unemployed}}{\text{Total Labour force}} \times \frac{100}{1}$$

2.1.3 Trade Openness

Trade openness is refered to as the level which countries or economies allow or have trade with other countries or economies. It is the aggregate value of international trade in goods and services and also reflects countries' integration into the world economy. Small countries are generally more integrated: their exports tend to be in a limited number of sectors and they need to import more goods and services than larger countries in order to satisfy domestic demand (Cavallo & Frankel, 2008). Openness in trade refers to the degrees to which countries or economies permit or have trade with other countries or economies. The trading activities include import and export, foreign direct investment (FDI), borrowing and lending, and repatriation of funds abroad (Bowdler and Malik 2005).

Different measures of openness to trade exist due to non-availability of perfect single measure of openness in the literature. The ratio of trade to GDP; as best alternative proxy of trade openness and the proxy our present study would utilize. This proxy has been used by Hanif and Batool (2006); Jin (2006); Bowdler and Malik (2005); Farvaque and Shah (2009); Zakaria (2010); Alfaro (2005); Temple (2002); among others.

2.1.4 Sacrifice Ratio (Trade-off) betweeen inflation and unemployment

The sacrifice ratio is measured most commonly by an expectations augmented Philips curve approach which simply defines a relationship between output and or unemployment and inflation with its relative foundation rooted to the works of Okun (1978) and Gordon and King (1982). The relation can be quantified given the time series of output and the relevant price index. The basic equation is the following Philips curve with adaptive expectations:

$$y_t - y_t^* = \alpha(\pi_t - \pi_{t-1}) + u_t; \qquad \alpha > 0 \quad \text{---------} \quad Equation\ (2.1)$$

Where y_t and y_t^* refer to actual and potential output and the term $(\pi_t - \pi_{t-1})$ is the disinflation occurred in time t. As α gets larger, the cost of disinflation increases. However, the main disadvantage with this approach is that the estimated sacrifice ratio is not varying over time. This approach constraints the output-inflation tradeoff to be the same during disinflations as during increases in trend inflation and temporary fluctuations in demand (Ball 1994). An alternative way is then to use episode-specific methods to measure output losses occurred in individual disinflation episodes. This kind of measurement makes it possible to analyze how sacrifice ratios vary in time and for different conditions.

Ball (1994) defines some specific disinflation episodes and calculates the tradeoff for each episode separately. The sacrifice ratio for some specific episode is then:

$$SR = \frac{\Delta Y}{\Delta \pi} \text{----------Equation (2.2)}$$

Ball (1994) identifies disinflation episodes in which trend inflation falls substantially and defines trend inflation as a centered, nine quarter moving average of actual inflation. The time range between an inflation peak and inflation through is called to be a disinflation episode. The sacrifice ratio in a given episode is then defined as the total deviation in output from its trend over the change in the trend inflation.

$$SR = \Sigma \frac{(y_t - y_t^*)}{(\pi_t - \pi_{t-1})} \text{----------Equation (2.3)}$$

The basic definitions related with disinflations in Ball's study were; Trend Inflation, Inflation Peak, Inflation Through and Disinflation Episode. The most delicate issue in Ball's calculation of sacrifice ratios is the measurement of the potential output. That is because; small differences in the fitted trends can make large differences for sacrifice ratios. This standard method

introduced by Ball (1994) defines potential (natural) level of output based on some assumptions but that method of measuring potential output was an alternative to standard statistical filters such as HP filter. The problem with the method is that the economists cannot reach consensus on the assumptions of it. Moreover Zhang (2001) modified Ball's (1994) method, and also used the HP-filter to calculate potential output. The empirical results from the data of G-7 countries revealed higher sacrifice ratios than the sacrifice ratios that don't account for long-lived effects. The new method assumes there is a possible strong persistence effect, thus, short-term loss and long-term loss are not the same (Zhang, 2001).

However, while this general definition is commonly accepted, sacrifice ratios have in practice been estimated using a wide range of different models and methods. For instance, a number of works have attempted to estimate sacrifice ratios from the relationship between nominal income changes and real output fluctuations, while others have relied more heavily on structural estimates of price and wage inflation and or on structural VAR models of various sizes. This work adopts the sacrifice ratio estimation method from Zhang's (2001) work with little modification. Therefore, the following formula following Zhang (2001) was used:

$$\text{SR} = \frac{\sum(\text{Annual deviations between trend of unemployment and that of actual unemployment})}{\Delta\text{Trend inflation over the course of disinflationary episode}}$$

$$\therefore \text{SR} = \frac{\sum U_t - \overline{U_t}}{\Delta\pi_t - \pi_{lp}}$$

Where;

SR= Sacrifice Ratio,

U_t = Actual unemployment,

$\overline{U_t}$ = Trend unemployment (proxied for NAIRU) obtained using HP − filter,

π_t = Inflation at the begining of the disinflation course, and

π_{lp} = Inflation at the last period of the disnflation course

2.2 Theoretical Background

The 1977 monetary policy credibility model of Kydland and Prescott and its subsequent extensions provide a suitable framework for the analysis of the relationship between inflation, openness and output (or unemployment) (Barro and Gordon 1983 and also Taylor 1983). Barro and Gordon (1983), view the Kydland and Prescott's model as a valuable model of actual monetary policies and that it gives significant insights into a broad range of phenomena. Rogoff (1985) extends the basic models of dynamic consistency and monetary policy to open economy settings, and suggest that when two countries coordinate their monetary policies, in effect turn themselves into a single larger country, and hence less open, economy. Thus, the decreased openness reduces the harm of the real depreciation induced by surprise monetary expansion, and as such raises equilibrium inflation. The deductions from Rogoff (1985) suggests that in larger and hence less open economies there is greater incentive for monetary expansion, and so the higher the equilibrium rate of inflation. In this setting therefore, inefficiently high inflation will arise (from the absence of precommitment) and this predict an inverse relationship between openness and inflation.

2.2.1 Openness and Inflation: The model of monetary policy credibility

Based on the model of monetary policy credibility pioneered by Kydland and Prescott (1977) and Barro and Gordon (1983), and later extended to include open-economy considerations by

Rogoff (1985), and Obstfeld and Rogoff (1996), among others, opine that the link between inflation and openness is demonstrated to be positive or negative depending on the slope of the AS curve and whether monetary policy is by rule or by discretion. Following Obstfeld and Rogoff (1996), assuming that the loss function of the Central Bank takes the form:

$$L = \frac{1}{2} E[\alpha(y - \hat{y})^2 + (\pi - \pi^*)^2] \quad \text{Equation (2.4)}$$

where y is (log) real GDP, $\hat{y}$ is the government's target for y, π is the inflation rate, π^* is the inflation target, E denotes the mathematical expectation, and α is positive parameter which captures the importance of the output target relative to inflation (which is assumed to have a target of zero). Output is given by an expectations-augmented Phillips curve equation below:

$$y = \beta(\pi - \pi^e) + U \quad \text{Equation (2.5)}$$

where the "natural rate" of output has been normalized to zero (in effect interpreting y as deviations from the trend, or the "cyclical" component of output), π^e denotes expected inflation, $U \sim \text{iid}(0, \sigma_u^2)$ is an output shock, and β (the slope of the aggregate supply) is a parameter that captures the Phillips curve trade off between inflation and output. Very similar results would be obtained if we used the more recently developed "New Keynesian" monetary policy model of Clarida, Gali, and Gertler (1999). There the loss function is given by:

$$L = \frac{1}{2} E_t \left\{ \sum_{i=j}^{\infty} \rho^j \left[\alpha \left(y_{t+j} - \hat{y}_{t+j} \right)^2 + \pi_{t+j}^2 \right] \right\} \quad \text{Equation (2.6)}$$

, where ρ is the discount factor, and the aggregate supply is given by a "New Keynesian" expectations-augmented Phillips curve:

$$\pi_t = \lambda y_t + E_t\pi_{t+1} + W_t \quad \text{Equation (2.7)}$$

with $\lambda > 0$, $W_t = \varphi W_{t-1} + Z_t$, $0 < \varphi < 1$, and $Z_t \sim \text{iid}(0, t^2)$.

The last equation can also be written in aggregate-supply form as:

$$y_t = \beta(\pi_t - E_t\pi_{t+1}) + U_t \quad \text{Equation (2.8)}$$

with $\beta = 1/\lambda$ and $U_t = -W_t/\lambda$. Then, $\beta = \beta(\text{open})$, with open < 0, is equivalent to $\lambda = \lambda(\text{open})$, with (open) > 0.

Two implications of the openness of the economy are now considered. First, we are making β a decreasing function of openness, in order to incorporate the assumption that "the output-inflation Phillips curve trade-off is worse in an open economy than in a closed economy" (Obstfeld and Rogoff, 1996). The same point has been made in a variety of theoretical approaches, including those of Rogoff (1985), Romer (1993), and Karras (1999). Thus we assume:

$$\beta = \beta(\text{open}) \quad \text{Equation (2.9)}$$

with $\beta' \equiv \frac{\partial \beta}{\partial} \text{open} < 0$, where the variable open measures the degree of openness of the economy.

Second, and again following Obstfeld and Rogoff (1996), we include a Purchasing Power Parity (hereafter; PPP) relationship, which implies:

$$\pi = \Delta e + v = \varepsilon + v \quad \text{Equation (2.10)}$$

where e is the (log, nominal) exchange rate, $\varepsilon \equiv \Delta e$ is the (nominal) depreciation rate, the error term $v \sim \text{iid}(0, \sigma_v^2)$ captures deviations from exact PPP, and the foreign price level is assumed to

be exogenous (and has been normalized to 1). The policy goal is to select ε in order to minimize equation (2.4) subject to equation (2.5), (2.9), and (2.10).

We make the standard assumption that policymakers solve for ε after they observe U but before they observe v, whereas the public forms inflation expectations before they observe either U or v.

The first-order condition implies that the optimum depreciation rate must satisfy that

$$E^D = \frac{\alpha\beta^2\varepsilon^e - \alpha\beta U + \alpha\beta\hat{y}}{\alpha\beta^2 + 1} \quad \text{Equation (2.11)}$$

where ε^e is expected depreciation and a "D" superscript stands for "discretion." At equilibrium, $\varepsilon^e = E(e^D)$, which gives $\varepsilon^e = \alpha\beta$, and therefore

$$\varepsilon^D = \alpha\beta\hat{y} - \frac{\alpha\beta}{\alpha\beta^2 + 1}U \quad \text{Equation (2.12)}$$

as the optimal equilibrium ("discretion") depreciation rate. Substituting equation (2.12) in equation (2.10) and (2.5) gives

$$\pi^D = \alpha\beta\hat{y} - \frac{\alpha\beta}{\alpha\beta^2 + 1}U + v \quad \text{Equation (2.13)}$$

and

$$y^D = \frac{\alpha\beta}{\alpha\beta^2 + 1}U + \beta v \quad \text{Equation (2.14)}$$

as the equilibrium inflation and output values, respectively.

Making use of equation (2.9), the effects of various degrees of openness are now easily derived. Equation (2.13) implies that average inflation will be $\pi^D = \alpha\beta\hat{y}$, and therefore $\frac{d\pi^D}{d(open)} < 0$. This

model therefore suggest that the relation ship between openness and inflation depends on the nature of the conduct of monetary policy. Where monetary policy is discretionary, the more open econo y is for a given rate of depreciation, the lower will bethe rate of average inflation. This is, of course, identical to Romer's (1993) result, predicting lower average inflation in more open economies. An additional result can be derived here for the average depreciation rate which, according to equation (2.12), is also given by $\varepsilon^{D} = \alpha\beta\hat{y}$, and so $\frac{d\varepsilon^{D}}{d(open)} < 0$, as well. Not surprisingly, because of the PPP relationship, the model predicts that more open economies will have a lower average depreciation rate. The intuition behind this is the same as with Romer's result: since the benefits of monetary expansions are lower in more open economies, the incentive to exploit the Phillips curve trade-off is lessened, and thus the average inflation bias and depreciation of the currency are reduced. This also supports the Marshall-Lerner condition between trade balance and depreciation Blanchard (2009: P429).

2.2.2 The Theory of Unemployment

Keynesian theory of unemployment start from a framework which states that there is a single composite good, output, produced under conditions of diminishing returns to each scarce factor of production and constant returns to scale. Conditions governing production are described by a production function, and the demand for labour is derived from this function. The supply of labour is based on individual decisions to give up other activities loosely described as leisure and allocate time to labour. These relations yield a negatively sloped aggregate demand curve for labour relating offers of employment and the relative price of labour, or real wage, and a positively sloped supply curve of labour. The intersection of the two curves determines the market clearing real wage and the equilibrium level of employment. Unemployment can be

defined as the difference between the amount of employment demanded and supplied at each real wage or as the difference between actual and equilibrium employment.

Keynes's (1936, pp. 35-6) believed that previous writers failed to provide a theory uniting wage rigidity and unemployment with the theory of aggregate output and prices. Although much progress has been made, the charge remains true. The theory of expectations that has developed from the work of Muth (1961) and Lucas (1972) implies that any systematic association between real wages and unemployment, resulting from slow adjustment of money wages, should not persist. Unemployed workers can offer to supply labour at a lower money wage; firms can offer to hire labour at a lower wage and offer lower wages to existing employees.

Keynes (1936) relies on rigid money wages as a necessary condition for excess supply and demand on the markets for labour and output and following the tradition of Lucas (1972 and 1975) and others in providing a rational explanation for the observed market conditions provide construct for unemployment theoretical baground. Keynes's (1936, p. 10) explanation of cyclical wage changes stems from the actual relationship between changes in money wages and changes in real wage. In the case of changes in the general level of wages, the change in real wages associated with a change in money wages is almost always in the opposite direction. When money wages are rising, real wages are falling; and when money wages are felling, real wages are rising. This is because, in the short period, falling money wages and rising real wages are each, for independent reasons, likely to accompany decreasing employment. Thus, labour being readier to accept wage cuts when employment is falling off, yet real wages inevitably rising in the same circumstances on account of the increasing marginal return.

Keynes, following Marshall, assumed that cyclical changes in real and money wages result from shifts in the demand for labour. Fisher (1973) attributed the shift in demand to unanticipated

price changes. This is the classical assumption found in Thornton, and if it is combined with slower adjustment of money wages than of prices like Keynes, then the classical conclusion real wages rise in recession and fall in expansion could be reached.

Barro’s (1977) study of post war unemplayment in the United States shows that nearly 80% of the variance of unemployment can be explained mainly by "unanticipated money growth" and the minimum wage. Unanticipated money growth is a measure of shifts in aggregate demand, so Barro's equation suggests strongly, that changes in aggregate demand and unemployment are related. From Barro's finding the errors in his equation are serially uncorrected which suggest that some measure of excess supply affecting wages and unemployment has been omitted. Barro shows, however, that a most obvious measure of labour market conditions the lagged unemployment rate is not significantly related to current unemployment once the effects of unanticipated money growth and the minimum wage rate are included (see Barro 1977, p. 108); thus real wages and the equilibrium rate of employment are determined simultaneously.

Keynes (1936, p. 15) defined unemployment as:" involuntary " if a rise in the price level that reduces real wages increases employment; The finding that unemployment is not closely linked to changes in real or money wages suggests that most cyclical unemployment is not involuntary according to Keynes's. Unemployment rises and falls cyclically in response to unanticipated changes in aggregate demand without much change in wage rates. Furthermore, in labour markets there is persistent unemployment during recoveries. Adjustment from recession to full employment is a process that continues for several years; usually this process is described as a gradual adjustment from disequilibrium to a unique equilibrium at full employment. The time required for adjustment of wages and, employment is longer than can be explained by the adjustment ofdemand to a one time shock (Hall, 1977).

During recessions bankruptcies rise, firms go out of business, jobs are eliminated both permanently and temporarily. The number of unemployed and the duration of unemployment rise in recession much more than can be explained solely as a result of errors in forming expectations and by a desire to search.

The work on labour contracts by Azariadis (1975), Baily (1974) and others introduces risk sharing, arrangements and implicit contracts intothe theory of labour markets. Firms absorb risk from workers by offering contracts that show the adjustment of money wages to changes in product demand. Risk averse workers prefer to absorb fluctuations in product demand by reducing hours rather than by reducing money wages. Neither Baily nor Azariadis claims to have produced a theory of aggregate unemployment, and Barro (1977) shows that risk sharing arrangements cannot explain unemployment if the labour market is competitive and expectations are rational in the sense of Muth (1961) and Lucas (1972).

2.2.3 Trade Openness and Unemployment

The impact of trade liberalization on a country's labour market situation is a core issue in modern trade theory. For a world with homogeneous firms, homogeneous workers and perfect competition on product and labour markets the mechanisms are well-known. However, for a world with heterogeneous firms, heterogeneous workers and imperfect competition, wage and employment effects are context specific. Most prominent in the recent debate is Melitz (2003), a study that focuses on heterogeneous firms with varying productivities and shows that trade liberalization reallocates workers into high productivity firms, generating a rise in the real wage.

Dutt, Mitra and Ranjan (2009), using cross-country data on trade policy, unemployment, and various controls, and controlling for endogeneity and measurement-error problems, they find that

unemployment and trade openness are negatively related. Using panel data, they find an unemployment-increasing short-run impact of trade liberalization, followed by an unemployment-reducing effect leading to the new steady state in the long-run. While that paper finds interesting empirical regularities that can be explained using plausible models of trade and search unemployment, the standard criticisms of cross-country regressions apply to that study as well. Countries differ from each other in very important ways that cannot always be controlled for by variables we use in such regressions.

Also as documented by Trefler (2004) for the case of NAFTA (North American Free Trade Agreement) in the short run, trade liberalization increases job turnover as workers are reallocated from shrinking to expanding sectors. The empirical evidence suggests that those adjustments temporarily raise frictional unemployment on the aggregate level. On the other hand, the long run effect of trade liberalization on the equilibrium rate of unemployment is less clear.

Davis (1998) incorporate minimum wages into Heckscher-Ohlin models and found that trade liberalization can exacerbate unemployment. Davidson, Martin and Matusz (1988, 1999) introduce frictional unemployment in models of comparative advantage and found that the sign of the relationship depends on a comparison of capital-labour endowments across countries. Egger and Kreickemeier (2009) introduce fair wages into a model with increasing returns to scale and found that trade liberalization increases unemployment. Felbermayr, Prat, and Schmerer (2008) introduce search frictions into a similar trade model and found that unemployment is likely to be decreasing in the degree of openness. As stated by Davidson and Matusz (2004), whether trade affects the level of equilibrium unemployment is primarily an empirical issue. Also, Blanchard (2006) talks about an overabundance of theories of wage setting and unemployment, when interacted with different explanations for international trade

(comparative advantage versus product differentiation models), the number of possible theoretical frameworks is large.

