THE EFFECTS OF INFLATION AND UNEMPLOYMENT ON THE MANUFACTURING SECTOR IN NIGERIA (1980-2018)

BY

ETAKPOBUNOR OCHUKO EMOGHENE

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DEPARTMENT OF ECONOMICS

FACULTY OF SOCIAL SCIENCES

UNIVERSITY OF NIGERIA,

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APPROVAL PAGE

This project has been supervised and approved as having satisfied the conditions for the award of a Post Graduate Diploma Degree in Economics, in the Department of Economics, Faculty of Social Sciences, University of Nigeria, Nsukka.

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DR. (MRS) IFEOMA MBA DATE
(PROJECT SUPERVISOR)

……………………………… ……………………

DR. J.O. CHUKWU DATE
(HOD ECONOMICS)

……………………………… ……………………

PROF. LEONARD UGWU DATE
(DEAN, FACULTY OF SOCIAL SCIENCES)

DEDICATION

This research work is dedicated to almighty God.

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ABSTRACT

The problem of unemployment in Nigeria has attracted the concern of stake holders, policy makers and researchers. Theory has it that there is a trade-off between unemployment and inflation. However, in Nigerian economy, inflation and unemployment occur concurrently. In few of this flaw in theory postulate, this study investigates the impact of inflation and unemployment on manufacturing output. The study utilized time series quarterly data from 1981Q1 to 2018Q4. Phillips Peron unit root test was used to determine the order of integration of the variables. The existence of long run association was tested using bound test approach. the study found that without the interaction of inflation and unemployment, inflation and unemployment only impact on manufacturing in the short run. However, the interaction of the variables shows that inflation impact on manufacturing through unemployment in the short run and long run. The study therefore recommends that for policy measures to boost manufacturing output to succeed, inflation and unemployment need to be checked.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

In the olden days when a tuber of yam is bought with a cowry, it is an expression of prices that existed at that time. In our own time N100 or more might be used to pay for a bottle water or N300 for a plate of food. That portion of increase in prices of these items is what we call inflation, a general increase in level of prices in the economy. The price level measures the average prices of goods and services in the economy. It is an indicator for gauging the purchasing power of money (i.e., what money can buy) at a particular time (Baye and Jansen, 2006). The Central Bank of Nigeria (CBN) (2012), in their review of monetary sector model for Nigeria explains that emphasis given to price stability in the conduct of monetary policy is designed to promote sustainable growth and development as well as strengthening the purchasing power of the domestic currency amongst others.

In economics, inflation is referred to as a persistent increase in the general price level of goods and services over a period of time. Ahlgrim and D'Arcy (2012) defined inflation as changes in the overall level of prices within an economy, which consequently leads to fall in value of the domestic currency. In an inflationary period, price level rises, which means that the purchasing power of money falls and money as a medium of exchange deteriorates in real value, and if unchecked would have adverse effect on the economy. Kasidi and Mwakanemela (2013) argue that most macroeconomic policies in most economies have often centered on attaining sustanable economic growth and achieving price stability (strengthening the purchasing power of money). Stability here, according to Anyanwaokoro (1999), does not mean a situation where price will remain fixed; rather it is a situation where variation in prices over a long period is minimal. There are three main approaches to measuring inflation. These include the consumer price index (CPI), wholesale price index and the gross national product implicit deflator. The CPI is an approach adopted by the CBN in measuring inflation in Nigeria. This approach is also applied in USA and other developed economy. CPI is a direct measure of inflation.

Unemployment was defined by InternationalLabour Organization (1982) as comprising all the persons above a specified age who during the reference period were without work, either paid or self-employment. They are currently available for work, and are seeking for work, but could not get employed. Although specific steps have been taken to get employed, they could not. The specified steps may include registration at a public or private employment exchange: application to employers; checking at worksites, factory gates, markets or other assembly places, placing or answering newspaper advertisements; seeking the assistance of friends or relatives; looking for land, building, machinery or equipment to establish own enterprises, arranging for financial resources; applying for permit and license e.t.c.

In any economy, inflation and unemployment are always on the "front burner"; all economies will always intend to keep them both on a low rate mostly on a single-digit rate because this will tend to bring about stability in the macroeconomic policies of the country. This stability is pivotal to effectively achieve growth and development in the economy and also the attainment of its set out goals and objectives of its economic policies (Orji, Orji-Anthony, and Okafor, 2015).

When money supply is altered, this in turn leads to inflation. Therefore, when money supply is increased, it will have a multiplier effect on the price of goods and services in the economy which will lead to its increase also. Hence, inflation is the upward movement in the prices of goods and services. The classical economist defined the long term Phillips curve to be the natural rate of unemployment in an economy. It states that on the long run, inflation and unemployment are not meant to have a relationship (Phillips, 1958)(Friedman, 1968).

Therefore, if employment rate is less than the natural rate, thus inflation rate will exceed the limits of expected rate and therefore the unemployment rate is higher than the acceptable limit, therefore the inflation rate will be less than the expected rate (Phillips, 1958) (Friedman, 1968).

Inflation as explained by the Keynesian implies the supply of money that keeps rising. They focus mainly with institutional crises that people face, when the industries raise the prices of goods and services. Industries make significant yields when they increase the prices of their goods and services. Furthermore, the Central Bank increases the supply of money to ensure the continuous functionality of the economy (Phillips, 1958)(Friedman, 1968).

Inflation and unemployment are very critical to the economic growth and development of any economy. These two (2) factors are mainly used to examine the level of poverty in developing economies. Therefore, countries are encouraged to continually increase their level of produce because this will help to cushion the effect of inflation in the economy. Also, increase in the level of goods and services will improve the standard of living and therefore create social harmony within the country.

According to Chinedu (2015), every year over 90 Universities in Nigeria produce thousands of graduates. This is a welcome development but they linger in the labour market without jobs. Employers often blamed the graduants for not being qualified for the available jobs. Out of frustration, most of them ended up engaging in various social vices, such as robbery, kidnapping, drug trafficking among others, just to earn a living. Nigeria is currently experiencing high inflation and unemployment. Nigerian inflation grew to 13.7 percent in April 2016, 0.9 percent higher than the previous month level of 12.8 percent. The cost-push inflation is driven primarily by the severe scarcity of petroleum products, which had forced increases in transportation costs and consequently arbitrary increases in the cost of all other commodities and services consistently for several months. Inflation had further increased to 17.6 percent in August, a fresh 11-year high and the seventh monthly increase in a row (NBS, 2016). Michael (2013) reported that crude oil provided approximately 90 percent of Nigeria's foreign exchange earnings, about 80% of federal revenue and contributes to the growth rate of Gross Domestic Product (GDP).

Since oil contributes to 90 percent of foreign exchange, the fall in oil price affected foreign exchange, which devalues naira. Nigeria, imports most of its consumable items, including refined petroleum, food items, raw materials and spare parts. The masses are bearing the burden of the increase in prices of imported goods and services in the form of high inflation. The government in trying to embark on a policy to control foreign exchange affected some firms, which led to their closure. Besides, some firms could not cope with the high cost of raw materials and spare parts and also the high cost of diesel due to power failure. NBS (2016) reported that in the second quarter of 2016, the nation's Gross Domestic Product (GDP) declined by -2.06 (year on year) in real terms. This was lower by 1.70% points from growth rate of -0.36% recorded in the first Quarter of 2016. According to Abdulsalam and Abdullahi (2016), the

Nigerian economy has remained largely underdeveloped despite the increase in the growth rate declared every year. In the 2014 budget, it was projected to grow at 4.5% and in 2015 5.5% percent, a figure which is far higher than developed countries like USA that observed a growth rate of 2.2% in 2014. The growth in Nigeria has been described as exclusive growth per capita income is low and unemployment and the inflation rate are high. According to Bakare (2012), a cursory glance at the data on Nigerian unemployment and output growth would suggest the existence of the new popular concept of “jobless growth”

1.2 STATEMENT OF THE PROBLEM

Globally, economic growth and price level have been fluctuating. And one of the strongest policy nightmares is about smoothening out the relations between economic growth and inflation rate. Compared to economic growth rate, inflation rate draws more attention. Various attempts to find answer to the question have produced contradicting results, and it is obvious that, so far, there is no consensus among researchers on this macroeconomic problem. The reason might well be adduced to peculiarity of each country’s economy, structure and level of development hence nature of relationship between growth and inflation is both region and country specific.

Inflation, unemployment and economic growth are very important variables in assessing the performance of the economy. For this reason, every country aspires to have price stability, full employment and economic growth. Inflation is seen as a persistent and an appreciable rise in the general level of prices in an economy (Jhingan 2009). The structuralists argue that inflation is crucial for economic growth while monetarists posit that it is harmful to economic growth (Doguwa, 2012). Nell (2000) opined that single digit inflation may be beneficial; on the other hand, double digit inflation imposes slower growth. Anochiwa and Maduka (2015) said the ability to manage the growth of inflation to single digit may be an important factor to accelerate economic growth.

The inflation rate in the economy of Nigeria has in recent years been fluctuating mainly due to the inconsistencies in the Real Gross Domestic Product (RGDP) (CBN, 2004). Also, other economic indicators such as unemployment rate are indicators of an ailing economy; this study is conducted to examine the impact of inflation on unemployment in Nigeria.

1.3 RESEARCH QUESTIONS

The research questions are:

i. What is the impact of inflation on manufacturing outputin Nigeria?
ii. What is the impact of unemployment on manufacturing outputin Nigeria?
iii. How does inflation through unemployment impact on manufacturing outputin Nigeria?
iv. What is the response of per capita output to unemployment in Nigeria?

1.4 OBJECTIVES OF THE STUDY

The broad objective of this study is to empirically examine the impact of unemployment and inflation on the manufacturing sector in Nigeria. However, in order to achieve the broad objective, the following sub-objective have been marshalled out;

(i) To determine the impact of inflation on manufacturing output in Nigeria.

(ii) To investigate the impact of unemployment on manufacturing outputin Nigeria.

(iii) To examine the effect of inflation through unemployment on manufacturing outputin Nigeria.

iv. To find out the response of per capita output to unemployment in Nigeria

1.5 RESEARCH HYPOTHESES

In order to test the objectives raised, the following hypothesis have been marshalled out.

$H_{0(1)}$: Inflation does not exert significant impact on manufacturing output in Nigeria.

$H_{0(2)}$: Unemployment has no significant impact on manufacturing outputin Nigeria.

$H_{0(3)}$:inflation through unemployment has no significant impact on manufacturing outputin Nigeria.

$H_{0(4)}$: per capita output does not response to Unemployment in Nigeria.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Conceptual Review

Unemployment is a global phenomenon and a growing concern for economies. Balami (2006) explains that unemployment is a phenomenon in which workers are involuntarily without work. This expresses the notion that workers who are both willing and able to work are unable to find work. As defined by the classical economists, it is the excess supply of labour over the demand for labour as a result as a result of the adjustment in real wages. This is also referred to as the Real Wage unemployment which occurs when the inflation adjusted wages are set above the wages as determined by the market-clearing level which predicates the surplus of job seekers over the available positions. The International Labour Organization (2001) also defines the concept of unemployment as a state of joblessness in which people are without jobs having sought for jobs within a period of about four weeks. It is a number of those without work, however willing and able to work, to those within the labour force.

The Fakhri (2011) revealed that over 2 million people are out of work globally, which is a reflection of the two-thirds of advanced economies and a half of developing economies witnessing a downturn in the growth rate in employment. In 2001, Jhingan explains unemployment as the number of people who are not working as a fraction of those in the labour force. For Aminu and Anono (2012) , it is conceptualized as the sum total of people seeking jobs, willing and able to work such that they make themselves available for employment even at prevailing wage rates, but do not get employed. This is represented as $u = \frac{un}{lab} \times 100\%$ where u is the unemployment rate, un is the number of unemployed people and lab is the labour force. The labour force in turn is defined as the sum total of employed and unemployed people.

Inflation on the other hand in the view of Balami (2006) is an expression of rise in general price level of a broad spectrum of goods and services over a long period of time. Iheonu, Ihedimma and Eze (2017) opines that price stability in any economy is a key responsibility of the apex banks such that unstable prices – inflation – imposes a reduction effect in the value of goods, services and money in any given economy. This corroborates the assertion of the Friedman (1969), that inflation is a monetary issue, thus being a reflection of the increase in the quantity of money than of output. This is as a result of its role in the determination of money supply. The printing of money in a bid to increase its supply is viewed Slavin (2008) as an inflation tax because it has same effect. Seigniorage (the printing of money to raise government revenue) reduces the value of money in people's wallet, thus acting as the cost of printing more money.

It is a measure of the rate of increase in the general price level over a stretch of time. Inflation can also be calculated for the consumer price index (CPI) as $P_{t+1} - P_t \times 100\%$ where P_{t+1} is the price for the current year and P_t is that for the previous year which is benchmarked for the base year.The National Bureau of Statistics (NBS) is the government institution which calculates the CPI from both rural and urban observations.

2.1.1. The inflation, unemployment and Economic Growth Trend in Nigeria

Unemployment and inflation in Nigeria have experienced fluctuations over the years. In 2012, unemployment was recorded at about 24.7% while in 1995, a low value of 1.8% was recorded (Aninu, 2006). These were attributed to the various policies of the government aimed at job creation, and macroeconomic stability. Inflation by 1994 had grown to about 76.8% which was a really high value while its lowest value was recorded in 1999 at a mark of 0.2% (WBG, 2017). the government though has attempted maintaining the inflation figures at single digits, but efforts to keep this has been shut down by the prevailing fluctuations in oil prices which creates a cost-push inflation in the Nigerian macroeconomic space. Beginning from 1969, inflation rate was 10.36% which was an anomaly as perceived by the then Federal military government. The government enacted policies which saw to the forestalling of wage increment (Olubusoyeand Rasheed, 2008).

By 1971, Nigeria experienced inflation rate to the tune of 16% as a result of increases in salaries as implemented by the Wages and Salaries Review Commission. This made the government implement restrictions on import of various goods and services, while excise duties were reduced on some others. Idalu (2015) recounts that the federal government also set up credit policies to the manufacture of domestically produced food. This saw to the fall in inflation to about 3.2% in 1972. 1973 and 1985 was another period Nigeria faced inflationary pressure as inflation averaged 17.96% within this period. Inflation was further reduced to 5.4% as a result of the anti-inflationary promulgations implemented between 1971 and 1973. But due to increases in expectations over wage increments, inflation further rose to 13.4% (1974). There was the increase in aggregate demand due to backdated paid wage arrears such that by 1975, inflation rate was 33.9%, thus, connoting a phenomenon - imported inflation.

The promulgation of the Green Revolution Campaign endeared the inflation rate to fall to value of 7.7% in 1982, though it did not last long, as it rose again in 1983 to 23.2%. By 1984, inflation had started falling again to 17.82% and then to 7.44% in 1985. In 1986, inflation was 5.72%, 11.29% in 1987 as a result of food supply improvement (Idalu, 2015). Inflation grew further, such that by 1995 it grew to 72.84% much after going beyond the benchmark of in 1999, inflation rose from 6.62% (1999) to 18.87% (2001). Idalu (2015) held that as a result of the global financial crisis, inflation averaged 11.92% between 2008 and 2011. By 2014, inflation had fallen to 8.06%, but then rose again to 9.02% in 2015 and then to 15.70% in 2016 (WBG, 2017).

The economy experienced downturn in about the fourth quarter of 2009 as explained by Aminu (2006) following the 2.73% increase in real GDP. The relative serenity in the Niger Delta region and the non-oil sector played crucial role in seeing to this increment. Structural imbalance of the Nigerian economy remains a major problem since the country is a mono- product based one. This lack of diversification has ensured a huge chunk of the populace are unemployed in lots of sectors which remain underutilised. This unemployment also cuts across other factors of production. Nigeria's lack of diversification forestalls the progression of the local economy, while its practice has the potentials of transforming the country and improving the reserves position. To this end, unemployment becomes another threat to the prosperity of the country as much as inflation is.

2.1.2 Causes of Unemployment in Nigeria

Unemployment in early Nigeria according to Fajana (1987) was not caused by the presence of expatriates but the mode of production and factor intensity, rising cost of labour, insufficient planning, population over growth, the mono-culture economy and the under- development of the other sectors, merging industries and the rural-urban migration of labour. These were majorly features of the Nigerian economy in the post-colonial era. Garba (2010) makes a case that the rise in the rate of unemployment was owed to the non-complementarily and non-collaboration of entrepreneurs with educational institutions. He furthered that synergy was non-existent and it revealed the weakness and shortcomings of the educational policies of the government. Dabaleneal (2000) believed there was adisengage between both the universities and requirements of labour by employers of labour. This created a mismatch between the type of labour produced alongside its quality and the available jobs in the country, thus creating a social cost without remedial actions to this ail.

Akintoye (2008) acknowledges that the high rate of unemployment which was observed in the Nigerian economy in the 1970s was majorly a consequence of the depression the country experienced during the period. He furthered that this led to the implementation of the stabilization policy enacted by the government aimed at the restriction of exports as discussed earlier. But this also has a resultant effect of import dependency by the major manufacturing enterprises in the country. The operation of these firms below their productive capacity was imminent, thus leading to the loss of jobs. Emunemu (2008) identifies unemployment in Nigeria as sourced from the privatization and under performance of the public sector, since prior to the time, employment was public sector driven. This was enabled by the mismatch in the quality of labour and the available jobs, with low employment in the private sector. For this, Okojie (2003) observed that the demand for labour had declined, even in most of the African countries as in Nigeria, thus stagnating the economies. He went on to attribute the urbanunemployment Africa experienced as stemming from the high mobility of labour as a factor input, especially in terms of geographical mobility. Other factors he identified included the reason of early marriage, high number of unskilled labour and gender discrimination in the labour market.

Todaro in 1992 observed that unemployment in Nigeria was caused by mass movement of youths as with economic activities, from the rural to urban regions of the country thus leading to the stagnation of the other sectors especially the extractive trade. For this, he suggested led to unbalance development. Fadayomi in the same year attributed it to the inability of the economy to advance and employ its resources effectively with particular reference to the rural areas. Usoro (1997) corroborated this observation by asserting that the rural-urban migration left the activities of the extractive sector to the older populace, thus resulting in the dwindling of productivity. KakwaghandIkwuba (2010) acclaim that youth unemployment resulted from heightened populace growth over supply of jobs, the insufficiency and inefficiency of labour as most were unemployable and the inadequacy of the school curricula in addressing vocational deficiencies in the country. Ajao (2004) observed that the abandonment of vocational education somewhat contributed to the high unemployment in the country, as well as high unemployment since most of the youths lack the requisite skills. He also bemoaned the inadequacies in the investment in human capital.

2.1.3 Causes of Inflation in Nigeria

Inflation according to the classical economists is caused majorly as a result of an increase in the volume of money. It is for this reason inflation is argued to be a monetary issue. The equation of exchange given as MV = PQ explains that with constant output level and velocity of circulation of money, the changes in the price levels would be proportional with the changes in money supply (Aminu, 2006). The Keynesians rather argue that inflation stems from the persistent increase in the demand for goods and or services and this informs the dichotomy in though on the causes of inflation by the monetarist and as opposed by the Keynesians. The Structuralists hold that inflation results from peculiar occurrences in developing economies and not just the growth in money supply. Their view of these peculiar occurrences is predicated by the structural bottlenecks the economy witnesses such as over dependence on imported intermediate goods. Supply side factors are also known to cause inflation, in that they drive the cost of production higher and eventually the prices of locally manufactured commodities (Layi, 2009). The long run trend of steady increases in general price levels is arguably affricated with the disparity in growth rates and efficiency of both the manufacturing sector and service industry. Other factors would be dichotomy in growth of nominal wages between sectors and their elasticity’s. Inflation in other climes is perceived to be the struggle for economic gains as income by various economic agents or groups. This is the basis of the Conflict Theory. This is embedded in the fact that both employees and employers have target real incomes under which consensus may or not be reached. Price stability would be achieved for the economy if the expectations are not above the actual real output. An excess of these claims over actual real output yields inflation.

Aminu and Anono (2012) accords that the causes of inflation include the openness ratio of an economy, the pre-announcement of wage increment, deficit in supply as well as excess demand, high cost of production and the recent removal of subsidy from petroleum products in the country. The manufacturing sector is known to produce most of the exportable. An increase in the degree of openness of any country is argued to enable the country increase- exports. This also has tendency of increasing imports for which if the increase in imports exceeds exports, there would be the tendency of having imported inflation. Most labour unions of the manufacturing sector as that of the Manufacturing Association of Nigeria has over time clamoured for increase in wages. With the government announcing such changes, this could spur more demand based on anticipated increase in income. Subsidy removal has tendency of increasing the cost of production which previously was been borne by the agent issuing the subsidy.