2.2.4 Inflation and Unemployment

Samuelson and Solow (1960) examine the relationship between the inflation and unemployment rate in the United States. An inverse relationship was established between inflation and unemployment. In another study conducted by Solow (1970) and Gordon (1971), results reveal the existence of a negative trade-off relationship between unemployment and inflation using U.S. macroeconomic data. These empirical findings have been known as the "Solow-Gordon affirmation" of the Phillips curve. King and Watson (1994) tested the existence of the Phillips curve using the U.S. post-war macroeconomic data and their findings provided empirical support to the existence of the trade-off relationship between unemployment and inflation in the USA over the researched period.

Hansen and Pancs (2001) examine the existence of the Phillips curve in Latviya; they also found out that there is a significant correlation between the unemployment rate and the actual inflation rates. Furthermore, Islam, Hassan, Mustapha and Rahman (2003) examine the hypothesis of Philips curve through US economic data from 1950 to 1999. They find out the weak long-run cointegrating relationship and long-run causality between unemployment and inflations. Furuoka (2007) examine the long-run & trade-off relationship and also causal relationship between the unemployment rate and the inflation rate in Malaysia during the period of 1975-2004.

A methodological innovation in assessing the Phillips curve has been the use of panel data analysis by Dinardo and Moore (1999); the study used panel data analysis to examine nine (9) member countries of the Organization for Economic Co-operation and Development (OECD);

the researchers use the method of Ordinary Least Squares (OLS) and Generalized Least Squares (GLS). Their findings confirmed the existence of the "common" Phillips curve in these OECD countries. Turner and Seghezza (1999) employ the panel data method and observed the Phillips curve in 21 OECD countries over the period from the early 1970s to 1997, to analyze the pooled data, Turner and Seghezza used the method of Seemingly Un-related Estimation (SURE) rather than the OLS. The researchers concluded that the overall result provided a "strong support" for the existence of the "common" Phillips curve among the 21 chosen member countries of OECD. By contrast, Masso and Staehr (2005) use the dynamic panel data method and failed to identify a significant relationship between unemployment rate and inflation rates.

2.3 Empirical Literature Review

At this stage we will review related works from Nigeria and also the cross country and other countries case studies with the central area of this thesis as the main target.

2.3.1 Nigerian Case Studies

In Nigeria, Abachi (1998) studies the trade-off between unemployment and inflation, using a trade-off model, his studies revealed that there is no trade-off between inflation and unemployment. Rather, the estimates established a non-linear curve that slopes upwards. Also, his findings showed that causality existed between inflation and unemployment, which implies that any attempt to control inflation results to the aggravation of unemployment and vice-versa.

Also, Onwioduokit (2006) investigates the relationship between unemployment and inflation in Nigeria and found that there is a negative relationship between unemployment and inflation with the coefficient of -0.412, this validates the Phillips hypotheses; however, the results of the causality test indicated no causality between unemployment and inflation in Nigeria.

Also, Fatima (2010) investigate the relationship between international trade flows and employment in Nigeria for the period 1981 to 2006 and the findings show that no significant link between trade flows and employment in Nigeria both in the short-run and long run.

Still on the relationship between unemployment and inflation, Studies by Aminu and Anono (2012), using the Augmented DickeyFuller technique, revealed that there is no causation between unemployment and inflation and that a long-term relationship exist between the two. Also, the study reveal a negative relationship between unemployment and inflation and a minimal applicability of various theories of unemployment and inflation in Nigeria.

Aminu, Manu and Salihu (2013), investigate the effect of unemployment and inflation on economic growth in Nigeria between 1986-2010 through the application of Augmented Dickey-Fuller technique in testing the unit root property of the series and Granger causality test. The results of unit root suggest that all the variables in the model are stationary and the results of Causality suggest that unemployment and inflation cause RGDP. The Johansen cointegration result shows that despite no causation between unemployment and inflation, but there existed 2 cointegrating equation, implying the existence of long run relationship between economic growth, unemployment and inflation. The results also revealed that unemployment and inflation possessed a positive impact on economic growth.

David (2013), attempt to rationalize the impact of international trade flows on employment generation in Nigeria within the framework of the vector error correction model. The study found that the volume of international trade has no significant positive impact on employment generation in Nigeria.

Bulus (2014), investigates the relationship between inflation, employment and economic growth in Nigeria from 1970 to 2012 using the GMM estimation technique and finds that: inflation is

negatively correlated with unemployment as stipulated by the Phillips curve and the Phillips relationship is unstable over time.

On the Openness and inflation relationship, Ojoko, Adejumo, Adekanye, Victor and Ogheneruemu (2014) used the VECM approach to investigate the effect of trade openness on the inflation of the Nigerian economy using annual data from 1970 to 2010. The results indicate a negative relationship between inflation and trade openness (-1.58) for the Nigerian economy, while the coefficient of the Error Correction Term (-0.91) of the model was significant and negative, which imply that the system corrects its previous period disequilibrium at a speed of approximately 91 percent annually. The results of the Impulse-Response Function (IRF) indicate that the response of inflation to openness shock was significant and positive for only two periods, but negative after the second period and all through the rest of the periods, thereby validating the negative relationship between inflation and trade openness in Nigerian economy.

Furthermore, Anthony, Onyinye and Joan (2015) examine the inflation and unemployment nexus in Nigeria by testing if the original Phillips curve proposition holds for Nigeria. The study adopted a distributed lag model with data covering the period 1970-2011 using OLS estimation technique. The result reveals that unemployment is a significant determinant of inflation and that there is a positive relationship between inflation and unemployment rate in Nigeria. This finding invalidates the original proposition on the Phillips curve hypothesis in Nigeria.

2.3.2 Cross Country and Other Countries Case Studies

Davis (1998) incorporates minimum wages into Heckscher-Ohlin models and found that trade liberalization can exacerbate unemployment. Davidson and Matusz (1988, 1999) introduce frictional unemployment in models of comparative advantage and found that the sign of the relationship depends on a comparison of capital-labour endowments across countries.

However, Hart (2003) tested the Phillips hypothesis by employing the hourly wage earning. He concluded that during the inter-war period (1926-66) in Britain, the Phillips curve was "not supported by our data".

Alfaro (2005) investigate the relationship between inflation, openness, and exchange-rate-regimes in the quest for short-term commitment as a further tests to Romer's (1993) extension of Kydland and Prescott's (1977) predictions for dynamic-inconsistency problems in open economies. Using panel data from developed and developing countries from 1973 to 1998 for 130 countries, the work find that openness does not play a role in restricting inflation in the short-run and also that inflation and openness are positively related. On the other hand, a fixed exchange-rate regime plays a significant role.

Also, Kim and Beladi (2005) estimates the trade openness and price level relationship for sixty-two (62) countries and found the direct relationship between inflation and openness in trade for some advanced economies such as Ireland, Belgium and the US.

Furuoka (2007), applies the Vector Error Correction Model (VECM) analysis to test the existence of the Phillips curve in Malaysia for the period from 1973-2004. The findings confirmed the Phillips theory. The research showed that there existed the co- integrating relationship- as well as causal relationship- between unemployment and inflation in Malaysia.

Furthermore, Sun and Heshmati (2010) examine the effects of international trade on China's economic growth. Applying econometric and non-parametric techniques on six (6) year data of 31 provinces in China from 2002 to 2007, their finding reveals that an increase participation in international trade helps stimulate rapid national economic growth in china.

Felbermayr, Prat, and Schmerer (2008) introduce search frictions into a similar trade model and found that unemployment is likely to be decreasing in the degree of openness. As stated by

Davidson and Matusz (2004), whether trade affects the level of equilibrium unemployment is primarily an empirical issue. Most prominent in the recent debate is Melitz (2003), a study that focuses on heterogeneous firms with varying productivities and shows that trade liberalization reallocates workers into high productivity firms, generating a rise in the real wage.

Dutt, Mitra and Ranjan (2009), using cross-country data on trade policy, unemployment, and various controls, and controlling for endogeneity and measurement-error problems, they found that unemployment and trade openness are negatively related. Using panel data, they found an unemployment-increasing short-run impact of trade liberalization, followed by an unemployment-reducing effect leading to the new steady state. While that paper finds interesting empirical regularities that can be explained using plausible models of trade and search unemployment, the standard criticisms of cross-country regressions apply to that study as well. Countries differ from each other in very important ways that cannot always be controlled for by variables we use in such regressions. Egger and Kreickemeier (2009) introduce fair wages into a model with increasing returns to scale and found that trade liberalization increases unemployment.

2.4 Literature Gap

Form the literature it is clear that, theoretically there is an ambigous findings on the relationship between the three (3) variables; inflation, unemployment and trade openness. Base on this also, the empirical evidence appear to produce no concensus; that is some found positive and others found negative links between openness and inflation and between openness and unemploymet. Therefore, this work seeks to contribute to the debate by presenting new evidence on the nature of this complex relationships. Furthewrmore, the literature survey shows that many works both on Nigeria and international, adopted different techniques to explain trade openness and,

inflation and unemployment problems in developed and developing countries. But evidently, the impact of trade openness on inflation and unemployment still remains the challenging issues which suggests that proper technique that leads to a better understanding of the trade openness and, inflation and unemployment problems in Nigeria is needed most especially if the effort put in place by the monetary and fiscal authorities to curve inflation and unemployment problems that challenge the stability of the Nigerian economy are to be of good impact in controlling the problems.

Thus, this work seeks to add to the existing literature by analysing the impact of trade on the other macroeconomic variables of inflation and unemployment in Nigeria. The work try to bridge the gap by establishing the level of impact of trade openness using the vector autoregressive econometric method of system of equation model. Thus, enabling the study to provide a very important recipe that will help and also serve as a guide for both the monetary policy decisions and the government in other fiscal and development policy decisions.

2.5 Trends of Inflation and Unemployment in Nigeria

The introduction of the Structural Adjustment Programme (SAP) led to the liberalization of the Nigerian economy in 1986, inflation began to increase due to the extensive money growth in the country coupled with government objective to fast track development, another episode of inflation started in the last quarter of 1987 and accelerated through 1988 and 1989 (CBN, 1990). In 1988 fuel prices were adjusted while the Naira depreciated significantly. Although government expenditure was relatively stable, long and short term interest rates rose sharply and affected financial markets. Thus headline inflation was recorded at 56% in 1988 (CBN, 1990). But as the effects of the Structural Adjustment Programme (SAP) policies gathered momentum,

inflation rise from 7.5% (1990) to 57.0% (1994), this was due to the devaluation of the naira by the Central Bank of Nigeria (CBN) through the Second Tier Foreign Exchange Market (SFEM). The devaluation reduced the aggregate real income and aggregate demand and at the same time raised the naira prices of goods whose production depended heavily on imported goods. Thus, the National Income (NI) fell and the price level rose (CBN, 1997). In 1995, inflation rate rose to 72.8% due to increased lending rate, the policy of guided deregulation and the lagged impact of fiscal indiscipline and this have an adverse effects on savings, investment, productivity and balance of payment in the Nigerian economy (CBN, 1997).

However, according to Ola (2001) the decrease in inflation rate from 72.8 percent in 1995 to 29.3 percent in 1996 and further declined to a single digit of about 7.9 Percent in 1998 was largely attributed to improved supply of foreign exchange stability in naira exchange rate ($1=N70.36 and $1=N69.84 in 1995 and 1996 respectively) sustained fiscal discipline, tight monetary policy, relatively good harvests and rehabilitation of roads which eased transport bottlenecks nation wide. Furthermore, with a tight monetary policy, inflation rate was a bit stable with a single digit till 1999. By mid-1999, there was policy reversal and inconsistency, with a surge in wages, banking sector distress with inflation rate rising to 18.9 percent in the year 2001. In 2003, stability in the macroeconomic economic environment was again restored with inflation rates almost stabilizing at a moderate rate though with a double digit. Between 2006 and 2007, inflation rate averaged a single digit value of 6.8%. Exchange rate was relatively stable thus curbing inflation inertia which posed little problems (CBN, 2008). However, inflation assumed an upward trend; averaging 12.6 percent between 2008 and 2010. The inflation rate then fell to 10.3 in the year 2011 and rose to 12.2 in 2012; it dropped to 8.0 in 2013 and rose to 8.3 in 2014 (CBN, 2015).

The incidence of unemployment in Nigeria especially in this 21st century is getting deeper and wide spread, cutting across all facets of age groups, educational strata and geographical entities (Obadan and Odusola, 2010). They opine that unemployment in Nigeria was more stable in the late 1980s than any other period because the rate of unemployment in Nigeria stood at single digit from 1986 to 1999 (Okigbo, 1989 in Obadan and Odusola, 2010). According to a 2009 World Bank Report, 40 millions (28.57%) of the country's employable people are unemployed. The figure, according to the same World Bank, rose to 50 million a year later (Daily Trust, 2009). According to Ogunmade (2013), between the years 2000 to 2009 unemployment rate in Nigeria have been in the double digits region but it only spiked to about 21.9 percent in 2010. In 2011, the NBS put the figure of the unemployed in Nigeria at 23.9% and the maximum peak of 27.4 percent was reached in 2012 (Emejo, 2013). The unemployment rate declined in 2013 to about 24.7% but in 2014 it begin to increase with the rate going up to 25% (NBS, 2015).

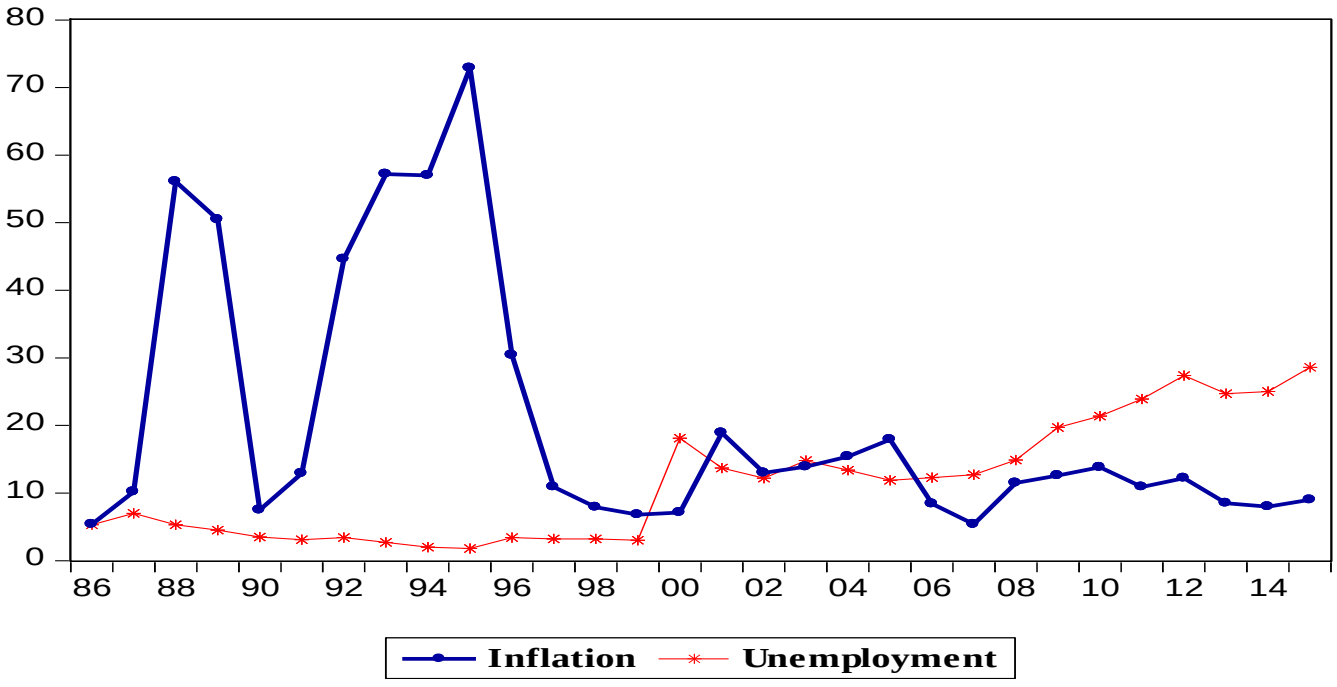


Figure 2.1: Inflation and Unemployment in Nigeria; 1986-2014.

2.6 Trade policy regimes, Inflation and Unemployment in Nigeria

The 1986-2004 trade policy regime in Nigeria saw a significant shift in trade policy direction towards greater liberalization. This shift in policy is directly attributable to the adoption of the structural adjustment programmes (SAP), and the Customs, Excise, Tariff etc (Consolidation) Decree, enacted in 1988. The Decree brought the Harmonized System of Customs Goods Classification Code (HS) and was a seven-year (1988 -1994) tariff regime. A new seven-year (1995 - 2001) tariff regime, established by Decree No. 4 of 1995 succeeded the previous (1988 – 1994) regime and thus coinciding with the 1995 to 2004 openness regime in Nigeria. Thus, the seven years tarrif regimes in both the 1986-1994 and 1995-2004 regimes highlighted a possible reason for their longer terms among other regimes.

But as a result of the facts above, between 1986-1994 Nigeria saw a significant rise in the level of inflation in Nigeria which was attributed to many facts like; adoption of SAP in July 1986 and the foreign exchange rate reform which saw the introduction of second tier foreign exchange market (SFEM) in late September same year. Fiscal deficit operations by the government and government's removal of subsidies and her reduced involvement in the economy, among others (See, Itua, 2000; and Udo and Agu, 2005). These developments and the depreciation of the naira have a role to play in Nigeria's inflationary trend within the period (1986-1994). Also, some resultant effects of the policies and other actions of policy makers within that period saw the unemployment level in the economy falling a relationship justified by the phillips curve.

Also, in 1995 the Sani Abacha's Government tactically and diplomatically brought the Chinese closer to Nigeria to fill the yawning gap created by the isolation of the country by the United States and its Western allies as a result of political crisis (Ogunsanwo, 2007). This change in the

emphasis and focus of Nigeria's foreign policy is what a number of scholars referred to as a 'policy shift to Asia' (Oche 1999; Adegbulu 2006).

Developments in 2005 confirmed the Nigerian Government's commitment to the gradual approach to elimination of quantitative restrictions and liberalization of tariff, There was a significant reduction in the maximum applicable tariffs when the maximum tariff rate was reduced to 150% in 2005. The second bold step relates to import prohibition where Nigeria made significant progress with a number of items under import ban reduced to 44 items only. These activities together with Nigeria and Brazil bilateral agreement signed in September 2005 are the likely consquences that formed the begining of another new regime that existed 2005-2009. The foundation of this regime (2005-2009) was formed with the Nigeria's trade policy in the NEEDS and trade policy documents of 2003 and 2004 respectively (WTO 2005).

Then between 1995-2004 openness rise in Nigeria which consquently saw a significant fall in the level of inflation and a sharp rise in the level of unemployment. Another relationship that show a tradeoff between the two variables wich can also be justified by the Phillips curve. Within the stepulated regime, Nigeria witness some policies and activities which can be attributed to the causes of the fall and rise in inflation and unemployment respectively some of which are: increase in lending rate and the adoption of the policy of guided deregulation, and also the lagged impact of fiscal indiscipline in the previous periods, decrease in consumption, due to low income earned by the citizens, thereby resulting to low production due to the inability of firms to sell their goods which forces them to reduce their output (see, Odusola and Akinlo, 2001; Gbosi, 2004; and Aminu and Anono, 2012).

Finally, Nigeria's further commitment to elimination of quantitative restrictions and liberalisation of tariff saw a significant reduction in the maximum applicable tariffs with

reduction of the tarrif to 35% in 2010 translating to a 76.67% reduction in the maximum tariff rate. In addition, there was an equally significant reduction in the number of tariff bands from 19 to 5. This effort translates to a tariff liberalisation to a simple average applied rate 11.5% in 2010 or 59.8% cut in the applied tariff. There was also a gradual decline in the number of tariff lines under import ban since to 436 HS-lines (or to 9.7% of the total lines) in 2010. All these are likely to explain the break in openness regime in 2010 in Nigeria.

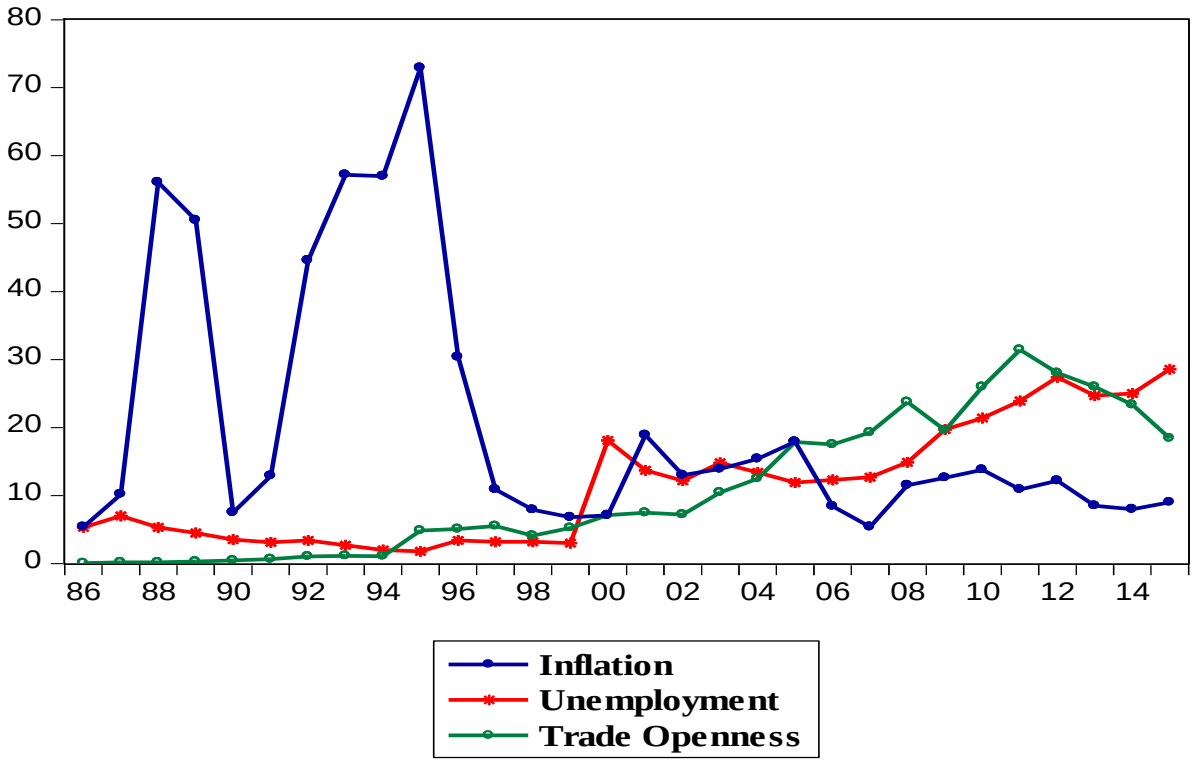


Figure 2.2: Inflation Unemployment and Trade openness in Nigeria; 1986-2015.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the procedures followed in arriving at the inference of this research work, the methods used in collecting data, which are used in investigating and analyzing a research problem. Taking into cognizance the study adopts the use of vector autoregressive model (here after VAR). Its estimation aids in formulation of decisive inference on the level of impact of trade openness on inflation and unemployment in Nigeria using the system of equations. The secondary data used was obtained from central bank of Nigeria (CBN) statistical bulletin and Nigerian national bureau of ststistics (NBS).

3.2 Theoretical Framework

Based on the model of monetary policy credibility pioneered by Kydland and Prescott (1977) and Barro and Gordon (1983), and later extended to include open-economy considerations by Rogoff (1985), and Obstfeld and Rogoff (1996), among others, the link between inflation and openness is demonstrated to be positive or negative depending on the slope of the AS curve and whether monetary policy is by rule or by discretion. Following Obstfeld and Rogoff (1996), the loss function of the Central Bank takes the form:

$$L = \frac{1}{2} E[\alpha(y - \hat{y})^2 + (\pi - \pi^*)^2] \quad \text{Equation 3.1}$$

where y is (log) real GDP, $\hat{y}$ is the government's target for y, π is the inflation rate, π^* is the

inflation target, E denotes the mathematical expectation, and α is positive parameter which captures the importance of the output target relative to inflation (which is assumed to have a target of zero). Output is given by an expectations-augmented Phillips curve equation below:

$$y = \beta(\pi - \pi^e) + U \quad \text{Equation 3.2}$$

where the "natural rate" of output has been normalized to zero (in effect interpreting y as deviations from the trend, or the "cyclical" component of output), π^e denotes expected inflation, $U \sim \text{iid}\ (0, \sigma_u^2)$ is an output shock, and β (the slope of the aggregate supply) is a parameter that captures the Phillips curve trade off between inflation and output. Very similar results would be obtained if we used the more recently developed "New Keynesian" monetary policy model of Clarida, Gali, and Gertler (1999).

There the loss function is given by:

$$L = \frac{1}{2}\, E_t \left\{ \sum_{i=j}^{\infty} \rho^j \left[\alpha \left(y_{t+j} - \hat{y}_{t+j} \right)^2 + (\pi - \pi^*)^2_{t+j} \right] \right\} \quad \text{Equation 3.3}$$

where ρ is the discount factor, and the aggregate supply is given by a "New Keynesian" expectations-augmented Phillips curve:

$$\pi_t = \lambda y_t + E_t \pi_{t+1} + W_t \quad \text{Equation 3.4}$$

with $\lambda > 0$, $W_t = \varphi W_{t-1} + Z_t$, $0 < \varphi < 1$, and $Z_t \sim \text{iid}(0, t^2)$.

Equation 2.4 can also be written in aggregate-supply form as:

$$y_t = \beta(\pi_t - E_t \pi_{t+1}) + U_t \quad \text{Equation 3.5}$$

with $\beta = 1/\lambda$ and $U_t = -W_t/\lambda$. Then, $\beta = \beta(\text{open})$, with open < 0, is equivalent to $\lambda = \lambda(\text{open})$, with (open) > 0.

Two implications of the openness of the economy are now considered. First, we are making β a decreasing function of openness, in order to incorporate the assumption that "the output-inflation Phillips curve trade-off is worse in an open economy than in a closed economy" (Obstfeld and Rogoff, 1996). The same point has been made in a variety of theoretical approaches, including those of Rogoff (1985), Romer (1993), and Karras (1999). Thus we assume:

$$\beta = \beta(\text{open}) \quad \text{Equation 3.6}$$

with $\beta' \equiv \frac{\partial \beta}{\partial} \text{open} < 0$, where the variable open measures the degree of openness of the economy.

Second, and again following Obstfeld and Rogoff (1996), we include a Purchasing Power Parity (hereafter; PPP) relationship, which implies:

$$\pi = \Delta e + v = \varepsilon + v \quad \text{Equation 3.7}$$

where e is the (log, nominal) exchange rate, $\varepsilon \equiv \Delta e$ is the (nominal) depreciation rate, the error term $v \sim \text{iid}(0, \sigma_v^2)$ captures deviations from exact PPP, and the foreign price level is assumed to be exogenous (and has been normalized to 1).

Furthermore, the activities in the external sector may affect inflation dynamics in an economy; because changes in the exchange rate can stimulate domestic inflation behaviour through imports (exports) prices. Gali and Lopez-Salido (2000) derived the open economy model of the NKPC by relaxing the assumption of a constant elasticity of output with respect to labour. Provided some intermediate inputs are imported, exchange rate would have an additional or independent

effect on the marginal cost as well as inflation dynamics. Gali and Lopez-Salido (2000), specified the baseline open economy NKPC model as follows:

$$\pi_t = \lambda mc_t^r + \delta m_t + \beta E_t\{\pi_{t+1}\} \quad \text{Equation 3.8}$$

Where inflation π_t depends on real marginal cost, or rather on deviation of real marginal cost from its steady state value, mc_t^r, m_t is the import price of intermediate inputs and expected future inflation is $E_t\{\pi_{t+1}\}$. The parameter β represents the firm's subjective discount factor and λ is a function of structural parameters $\lambda = ((1-\theta)(1-\beta\theta))/\theta$.

Also, note that: $\lambda = (1-\omega)(1-\theta)(1-\beta\theta)\phi^{-1}$

$$\gamma f = \beta\theta\phi^{-1}, \quad \gamma b = \omega\phi^{-1} \quad \text{and} \quad \phi = \theta + \omega[1-\theta(1-\beta)].$$

All the coefficients are explicit functions of model parameters: θ, which measures the degree of price stickiness; ω, the degree of backwardness in price setting, and the discount factor β.

In addition, Kara and Nelson (2003) view the real marginal cost as measure of domestic inflation and real effective exchange rate or real import price as measure of external inflation in their specification of the open economy NKPC model. Adopting their conceptualization, the open economy hybrid NKPC model is given as:

$$\pi_t = \lambda mc_t^r + \delta m_t + \gamma f E_t\{\pi_{t+1}\} + \gamma b \pi_{t-1} \quad \text{Equation 3.9}$$

Now, base on the Approximation of the real marginal cost in both baseline and hybrid NKPC, the literature provides two ways by which it could be approximated: by output gap and by labour income share Gali and Gertler (1999), thus, this justifies the unemployment existence in the

model.The real marginal cost approximation by the output gap in the closed economy NKPC can be rewritten algebraically as:

$$\pi_t = \alpha\kappa x_t + \gamma f E_t\{\pi_{t+1}\} + \gamma b\pi_{t-1} \quad \text{Equation 3.10}$$

Where, output elasticity κ is a positive constant and x_t is the output gap defined as the difference between the log of real output y_t and the log of the natural or potential level of output y_t^*.

On the other hand, the real marginal cost approximation by the labour income share is given by:

$$\pi_t = \lambda s_t + \delta m_t + \gamma f E_t\{\pi_{t+1}\} + \gamma b\pi_{t-1} \quad \text{Equation 3.11}$$

Gali and Gertler (1999) assert the importance of labour income share as a measure of real economic activity because it takes into account the effect of productivity gains on inflation which is not often captured by the simple output gap measures. Nevertheless, using unemployment as in the original Philips curve in addition to output gap as proxies for the driving force of the model, Gulyas and Starz (2006) argued that there exist a trade-off between inflation and real economic activity.

The real marginal cost approximation of the external factor according to Kara and Nelson (2003), if there is complete pass-through of exchange rate movements to import price, real import price changes can be a good substitute for exchange rate in measuring external inflation. While if pass-through is slow and incomplete, then real import price may capture external influences better than the real exchange rate. Thus, equation (3.11) becomes:

$$\pi_t = \lambda s_t + \phi q_t + \gamma f E_t\{\pi_{t+1}\} + \gamma b\pi_{t-1} \quad \text{Equation 3.12}$$

Where q_t is nominal effective exchange rate.

3.3 Analytical Technique

3.3.1 Correlation

Correlation as a measure of the degree of association between two variables, the simple correlation co-efficient "r" can be computed using the following formula:

$$r = \frac{\sum_{i=1}^{n}(x_i y_i - n\overline{X}\,\overline{Y})}{\sqrt{(\sum_{i=1}^{n} x_i^2 - n\overline{X}^2)(\sum_{i=1}^{n} y_i^2 - n\overline{Y}^2)}} \text{ ---------- Equation 3.13}$$

Where;

x_i and y_i are the two series to be correlated,

$\overline{X}$ and $\overline{Y}$ are the means of the x and y series, and

n is total number of entries in each of the x and y series.

3.3.2 Sacrifice ratio

Zhang (2001) modified Ball's (1994) sacrifice ratio estimation method, and also used the HP-filter to calculate potential output. The new method assumes there is a possible strong persistence effect, thus, short-term loss and long-term loss are not the same (Zhang 2001). This work will adopt and use the sacrifice ratio estimation method from Zhang's (2001) work.

Finally, following Zhang (2001) we estimated the sacrifice ratio using the following formula below:

$$\text{Sacrifice Ratio} = \frac{\sum(\text{Annual deviations between trended output and actual output})}{\Delta\text{Trend inflation over the course of disinflationary episode}} \text{ --- Equation 3.14}$$

$$\therefore SR = \frac{\sum U_t - \overline{U_t}}{\Delta\pi_t - \pi_{lp}} \text{ ---------- Equation 3.15}$$

Where; SR= Sacrifice Ratio,

U_t = Actual unemployment,

$\overline{U_t}$ = Trend unemployment (proxied for NAIRU) obtained using HP − filter,

π_t = Inflation at the begining of the disinflation course, and

π_{lp} = Inflation at the last period of the disnflation course

3.3.3 Granger Causality

Correlation does not necessarily imply causation in any meaningful sense of that word. The Granger (1969) approach to the question of whether Y causes X is to see how much of the current Y can be explained by past values Y of and then to see whether adding lagged values of X can improve the explanation. Y is said to be Granger-caused by X, if X helps in the prediction of Y, or equivalently if the coefficients on the lagged X's are statistically significant. Note that two-way causation is frequently the case; X Granger causes Y and Y Granger causes X. It is important to note that the statement "X Granger causes Y" does not imply that Y is the effect or the result of X. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term.

Therefore, using:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \cdots + \alpha_l Y_{t-l} + \beta_1 X_{t-1} + \cdots + \beta_l X_{-l} + \varepsilon_t$$

$$X_t = \alpha_0 + \alpha_1 X_{t-1} + \cdots + \alpha_l X_{t-l} + \beta_1 Y_{t-1} + \cdots + \beta_l Y_{-l} + u_t$$

for all possible pairs of (Y and X) series in the group. The reported *F*-statistics are the Wald statistics for the joint hypothesis:

$$\beta_1 = \beta_2 = \cdots \beta_l = 0$$

for each equation. The null hypothesis is that X does *not* Granger-cause Y in the first regression and that Y does *not* Granger-cause X in the second regression.

3.3.4 Vector Autoregression (VAR)

Since the critique of Sims (1980) in the early eighties of the last century, multivariate data analysis in the context of vector autoregressive models (henceforth: VAR) has evolved as a standard instrument in econometrics. VAR models became popular for economic analysis when Sims (1980) advocated them as alternatives to simultaneous equations models. In contrast, in VAR models often all observed variables are treated as a priori endogenous. Statistical procedures rather than subject matter theory are used for imposing restrictions. Because statistical tests are frequently used in determining inter-dependencies and dynamic relationships between variables, this methodology was soon enriched by incorporating non-statistical a priori information. VAR models explain the endogenous variables solely by their own history, apart from deterministic regressors.

As Sims (1980) and others argued in a series of influential early papers, VARs held out the promise of providing a coherent and credible approach to data description, forecasting, structural inference, and policy analysis. At the same time, Granger (1981) and Engle and Granger (1987) endowed econometricians with a powerful tool for modeling and testing economic relationships, namely, the concept of cointegration. Moreover, the discovery of the importance of stochastic trends in economic variables and the development of cointegration analysis by Granger (1981), Engle and Granger (1987), Johansen (1995) and many others has led to important new developments in analyzing the relations between economic variables. A thorough theoretical

exposition of all these models is provided in the monographs of Lutkepohl (2006), Hendry (1995), Johansen (1995).

In particular, vector autoregression (VAR) models have been capable of describing the rich dynamic structure of the relationships between economic variables. The VAR models are usually presented through impulse responses that measure the effects of the different shocks on the variables of study and the variance decomposition. Impulse response analysis or forecast error variance decompositions are typically used for disentangling the relations between the variables in a VAR model. VAR models are easy to use for forecasting and can also be applied for economic analysis.

In deciding the number of lags, it has been common to use a statistical method, like the Akaike information criteria. Alternatively, one can choose a rather large lag length a priori, and thereafter check that the results are independent of this assumption (this is the approach taken in Blanchard and Quah, 1989). However, a large lag length relatively to the number of observations, will typically lead to poor and inefficient estimates of the parameters. On the other hand, a too short lag length will induce spurious significance of the parameters, as unexplained information is left in the disturbance term. The approach suggested here is to use some of the statistical information criteria to select the smallest possible lag length. Adjustment can thereafter be made to allow for more lags if the residual are non-white. In contrast to what has been practice in many traditional VAR papers like Bernanke (1986) or Bayoumi and Eichengreen (1992), more emphasis should be put into assuring that the models are dynamically well specified. That is, non-correlation, heteroscedasticity, and the order of integration, cointegration should be dealt with appropriately. In this sense, the approach taken should be more in line with the works of Hendry and Mizon (1991) and Clements and Mizon (1991). They

select an unrestricted VAR that is congruent, that is a model that captures the dynamic relationships in the data, is well specified and has constant parameters. The VAR can be estimated through single equation methods like OLS, which would be consistent, and under the assumption of normality of the errors, efficient (see Canova 1995a,b). The unrestricted VARs are on reduced form, and are therefore un-interpretable without "reference" to theoretical economic structures.

3.3.5 Impulse Response

Impulse responses will be carried out in order to ascertain the responses of current and future values of each of the variable to a unit increase in the current value of the VAR error (Stock and Watson, 2001). In other words, Impulse response will be applied to examine the effect of a one time shock to one of the innovation on current and future values of the endogenous variable. Therefore, a shock to the $\boldsymbol{ith}$ variable does not only affect the $\boldsymbol{ith}$ variable but it also transmitted to all other endogenous variable in the VAR through its lag structure. e.g: if $\boldsymbol{\varepsilon_t}$'s are uncorrelated, then, the $\boldsymbol{ith}$ innovation$\varepsilon_{i,}$t is a shock to the $\boldsymbol{ith}$ endogenous variable $\boldsymbol{y_{i,}}$t. However, innovations are normally correlated since they have common component. To obtain the impulses, a transformation $\boldsymbol{\rho}$ is applied to the innovations to make them uncorrelated thus,

$$\nu_t = \rho\varepsilon_t \sim(0, D) \quad \text{Equation 3.14}$$

Where, D is a diagonal covariance matrix.