2.2.4Overview of the Nigerian Manufacturing Sector

The manufacturing sector in most economy is known to be the engine of growth and a prerogative for sustainable development as the success of any economy is measured by the productivity of the and competitive prowess of the economy against others (Borodo, 2010). This is predicated on the premise that economies are better fortified in wealth creation and national income growth via an active manufacturing sector. The manufacturing sector-of the Nigerian economy has over the past decades has been in below capacity state of nature. Policies has though been promulgated to alleviate the issues around the industry's ails, the sector still experiences difficulty in attaining optimal growth. Studies as Adebiyi (2004) and Olorunisola (2001) highlighted the series of development policies the government has undertaken in a bid to overcome these worries. Such steps include the institution of the Investment Company of Nigeria (ICON), in 1959, the Nigerian Industrial Development Bank (1964), the Nigerian Bank for Commerce and Industry (NBCI) in 1973, National Economic Reconstruction Fund

(NERFRUND) in 1991, and even the Bank of Industry established in 2001. These policies were all implemented to spur large scale manufacturing enterprises in the country.

The manufacturing sector is adjudged to have the potentials of job creation, poverty reduction and contribution to GDP, but the employment generation by the sector was observed to have declined from about 2,841,083 workers (2002) to 1,026,305 workers (2008). The creation of wealth is propagated when the macro economy is business and investment friendly. The issues of declining power provision, insecurity and unfavourable loan conditions are some of the issues as highlighted by Aliu (2010) which have ravaged the potentialities of the manufacturing sector in meeting up with the target objectives.

2.2 Theoretical Literature

The Arthur Lewis Growth Theory

The Arthur-Lewis theory of growth is discussed because of its influence over the development of the industrial sector in tandem with the traditional sector. Lewis (1954) explains how economies with two major sectors - one being the traditional sector and the other being the industrial sector can achieve growth in the aggregate economy from the activities of both sectors. Todaro (2011) holds that it is one of the best theories which focuses on the structural transformation of the subsistent economy. Aminu (2006) notes that Lewis' two sector model assumes surplus supply of labour in the traditional economy and less in the industrial economy all encompassed in underdeveloped economy. Aminu (2006) acknowledges that the focal point of the model is on the transfer of labour in tandem with the growth of output and employment in the modern sector.

The Nigerian economy is drawn along the lines of two major sectors which are the agricultural sector (traditional) and the manufacturing sector (industrial). The influx of labour from the traditional sector has been inspired by the juicy wages, and cleaner jobs the industrial sector presents which has brought about faster development in the sector, even as the Nigerian manufacturing sector is yet to be at its full potentials. The speed with which expansion occurs in the agricultural sector would be predicated by the level of investment in the manufacturing sector along with the level of capital accumulation in the latter. Investment as such is influenced by the surplus of profits from the manufacturing sector on the premise that the capitalists in the sector would plough back profits. Lewis (1954) assumed that wages in the manufacturing sector is constant such that the supply of labour from the traditional sector is perfectly elastic (Todaro andStephen, 2011).

The Theory of Inflation

The most common theories of inflation according to Balami (2006) are cost-push inflation and demand-pull inflation.

a) **Cost-push inflation** According to Balami (2006) is a kind of inflation which is caused by a decline in the total output of a given economy as a result of persistent increase in the cost of production. This form of inflation is sometimes regarded as the supply side inflation.
b) **Demand-pull Inflation** This is a kind of inflation which is as a result of a persistent increase in demand for goods and services. Aggregate demand is the summation of the demand for goods and services. If the demand for goods rises, it results in what is referred to as Demand-pull inflation according to Balami (2006).
c) **unemployment-inflation trade-off (Phillips curve)** Here, some of the theories of the relationship between unemployment and inflation were reviewed. The Milton Friedman Nobel memorial lecture (1976), the Phillips curve is categorized into four theories namely: the negative, the natural hypotheses, and the positive hypotheses. Keynes is left with the explanation of the Phillips curve and postulated a shift in Phillips curve. Philips argued that there was a stable negative relation between the level of unemployment and the rate of change of wages. High levels of unemployment being accompanied by falling wages, while low levels of unemployment by rising wages. The wage change in turn was linked to price change by allowing for the secular increase in productivity and treating the excess of price over wage cost as given by a roughly constant mark-up factor.

This relation was widely interpreted as a causal relation that offered a stable trade-off to policy makers. They could choose a low unemployment target; such as UL at the cost of inflation. In that case they would have to accept an inflation rate of A. There would remain the problem of choosing the measure (monetary fiscal, perhaps other) that would produce the level of aggregate nominal demand required to achieve UL, but if that were done, there need be no concern about maintaining that combination of unemployment and inflation.

Alternatively, the policy makers could choose a low inflation rate or even deflation as their target. In that case they would have to reconcile themselves to higher unemployment UO, for zero inflation, UH, for deflation Friedman (1976). Economics then busied themselves with trying to extract the relation depicted in Fig. 2.4.1 from evidence for different countries and periods, to eliminate the effect of extraneous disturbances, to clarify the relation between wage change and price change, and so on. In addition, they explored social gains and losses from inflation on the other, in order to facilitate the choice of the "right" trade-off. Unfortunately for this hypothesis, in Nigeria evidence failed to support it. Empirical estimates of the Philips curve relation were unsatisfactory. More important, the inflation rate that appeared to be consistent with a specified level of unemployment did not remain fixed: among countries. Looked at the other way, high rates of inflation that had earlier been associated with low levels of unemployment later change to high levels of unemployment. The phenomenon of simultaneous high inflation and high unemployment increasingly forced itself on public and professional notice, receiving the unlovely label of "stagflation". Researchers are skeptical about the validity of a stable Philips curve. What mattered for employment was not wages in dollars or Naira but real wages- what the nominal wages would buy in the market. Low unemployment would, indeed mean pressure for a higher real wage-but real wages could be higher even if nominal wages were lower, provided that prices were still lower. Similarly, high unemployment would, indeed, mean pressure for a lower real wages could be lower, even if nominal wages were higher, provided prices were still higher.

According to him there is no need to assume a stable Philips curve in order to explain the apparent tendency for an acceleration of inflation to reduce unemployment. That can be explained by the impact of unanticipated changes in nominal demand on markers characterized by (implicit or explicit) long-term commitments with respect to both capital and labour. Long-term labor commitments can be explained by the cost of acquiring information by employers about employees and by employees about alternative employment opportunities plus the specific human capital that makes an employee's value to a particular employer grow over time and exceed his value to other potential employers Friedman (1976).

The Theory of Unemployment

The various theories of unemployment are discussedin this section of the work. Unemployment as predefined is the state of being without work either for one with education or not, in which one's source of livelihood is non-existent. There are basic theoretical approaches as to the cause of unemployment. For the Keynesians, unemployment is basically as a result of the desire of investors to receive more money than to produce goods without public bodies producing new money. The various theories of unemployment would thus be discussed in this section of the study so as to shed more light on the types and theories of unemployment as contained in literature.

Classical Unemployment

This in some quarters is also referred to as the real wage unemployment. It is argued by the Classical economists to occur when the number of job-hunters surpass the available vacancies as a result of the real wages for job being set above the market clearing level. Some other economists also argue that another cause for this might not just be the discrimination between real wages and market-clearing prices, but also the drop in wages below liveable wage that most employed workers decide to drop out of the labour market and thus do not seek employment any more as is commonly found in economies where families are supported by [public] welfare programmes. In reference to this, wages are set above the welfare programmes as incentives to attract the unemployed back into the labour market as against over reliance on the welfare package.

Government regulation has also been argued to be another source of unemployment as it concerns the labour market. Minimum wage promulgations are believed to increase the cost of some labourers, especially the low-skill labour, thus disenfranchising them from labour participation since the new wage is now greater than the value of their labour. It also works out in the opposite when the minimum wage is not minimum enough. It causes the reduction in value of labour which discourages the supply especially for highly trained labour. Alain (2006) argues that laws restricting layoff could increase the propensity of businesses to hire because hiring is now a risk-prone venture.

- Keynesian Unemployment

Keynesians' argument is based on the disparity between the potential and actual unemployment levels. Keynes (1936) argues that the cause of unemployment is embedded in deficiency in demand, thus the referral of the Keynesian unemployment in recent times as the Deficient-Demand unemployment or popularly known as the Cyclical unemployment. This unemployment stems from the insufficiency of demand in tandem with inadequate aggregate supply. The demand for goods and services fall and as such there is less need for production which necessitates the acquisition of fewer workers. Since wages are sticky and do not fall immediately, there is a distortion in the equilibrium level in the commodity and labour market which results in mass unemployment.

Cyclical unemployment is believed to be a really bad form of unemployment because as argued in Keynesian economics, even at full employment, the number of unemployed workers far exceed that of the number of vacancies. This, Seymour (2005) explains quoting Keynes (1936) as the reflection of the business cycle - thus the name cyclical unemployment. The resolution to unemployment in this case is the government intervention aimed at increasing the supply of jobs.

- **Structural Unemployment**

There comes a time the labour market is incapable of providing jobs for everyone who needs job mainly as a result of the mismatch between skills of the unemployed workers and the skills required for the available jobs. This becomes a structural problem, thus the name - Structural unemployment. With this foundation, it is understandable why an adjustment of the demand side of labour is insufficient to resolve the issues persistent in this form of unemployment. Cyclical unemployment in its own way rubs off on structural unemployment thus increasing its persistence. This is because a persistent inadequate aggregate demand [as featured in cyclical unemployment] would result in obsolescence of the skills of the workers and or the discouragement from the labour market participation. Thus, they might not even fit into vacancies that are created when the economy recovers.

A more recent and common form of the structural unemployment is the technological unemployment. This takes the form of the replacement of labour by machines, software, applications and other technological advancements. It reveals the rate at which labour is substituted for technology, thus the way in which steady increases in labour productivity becomes synonymous with fewer workers being required to produce same level of output annually. This form could be linked to the cyclical unemployment because in some way, an increase in the aggregate demand can solve this problem in that, the demand for labour must grow adequately quickly to engage not only the teeming labour force, but also the redundant worker which are products of the increased labour productivity from technological advancement(Harry, 1934).