3.3.6 Variance decomposition

While impulse response functions trace the effects of a shock to one endogenous variable on to the other variables in the VAR, variance decomposition separates the variation in an endogenous

variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR. Note that since non-orthogonal factorization will yield decompositions that do not satisfy an adding up property, your choice of factorization is limited to the Cholesky orthogonal factorizations.

The table format displays a separate variance decomposition for each endogenous variable. The second column, labeled "S.E.", contains the forecast error of the variable at the given forecast horizon. The source of this forecast error is the variation in the current and future values of the innovations to each endogenous variable in the VAR. The remaining columns give the percentage of the forecast variance due to each innovation, with each row adding up to 100. As with the impulse responses, the variance decomposition based on the Cholesky factor can change dramatically if you alter the ordering of the variables in the VAR.

3.4 Model Specification

The most common empirical methodology for examining the trade openness and inflation relation had been to apply single equation model for inflation, treating trade openness as an independent variable with others and inflation as the dependent variable. In this work, we use VAR and our model adopt some of the variables from the model used by Tahir (2010) and modify it inflation (INF), total trade openness (TOP), exchange rate (EXCHR), and introducting unemployment (UN), as the set of macroeconomic variables to be used. Therefore, following Lutkepohl (2001), the mathematical representation of a VAR is:

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + BX_t + \varepsilon_t \quad \text{Equation 3.15}$$

where $\mathbf{y_t}$ is a $\mathbf{k}$ vector of endogenous variables, $\mathbf{X_t}$ is a $\mathbf{d}$ vector of exogenous variables, $\mathbf{A_1} \ldots \mathbf{A_p}$and $\mathbf{B}$ are matrices of coefficients to be estimated, and $\boldsymbol{\varepsilon_t}$ is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. Since only lagged values of the endogenous variables appear on the right-hand side of the equations, simultaneity is not an issue and ordinary least square (OLS) yields consistent estimates. Moreover, even though the innovations may be contemporaneously correlated, OLS is efficient, since all equations have identical regressors. Therefore, base on the theoretical arguments the economic literature suggests the following vector of endogenous variables relevant for our empirical investigation

and are defined as:

$$y_t = (\mathrm{INF}, \mathrm{UNEM}, \mathrm{TOP}, \mathrm{EXCHR},) \quad \text{Equation 3.16}$$

Finally, our model to be estimated is specified as follows:

$$\mathrm{INF_t} = \alpha_{11}\mathrm{INF_{t-p}} + a_{12}\mathrm{UNEM_{t-p}} + \alpha_{13}\mathrm{TOP_{t-p}} + \alpha_{14}\mathrm{EXCHR_{t-p}} + c_1 + \varepsilon_{1t} \quad \text{Equation 3.17}$$

$$\mathrm{UNEM_t} = \alpha_{21}\mathrm{INF_{t-p}} + a_{22}\mathrm{UNEM_{t-p}} + \alpha_{23}\mathrm{TOP_{t-p}} + \alpha_{24}\mathrm{EXCHR_{t-p}} + c_2 + \varepsilon_{2t} \quad \text{Equation 3.18}$$

$$\mathrm{TOP_t} = \alpha_{31}\mathrm{INF_{t-p}} + a_{32}\mathrm{UNEM_{t-p}} + \alpha_{33}\mathrm{TOP_{t-p}} + \alpha_{34}\mathrm{EXCHR_{t-p}} + c_3 + \varepsilon_{3t} \quad \text{Equation 3.19}$$

$$\mathrm{EXCHR_t} = \alpha_{51}\mathrm{INF_{t-p}} + a_{52}\mathrm{UNEM_{t-p}} + \alpha_{53}\mathrm{TOP_{t-p}} + \alpha_{54}\mathrm{EXCHR_{t-p}} + c_5 + \varepsilon_{5t} \quad \text{Equation 3.20}$$

Where: $\boldsymbol{a_{ij's}}$ are the parameters to be estimated, c is constant and $\boldsymbol{\varepsilon_{ij's}}$ are the error terms, then

INF= Inflation- annualized percentage change in consumer price index (CPI) which is commonly used in Nigeria. This measure has been used, Mordi, et al (2007), and Lin (2010).

TOP = Measures of openness to trade. This study utilizes $\left(\frac{X+M}{GDP}\right)$ as best alternative proxy of trade openness as used by Hanif and Batool (2006); Jin (2006); Zakaria (2010).

UNEM = Unemployment – the percentage rate of unemployment is the measure used as also used by Arratibel, Rodriguez and Thimann (2002), Islam, *et al* (2003).

EXCHR = Exchange rate –Naira-Dollar offical exchange rate will be used; adopted from Tahir (2010) and Sanusi (2010).

3.5 Unit Root Test

The study run the stationarity (Augmented Dickey-Fuller) test to overcome the problem often associated with non-stationary time series which according Gujarati (1995) are misleading and makes prediction unreliable. The order of integration would help ascertain the number of times a variable will be differenced to arrive at stationarity. It will also give the standing ground to make meaningful inferences from the estimation of the variables under investigation. The Augmented Dickey Fuller (ADF) test is used to examine the characteristics of the data samples at level, constant and constant and trend. The general ADF equation is specified as follows:

$$\Delta Y_t = a_0 + \delta Y_{t-1} + \sum \alpha_i Y_{t-i} + \varepsilon_t \quad \text{Equation 3.22}$$

Where; Δ = first difference operator, δ = the trend variable, Y is the variable under consideration and ε is the white noise error term. In the case of equation (3.4), the null hypothesis is: H_0: $\delta = 0$ (i.e. there is a unit root or the time series is non Stationary) and alternative hypothesis is H_1: $\delta < 0$ (i.e. the time series is stationary possibly around a stochastic trend).

3.6 Cointegration Test

The purpose of cointegration is to find out whether a group of non-stationary series is cointegrated or not. If the group of series is cointegrated, it implies that there is long run relationship among the series. We can use VAR if not cointegrated or use Vector Error model (VEC) if the long run relationship is established. The idea of cointegration is due to Granger (1981), and was articulated in detail by Engle and Granger (1987).

3.7 Data and Sources

The data for this study was obtained from the publications of the Central Bank of Nigeria (CBN), the National Bureau of Statistics (NBS) and the International Financial Statistics (IFS), IMF and World Bank would be needed for a recently collected data of 2014 and 2015. The data runs from 1986 to 2015 for the variables.

CHAPTER FOUR

RESULTS PRESENTATION AND INTERPRETATION

This chapter starts by estimating Break Least Square Regression (henceforth, BLSR) in order to identify trade openness regimes in Nigeria. This enables the estimation of the correlation and sacrifice ratio within the regimes identified. The chapter also estimates the aggregate correlation, sacrifice ratios and causality accross the regimes and how they translates to a monetary policy menu for the central bank. Empirical results of the VAR model estimated and that of all the diagnostics tests; unitroot and cointegration among others are presented.

4.1 Break Least Square Regression on Trade Openness (TOP)

Table 4.1 below present the Break Least Square Regression result on trade openness. In the identification of Trade Openness Regimes (henceforth, TOR) in Nigeria between 1986 to 2015, the result shows that structural change occured in four (4) regimes which are accentuated by three (3) structural breaks as shown by the coefficients of the intercepts. This is justified using 15% trimming ratio and 5% significance level. The four regimes identified are; 1986-1994, 1995-2004, 2005-2009 and 2010-2015 are all statistically significant with their P-values lessthan 5% except for the 1986-1994 regime. The regression result was obtained with an R^2 of about 94% and an adjusted R^2 about 93% . the probability of the F-statistics is significant at 1% and this indicates the roburstness of the estmated BLSR.

Empirically, the result identifies that openness regimes in Nigeria are not of same duration. The first two regimes which cover the period 1986 to 2004 are the longest regimes; with the first lasting 9 years and the second 10 years. This could be as a result of terms of trade and trade policies adopfted during these periods which was covered by miltary regimes and the transition

to democracy in 1999 with first tenure ending 2003 in the economy. The last two regimes were shorter and are mared by politically unstable situation in Nigeria, with 2007 elections and death of late president Yar'adua in 2010, Goodluck's admistration took over and the 2011 elections came with the post election violence, and the regional violences and the Insurgency of Boko Haram all existed, then finally his tenure ending in 2015.

Table 4.1: Least Squares Regression with Breaks on Trade Openness (TOP)

Dependent Variable: TOP					
Method: Least Squares with Breaks					
Break selection: Trimming 0.15, Sig. level 0.05					
Breaks: 1995, 2005, 2010					
Break (Observations)	**Variable**	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
1986 - 1994 (9 obs)	C	0.563333	0.894916	0.629482	0.5345
1995 - 2004 (10 obs)	C	6.949000	0.848992	8.185005	0.0000
2005 - 2009 (5 obs)	C	19.60400	1.200655	16.32775	0.0000
2010 - 2015 (6 obs)	C	25.54333	1.096043	23.30504	0.0000
R-squared	0.936910	Prob(F-statistic)		0.000000	
Adjusted R-squared	0.929631				

Source: Eviews 9.0

In the following section, the correlation between inflation and unemployment are estimated for each of the regimes identified in this section.

4.2 Correlation between Inflation and Unemployment within Trade Openness Regimes.

Having identified the trade openness structural regimes that exist between 1986 to 2015, we looked at the correlation between inflation and unemployment within these regimes. The 1986 to 1994, 1995 to 2004, and 2010 to 2015 regimes all had a negative correaltion of about -0.41, -0.39, and -0.44 respectively (See Table 4.2 below). These negative correlations are consistent with the short run Phillips curve. Also, to the Central Banker, this present a strong policy menu

which the Keynsians rely on to support their model of aggregate demand-driven business cycle. Therefore, in such models, higher prices and ouput drive down real wages and unemployment leading to negative empirical relationship between inflation and unemployment; which according to the Keynesians is a practical tool that could be used to help central bankers manage monetary policy. Thus, these negative correlations shows that inflation-minded central bankers (Conservative practice) can use the policy tools to reduce inflation at the cost of rising unemployment or otherwise if they are growth sensitive (non-conservative) in thier policy they have an available policy menu given the negative correlations to allow inflation to rise and register a fall in unemployment in the economy and increase ouput leading to output oriented growth as supported by the Okun's law.

Table 4.2: Result of inflation and unemployment correlations within and accross breaks

CORRELATION (1986-1994)				**CORRELATION (1995-2004)**		
	INF	**UNEM**			**INF**	**UNEM**
INF	1	-0.40987		**INF**	1	-0.3894
UNEM	-0.4097	1		**UNEM**	-0.3894	1
CORRELATION (2005-2009)				**CORRELATION (2010-2015)**		
	INF	**UNEM**			**INF**	**UNEM**
INF	1	0.1069		**INF**	1	-0.4345
UNEM	0.1069	1		**UNEM**	-0.4345	1

CORRELATION ACCROSS REGIMES; WHOLE RESEARCH PERIOD (1986-2015)		
	INF	**UNEM**
INF	1	-0.4895
UNEM	-0.4895	1

Source: Author's computation using eviews 9.0

The third regime 2005-2009 as shown in **Table 4.2** above or **Figure 4.1** below was the only exceptional regime within which the correlation was positive at about 0.11, this is suggestive of the existance of stagflation during the period 2005-2009. The positive correlation means as

inflation is rising so will be unemployment and the situation in which both the two are rising then the economy is face by stagflation.

It should however be noted that the correlation between inflation and unemployment during the entire sampled research period is negative at about -0.49 as shown in **Table 4.2** above. In general therefore, the relationship between inflation and unemployment in Nigeria is consistent with the short run Phillips curve. This means that there are possibilities of using macroeconomic policy to either raise employment at the cost of higher inflation or reduce inflation at the cost of higher unemployment.

Trade Openness with Inflation and Unemployment correlation within breaks

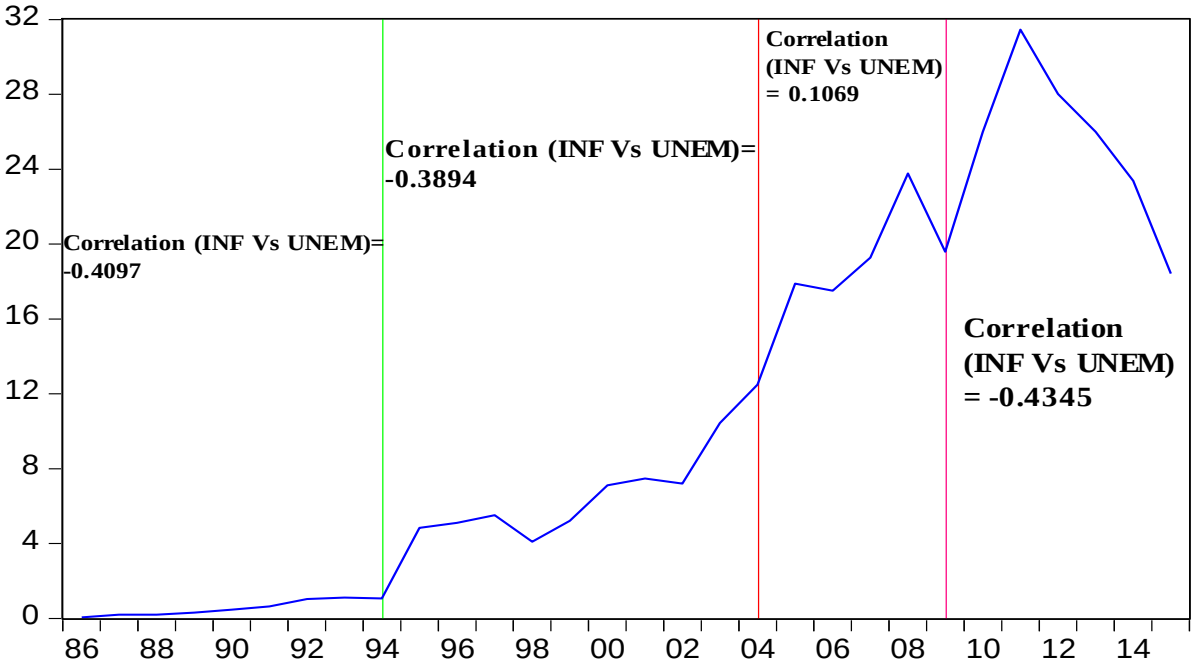


Figure 4.1: Trade Openness breaks and their respective inflation and unemployment correlations

4.3 Sacrifice Ratio between Inflation and Unemployment within Trade Openness Regimes.

Using the Sacrifice Ratio (henceforth, SR) formula adopted in chapter two and explained in chapter three following Zhang (2001), the research found that the sacrifice ratio between inflation and unemployment within the 1986-1994 openness regime in Nigeria was about -0.02% (See, Table 4.3 and the calculations below). Which means that the policy makers traded off atleast 0.02% of unemployment with every 1% increase in inflation in Nigeria between 1986-1994 is attributable. Thus, an upward movement along the Phillips curve was registered in the economy during this period.

Table 4.3: 1986-1994 Inflation, Unemployment, Unemployment trend and UNEM − (NAIRU)

Year	INF	UNEM	UNEM TREND (NAIRU)	UNEM-(NAIRU)
1986	5.4	5.3	5.27853725	0.0215
1987	10.2	7	4.85652177	2.1435
1988	56.1	5.3	4.43472091	0.8653
1989	50.5	4.5	4.0347841	0.4652
1990	7.5	3.5	3.68701352	-0.187
1991	12.9	3.1	3.42636353	-0.326
1992	44.6	3.4	3.28591837	0.1141
1993	57.2	2.7	3.29549862	-0.595
1994	57	2	3.48606569	-1.486

$\therefore$ Using $\text{SR} = \frac{\sum U_t - \overline{U_t}}{\Delta\pi_t - \pi_{lp}}$ from chapter 2 above,

$$\text{SR} = \frac{1.0146}{-51.6}$$

$$\mathbf{SR = -0.0197}$$

Furthermore, using the SR formula, the research found that the sacrifice ration between inflation and unemployment during this regime (1995-2004) was about 0.9% (See, Table 4.4 and the calculations below). Which means that the resultant effect of the policy makers decision in Nigeria allow unemployment to rise by about 0.9% due to a single percent reduction in the level of inflation between 1995-2004. With the resultant high sacrifice ration of about 1:0.9 between in inflation and unemployment is attributable. Thus, during this period the economy saw a downward movement along the Phillips curve.

Table 4.4: 1995-2004 Inflation, Unemployment, Unemployment trend and UNEM − (NAIRU)

Year	INF	UNEM	UNEM TREND (NAIRU)	UNEM-(NAIRU)
1995	72.9	1.8	3.88262599	-2.083
1996	30.4	3.4	4.49532529	-1.095
1997	10.9	3.2	5.31348309	-2.113
1998	7.9	3.2	6.31546564	-3.115
1999	6.8	3	7.45850436	-4.459
2000	7.1	18.1	8.66867602	9.4313
2001	18.9	13.7	9.82747232	3.8725
2002	13.0	12.2	10.9106982	1.2893
2003	13.9	14.8	11.932884	2.8671
2004	15.4	13.4	12.9214528	0.4785

$\therefore$ Using $\mathrm{SR} = \frac{\sum U_t - \overline{U_t}}{\Delta\pi_t - \pi_{lp}}$ from chapter 2 above,

$$\mathrm{SR} = \frac{5.0734}{57.5}$$

$$\mathbf{SR = 0.088}$$

The openness regime of 2005-2009 was the shortest regime in the economy within the research sample period (1986- 2015). The SR formula used in the research found that the sacrifice ratio was about -1.95% (See, Table 4.5 and the calculations below). Meaning that, for every

percentage change in the inflation level, the unemployment level reduced by about 1.95%. But with a positive correlation registered within this period as explained in section 4.2 above, we now assume öthat the negative sacrifice ratio was a result of a shift of the Phillips curve to a new position outwards (to the right) due to changes in inflation expectations in the economy.

Table 4.5: 2005-2009 Inflation, Unemployment, Unemployment trend and UNEM − (NAIRU)

Year	INF	UNEM	UNEM TREND (NAIRU)	UNEM - (NAIRU)
2005	17.9	11.9	13.9324992	-2.032
2006	8.4	12.3	15.0269029	-2.727
2007	5.4	12.7	16.245219	-3.545
2008	11.5	14.9	17.6007332	-2.701
2009	12.6	19.7	19.0712792	0.6287

$\therefore$ Using $\text{SR} = \frac{\sum U_t - \overline{U_t}}{\Delta\pi_t - \pi_{lp}}$ from chapter 2 above,

$$\text{SR} = \frac{-10.38}{5.3}$$

$$\mathbf{SR = -1.954}$$

Finally, the last regime (2010-2015) within the scope of the research saw a sacrifice ratio of about 0.9% (See, Table 4.6 and the calculations below). Which means that the Nigerian economy witnessed about 0.9% rise in unemployment due to the policy makers effort to reduce inflation by 1% within that period . A tradeoff relationship on a negatively sloped Phillips curve that witnessed a downward movement along the Phillips curve.

Table 4.6: 2010-2015 Inflation, Unemployment, Unemployment trend and UNEM − (NAIRU)

Year	INF	UNEM	UNEM TREND (NAIRU)	UNEM-(NAIRU)
2010	13.8	21.4	20.60768336	0.7923
2011	10.9	23.9	22.16705926	1.7329
2012	12.2	27.4	23.7144436	3.6856
2013	8.5	24.7	25.2322025	-0.532
2014	8.0	25	26.73955765	-1.74
2015	9.0	28.60	28.25040871	0.3496

∴ Using $SR = \frac{\sum U_t - \overline{U_t}}{\Delta\pi_t - \pi_{lp}}$ from chapter 2 above,

$$SR = \frac{4.2886}{4.8}$$

$$\mathbf{SR = 0.899}$$

Trade Openness breaks with Inflation and Unemployment sacrifice ratio

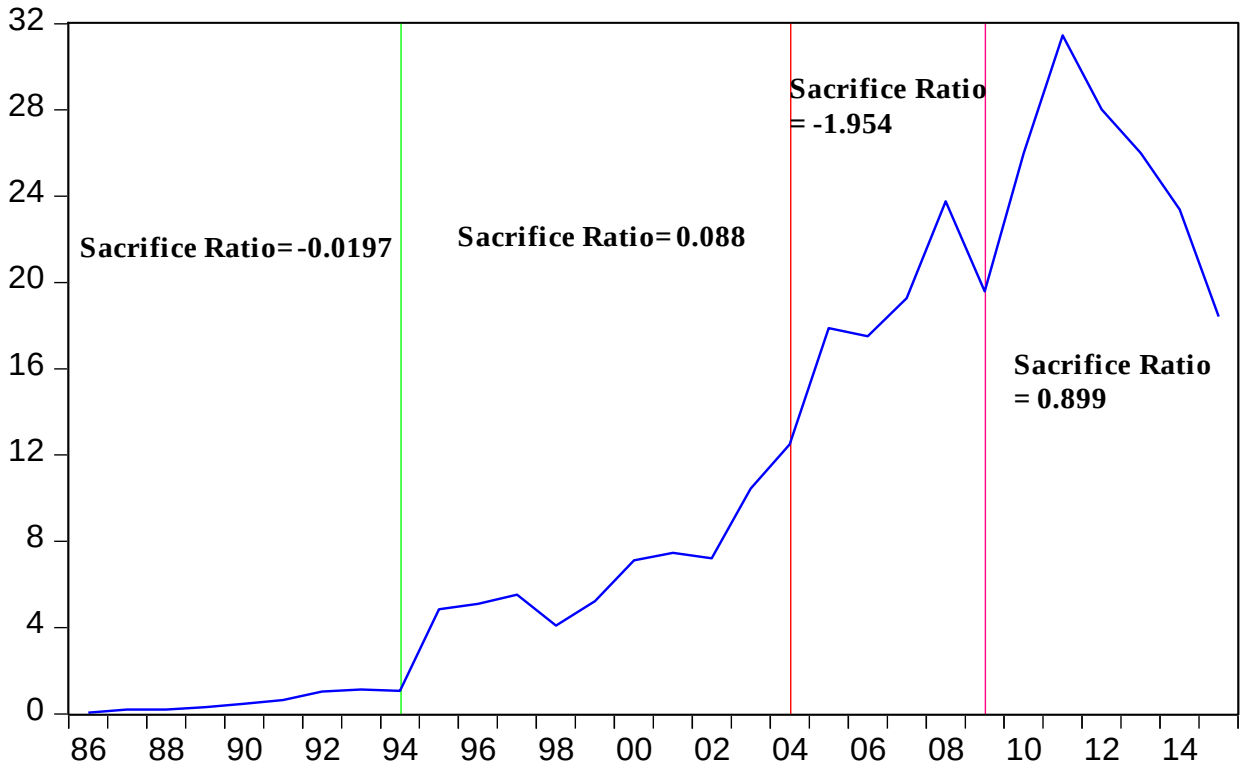


Figure 4.2: Trade openness breaks and their respective sacrifice ratios

4.4 Granger Causality

The granger causality test result from table 4.7 below shows the the result of causation between the three variable; inflation trade openness and unemployment. At 10% the result shows that we cannot reject the hypothesis that trade openness (TOP) does not Granger cause inflation (INF) and unemployment (UNEM) with no reverse causation from inflation to trade openness or from unemployment to trade openness. Therefore it appears that Granger causality runs one-way from trade openness (TOP) to both inflation (INF) and unemployment (UNEM). But we do reject the hypothesis that inflation (INF) does not Granger cause unemployment (UNEM) and the reverse order causation of unemployment to inflation. This means there was no causation between inflation and unemployment and vice versa.

Table 4.7: Granger Causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
TOP does not Granger Cause INF	29	3.44598	0.0748
INF does not Granger Cause TOP		0.04638	0.8312
UNEM does not Granger Cause INF	29	1.27833	0.2685
INF does not Granger Cause UNEM		1.65857	0.2091
UNEM does not Granger Cause TOP	29	0.03798	0.8470
TOP does not Granger Cause UNEM		7.28432	0.0121

Source: Eviews 9.0

4.5 Preliminary Test

4.5.1 Test for Unit Root

The Augmented Dickey Fuller (ADF) test and the Phillips-Perron (PP) test was used to check for the presence of unit root in the series and the result of the test is shown in table 4.8 below. The test was conducted on all the considered variables from the VAR model in the methodology

section above (Chapter Three). The result shows that the INF critical value of $\mathbf{-4.604935}$ and $\mathbf{-2.637117}$ at 1% and 10% significance level respectively from both the ADF and PP unit root test. This indicates that there was no presence of unit root at levels and INF is stationary at level and is integrated of order Zero. UNEM results shows the presence of unit root at levels in both the ADF and PP unit root tests. But after taking the first difference, at 1% significance level both ADF and PP tests reported the absence of unit root and hence the series is stationary and integrated of order one.

Table 4.8: Augmented Dickey Fuller and Phillips-Perron Unit Root Test

Variable	Augmented Dickey-Fuller test statistics			Phillips-Perron test statistics		
	Level	1ST Difference	Comment	Level	1ST Difference	Comment
	t-statistics	t-statistics		Adj. t-Stat	Adj. t-Stat	
INF	**-4.604935***		**I(0)**	**-2.637117*****		**I(0)**
UNEM	-0.207378	**-5.890254***	**I(1)**	-0.014951	**-5.881048***	**I(1)**
TOP	-0.919905	**-4.443379***	**I(1)**	-0.967087	**-4.545338***	**I(1)**
EXCH	-0.085796	**-4.896997***	**I(1)**	-0.060519	**-4.888113***	**I(1)**

***, **, and *** indicates the level of significance at 1%, 5%, and 10% respectively. Also, embolded values are the t-statistics and Adj. t-statistics that are significant.**

The TOP and EXCHR stationarity results shows the presence of unit root in both series at levels using the ADF and PP unit root tests. At first difference, both of them became stationary at 1% significance level from both ADF and PP tests respectively; hence the series are integrated of order one. The result indicates the presence of unit root in one of the series at levels but the rest are stationary after taking the first difference. The outcome of the unit root test suggests that the condition to run a VAR model has not been fully satisfied because not all the series were stationary at first difference. Next is to determine whether it is a restricted or an unrestricted VAR shall be estimated and to determine this, the long-run cointegration test with linear deterministic trend is to be estimated according to the Johansen method.

4.5.2 Cointegration test (the Johansen method)

Having tranformed the Variables using the logrithmic linear tranformation, we test for cointegration among all the I(1) stationary variables. The only I(0) variable is INF and was treated as exegenously determined. The results presented in Table 4.9, are the results of both Trace statistic and Maximum Eigenvalue. The Trace statistic suggests that there are 3 cointegrating equations which given the $\mathbf{r \leq = n - 1}$ rule, we can finally conclude that there is no cointegration. This was supported by the observation from the result below from Table 4.8 where for all values of the trace statistics, they are greater than their corresponding critical values at 5% level and the hypotheses were confirmed to be accepted from the p-values.

Then on the basis of this result we can proceed by generating an unresticted VAR system and estimate each equation in order to determine the short run dynamics of the variables from the unrestricted VAR system. The next test is to determine the structure of each of the equation in the VAR system by determining the optimal lag length.

Table 4.9: Cointegration Result

Series: LOG(EXCHR) LOG(UNEM) LOG(TOP)			
Exogenous series: LOG(INF)			
Unrestricted Cointegration Rank Test (Trace)			
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value
None *	0.618787	42.80328	29.79707
At most 1 *	0.285491	15.80016	15.49471
At most 2 *	0.203980	6.387671	3.841466
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level			
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)			
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value
None *	0.618787	27.00312	21.13162
At most 1	0.285491	9.412487	14.26460
At most 2 *	0.203980	6.387671	3.841466
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level			

Source: Eviews 9.0

4.5.3 VAR Lag Order Selection Criteria

The result of the test for optimal lag is presented in table 4.10. The precondition of the selection criteria requires that the minimum value should be selected for each of the criteria to be considered. The result indicates that majority the criteria under consideration that is the LR, FPE, and AIC and HQ criteria where optimal at lag one (1). Therefore lag length one (1) is the optimal lag selected for the VAR model. This implies that all the variables in the model will be lagged up to one (1) period backward. Finally, the only critria that have selection at Zero lag was the SC ctiriteria and at lag two (2) from table 4.4 below all the criteria under consideration are not optimal and none of them make a selection.

Table 4.10: VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria						
Endogenous variables: LOG(INF) D(LOG(UNEM)) D(LOG(TOP)) D(LOG(EXCHR))						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-52.35250	NA	0.000764	4.174259	**4.366235***	4.231344
1	-30.00464	**36.41873***	**0.000486***	**3.704048***	4.663927	**3.989470***
2	-15.00234	20.00307	0.000571	3.777951	5.505733	4.291711
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

Source: Eviews 9.0

4.6 Vector Autoregression result

The unrestricted vector autoregression estimates from table 4.11 below shows the respective coefficients of the the four different equatons in the model and also attach to all the coefficients are their standard errors and t-statistics estimates. Accross the columns are the explained

variables LOG(INF), D(LOG(UNEM)), D(LOG(TOP)), and D(LOG(EXCHR)) equations with the Lag one (-1) of all of them corresponding in the rows that explained them. The INF equation have an R^2 value of about 0.40 which means about 40% of the INF was explained by the variables in the equation; thus, this is was the highest R^2 obtained across the whole VAR equations. The adjusted R^2 of 0.29% under the INF equation indicates that the model does not assumes a relatively good fit given that the R^2 of about 0.40 denotes that about 60% of the variation in inflation cannot be explained by a variation in the variables in the model. The rest of the eqution of UNEM, TOP and EXCHR are having about 0.39, 0.20 and 0.05 R^2 respectively. This means that about 39% of the UNEM situation is explained by the explanatory variables in the eqaution, then only 20% of the TOP and only 5% of the EXCHR. Next we look at the short run dynamics of the explained variables against the statistical significance of the explanatory variables and also determine the causal relationships and the models diagnostics tests.

Table 4.11: Vector Autoregression Estimates

Vector Autoregression Estimates				
Included observations: 28 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
	LOG(INF)	**D(LOG(UNEM))**	**D(LOG(TOP))**	**D(LOG(EXCHR))**
LOG(INF(-1))	0.562083 (0.18028) [3.11781]	-0.161024 (0.09381) [-1.71643]	0.171284 (0.09237) [1.85434]	-0.029341 (0.08692) [-0.33754]
D(LOG(UNEM(-1)))	0.181560 (0.33048) [0.54939]	-0.222670 (0.17197) [-1.29481]	-0.090384 (0.16932) [-0.53380]	-0.064361 (0.15934) [-0.40391]
D(LOG(TOP(-1)))	0.368969 (0.36076) [1.02274]	0.093747 (0.18773) [0.49937]	-0.217201 (0.18484) [-1.17506]	-0.147480 (0.17395) [-0.84785]
D(LOG(EXCHR(-1)))	0.194810 (0.41427) [0.47025]	0.646428 (0.21557) [2.99865]	0.175071 (0.21225) [0.82482]	0.044634 (0.19974) [0.22346]
C	1.081523 (0.50608) [2.13705]	0.385000 (0.26335) [1.46193]	-0.283955 (0.25930) [-1.09510]	0.246985 (0.24401) [1.01218]
R-squared	0.397197	0.389823	0.196240	0.053324
Adj. R-squared	0.292361	0.283705	0.056456	-0.111315
Sum sq. resids	9.557439	2.588024	2.508951	2.221890
S.E. equation	0.644625	0.335444	0.330280	0.310812
F-statistic	3.788768	3.673490	1.403881	0.323886
Log likelihood	-24.68189	-6.391942	-5.957519	-4.256427
Akaike AIC	2.120135	0.813710	0.782680	0.661173
Schwarz SC	2.358029	1.051604	1.020574	0.899067
Mean dependent	2.747221	0.050268	0.163363	0.138217
S.D. dependent	0.766304	0.396346	0.340017	0.294835
Determinant resid covariance (dof adj.)		0.000356		
Determinant resid covariance		0.000162		
Log likelihood		-36.72324		
Akaike information criterion		4.051660		
Schwarz criterion		5.003235		

Source: Eviews 9.

4.7 Impulse response

The result shows the accumulated response of all the variables to a structural one standard deviation shock to each of the variables. Because the data are entered as first differences of

logarithms in all cases except LOG(INF) that is stationary at level, the Impilse Response Functions (henceforth, IRFs) may be regarded as measuring a proportional change in each case; as such the short run dynamic elasticities between the variables are captured. To ascertain some of the theseis objectives, we only look at the IRFs that explain the demands of the reserch questions that centered specifically on the thesis objectives.

4.7.1 Accumulated response of inflation to unemployment

The accumulated response of inflation to a one standard deviation shock to unemployment rate, is negative this support the argument of the existance of the Philliphs curve in the short run that has an inverse relationship between INF and UNEM; the result was in aggreement with the findings of Lane (1997) as shown in figure 4.3 below. The result also found that the response is also fairly gradual, short and instantenous starting at -0.2 in the first quarter and ending after 5 quarters at -0.4 from which it normalizes at -0.5 from the sixth quarter. To reach the full impact, it takes about 6 quarters which makes fairly short. According to figure 4.3, the immediate effect of a structural one standard deviation shock to the unemployment rate cause a change of 20% decrease in the rate of inflation rate. The full effect of this shock, which is realized after about 6 quarters, is about -0.5 (or 50 percent) decrease in the inflation rate.

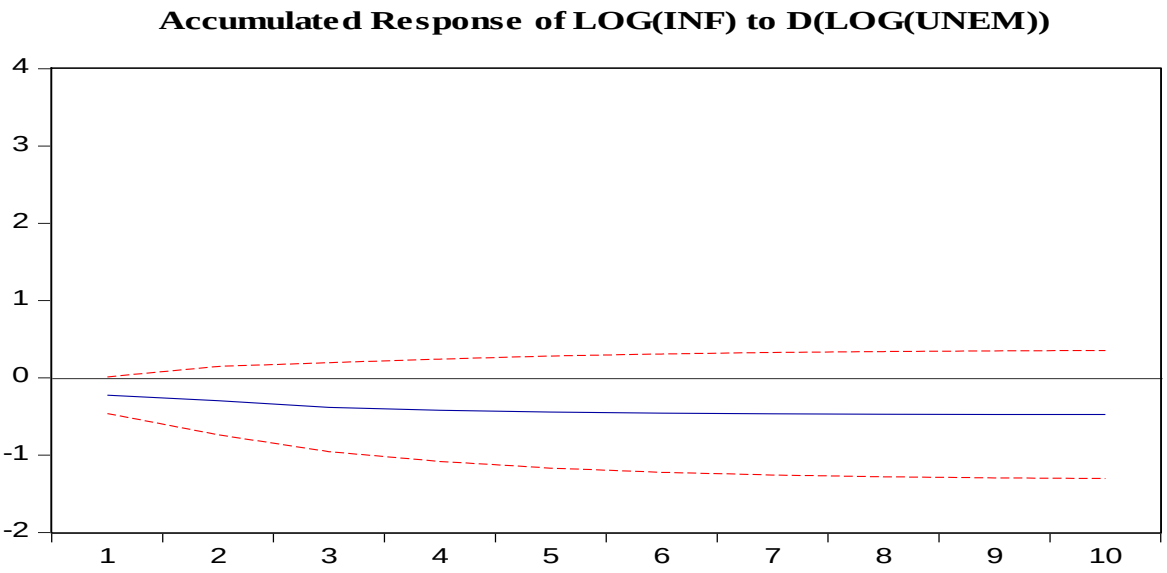


Figure 4.3: Response of inflation to unemployment

Table 4.12: Accumulated Impulse Response of inflation to Structural One SD Shock to unemployment

Quarters After Shock	Unemployment
T=1	−0.2
T=5	−0.4
T=10	−0.5

Source: Eviews 9.0

4.7.2 Accumulated response of inflation to trade openness

The response of inflation to a one standard deviation shock to trade opennes, is positive which is in support of the works of Alfaro (2005), Kim and Beladi (2005) among others as shown in figure 4.4 below. The result also found that the response is also fairly gradual and slow but takes a long duration to stablize. Starting at 0.2 in the first quarter, it instantly move to 0.5 in the second quarter and a gradual rise to 0.6 and 0.7 in the third and fourth quater respectively. The rise ends after 6 quarters at 0.8 from which it finally stablize. To reach the maximum impact, it

takes about 6 quarters in a small but gradual rising process. According to figure 4.4, the immediate effect of a structural one standard deviation shock to trade openness is 0.2 increase, or 20% change positively in inflation level. The full effect of this shock, which is realized after about 6 quarters, is about 0.8 (or 80 percent) change in the inflation rate.