- Marxian Theory of Unemployment

Karl Marx in his 1863 publication is attributed to having posited that it is in the very nature of the capitalist mode of production to overwork some workers while keeping the rest as a reserve army of unemployed paupers. For Marx, the system's propensity to reduce wages and labour participation causes a requisite decrease in aggregate demand in the entire economy which has resultant unemployment and successive periods of fall in economic activity just before there could be rise in investment. Marx argues further that unemployment is a feature of capitalism as he tagged it an unstable system marred by periodic crises of mass unemployment. Given the social stratification as revealed by Marxian economics, the proletariat who forms the reserve army of labour by virtue of being unemployed, cause a downward pressure on the reward for labour as they are either categorised as surplus labour or the underemployed, thus they scramble for the scarce jobs at even much lower prices - this way the downward pressure on the reward for labour.

This forms a benefit to the capitalists, in that, this economic occurrence does not increase profits, but lower costs, since jobs would be taken at much lower prices, thus reducing economic rents at the detriment if the workers. Given this underlying argument, Marx proposes in Dialectic Idealism that the only way to abolish unemployment is to abolish the capitalist system of production in tandem with the forced scramble for wages with a shift to a socialist [communist] system, thus revealing the persistence of unemployment being a result of the incapacitation of capitalism to attain full employment.

- Frictional Unemployment

There exists a time in between which labourers switch jobs. Between the time frame of switching from one job to another, they might be unemployed for a while. Such kind of unemployment is referred to as Frictional unemployment. This mismatch which results in search for new jobs is attributable to disparity in skills, payment structure, work hours, geographical location of work place, seasonal industries and a myriad of other considerable heterogeneous factors. The major victims of this type of unemployment are new graduates and re-entrants like nursing mothers.

Employers of labour take time to search for labour with the right skills which is beneficial to the economy in that it ensures distribution of labour resources and avoids mismatch of labour. But then, the mismatch in itself can become a bane to economic development and growth such that should it linger for a longer period, it rubs off negatively on the economy as those seeking to be employed might remain unemployed if they are not considered to possess the right skill for the vacancy. Government forestalls such type unemployment via the creation of education, vocational education and training and other assistance as the creation of day care centres to enable nursing mothers not stay out too long from being employed.

2.3 Empirical Literature

The influence unemployment and inflation have on the aggregate economy has over time been studied. Several results have also been reached. This section of the report analyses the impact unemployment and inflation has had especially on the manufacturing sector in Nigeria. ModebeandEzeaku (2016) investigated the dynamics of inflation and the Nigerian manufacturing sector's performance using time series data from 1982 to 2014. They found out from their baseline regression that inflation and interest rate have negative influence on the manufacturing sector's growth and this was insignificant. They further found that exchange rate had a positive and significant influence on the growth rate in output of the manufacturing sector. In terms of causal relationship, it was discovered that inflation does not granger cause the growth in the manufacturing sector's output.

Mawufemor, Isaac and Mohammed (2016) conducted their study in Ghana, while calibrating the productivity of the country's manufacturing sector in cognisance of the effect of inflation. They collected data from 1968 to 2013 and employed the Vector Error Correction Model (VECM) and the Ordinary Least Square (OLS) in analysing the annual ranged data. The OLS results proved that negative relationship existed between inflation and the productivity of the manufacturing sector such that inflation leads to decrease in the productivity of the sector. The VECM model on the other hand revealed that there is a stable long run relationship between inflation and the productivity of the manufacturing sector in Ghana while the short run dynamics proved insignificant.

Ayoub (2015) conducted a panel analysis of 113 developing economies collecting data from 1974 to 2013. His investigation centered on the how inflation influences sectoral growth in developing economies. The industrial sector whose proximity is close to the manufacturing sector was one of the sectors studied in his report. His findings were that inflation impacts the industrial sector negatively. The other sectors include the services sector and the agricultural sector. The services sector like the industrial was influenced negatively while the agricultural sector was found to be impacted upon positively. All findings were significant. The model was estimated using the System GMM and justified by its ability to combine the standard set of moment conditions in first difference with the lagged levels as instruments and then another set of moment conditions derived from the equations in level, all accounting for endogeneity from country-specific effects and time invariant factors.

Sokunle and Harper (2011) conducted a study on the determining factors of the manufacturing sector's growth in the Sub-Saharan African region while collecting data from 2008 to 2010 for all Sub-Saharan African countries. The dependent variable was the output from the manufacturing sector while the independent variables included FDI, real interest rates, inflation rate and government incentives proxied by the tariff rates as a percentage of manufactured products. The findings of the study revealed that the selected independent variable were found to insignificantly influence the growth of the manufacturing sector in the Sub-Saharan African region. Odior's (2013) study centered on identifying the relationship status between some macroeconomic variables and the productivity of the manufacturing sector in Nigeria. He collected annual data from 1975 to 2011 and modelled a Vector Error Correction mechanism to explain the relationship between the aforementioned variables. The findings of the study reveal that the credit to the manufacturing sector via loans and FDI possess the potential of raising the productivity of the manufacturing sector in Nigeria. Broad money supply was found to have a positive and significant impact. Inflation rate as measured by the Consumer Price Index (CPI) was found to be negative and significant in influencing the productivity of the manufacturing sector in Nigeria.

Kareem (2015) found out that inflation has a positive and significant impact on economic growth. His discovery further shows that GDP granger causes inflation at the 1% level of significance. He adopted the Augmented Dickey Fuller (ADF) test in testing for the stationarity of the series and found out that of the variables employed, none was stationary in levels. Employment, Inflation and Interest rate were stationary at first difference, while GDP and FDI were stationary at second difference. The study employed an OLS estimation and a Granger causality test. Data collected ranged annually from 1985 to 2012.

Unemployment on the other hand has also been observed in terms of its contribution to the fate of the manufacturing sector in Nigeria. Amassoma and Nwosa (2013) adopted data from 1986 to

2010 in investigating the influence of unemployment on productivity growth in Nigeria. Their report employed the Error Correction Model (ECM) and produced both short and long run results. For both periods, it was discovered that unemployment has an insignificant influence on the productivity growth in the Nigerian economy. Francis and Ramey in 2004 conducted a similar study and it was established that there existed a negative correlation between employment and the productivity growth. This finding was also corroborated by the research work by Blanchard and Quah (1989) and Gordon (1997).

Nwezi and Ojiagu (2014) made enquiry into the relationship between structural youth unemployment and the productivity of the Sub-Saharan African region, using Nigeria as peculiar scope and the manufacturing sector as the sector of interest. The study used the Ordinary Least Square estimation technique as its methodology for data ranging from 2000 to 2013. This study found that structural youth unemployment positively and significantly influences the manufacturing sector's productivity as measured by GDP. The study is prone to defects of under specification of model as it was a simple linear regression. The sample size too was observed to be smaller than a period of 30years, and though the correlation coefficient between structural youth unemployment and GDP was found to be very strong, estimated at about 87%, the stationarity of either variable was not determined. Any of these factors could be influential in bringing about the significance of the dependent over the independent.

Sodipe and Ogunrinola (2011) verified via their study, the employment-growth relationship in Nigeria. They adopted a time series analysis using the OLS as the estimation technique. Their data was corrected for stationarity using the Hodrick-Prescott filter and it was found that there exist positive and significant relationship between employment and economic growth, while between the growth rates, there existed a negative relationship. This would mean that though more economic growth increases employment in Nigeria, this increase was growing at a decreasing rate.

For Bans-Akutey, Yaw Deh, Mohammed and Faisal (2016), the influence inflation has on the manufacturing sector's productivity in Ghana was studied with specific interest in the nature of short run relationship between both variables as well as implications for long run. The study employed annual data for the Ghanaian macroeconomy from 1968 to 2013 with the ADF and KPSS used as tests for unit root. The ADF test revealed that the manufacturing sector's productivity and inflation respectively are stationary at first difference, while the KPSS confirmed stationary of both series at first difference. Their Johansen's test shows that there is a long run relationship between both variables, while they employed the OLS in estimating therelationship between both. Inflation was found to negatively influence manufacturing sector's productivity and this was found to be significant at the 5% level of significance.

Enu and Havi (2014) investigated the occurrence of macroeconomic disturbances in the manufacturing sector of Ghana. The study was focused on the macroeconomic factors which drive Ghana's manufacturing output. A multivariate VAR approach was followed for data which included private sector credit, consumer price index measuring inflation, telephone representing infrastructure, labour force, real GDP per capita, real Exchange rate, and the fixed capital formation. Value added in the manufacturing sector as a proportion of GDP was used to proxy the sector output. The variables were all found to be integrated of order 1, thus justifying their use of the VAR model. It was found in the long run that private sector credit, labour and real exchange rate negatively influence the manufacturing sector's output while in the short run, previous values of the consumer price index, and real exchange rate hindered the expansion of the manufacturing output.

Nwezi and Ojiagu (2014) considered an investigation of structural youth unemployment and its relation to the productivity of Sub-Saharan Africa, drawing inferences from the Nigerian manufacturing sector. They modelled the Nigerian manufacturing sector output to be proxied by the country's GDP, while unemployment rate was regressed against the former. It was found that structural youth unemployment was positively and significantly a factor for the country's manufacturing sector output. Their model though may have been prone to problems of specification errors which may also cause some level of bias, thus affecting the consistency of the estimates. This thus leads to the investigation by this study under more stringent conditions for the implications of inflation and unemployment in the Nigerian manufacturing sector.

Onakoya (2018) examined the influence macroeconomic factors have on the output of the manufacturing sector. His study runs from 1981 to 2015 in annual frequency. The series were subjected to unit root test and it was found that they were stationary after first difference. This necessitated the use of the Johansen cointegration test for the presence of long run relationship. Manufacturing sector output remained the dependent variable for his model while the use of inflation rate, interest rate, exchange rate, and broad money supply all served as the independent variables. Inflation rate as with interest rate was found not to significantly influence the manufacturing sector's output. On the other hand, it was found of lagged GDP and unemployment rate to have contributed positively and significantly to the manufacturing sector's output in Nigeria, in the long run. These results were all tested at the 5% level of significance. His model was found not to possess autocorrelation or heteroscedasticity.