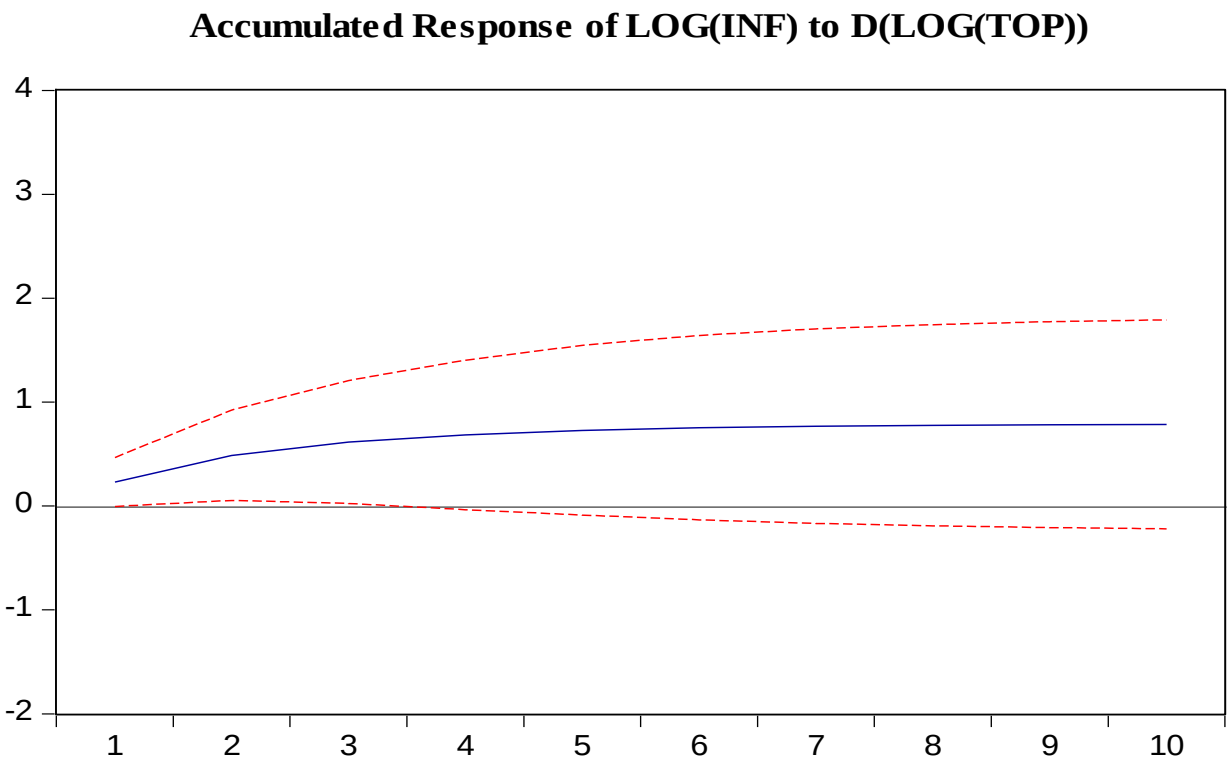


Figure 4.4: Response of inflation to trade openness

Table 4.13: Accumulated Impulse Response of inflation to Structural One SD Shock to trade openness

Quarters After Shock	Trade openness
T=1	0.2
T=5	0.7
T=10	0.8

Source: Eviews 9.0

4.7.3 Accumulated response of unemployment to inflation

The accumulated response of unemployment rate to a one standard deviation shock to inflation rate, is negative which supports the short run Phillips curve theoretical arguments by Lane (1997) and Kitov and Kitov (2010) as shown in figure 4.5 below. The result also found that the response is also fairly gradual and small in magnitude starting at -0.12 in the first quarter and ending after 9 quarters at -0.30 from which it normalizes and became stable. To reach the maximum impact, it takes about 9 quarters which makes it fairly long but slow and short in magnitude (starting at -0.12 and ending at -0.30). According to figure 4.5, the immediate effect of a structural one standard deviation shock to the inflation rate is -0.12 decrease, or -12% reduction change in unemployment level. The full effect of this shock was realized after 9 quarters, -0.30 (or 30 percent) decrease chnage in the unemployment rate.

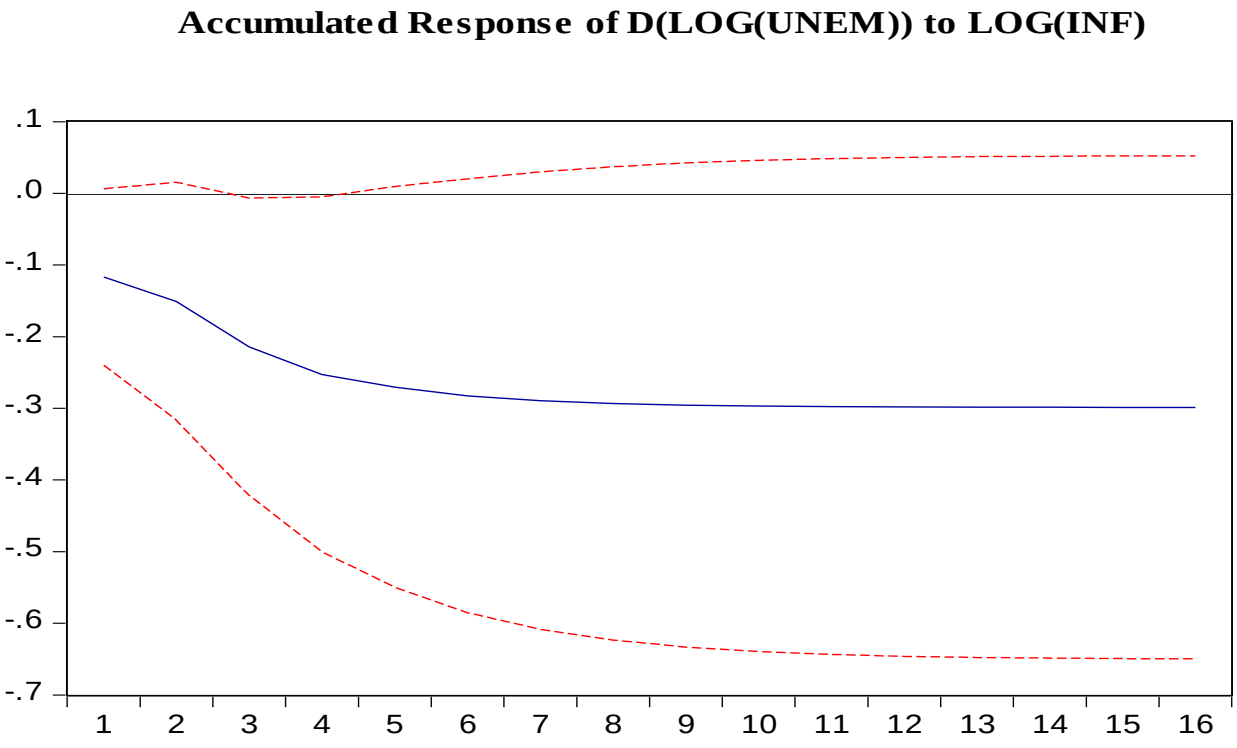


Figure 4.5: Response of unemployment to inflation

Table 4.14: Accumulated Impulse Response of unemployment to Structural One SD Shock to inflation

Quarters After Shock	Inflation
T=1	−0.12
T=5	−0.27
T=10	−0.30

Source: Eviews 9.0

4.7.4 Accumulated response of unemployment to trade openness

The response of inflation to a one standard deviation shock to trade opennes, was initially positive but become negative in the third quarter which support the theoretical position of negative relationship between openness and unemployment as found in the works of Nwaka, Uma and Tuna (2015) in the case of Nigeria and Dutt et al (2009), Hasan, Mitra, Ranjan and Ahsan (2010) among others (see Figure 4.6 below). The result also found that the response is also fairly gradual and slow but takes a duration of about 6 quarters to stablize. Starting at 0.00 in the first quarter, it instantly move to 0.02 in the second quarter and instantly fall to −0.06 in the third and gradually fall to −0.09 sixth quater. The decline ends after 6 quarters at −0.09 from which it finally stablize. To reach the maximum impact, it takes about 6 quarters in a small but gradual falling process. According to figure 4.6, the immediate effect of a structural one standard deviation shock to trade openness is 0.02 increase, or 2% change positively in unemployment level in the second quarter. The full effect of this shock, which was realized after about 6 quarters was −0.09 or 9% change in the unemployment rate.

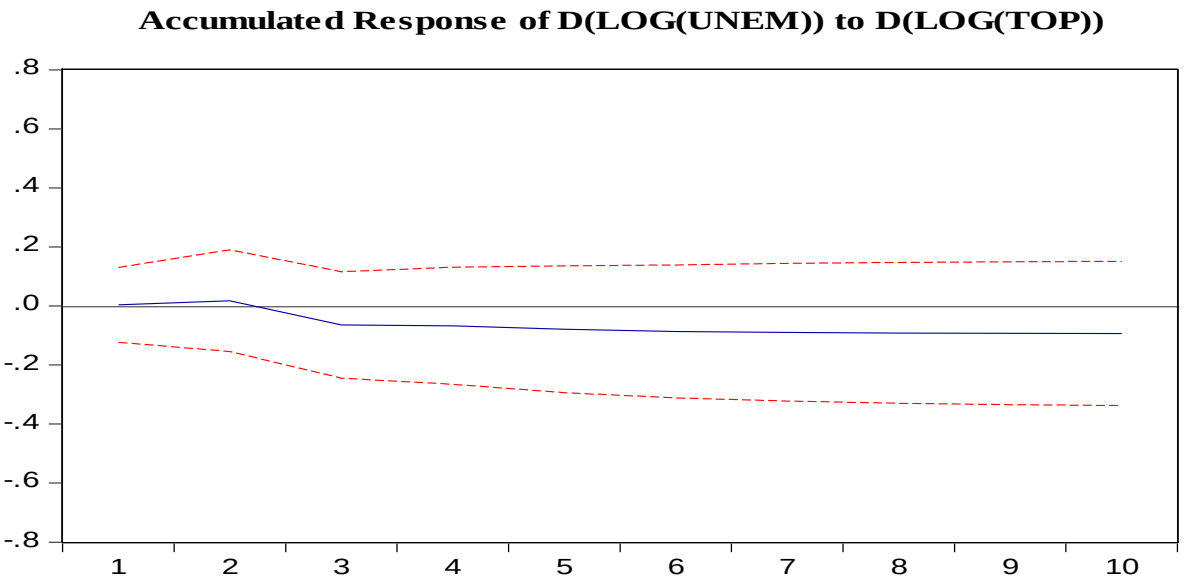


Figure 4.6: Response of unemployment to trade openness

Table 4.15: Accumulated Impulse Response of unemployment to Structural One SD Shock to trade openness

Quarters After Shock	Trade openness
T=1	0.00
T=5	−0.08
T=10	−0.09

Source: Eviews 9.0

4.8 Variance decomposition

Next we extend the analysis of the variables in the VAR model by decomposing the variances in order to make forecast using the variance decomposition (bearing in mind that the forecasting model is sensitive to the identification assumption made). As indicated earlier, we can use the variance decompositions to explore the relative contribution of the structural shocks in explaining changes in inflation and unemployment. The variance decomposition, shown in Table 4.16 (a & b) below for inflation and unemployment respectively measure the extent to which

each shock contributes to unexplained movement in each variable. Therefore we assume forecast error variance decomposition with contemporaneous shocks.

The result of the variance decomposition of inflation from Table 4.16 (a) below shows that the first column suggests high inflation persistence, as up to 96 percent of the price level changes are explained by its own shocks in the long-run. This underscores the importance of other factors that are not explicitly accounted for, in the role they play in the inflationary process in Nigeria. Also, the table reveals that, trade openness shocks contribute relatively more to inflation than unemployment and exchange rate shocks. Specifically, while exchange rate changes account for only about 2 percent maximum value of the variations of the price level (at 1-10 quarters horizon), unemployment shocks account for about 0.8 percent maximum value within the same horizon but trade openness shocks recorded the highest maximum value 2.3 percent in almost all the quaters.

Table 4.16 (a): Variance decomposition of inflation

Variance Decomposition of LOG(INF):					
Period	**S.E.**	**Shocks:**			
		LOG(INF)	**D(LOG(UNEM))**	**D(LOG(TOP))**	**D(LOG(EXCHR))**
1	0.644625	100.0000	0.000000	0.000000	0.000000
2	0.770037	96.30604	0.820918	2.277413	0.595630
3	0.815428	95.19189	0.733369	2.282629	1.792115
4	0.828228	95.10120	0.723299	2.271644	1.903854
5	0.832741	95.03930	0.720680	2.284206	1.955811
6	0.834285	95.01996	0.718890	2.284711	1.976444
7	0.834798	95.01428	0.718481	2.285194	1.982049
8	0.834975	95.01209	0.718321	2.285403	1.984182
9	0.835035	95.01139	0.718265	2.285451	1.984896
10	0.835055	95.01115	0.718247	2.285472	1.985134

Source: Eviews 9.0

The variance decomposition of unemployment result presented in table 4.16 (b) below shows that the second column suggests high unemployment persistence, as up to about 88 percent of the

unemployment changes are explained by its own shocks. This underscores the importance of other factors that are not explicitly accounted for, in the role they play in contributing to the unemploymenrt problem in Nigeria. Also, the table reveals that, inflation shocks contribute relatively more to unemployment problem than trade openness. But above the two variables (inflation and trade openness) have been the exchange rate shocks which specifically account for only about 24 percent maximum value of the variations of the unemployment rate (at 1-10 quarters horizon). The inflation shocks account for about 12 percent maximum value within the same horizon but trade openness shocks recorded the highest maximum value of about 3.3 percent within the 10 quaters horizon.

Table 4.16 (b): Variance decomposition of unemployment

Variance Decomposition of D(LOG(UNEM)):					
Period	**S.E.**	**Shocks:**			
		LOG(INF)	**D(LOG(UNEM))**	**D(LOG(TOP))**	**D(LOG(EXCHR))**
1	0.335444	12.12442	87.87558	0.000000	0.000000
2	0.401142	9.199673	65.59836	1.034966	24.16700
3	0.413036	11.02238	62.01391	3.246047	23.71766
4	0.415660	11.74983	61.29788	3.265059	23.68724
5	0.416102	11.90301	61.18496	3.272648	23.63938
6	0.416324	11.97622	61.11957	3.274286	23.62993
7	0.416384	11.99936	61.10207	3.273552	23.62501
8	0.416404	12.00696	61.09620	3.273632	23.62320
9	0.416412	12.00968	61.09405	3.273606	23.62267
10	0.416414	12.01058	61.09335	3.273596	23.62247

Source: Eviews 9.0

4.9 Diagnostyics test on the VAR

4.9.1 Vector Autoregression stability test

The inverse roots of the characteristic AR polynomial of the estimated VAR is stable (stationary) if all roots have modulus less than one and lie inside the unit circle. If the VAR is not stable,

certain results (such as impulse response standard errors) are not valid (see Lütkepohl, 1991). There will be K_p roots, where *K* is the number of endogenous variables and *p* is the largest lag. The result from figure 4.7 below shows that all the root have modulus less than one and they all lie inside the circle. Which finally suggest that the VAR is stable and stationary.

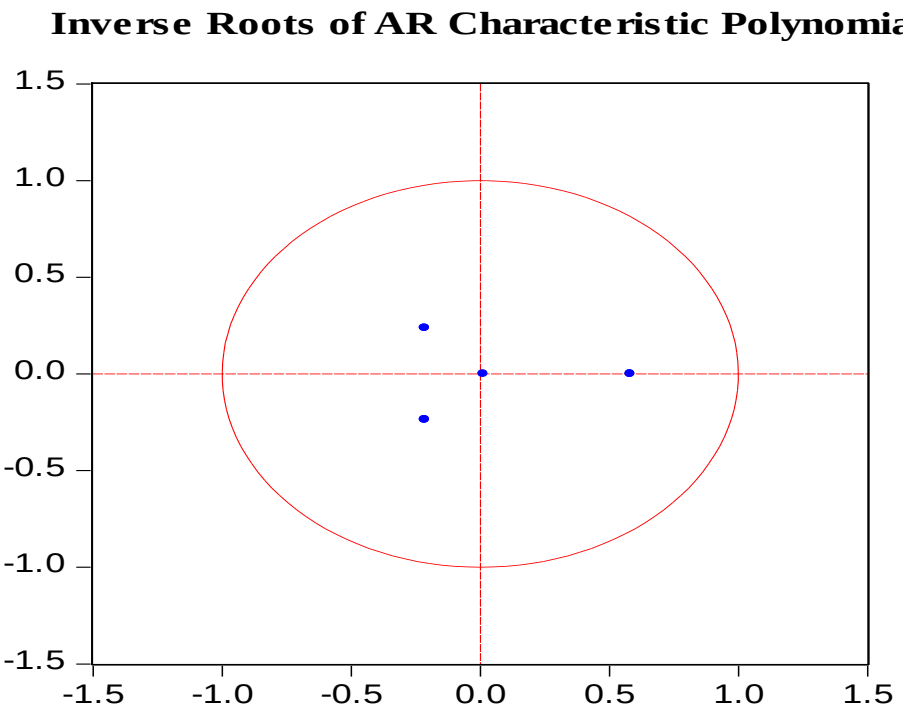


Figure 4.7: Inverse roots of AR characteristic polynomial graph

4.9.2 Diagnostics test of the equations of the VAR

Table 4.12 below present the diagnostics tests results on the residuals of the VAR equations. The Breusch-Godfrey serial correlation LM test shows that in all the four equations there was no presence of serial correlation in the residuals, also the Breusch, Pagan and Godfrey heteroskedasticity test shows that there was no hetroskedasticity in the residuals. The Jarque-Bera normality test from table 4.12 below shows that the residuals of inflation and

unemployment equations are normally distributed but in the case of the trade openness and exchange rate equations, the residuals are not normally distributed.

Table 4.17: Diagnostic test of the VAR equations

Diagnostic Test of the VAR equations				
EQUATION ⟶ / **TESTS ↓**	**INFLATION**	**UNEMPLOYMENT**	**TRADE OPENNESS**	**EXCHANGE RATE**
B-G Serial Correlation LM	2.941871	2.678527	4.619443	0.402405
(Probability)	(0.2297)	(0.2620)	(0.0993)	(0.8177)
Heteroskedasticity B-P-G	9.847309	11.97918	5.233172	6.181188
(Probability)	(0.1974)	(0.1012)	(0.6315)	(0.5188)
Normality Jarque-Bera	0.076813	4.220201	**21.74049***	**147.1987***
(Probability)	(0.962322)	(0.121226)	(0.000019)	(0.000000)

Source: Eviews 9.0

CHAPTER F IVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary of the entire work, the conclusions drawn from the findings made and recommendations offered based on the result obtained.

5.1 Summary

This study provided the extent which trade openness causes both inflation and unemployment in Nigeria. It also estimate the correaltion between inflation and unemployment and the sacrifice ratio (trade-off) between them in Nigeria within the estimated trade openness regimes that existed from the 1986 to 2015 in the economy. The study also estimates the causality relationship between trade openness and inflation and unemployment. The relative magnitude of the impact of trade openness on inflation and unemployment in Nigeria within the study period (1986 to 2015) was also estimated. Above all, the study identifies the nature of the relationship that existed between inflation and unemplyment in Nigeria and also that of inflation and openness and finally the relationship between unemployment and trade openness . All based on the foundation laid by Romer's hypothesis (1993) and the work of Kydland and Prescott's (1977).

The least square with breaks regression estimates was used to estimate the structural breaks in trade openness in Nigeria within the study period. The regime breakpoints are estimated using the Bai (1997), Bai and Perron (1998), technique which offers useful overviews that describe estimating linear regression models that are subject to structural change. Consquently, the identified regimes are; 1986 to 1994, 1995 to 2004, 2005 to 2009, and 2010 to 2015.

The correlation between inflation and unemployment was estimated within the identified trade openness regimes. According to the correlation between inflation and unemployment was all

negative except 2005-2009 which exhibit posotive correlation. Thus, the result shows that a policy menu existed and allows the monetary authorities to either choose to be conservative on the inflation side or become more output oriented. And also, the result indicates that the more open the economy is the less negative the correlation and the more the restriction attached to importation the less negative the inflation and unemployment correlation becomes. The overall correlation between inflation and unemployment accross the entire study period (1986 to 2015) was also negative, hence also justifying the existance of short run Phillips curve relationship between the variables within the study period.

Furthermore, Zhang (2001) disinflation formula was used to estimate the sacrifice ratio between inflation and unemployment within the identified openness regimes in Nigeria. The result shows that the sacrifice ratio was positive in periods with less openness (1986-1994, 1995-2004, and 2010-2015) and negative in the period that has the persistent rise in openness in Nigeria (2005-2009). The three period with positive sacrifice ratio withnessed either upward or downward movements along the Phillps curve whereas, the period with negative sacrifice ratio coincides with period that recorded a positive correlation between inflation and unemployment thus the expectation that a shift in the phillips curve existed during this period was attributable to such existances. There also exist a causal relationship running from trade oprnness to both inflation and unemployment.

Finally, the VAR result shows that the impact of inflation on unemployment and that of unemployment on inflation using the IRFs were all negative but different in magnitude and duration; thus justifying the existence of the Phillips curve relationship in the short, and immediate medium term in the economy. The result was consistent with findings of Lane (1997) among others in the case of unemployment's impact on inflation and the works of Kitov and

Kitov (2010) among others in the case of inflation's impact on unemployment. Also, the impact of trade openness on inflation and unemployment in Nigeria in the short run was positive and negative respectively. Thus, justifying and consistent with some works like Alfaro (2005), Kim and Beladi (2005) among others in the case of inflation and openness relationship and the works of Nwaka, Uma and Tuna (2015) in the case of Nigeria, Dutt et al (2009) and Hasan, Mitra, Ranjan and Ahsan (2010) among others in the case of unemployment and openness relationship.

5.2 Conclusions

First, as noted in the literature, the Romer's argument that trade openness was correlated with the sacrifice ratio betweeen inflation and unemployment was fully ascertained in the case of the result of this study. Openness regimes in Nigeria come along with a different monetary policy decision and target. But also, trade openness in itself have a positive impact of relative magnitude starting at 0.2 and finally stablizing at 0.8 after 6 quarters on the inflation (the effect of imported inflation). Thus, this implies that incresing the degree openness causes a rise in inflation level in the economy. And the impact of trade openness and its relative magnitude on unemployment in Nigeria was negative, short and fairly small, thereby making the relationship inverse with higher trade openness leading to a fall in unemployment. Thus, higher openness reduces unemployment in Nigeria.

The Nigerian short run Philliphs curve was assumed to be nagatively sloping as posited in the literature. This was backed by the findings in the estimations of the correlation between inflation and unemployment within the identified openness regimes and across the entire resaerch period (1986 to 2015) and the VAR inflation and unemployment IRFs relationships; all were nagative.

Finally, there was a meaningful sacrifice ratio between inflation and unemployment which suggest that monetary authorities are likely to be trading off infaltion for unemployment or

unemployment for inflation. Also, the research result suggest that in the short run impact of openness on inflation and unemployment was positive and negative respectively.

5.3 Recommendations

From the results obtain the following recommendations were deduced:

- The result revealed that the correlation between inflation and unmployment was negative. The negative correlation was consistent with the short run Phillips curve presenting a strong policy menu to the monetary policy authorities which is in line with the Keynesians model of aggregate demand-driven business cycle. This implies that the relationship identified supports the dual mandate of the CBN, which includes both output and inflation targets of the monetary policy. Thus, the monetary authorities in policy making decisions can choose to either pursue output driven monetary policy or inflation driven policy.
- Also, there is need for conscientious policy decision by the monetary policy making authorities because to curb the persitent inflation in Nigeria, unmeployment problems would increase in the economy as implied by the correlations result and the sacrifice ratio which reveals that trade off existed in the short run. Thus, this should serve as a tool for consideration in policy making decisions as to which of the two is to be sacrificed at the expense of the other between inflationary problem or the unemployment.
- The impact of trade openness on the rate of unemployment is negative, which means that openness should be considered in Nigeria when making decisions to curb the unemployment problem. Therefore, in policy making the authorities can increase trade openness in trying to reduce the unemployment level.

- Trade openness level in the economy should be put to watch because it may add to the inflation problem of the economy given there positive relationship. This implies that a care should be observed on the inflation level when making policy decisions that allow the degree of openness to increase in the Nigerian economy.
- Finally, it appears that the increasing liberalization of trade in Nigeria has significantly increase the inflation problem in the economy and decerase the unemployment problem by a weaker magnitude on the average. This therefore suggest the need for authorities to carefully consider the effect and magnitude of trade openness and inflation relationship and that of openness and unemployment in their reform efforts aiming to increase trade openness. In this regard, the recent re-introduction of ban restrictions in trade are likely to raise exports in the domestic economy and also reduce inflation pressure in the medium and long term but there would be likely effect of increasing level of unemployment in the economy as well..

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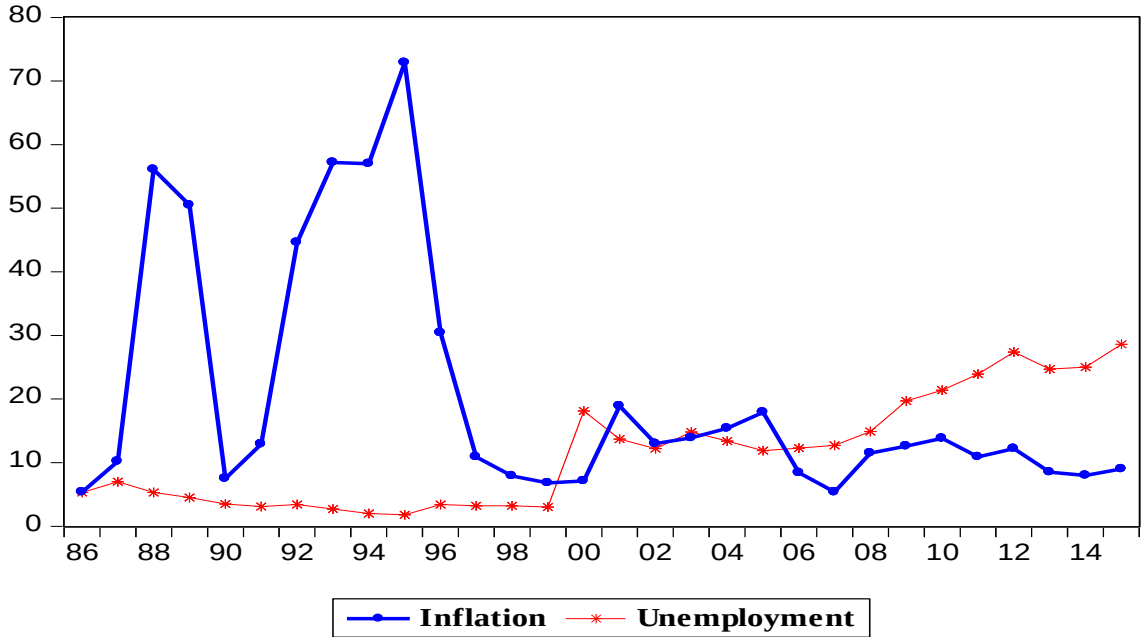
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APPENDICES

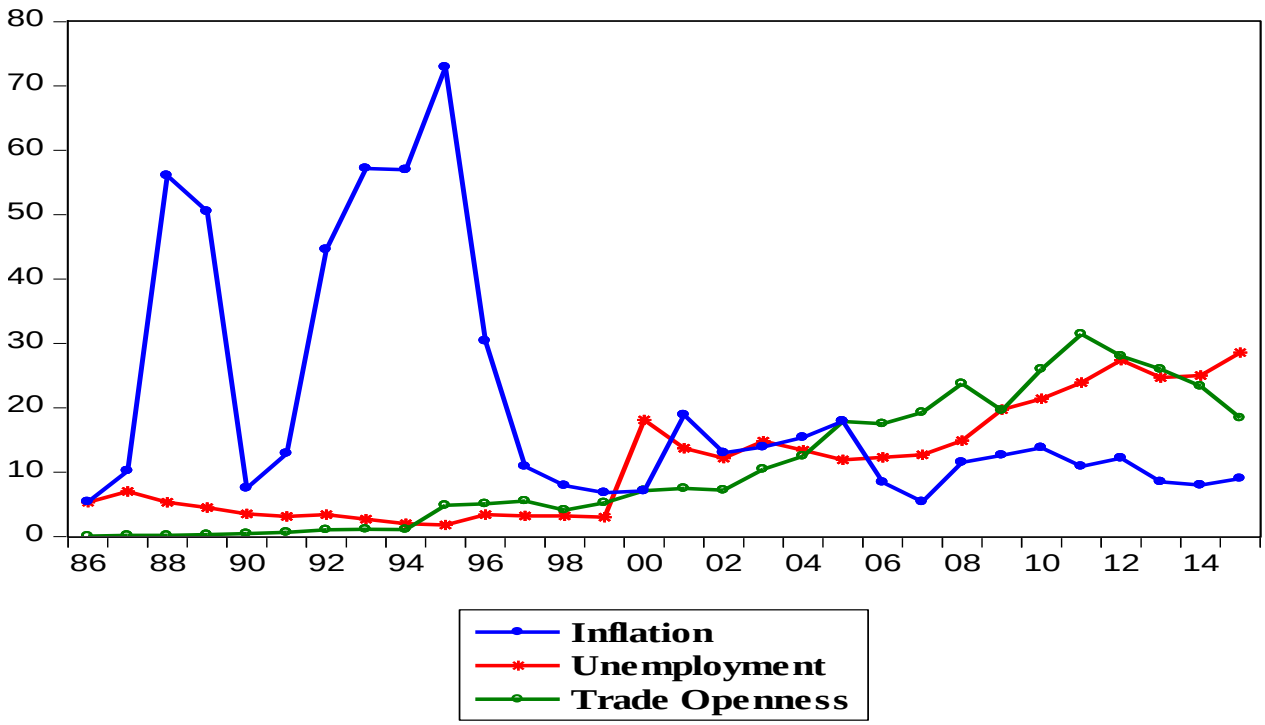
Appendix 1: DATA

Year	INF	UNEM	EXCHR	TOP
1986	1.1	5.3	2.0206	0.06
1987	1.23	7	4.0179	0.19
1988	1.64	5.3	4.5367	0.19
1989	2.45	4.5	7.3916	0.30
1990	2.64	3.5	8.0378	0.47
1991	2.95	3.1	9.9095	0.64
1992	4.29	3.4	17.2984	1.03
1993	6.74	2.7	22.0511	1.12
1994	10.61	2	21.8861	1.07
1995	18.32	1.8	21.8861	4.84
1996	23.69	3.4	21.8861	5.10
1997	26.22	3.2	21.8861	5.52
1998	28.28	3.2	21.8861	4.09
1999	30.15	3	92.6934	5.22
2000	32.24	18.1	102.1052	7.11
2001	38.33	13.7	111.9433	7.47
2002	43.26	12.2	120.9702	7.21
2003	49.34	14.8	129.3565	10.44
2004	56.73	13.4	133.5004	12.49
2005	66.87	11.9	132.1470	17.88
2006	72.37	12.3	128.6516	17.51
2007	76.27	12.7	125.8331	19.27
2008	85.10	14.9	118.5669	23.77
2009	95.77	19.7	148.8802	19.59
2010	108.93	21.4	150.2980	25.99
2011	120.72	23.9	153.8616	31.45
2012	135.48	27.4	157.4994	28.02
2013	146.98	24.7	157.3112	26.00
2014	158.81	25	158.5526	23.38
2015	173.22	28.60	192.6439	18.42

APPENDIX 2: INFLATION AND UNEMPLOYMENT IN NIGERIA; 1986-2014



APPENDIX 3: INFLATION UNEMPLOYMENT AND TRADE OPENNESS IN NIGERIA; 1986-2015



APPENDIX 4: Break Least Square Regression on Trade Openness

Dependent Variable: TOP
Method: Least Squares with Breaks
Date: 05/17/16 Time: 12:37
Sample: 1986 2015
Included observations: 30
Break type: Bai-Perron tests of L+1 vs. L sequentially determined breaks
Break selection: Trimming 0.15, , Sig. level 0.05
Breaks: 1995, 2005, 2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1986 - 1994 -- 9 obs				
C	0.563333	0.894916	0.629482	0.5345
1995 - 2004 -- 10 obs				
C	6.949000	0.848992	8.185005	0.0000
2005 - 2009 -- 5 obs				
C	19.60400	1.200655	16.32775	0.0000
2010 - 2015 -- 6 obs				
C	25.54333	1.096043	23.30504	0.0000

R-squared	0.936910	Mean dependent var	10.86133
Adjusted R-squared	0.929631	S.D. dependent var	10.12073
S.E. of regression	2.684747	Akaike info criterion	4.936616
Sum squared resid	187.4045	Schwarz criterion	5.123442
Log likelihood	-70.04924	Hannan-Quinn criter.	4.996383
F-statistic	128.7038	Durbin-Watson stat	1.067925
Prob(F-statistic)	0.000000		

APPENDIX 5: RESULT OF INFLATION AND UNEMPLOYMENT CORRELATIONS WITHIN AND ACCROSS BREAKS

CORRELATION (1986-1994)		
	INF	**UNEM**
INF	1	-0.40987
UNEM	-0.4097	1

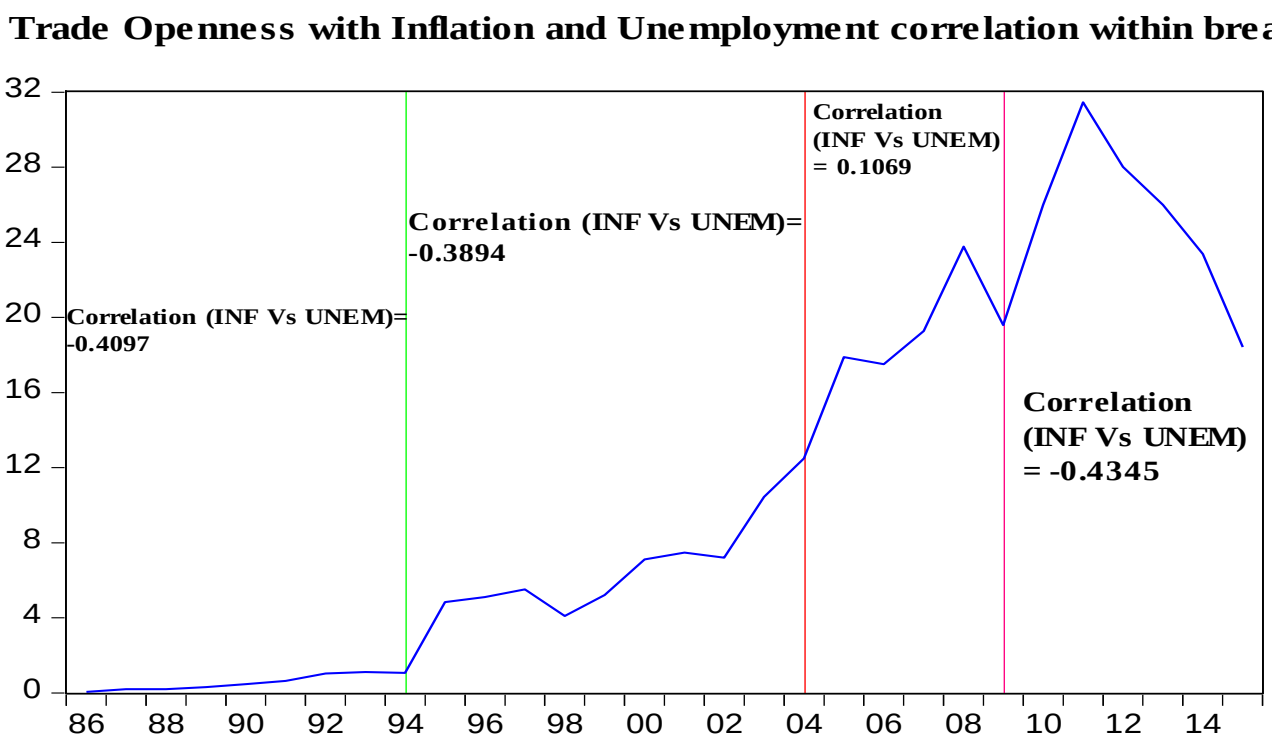
CORRELATION (1995-2004)		
	INF	**UNEM**
INF	1	-0.3894
UNEM	-0.3894	1

CORRELATION (2005-2009)		
	INF	**UNEM**
INF	1	0.1069
UNEM	0.1069	1

CORRELATION (2010-2015)		
	INF	**UNEM**
INF	1	-0.4345
UNEM	-0.4345	1

CORRELATION ACCROSS REGIMES; WHOLE RESEARCH PERIOD (1986-2015)		
	INF	**UNEM**
INF	1	-0.4895
UNEM	-0.4895	1

APPENDIX 6: TRADE OPENNESS BREAKS AND THEIR RESPECTIVE INFLATION AND UNEMPLOYMENT CORRELATIONS



APPENDIX 7A: 1986-1994 INFLATION, UNEMPLOYMENT, UNEMPLOYMENT TREND AND UNEM – (NAIRU)

Year	INF	UNEM	UNEM TREND (NAIRU)	UNEM-(NAIRU)
1986	5.4	5.3	5.27853725	0.0215
1987	10.2	7	4.85652177	2.1435
1988	56.1	5.3	4.43472091	0.8653
1989	50.5	4.5	4.0347841	0.4652
1990	7.5	3.5	3.68701352	-0.187
1991	12.9	3.1	3.42636353	-0.326
1992	44.6	3.4	3.28591837	0.1141
1993	57.2	2.7	3.29549862	-0.595
1994	57	2	3.48606569	-1.486

APPENDIX 7B: 1995-2004 INFLATION, UNEMPLOYMENT, UNEMPLOYMENT TREND AND UNEM – (NAIRU)

Year	INF	UNEM	UNEM TREND (NAIRU)	UNEM-(NAIRU)
1995	72.9	1.8	3.88262599	-2.083
1996	30.4	3.4	4.49532529	-1.095
1997	10.9	3.2	5.31348309	-2.113
1998	7.9	3.2	6.31546564	-3.115
1999	6.8	3	7.45850436	-4.459
2000	7.1	18.1	8.66867602	9.4313
2001	18.9	13.7	9.82747232	3.8725
2002	13.0	12.2	10.9106982	1.2893
2003	13.9	14.8	11.932884	2.8671
2004	15.4	13.4	12.9214528	0.4785