Rasheed (2010) investigated the productivity in the Nigerian manufacturing subsector using co-integration and an error correction model. The study indicates the presence of a long-run equilibrium relationship index for manufacturing production, determinants of productivity, economic growth, interest rate spread, bank credit to the manufacturing subsector, inflation rates, foreign direct investment, exchange rate and quantity of graduate employment. This finding has research gap on the area of factors that affect manufacturing sector in Nigeria.

Mensah, Ofori-Abebrese and Pickson (2016) launched an investigation into the relationship between industrial performance and macroeconomic factors in Ghana. Their study employed annual data from 1980 to 2013 and was estimated using the Autoregressive and Distributed Lag (ARDL) Model. Industrial output was used as the dependent variable while the independent variables included lending rate, inflation rate, employment, government expenditure, import tariffs on immediate goods and excise duties. Industrial output, lending rate and real effective exchange rate were found to be stationary at first difference while the rest were stationary in levels. This supports the use of the ARDL model as proposed. It was found that the variables had a significant long run relationship. Lending rate, inflation rate, employment, and government expenditure were found to influence the industrial sector's growth positively and significantly, while real exchange rate in their model was found to have a negative relationship. This relationship was also found to be insignificant.

Odior (2013) in trying to know the influence that macroeconomic factors have on manufacturing production in Nigeria conducted a study on this by choosing the time span 1975 to 2011. Before the actual estimation was carried out, the stationarity properties of the variables were explored by using the Augmented Dickey Fuller Test. The study examined the stochastic characteristics of each of the times series variables by testing their stationarity using Augmented Dickey Fuller test. The error correction mechanism model was also estimated. Manufacturing sector credit and foreign direct investment based on the results have the potential to enhance production in the manufacturing sector of Nigeria, while broad money supply demonstrated a minimal impact on manufacturing production in Nigeria.

Eze and Ogiji (2013) Utilized an error correction analysis to ascertain the impact that fiscal policies have on the output of the manufacturing sector in Nigeria. The findings showed that a negative significant relationship exists between government tax revenue and manufacturing between Government expenditure and the output of the manufacturing sector in Nigeria. A level relationship also existed between fiscal policies and manufacturing output based on the results. For Loto (2012), he assessed the major determinants of output expansion in the manufacturing sector of Nigeria over the study period 1980 and 2010. He used the OLS method and discovered that the rate of inflation is crucial in explaining manufacturing output expansion in Nigeria as at the sample period. The research found direct relationship between output expansion and real GDP as well as GDP per capita, while gross domestic capital formation, inflation, capacity utilization had a negative effect on output expansion in the manufacturing industry.

Imoughele and Ismaila (2014) examined the impact of monetary policy on Nigeria's manufacturing sector performance for the period 1986-2012. Data was collected from the Statistical Bulletin and Annual Report and Statement of Accounts of the Central Bank of Nigeria as well as the Annual Abstracts of statistics (various issues) published by the National Bureau of Statistics (NBS). Unit root test, Granger Causality test, co integration and VAR model were some of the econometrics techniques used for data estimation. Augmented

Dickey Fuller (ADF) test statistic revealed that the time series properties of the variables attained stationarity in levels and at first order. The variables were co integrated at most 2 with at least 3co integrating equations. The individual variables: external reserve, exchange rate and inflation rate were statistically significant to manufacturing sector output while broad money supply andinterest rate were not statistically significant to manufacturing sector output in the previous and current year. However, interest rate, exchange rate and external reserve impacted negatively on the sector output but broad money supply and inflation rate affect the sector positively. The pair-wise Granger Causality results suggest that real exchange rate and external reserves granger cause Nigeria's manufacturing output to each other unidirectional. The paper also found that the manufacturing sector contribute insignificantly to the Nigerian economy.

Ajudua and Ojima (2016) analyzed the determinants of output in the Nigerian manufacturing sector from 1986-2014. Gross Capital Formation, Bank Credit to Manufacturing Sector, Lending Rate, employed labour Force, Foreign Direct Investment, Manufacturing Capacity Utilisation Rate, and Foreign Exchange Rate were used as explanatory variables and were regressed on manufacturing sector output (dependent variable). The Unit root test using the Augmented Dickey Fuller test was conducted to test for stationarity among variables. The Johansen Co-integration test was also employed to test for long run equilibrium relationship among the variables; the Granger Causality test was conducted so as to ascertain the causal relationship between variables while the stability test was also conducted to check for the long run stability of the variables employed. The paper found a significant relationship between the explanatory variables employed and the output of the manufacturing sector in Nigeria during the period studied.

Afaha and Ologundudu (2014) investigated the relationship between manufacturing production and determinants of productivity for optimal performance in the industrial sector and found that while liberalization of the Nigerian economy has promoted manufacturing growth, interest rate spread and exchange rates had negative impact on the growth of manufacturing sub-sector in Nigeria during the year of their study. They also found that the rise in the manufacturing sub-sector is a reflection of high inflation rate and cannot be interpreted to mean a real growth in the sector. Kim and Lau (1994) in their study comparatively analysed the manufacturing sector as the source of economic growth between the Asia Tigers (Hong Kong, Korea, Singapore and Taiwan) and Germany, France, USA, UK and Japan. They concluded that capital accumulation accounted for between 48% to 72% of the growth.

Ukoha (2000) analyzed the determinants of capacity utilization in the Nigerian manufacturing industry between 1970 and 1998. He concluded that the exchange rate, capital expenditure on manufacturing and per capita real income has positive effects on manufacturing capacity utilization while inflation and loans and advances to manufacturing were found to have negative effect. Bamikole (2012) studied the impact of capacity utilisation on manufacturing productivity growth in Nigeria using cointegration analysis for the period 1975 to 2007. He found out that a negative long run relationship exists between manufacturing productivity and capacity utilisation.

Mohammed, Okoroafor and Awe (2015) observed the influence inflation and unemployment has on economic growth. They used data from 1987 to 2012 in annual frequency and employed the Ordinary Least Square technique. It was found that in the long run, interest rate and total public expenditure has significant impact on economic growth while inflation and unemployment respectively have negative effects. They justified this on the premise that inflation may not be due to aggregate demand pressure but as a result of shocks in the supply chain of goods domestically and internationally.

A stagflation phenomenon in Nigeria was reported by Njoku, and Ihugba (2011) Sanusi (2012), Amassoma, and Nnwosa (2013). This is a situation of concurrent high inflation rate, high unemployment and slowed GDP growth rate. This situation deleteriously affects the manufacturing industry through the inability of policy makers to deploy expansionary and / or stabilization macroeconomic policies. Changes in unemployment are more responsive to changes in output in areas with more manufacturing workers (Owyang, Sekhposyan and Vermann, 2013). This is corroborated by the work of Berument, Dogan and Tansel (2009) who evaluated macroeconomic policy and unemployment by sectoral economic activity with evidence gathered from Turkey. Anaman and Osei-Amponsah (2009) deployed the cointegration and error correction techniques in finding out the determinants of manufacturing output in Ghana from 1974 to 2006.They report a run a nexus between the output of the manufacturing sector and political stability, the level of per capita real GDP, and the export-import ratio. These have implications for the performance of the manufacturing sector. The first Kaldor (1967) law predicated on a two-year study(1953- 1954), conducted using the data of 12 OECD countries established a positive nexus between manufacturing output and economic growth. This was confirmed by Elhiraika (2008) who evaluated data from 36countries over eight-year period (1980-2007). The rapidity of manufacturing sector growth also propels the economy on the path of accelerated positive growth because of increased share of the manufacturing sector (Penelope and Thirlwall, 2013). However, Obamuyi, Edun and Kayode (2012) could not confirm an interconnection between economic growth and.manufacturing output.

Mwakanemela (2014) conducted a research to investigate the relationship among the macroeconmics variables such as FDI, trade openess and inflation rate on the manufacturing export performance of Tanzania from the period of 1980 to 2012. Vector Error Correction Model (VECM) and Ordinary Least Squares (OLS) regression were employed in the research and the result from regression analysis indicated that inflation rate negatively impacts manufacturing performance. Chaudhry, Ayyoub, and Imran (2013) also studied the impact of inflation on three major sectors - services, agriculture and manufacturing in Pakistan for the period of 1972 to 2010. From the empirical result of their study, it clearly showed that the rise of inflation rate is harmful to the manufacturing sector.

Gumbe and Kaseke (2009) examined the impact of 100 manufacturing firms during the inflation period from 2005 to 2008 in Zimbabwe. They stated that manufacturing sector tend to bear the brunt of inflation and the sector experienced a negative impact where numbers of companies gone through crisis like drastic reduction of production, laid off workers and closed plants to maintain the business and counter the effect of inflation. Gopakumar and Salian (2010), studied the relationship between inflation and GDP growth in India using error correction models. They observed a negative relationship in the long run between inflation and GDP growth, concluding that inflation is harmful towards growth. Medee (2015) investigated the impact of manufacturing sector on inflation in Nigeria with the use ofco- integration and errorcorrection mechanism (ECM) methods on time series data from 1980 and 2013. The empirical results show that when manufacturing sector is not performin inflation is tending to occur. In other words, both of these variables are having negative relationship.

Secondly, for the positive impact of inflation towards manufacturing growth, we have reviewed the study of Adaora (2013). He states that the relationship between inflation and manufacturing sector growth in Nigeria is positive. Data used in the study was obtained from the Central Bank of Nigeria (CBN). The observations that were selected comprised the period between 1981 and 2011. OLS method was used to examine the relationship between money supply, government expenditure and inflation rate which are the independent variables and the manufacturing index as the dependent variable for the model. The empirical result has revealed that inflation rate positively impacts the manufacturing sector where an increase of inflation rate contributes to upsurge in the manufacturing output and the manufacturer should not discouraged by the growth of inflation rate.