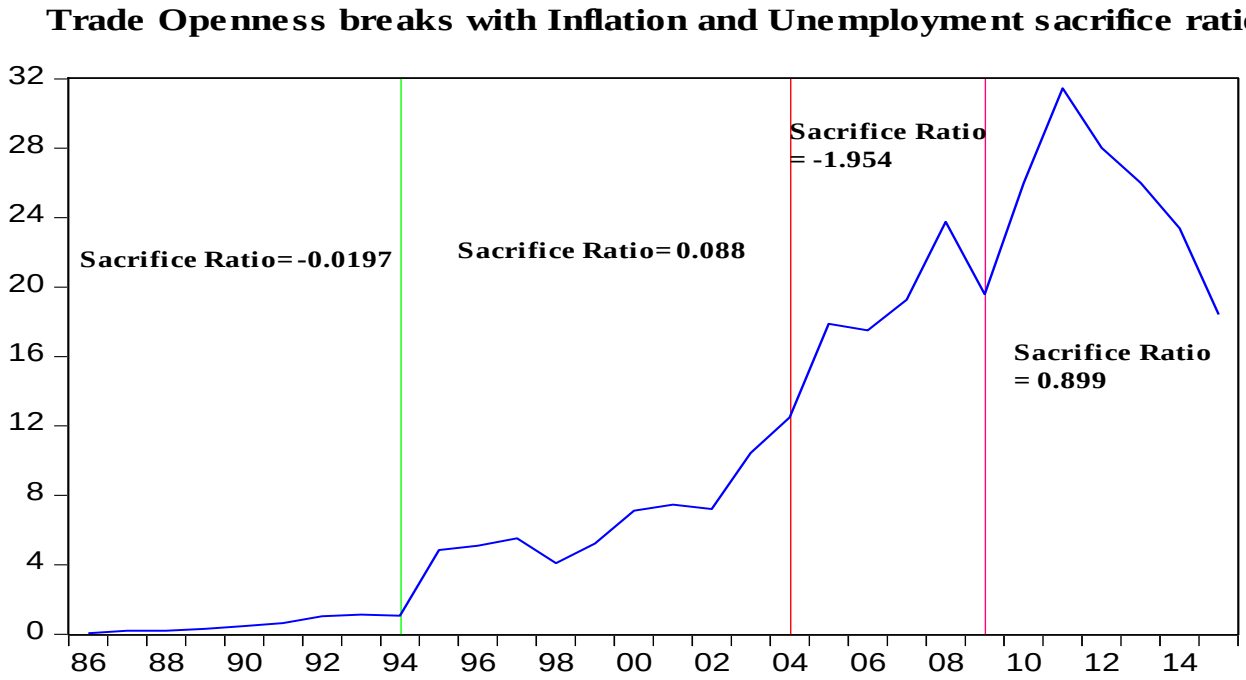
APPENDIX 7C: 2005-2009 INFLATION, UNEMPLOYMENT, UNEMPLOYMENT TREND AND UNEM – (NAIRU)

Year	INF	UNEM	UNEM TREND (NAIRU)	UNEM - (NAIRU)
2005	17.9	11.9	13.9324992	-2.032
2006	8.4	12.3	15.0269029	-2.727
2007	5.4	12.7	16.245219	-3.545
2008	11.5	14.9	17.6007332	-2.701
2009	12.6	19.7	19.0712792	0.6287

APPENDIX 7D: 2010-2015 INFLATION, UNEMPLOYMENT, UNEMPLOYMENT TREND AND UNEM – (NAIRU)

Year	INF	UNEM	UNEM TREND (NAIRU)	UNEM-(NAIRU)
2010	13.8	21.4	20.60768336	0.7923
2011	10.9	23.9	22.16705926	1.7329
2012	12.2	27.4	23.7144436	3.6856
2013	8.5	24.7	25.2322025	-0.532
2014	8.0	25	26.73955765	-1.74
2015	9.0	28.60	28.25040871	0.3496

APPENDIX 7E: TRADE OPENNESS BREAKS AND THEIR RESPECTIVE SACRIFICE RATIOS



APPENDIX 8: Granger Causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
TOP does not Granger Cause INF	29	3.44598	0.0748
INF does not Granger Cause TOP		0.04638	0.8312
UNEM does not Granger Cause INF	29	1.27833	0.2685
INF does not Granger Cause UNEM		1.65857	0.2091
UNEM does not Granger Cause TOP	29	0.03798	0.8470
TOP does not Granger Cause UNEM		7.28432	0.0121

APPENDIX 9: AUGMENTED DICKEY FULLER AND PHILLIPS-PERRON UNIT ROOT TEST

Variable	Augmented Dickey-Fuller test statistics			Phillips-Perron test statistics		
	Level	1ST Difference	Comment	Level	1ST Difference	Comment
	t-statistics	t-statistics		Adj. t-Stat	Adj. t-Stat	
INF	**-4.604935***		**I(0)**	**-2.637117*****		**I(0)**
UNEM	-0.207378	**-5.890254***	**I(1)**	-0.014951	**-5.881048***	**I(1)**
TOP	-0.919905	**-4.443379***	**I(1)**	-0.967087	**-4.545338***	**I(1)**
EXCH	-0.085796	**-4.896997***	**I(1)**	-0.060519	**-4.888113***	**I(1)**

APPENDIX 10: COINTEGRATION RESULT

Date: 06/13/16 Time: 00:10
Sample (adjusted): 1988 2015
Included observations: 28 after adjustments
Trend assumption: Linear deterministic trend
Series: LOG(EXCHR) LOG(UNEM) LOG(TOP)
Exogenous series: LOG(INF)
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.618787	42.80328	29.79707	0.0009
At most 1 *	0.285491	15.80016	15.49471	0.0450
At most 2 *	0.203980	6.387671	3.841466	0.0115

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.618787	27.00312	21.13162	0.0066
At most 1	0.285491	9.412487	14.26460	0.2534
At most 2 *	0.203980	6.387671	3.841466	0.0115

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

APPENDIX 11: VAR LAG ORDER SELECTION CRITERIA

VAR Lag Order Selection Criteria
Endogenous variables: LOG(INF) D(LOG(UNEM)) D(LOG(TOP)) D(LOG(EXCHR))
Exogenous variables: C
Date: 06/13/16 Time: 00:16
Sample: 1986 2015
Included observations: 27

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-52.35250	NA	0.000764	4.174259	4.366235*	4.231344
1	-30.00464	36.41873*	0.000486*	3.704048*	4.663927	3.989470*
2	-15.00234	20.00307	0.000571	3.777951	5.505733	4.291711

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

APPENDIX 12: VECTOR AUTOREGRESSION ESTIMATES

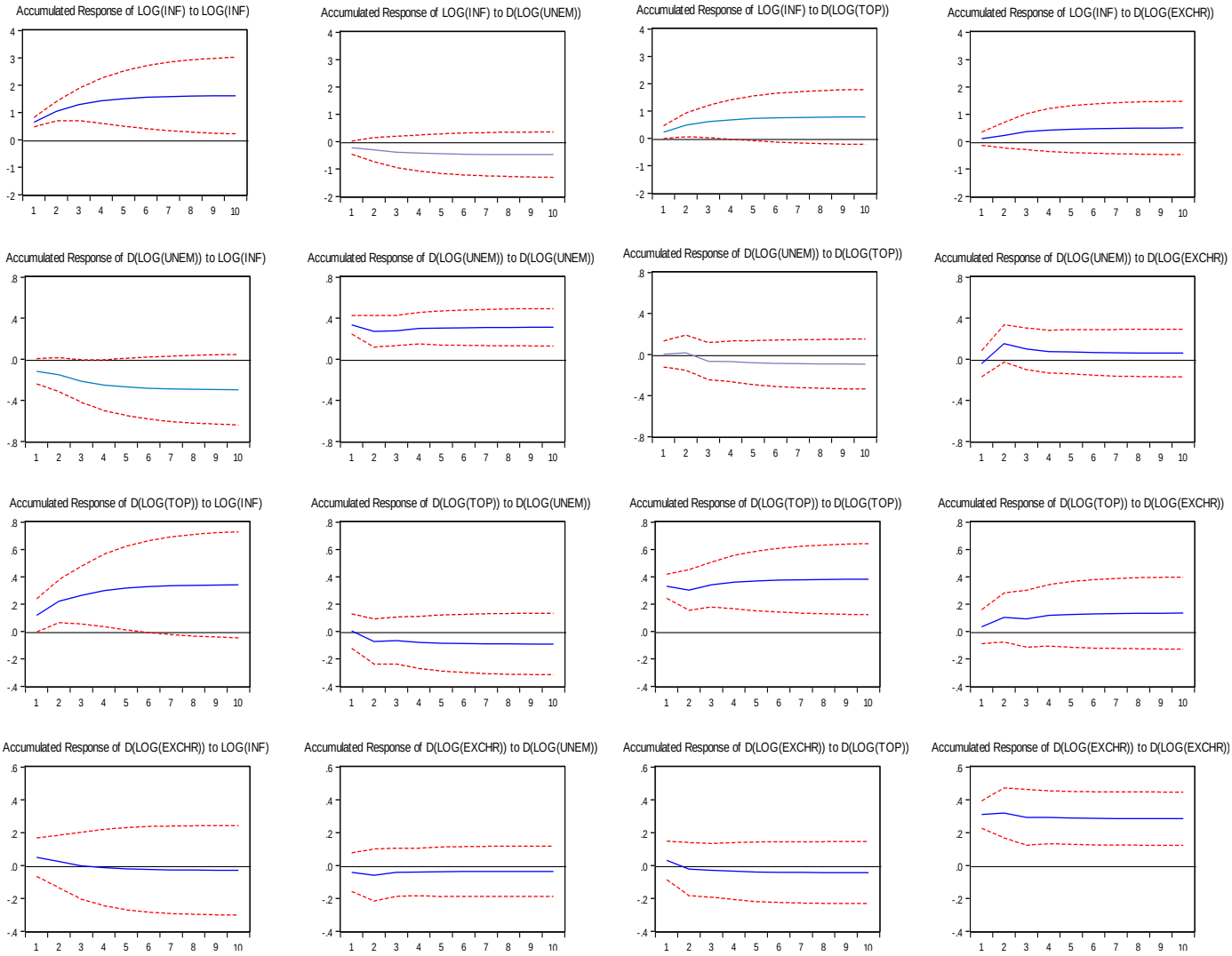
Vector Autoregression Estimates
Date: 06/13/16 Time: 12:50
Sample (adjusted): 1988 2015
Included observations: 28 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LOG(INF)	D(LOG(UNEM))	D(LOG(TOP))	D(LOG(EXCHR))
LOG(INF(-1))	0.562083	-0.161024	0.171284	-0.029341
	(0.18028)	(0.09381)	(0.09237)	(0.08692)
	[3.11781]	[-1.71643]	[1.85434]	[-0.33754]
D(LOG(UNEM(-1)))	0.181560	-0.222670	-0.090384	-0.064361
	(0.33048)	(0.17197)	(0.16932)	(0.15934)
	[0.54939]	[-1.29481]	[-0.53380]	[-0.40391]
D(LOG(TOP(-1)))	0.368969	0.093747	-0.217201	-0.147480
	(0.36076)	(0.18773)	(0.18484)	(0.17395)
	[1.02274]	[0.49937]	[-1.17506]	[-0.84785]
D(LOG(EXCHR(-1)))	0.194810	0.646428	0.175071	0.044634
	(0.41427)	(0.21557)	(0.21225)	(0.19974)
	[0.47025]	[2.99865]	[0.82482]	[0.22346]
C	1.081523	0.385000	-0.283955	0.246985
	(0.50608)	(0.26335)	(0.25930)	(0.24401)
	[2.13705]	[1.46193]	[-1.09510]	[1.01218]
R-squared	0.397197	0.389823	0.196240	0.053324
Adj. R-squared	0.292361	0.283705	0.056456	-0.111315
Sum sq. resids	9.557439	2.588024	2.508951	2.221890
S.E. equation	0.644625	0.335444	0.330280	0.310812
F-statistic	3.788768	3.673490	1.403881	0.323886
Log likelihood	-24.68189	-6.391942	-5.957519	-4.256427
Akaike AIC	2.120135	0.813710	0.782680	0.661173
Schwarz SC	2.358029	1.051604	1.020574	0.899067
Mean dependent	2.747221	0.050268	0.163363	0.138217
S.D. dependent	0.766304	0.396346	0.340017	0.294835

Determinant resid covariance (dof adj.)	0.000356
Determinant resid covariance	0.000162
Log likelihood	-36.72324
Akaike information criterion	4.051660
Schwarz criterion	5.003235

APPENDIX 13: IMPULSE RESPONSE

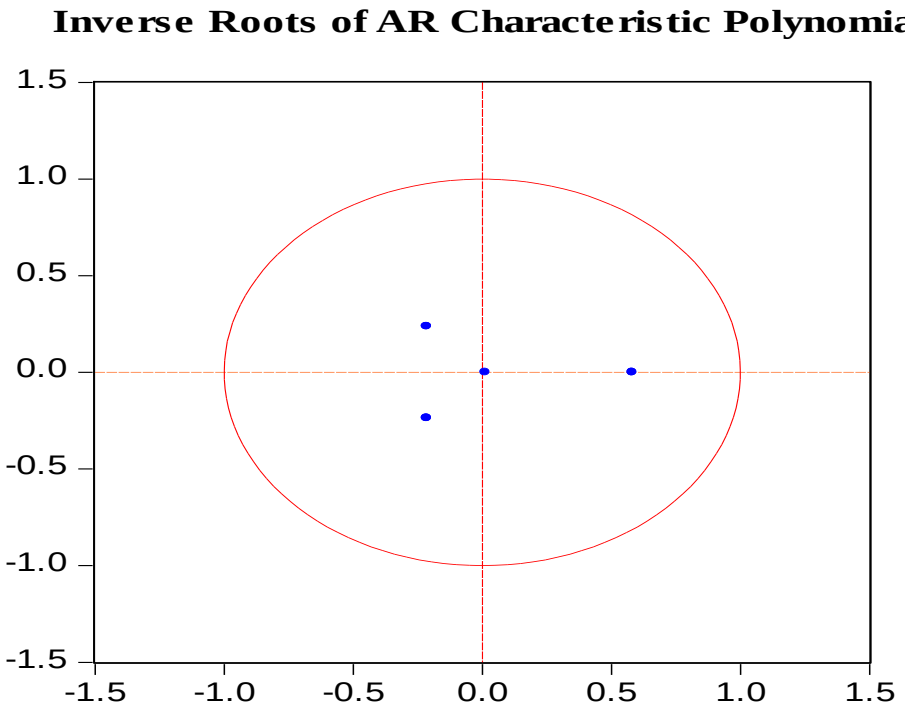
Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.



APPENDIX 14: VARIANCE DECOMPOSITION

Variance Decomposition of LOG(INF):					
Period	S.E.	LOG(INF)	D(LOG(UNEM))	D(LOG(TOP))	D(LOG(EXCHR))
1	0.644625	100.0000	0.000000	0.000000	0.000000
2	0.770037	96.30604	0.820918	2.277413	0.595630
3	0.815428	95.19189	0.733369	2.282629	1.792115
4	0.828228	95.10120	0.723299	2.271644	1.903854
5	0.832741	95.03930	0.720680	2.284206	1.955811
6	0.834285	95.01996	0.718890	2.284711	1.976444
7	0.834798	95.01428	0.718481	2.285194	1.982049
8	0.834975	95.01209	0.718321	2.285403	1.984182
9	0.835035	95.01139	0.718265	2.285451	1.984896
10	0.835055	95.01115	0.718247	2.285472	1.985134
Variance Decomposition of D(LOG(UNEM)):					
Period	S.E.	LOG(INF)	D(LOG(UNEM))	D(LOG(TOP))	D(LOG(EXCHR))
1	0.335444	12.12442	87.87558	0.000000	0.000000
2	0.401142	9.199673	65.59836	1.034966	24.16700
3	0.413036	11.02238	62.01391	3.246047	23.71766
4	0.415660	11.74983	61.29788	3.265059	23.68724
5	0.416102	11.90301	61.18496	3.272648	23.63938
6	0.416324	11.97622	61.11957	3.274286	23.62993
7	0.416384	11.99936	61.10207	3.273552	23.62501
8	0.416404	12.00696	61.09620	3.273632	23.62320
9	0.416412	12.00968	61.09405	3.273606	23.62267
10	0.416414	12.01058	61.09335	3.273596	23.62247
Variance Decomposition of D(LOG(TOP)):					
Period	S.E.	LOG(INF)	D(LOG(UNEM))	D(LOG(TOP))	D(LOG(EXCHR))
1	0.330280	12.66587	2.072834	85.26130	0.000000
2	0.358657	19.19722	3.203534	75.38182	2.217421
3	0.363114	20.15329	3.552689	73.91508	2.378937
4	0.365332	20.79477	3.512118	73.06873	2.624383
5	0.365797	20.98419	3.503500	72.88366	2.628652
6	0.365965	21.04634	3.501434	72.82164	2.630577
7	0.366027	21.06908	3.500273	72.79773	2.632914
8	0.366046	21.07650	3.499950	72.79030	2.633249
9	0.366053	21.07905	3.499834	72.78771	2.633411
10	0.366056	21.07992	3.499793	72.78682	2.633469
Variance Decomposition of D(LOG(EXCHR)):					
Period	S.E.	LOG(INF)	D(LOG(UNEM))	D(LOG(TOP))	D(LOG(EXCHR))
1	0.310812	2.648999	0.646367	0.369875	96.33476
2	0.316611	3.252002	1.425624	2.299499	93.02287
3	0.318523	3.876336	1.476556	2.273572	92.37354
4	0.318717	3.986000	1.479634	2.270977	92.26339
5	0.318816	4.033789	1.479316	2.275464	92.21143
6	0.318848	4.050714	1.479023	2.275139	92.19512
7	0.318857	4.055929	1.478992	2.275196	92.18988
8	0.318861	4.057815	1.478965	2.275215	92.18800
9	0.318862	4.058447	1.478956	2.275215	92.18738
10	0.318863	4.058660	1.478953	2.275217	92.18717
Cholesky Ordering: LOG(INF) D(LOG(UNEM)) D(LOG(TOP)) D(LOG(EXCHR))					

APPENDIX 15: INVERSE ROOTS OF AR CHARACTERISTIC POLYNOMIAL GRAPH



APPENDIX 16: DIAGNOSTIC TEST OF THE VAR EQUATIONS

Diagnostic Test of the VAR equations				
EQUATION ⟶ / TESTS ↓	**INFLATION**	**UNEMPLOYMENT**	**TRADE OPENNESS**	**EXCHANGE RATE**
B-G Serial Correlation LM	2.941871	2.678527	4.619443	0.402405
(Probability)	(0.2297)	(0.2620)	(0.0993)	(0.8177)
Heteroskedasticity B-P-G	9.847309	11.97918	5.233172	6.181188
(Probability)	(0.1974)	(0.1012)	(0.6315)	(0.5188)
Normality Jarque-Bera	0.076813	4.220201	**21.74049***	**147.1987***
(Probability)	(0.962322)	(0.121226)	(0.000019)	(0.000000)