Enu, Hagan and Attah-Obeng (2013) made inquiry into the impact macroeconomic factors have on industrial production in Ghana. Their study justified the use of the OLS on the premise of its simplicity in estimation with an objective of closely fitting a function with data minimization of the sum of square errors from the data. For a sample of 21 years, they found out that real petroleum prices and exchange rate had negative influence on the industrial sector's performance while the import of goods and government spending had positive influence on industrial sector's performance. The study though does not control for unemployment nor inflation in its modelling. Other such models which failed to include unemployment and or inflation or both in their analysis are as discussed below; Goldar et al. (2003) using industrylevel data from Annual survey of industries and incorporating some trade-related variables explicitly into econometric analysis, concluded that tariff reforms have favourable and significant effects on TFPG whereas the deceleration in productivity growth in the 90s is perhaps due to slower growth in agriculture and gestation lag in investment project. Akinlo (2006) examined the effects of macroeconomic factors on productivity in 34 sub-Saharan African countries for the period 1980 to 2002. The result showed that external debt, inflation rate, lending rate among others negatively influenced productivity. Human capital, credit to private sector % of GDP, foreign direct investment % of GDP, manufacturing value added as a share of GDP have significant positive influence on productivity.

Msuya et al., (2008) tried to explain productivity variation among small holder maize farmers in Tanzania using Stochastic Frontier Production Function (SFPF). They found that low level of education of farmers, lack of extension services; limited capital, land fragmentation and unavailability of inputs among others were the major determinants of productivity in Tanzania. Constantin et al., (2009) used the Cobb - Douglas functional form of Stochastic. Frontier Production functions to examine productivity of Brazilian agribusiness. They identified harvest area, credit, and lime stone as significant variables that influence productivity in Brazil,

Nto and Mbanasor (2011) in a study on "productivity in agribusiness firms and its determinants in Abia State, Nigeria", they observed that the major determinants of productivity are skilled labour and raw materials. While skilled labour exerted positive influence on productivity with coefficient of 0.823, cost of raw materials negatively influenced productivity among agribusiness firms in the area. Nto et al. (2012) examined the determinants of productivity among manufacturing firms in South-Eastern Nigeria. The study employed the Cobb-Douglas Production Function in the analysis of the data. The study revealed that the major determinants of productivity are amount spent onuns killed labour (+), cost of raw material (+) and net productivity asset (+) with all exhibiting expected positive influence on productivity at 1% probability level respectively.

Ray (2012) determined the determinants of total factor productivity growth in selected manufacturing industries in India. Using OLS technique, the econometric result suggested that explicit trade variables as well as macroeconomic variables have relevant significant impact on total factor productivity growth of those industries. The unmistakable implication for Indian policymakers is the need to open up more to foreign imports, which will help to bring about institutional and technological progress conducive to TFP growth. Anaman et al.(2009) examined the determinants of the output of the manufacturing industry in Ghana from 1974 to 2006. They employed cointegration and error correction model analysis to establish the determinants. They showed that the level of output of the manufacturing industry was driven in the long-run period by the level of per capita real GDP (+), the export-import ratio (+) and political stability (+). In the short run period the level of output of the manufacturing industry was influenced by the export-import ratio (+) and political stability (+). They suggested that increasing level of manufacturing in Ghana would partly depend on the growth of export - based manufacturing firms.

2.4 Limitations of Previous Studies and Expected Value Addition

Most of the works reviewed investigated inflation or unemployment and their impact on growth. some also considered unemployment and manufacturing output. This work tends to deviate from the existing literature by looking at the impact of inflation through unemployment on manufacturing output. Also, examines the response of per capita income on unemployment in Nigeria. This is however relevant contribution especially this period where the unemployment rate in Nigeria is soaring high. Thus, the study is sector specific. It argues that since manufacturing sector is engine of growth of an economy, boosting this sector would result to a flourishing economy.

CHAPTER THREE

METHODOLOGY

3.1: Theoretical Framework

The theoretical framework of this study is anchored on Marxian Theory of Unemployment. Karl Marx in his 1863 publication argued that it is in the very nature of the capitalist mode of production to overwork some workers while keeping the rest as a reserve army of unemployed paupers. For Marx, the system's propensity to reduce wages and labour participation causes a requisite decrease in aggregate demand in the entire economy which has resultant unemployment and successive periods of fall in economic activity just before there could be rise in investment. Marx argues further that unemployment is a feature of capitalism as he tagged it an unstable system marred by periodic crises of mass unemployment.

3.2 Model Specification

Model Specification for Objective One, Two and Three

In order to determine the impact of inflation on manufacturing sector in Nigeria, the study specifies the following functional equation.

$$MGDP = f(INF, UNMP, FD, GEXP, SVGS\ ) \ldots\ldots\ldots\ldots\ldots\ldots\ldots .3.1$$

Where

$MGDP$ stands for manufacturing contribution to gross domestic product

INF stands for inflation

RIR stands for real interest rate

FD stands for financial development

$GEXP$ stands for government expenditure

$SVGS$ stands for savings

The econometrics specification of the long run form of equation 3.1 is given as

$MGDP_t = \beta_0 + \beta_1 INF_t + \beta_2 UNMP_t + \beta_3 FD_t + \beta_4 GEXP_t + \beta_5 SVGS_t + \beta_6 INF * UNMP_t$…..3.2

In practice, since specifying an equation that captures expertly the impact of explanatory variables on the explained variable could lead to over parameterization of the model, it therefore become necessary to keep the model simple by introducing the unobserved-error term into the model. In view of that, an estimable form, the long run form of objective one is specified thus;

$MGDP_t = \beta_0 + \beta_1 INF_t + \beta_2 RIR_t + \beta_3 FD_t + \beta_4 GEXP_t + \beta_5 SVGS_t + \beta_6 INF * UNMP_t + \mu_t$…..3.3

In the long run specification, β_6 is the coefficient of interaction variables. The idea behind the interaction of inflation and unemployment is that over a period of time in Nigeria the rate of inflation has been sky-rocketing and unemployment rate has also soared high. This informs the need to model the interaction of the two variables to determine their impact manufacturing output.

Also, the short run dynamics of objective one is specified as

$$\Delta MGDP_t = \beta_0 + \beta_1 \sum_{i=1}^{p} \Delta MGDP_{t-i} + \beta_2 \sum_{i=0}^{q} \Delta INF_{t-i} + \beta_3 \sum_{i=0}^{q} \Delta RIR_{t-i} + \beta_4 \sum_{i=0}^{q} \Delta FD_{t-i} + \beta_5 \sum_{i=0}^{q} \Delta GEXP_{t-i} + \beta_6 \sum_{i=0}^{q} \Delta SVGS_{t-i} + \beta_7 \sum_{i=0}^{q} \Delta (INF * UNMP)_{t-i} + \varphi ECM_{t-1} + \mu_t \ldots\ldots 3.4$$

Where

Error Correction Term = ECT and

$\beta_0 \ldots \beta_n$ represents the parameters to be estimated

φ measure of speed of adjustment of the short run model towards the long-run. This is expected to be negative and statistically significant at 5percent level.

Model Specification for Objective Four

Objective four is to find out the response of per capita output to unemployment in Nigeria. In order to do that, the study specifies the model below

$$RGDPCP = f(INF, UNMP) \ldots\ldots\ldots\ldots\ldots\ldots 3.5$$

To achieve this objective, the study will adopt the Vector Autoregressive (VAR) Model; developed by Sims (1980). The term autoregressive is due to the appearance of the lagged value of the dependent variable on the right-hand side and the term vector is due to the fact that we are dealing with two or more variables. According to Sims, the goal of the VAR analysis is to determine the interrelationship among variables in the system. The choice of this model is based on the fact that it has been applied and favoured by researchers (e.g., Hung and Wade, 2009; Atabaev and Ganiyev, 2013; Vizek, 2006; Biljanovska, and Meyer-Cirkel, 2016) as the best method for the analysis of transmission mechanisms. The VAR model in its general form is given as:

$$Y_t = \alpha + \sum_{j=1}^{p} \beta_t Y_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.6$$

Where Y_t is a vector of endogenous variables; α is (n x 1) vector of constants, β_t is (n x n) matrix of coefficients, p is the number of lag and μ_t is (n x 1) vector of error term. The error term (μ_t) is independently and identically distributed with a zero mean E (μ) = 0 and no serial correlation in individual error terms E ($e_t e'_{t-k}$) = 0 for any non-zero k. The VAR model is transformable into vector moving average (VMA) representation in order to ascertain the system's response to shocks or impulses. This sated as follows:

$$Y_t = \mu + \sum_{i=0}^{\infty} \emptyset_i \varepsilon_{t-i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.7$$

Where $\emptyset_i$ is the matrix of impulse response coefficients and ε is the mean of the process. The vector moving average representation is used to obtain the impulse response function while the variance decomposition reveals the size of unexpected change of a variable that is attributable to its own lags and innovations to other variables in the system (Ajluni, 2005). The VAR model for the study specified as follows:

$$RGDPPC_t = \alpha_0 + \sum_{i=1}^{m} \alpha_1 RGDPPC_{t-i} + \sum_{i=0}^{m} \alpha_2 UNMP_{t-i} + \sum_{i=0}^{m} \alpha_3 INF_t + \mu_{1t} \; \dots \dots 3.8$$

$$UNMP_t = \beta_0 + \sum_{i=1}^{m} \beta_1 UNMP_{t-i} + \sum_{i=0}^{m} \beta_2 RGDPPC_{t-i} + \sum_{i=0}^{m} \beta_3 INF_t + \mu_{2t} \dots \dots 3.9$$

$$INF_t = \delta_0 + \sum_{i=1}^{m} \delta_1 INF_{t-i} + \sum_{i=0}^{m} \delta_2 UNMP_t + \sum_{i=1}^{m} \delta_3 RGDPPC_t + \mu_{3t} \dots \dots \dots 3.10$$

Where α_i,β_i and δ_i are the unknown parameters. α_0,β_0 and δ_0 are the constant terms. μ_{it} denotes the stochastic error terms. M refer to the number of lags. Variables in the model remained s defined.

3.3 Description of Variables

The study utilized variables such as real gross domestic product (RGDP): which measures the total amount of goods produced in a county; inflation (INF) is the persistence rise in the general price level in the country. Unemployment (UNMP) is the total number of unemployed labour force in Nigeria.Real gross domestic product per capita is the ratio of real gross domestic product to the population. The study also uses financial development measured by the ratio of private credit to gross domestic product. Other variables in the model include real interest rate (the real cost of borrowing), government expenditure and domestic savings.

3.4 Model Justification

Objective one, two and three will be estimated using auto regressive distributed lag (ARDL) model. This is because past or lag value of economic growth affects the current economic growth of a nation. Using ARDL to capture the effects of lags of these variables on the dependent variables becomes paramount.

However, objective four will be captured using Vector Autoregressive (VAR) model. His is because of the suitability of VAR in addressing issues of impulse response. It is pertinent to note however that where there is existence of cointegration among the variables of the VAR model, the study will estimate Vector Error Correction (VEC) Model and use the result to test for impulse response.

3.5 Pre-estimation test

The study will conduct pre-estimation test such as unit root test, correlation matrix and conitegration. The type of cointegration to adopt depends on the order of integration. Where there is existence of I (0) and I (1) variables, Pesaran bound test approach will be adopted. However, if the variables are all of I (1), the study will adopt Johansen cointegration approach.

3.6 Post Estimation Test

Post estimation test such as residual diagnostic test and stability diagnostic test will be conducted. These includes serial autocorrelation (Breusch-Godfrey) LM test, Heteroscedasticity test using Breusch-Pagan-Godfrey heteroscedasticity test, normality test, CSUM test etc.

3.7 Data Source and Econometric software

The study used time series data for all variables employed. The period length ranges from 1981 to 2016. Data on all the variables of the study are sourced from Central Bank of Nigeria statistical bulletin and World Bank's Development Indicators 2015 edition. The study made use of E-views 9 econometrics software for this analysis.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DATA ANALYSIS

The results of the various tests specified in the previous chapter are presented here. It is also in this chapter that we can address the research hypothesis and test them against the alternatives.

4.1Descriptive Statistics

Table 4.1**: Descriptive statistic of variables used in the study**

	MGDP	FD	INF	UNEMPR	RIR	GDPCP	GEXP
Mean	399.3286	13.54776	19.42028	6.631404	1.133195	3993795.	63925.90
Median	393.0450	11.30000	13.19450	6.717875	2.697500	551520.8	406.1076
Maximum	1141.411	36.90000	72.72900	10.61015	25.28000	23842126	650401.3
Minimum	26.59000	5.900000	3.226000	4.275000	-43.57000	47619.70	7.584340
Std. Dev.	316.7293	6.044452	15.51549	1.156160	13.83443	6118094.	133617.9
Skewness	0.535900	1.429052	1.686361	0.703474	-0.906235	1.714780	2.337915
Kurtosis	2.326665	5.320437	4.931968	4.432900	3.688925	4.724009	7.885852
Jarque-Bera	10.14686	85.83683	95.68242	25.54046	23.81120	85.94887	289.6547
Probability	0.006261	0.000000	0.000000	0.000003	0.000007	0.000000	0.000000
Sum	60697.95	2059.260	2951.883	1007.973	172.2456	5.59E+08	9716736.
Sum Sq.	15147935	5516.846	36350.30	201.8425	28900.11	5.20E+15	2.70E+12

Dev.							
Observations	152	152	152	152	152	140	152

Source: Eviews 9 Output for Descriptive statistic of variables used in the study

Table 4.1 shows the result of descriptive statistics of the variables used in the study. It could be observed that gross domestic product per capita (GDPCP) recorded the highest mean value followed by government expenditure (GEXP), manufacturing contribution to gross domestic product (MGDP), inflation (INF) and financial development (FD). The mean value of each of these variables exceeds 10. However, unemployment rate (UNEMPR) and real interest rate (RIR) recorded mean value that is below 10. With this, RIR had the lowest mean value. Similarly, looking at the degree of spread of the variables, the study found that UNEMPR tends to cluster most around its mean followed by FD, RIR and INF. Other variables such as GDPCP, GEXP and MGDP tend to depart more from their respective mean values.

Also, RIR shows negative skewness (skewed to the left) while other variables have positive skewness (skewed to the right). Looking at the kurtosis, table 4.1 shows that UNEMPR, RIR, FD, GDPCP, GEXP and INF have kurtosis greater than 3. Thus, they are said to be leptokurtic. They have tails that asymptotically approach zero slowly than a Gaussian. These variables have data that extremely deviate from their mean. However, only MGDP has kurtosis less than 3. It is said to be platykurtic and the distribution produces less extreme deviation or outlier. The probability values of Jacque Bera were all less than 0.05 and it shows that the data is not from normal distribution. This could be that the data is from student t-distribution or any other distribution such as Laplace, Rayleigh, exponential and so on. Lastly, the number of observations was 152 which is large enough to solve the problem of loss of degrees of freedom.

4.2 Unit Root Test of the Variable

The variables of interest were subjected to unit root test in order to ensure stationarity of the series. The unit root method adopted is Phillips Peron unit root test.

Table 4.2: Result of Phillips Peron (PP) unit root test of the variables

	Level Form		First Difference		
Variables	*5% critical value*	*PP test statistics*	*5% critical value*	*PP test statistics*	*Order of integration*
MGDP	*-2.880591*	*2.318573*	*-2.880722*	*-3.655906*	*I(1)*
GEXP	*-2.880591*	*3.687755*			*I(0)*
RIR	*-2.880591*	*-3.480786*			*I(0)*
FD	*-2.880591*	*-1.923963*	*-2.880722*	*-4.760354*	*I(1)*
INF	*-2.880591*	*-2.640333*	*-2.880722*	*-4.415856*	*I(1)*
UNEMPR	*-2.880591*	*-1.990179*	*-2.880722*	*-3.929220*	*I(1)*
GDPCP	*-2.882279*	*-1.575146*	*-2.882433*	*-5.127964*	*I(1)*

Source: Eviews 9 Output for the Result of PP unit root test of the variables

Table 4.2shows the result of ADF unit root test conducted. The variables were tested using ADF and it was observed that MGDP, FD, INF, UNEMPR, GDPCP were found to be stationary in first difference while the result of RIR and GEXP were stationary in their level form. Hence, the study has a mixture of I(0) and I(1) variables which invariably explains the method of cointegration test to be adopted.

4.3 Correlation Test

In order to test for correlation between the variables, pairwise correlation test was adopted. This test compares the correlation result of each pair variables against 0.8 thresh hold proposed by Gujarati and Sangeetha (2007). A correlation value of 0.8 or above shows the presence of multicollinearity.

Table 4.3: Result of Pairwise Correlation Matrix Test

	MGDP	FD	INF	UNEMPR	RIR	GDPCP	GEXP
MGDP	1.000000						
FD	0.620294	1.000000					
INF	-0.406717	-0.424526	1.000000				
UNEMPR	-0.149910	0.197432	0.011203	1.000000			
RIR	0.399883	0.299217	-0.548070	-0.157828	1.000000		

GDPCP	0.311911	0.583399	-0.255603	0.138014	0.268006	1.000000	
GEXP	0.703052	0.416595	-0.244728	-0.332445	0.271284	-0.065015	1.000000

Source: Eviews 9 Output for the Result of Pairwise Correlation Matrix Test

In order to test for the existence of multi-collinearity in the variables, the study conducted Pair-wise correlation test. The result of this test is presented in table 4.3. The result however, indicates that none of the variables had pair -wise correlation matrix of greater or equal to 0.8. This implies that our variables are free from multi-collinearity and as such, none of the variables contains full information about the other.

4.4 Cointegration Test

It was observed from the result of unit root test that there are mixture of I(0) and I(I) variables in this study which indicates that Pesaran Bound test approach to cointegration should be used to check the existence of long run association among the variables in the model. This result is presented in table 4.4. The null hypothesis associated with this test is that no long run association exists and the decision is to reject the null hypothesis if the value of F-statistic from the bound test conducted is greater than the upper bound value of Paseran test statistic.

Table 4.4: Result of bound test (cointegration of the variables)

Null hypothesis: No long run relationship exists

Test Statistic	Value	K	Bound Test	
			Lower bound	**upper bound**
F-statistic	***4.743109***	***5***	***2.62***	***3.79***

Source: Eviews 9 Output for the Result of bound test (cointegration of the variables)

Table 4.4 shows that the value of F-statistic lies above the upper bound value of Paseran test statistic. This is an indication that the null hypothesis that there is no long run association among the variables in the model is to be rejected. Therefore, there exists long run association among the variables in model for objective one.

4.5 Model Estimation for Objective One

Model Selection based on AIC

The model selection is based on AIC information. The result of the ARDL model selection is presented in figure 4.1.

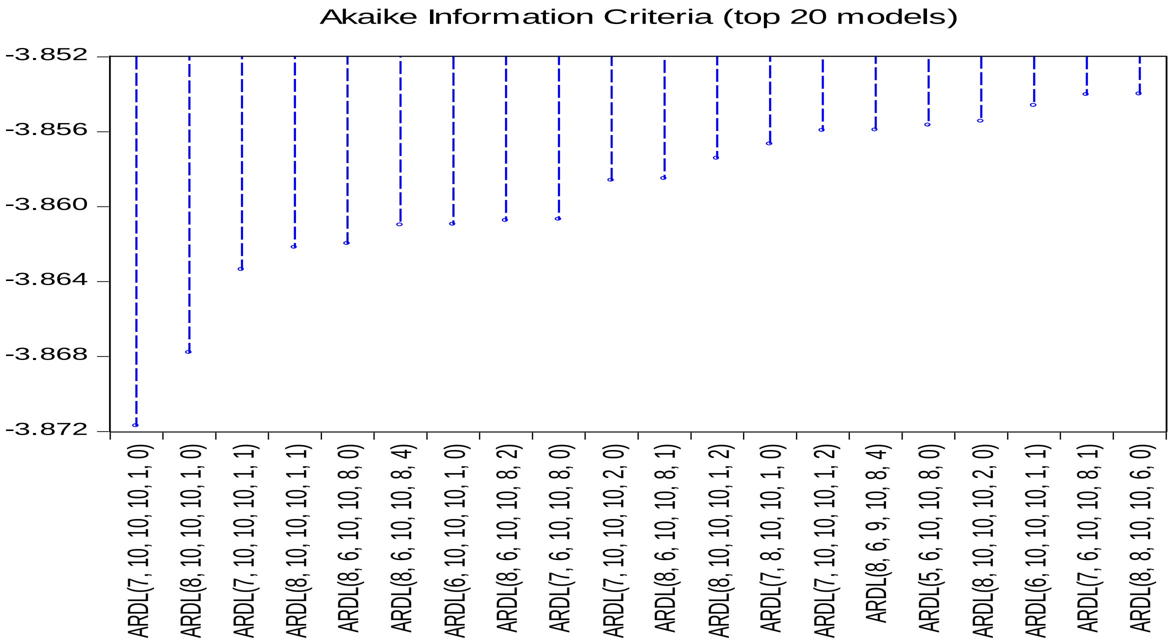

Fig 4.1 Graph of ARDL model lag selection for objective one

The Autoregressive Distributed Lag (ARDL) model selection is presented in figure 4.1. The result of the lag length selection showed that after 20 evaluations, the selected ARDL (7,10,10,10,1,0) is different from other ARDL such as ARDL (8,10,10,10,1,0) and ARDL (7,10,10,10,1,1). Therefore, ARDL (7,10,10,10,1,0) becomes the suitable model for our analysis.

The Long Run Result of Objective One

The result of cointegration conducted shows that there exist long run association among the variables. With this, the long run result of objective one is presented in table 4.5.

Table 4.5: The Long Run Result of Objective One and Two

Dependent Variable: LOG(MGDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.

INF	0.055795	0.046432	1.201646	0.2324
LOG(FD)	-0.648038	1.689070	-0.383665	0.7021
UNEMPR	-0.421836	0.419468	-1.005644	0.3171
RIR	-0.020129	0.022721	-0.885940	0.3778
LOG(GEXP)	0.405939*	0.125229	3.241565	0.0016
C	6.833547	2.682144	2.547792	0.0124

Source: Author's compilation from the result of ARDL cointegrating and long run form

R-Squared 0.999450 R-Squared Adjusted 0.999209 F-Statistic 4143.703

Prob(F-statistic) 0.000000 Durbin Watson 2.132693

Table 4.6 shows the result of the long run estimation of objective one and two. It could be observed that only government expenditure was found to be statistically significant. The study found that unemployment and inflation do not significantly impact on manufacturing. Looking at the impact of government expenditure on manufacturing, the study found that holding other variables in the model constant, one percent change in government expenditure would lead to about 0.4 percent change in manufacturing. Thus, increasing government expenditure by 10 percent would lead to about 4 percent increase in manufacturing.

Lastly, it could be observed that the R-squared indicates that about 99 percent of the variation in the model is caused by the explanatory variables. The value of the Durbin Watson (2.132693) shows that the model is free from autocorrelation.

Cointeq = LOG(MGDP) - (0.0558*INF -0.6480*LOG(FD) -0.4218*UNEMPR -0.0201*RIR + 0.4059*LOG(GEXP) + 6.8335) ------------4.1

Table 4.6: The Short Run Result of Objective One

Dependent Variable: D(LOG(MGDP))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(MGDP(-1))	0.697831*	0.079413	8.787360	0.0000
DLOG(MGDP(-2))	-0.127736	0.091165	-1.401145	0.1643
DLOG(MGDP(-3))	0.101697	0.085529	1.189024	0.2373
DLOG(MGDP(-4))	-0.382806*	0.089756	-4.264952	0.0000
DLOG(MGDP(-5))	0.235148*	0.090400	2.601191	0.0107
DLOG(MGDP(-6))	-0.110522	0.070398	-1.569955	0.1196

D(INF)	0.008464*	0.001433	5.904856	0.0000
D(INF)	-0.003942	0.002845	-1.385313	0.1691
D(INF)	-0.003433	0.002746	-1.250256	0.2142
D(INF)	-0.014944*	0.002913	-5.129538	0.0000
D(INF)	0.028247*	0.003534	7.992267	0.0000
D(INF)	-0.009859*	0.003266	-3.018815	0.0032
D(INF)	-0.005227	0.003015	-1.733554	0.0861
D(INF)	-0.001781	0.003306	-0.538760	0.5913
D(INF)	0.008046*	0.003897	2.064914	0.0416
D(INF)	-0.003959*	0.001986	-1.993681	0.0490
DLOG(FD)	0.763603*	0.095984	7.955490	0.0000
DLOG(FD(-1))	-0.510441*	0.191238	-2.669144	0.0089
DLOG(FD(-2))	-0.135559	0.183458	-0.738912	0.4617
DLOG(FD(-3))	-0.132263	0.192380	-0.687509	0.4934
DLOG(FD(-4))	0.396197	0.204430	1.938061	0.0555
DLOG(FD(-5))	-0.178839	0.175967	-1.016321	0.3120
DLOG(FD(-6))	-0.149092	0.158552	-0.940332	0.3494
DLOG(FD(-7))	-0.354720*	0.162607	-2.181456	0.0315
DLOG(FD(-8))	0.755075*	0.169771	4.447620	0.0000
DLOG(FD(-9))	-0.277062*	0.087738	-3.157821	0.0021
D(UNEMPR)	-0.112075*	0.030116	-3.721438	0.0003
D(UNEMPR(-1))	0.091364	0.050515	1.808655	0.0736
D(UNEMPR(-2))	0.049477	0.044608	1.109155	0.2701
D(UNEMPR(-3))	0.081660	0.044737	1.825342	0.0710
D(UNEMPR(-4))	-0.210245*	0.049875	-4.215434	0.0001
D(UNEMPR(-5))	0.101185*	0.043821	2.309049	0.0230
D(UNEMPR(-6))	0.012015	0.039962	0.300659	0.7643
D(UNEMPR(-7))	0.088358*	0.039609	2.230741	0.0280
D(UNEMPR(-8))	-0.192979*	0.039108	-4.934560	0.0000
D(UNEMPR(-9))	0.099649*	0.020162	4.942322	0.0000
D(RIR)	0.002135*	0.000773	2.762440	0.0069
DLOG(GEXP)	0.007103	0.004253	1.670060	0.0981
CointEq(-1)	-0.017498*	0.008341	-2.097839	0.0385

Source: Author's compilation from the result of ARDL cointegrating and long run form

R-Squared 0.999450 R-Squared Adjusted 0.999209 F-Statistic 4143.703

Prob(F-statistic) 0.000000 Durbin Watson 2.132693

Table 4.6 shows the short run impact of inflation and unemployment on manufacturing. It could be observed that most of the variables assumed their correct a priori sign except inflation which was observed to be positive. Also, all the variables in the model were found to be statistically significant in explaining manufacturing output in the short run.

On the basis of the ceteris paribus interpretation of the variables in the model, the study found that holding other variable in the model constant, 1 percent change in the previous year manufacturing output would lead to about 0.6 percent change in the present value of manufacturing. Also, inflation which is the persistent rise in the general price level was found to exert positive and statistically significant impact on manufacturing. The study found that holding other variables in the model constant, one percent change in inflation would lead to about 0.01 percent change in the value of manufacturing. The implication of the positive impact of inflation on manufacturing value could be that manufacturers make use of their old inventories to increase productivity in order to take the advantage of the rise in the general price level.

Also, financial development was found to impact on positively on manufacturing output. The study found that holding other variables in the model constant, a change in financial development would lead to about 0.7 percent change in manufacturing contribution to gross domestic product. With this, if the financial development should increase by 10 percent, manufacturing contribution to gross domestic product would increase by 7 percent. Financial development therefore crowds in manufacturing contribution to gross domestic product.

Similarly, the rate of unemployment was found to exert negative and statistically significant impact on manufacturing contribution to gross domestic product. The study found that holding other variables in the model constant, 1 percent change in unemployment wold lead to about 0.11 percent change in manufacturing value. It therefore shows that 10 percent increase in unemployment would lead to about 1.1 percent decrease in manufacturing contribution to gross domestic product. Thus, unemployment crowds out manufacturing contribution to gross domestic product.

The real interest rate which measures the real cost of borrowing was found to exert positive and statistically significant impact on manufacturing. The study found that holding other varaibles in the model constant, 1 percent change in real interest rate would lead to about 0.002 percent change in manufacturing. With this, increasing the real cost of borrowing by 100 percent would lead to about 0.2 percent increase in manufacturing. This therefore shows that the effect of capital mobility is not effective in Nigeria. Most investors are scared even when the interest rate is above the world interest rate.

More so, the speed of adjustment of the model to long run equilibrium was found to be negative and statistically significant. This was in line with the a priori expectation. The study found that about 100 percent of the fluctuations in the short run get adjusted toward long run equilibrium at the speed of 1.7 percent quarterly. This however would take a very long time for the system to get adjusted fully towards long run equilibrium.

Lastly, it could be observed that the R-squared indicates that about 99 percent of the variation in the model is caused by the explanatory variables. The value of the Durbin Watson (2.132693) shows that the model is free from autocorrelation.

Serial Correlation LM

The study examined the presence of serial correlation in the residual of the estimated model using Breusch-Godfrey LM test. The null hypothesis for this test is that there is no serial correlation in the residual. The decision rule is to reject the null hypothesis if the probability Chi-square of the observed residual squared is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level. The result of this test is presented in table 4.7.

Table 4.7: Result of Breusch-Godfrey Serial Correlation LM Test

F-statistic	2.751310	Prob. F(2,102)	0.0689
Obs*R-squared	7.698049	Prob. Chi-Square(2)	0.0813

Table 4.7 shows the result of Breusch-Godfrey serial correlation LM test. It could be observed that the Prob. Chi-Square (2) of Obs*R-squared (0.0813) is greater than 0.05. This implies that the null hypothesis cannot be rejected. Therefore, not rejecting the null hypothesis is an indication that the residual of the model presented in table 4.6 does not suffer serial correlation.

Heteroscedasticity Test

In order to test for heteroscedasticity in the residual, the study conducted Breusch-Pagan-Godfrey heteroscedasticity test. The null hypothesis for this test is that the variance of the residual is homoscedastic. The decision is to reject the null hypothesis if the probability Chi-square of the observed residual squared is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level. The result of this test is presented in table 4.8.

Table 4.8: Result of Breusch-Pagan-Godfrey heteroscedasticity Test

F-statistic	2.223777	Prob. F(43, 98)	0.5106
Obs*R-squared	70.12816	Prob. Chi-Square(43)	0.1256
Scaled explained SS	94.65770	Prob. Chi-Square(98)	0.1123

Table 4.8 shows the result of Breusch-Pagan-Godfrey heteroscedasticity test. It could be observed that the Prob. Chi-Square (0) of Obs*R-squared is more than 0.05. This implies that the null hypothesis that the variance of the residual is homoscedastic cannot be rejected at 5 percent.

Stability Test

The study examined the stability of estimated model using CUSUM test. The null hypothesis for this test is that the model is dynamically stable and it is to be rejected if the trend line lies outside the boundary lines. Otherwise, the model is dynamically stable. This is presented in figure 4.2.

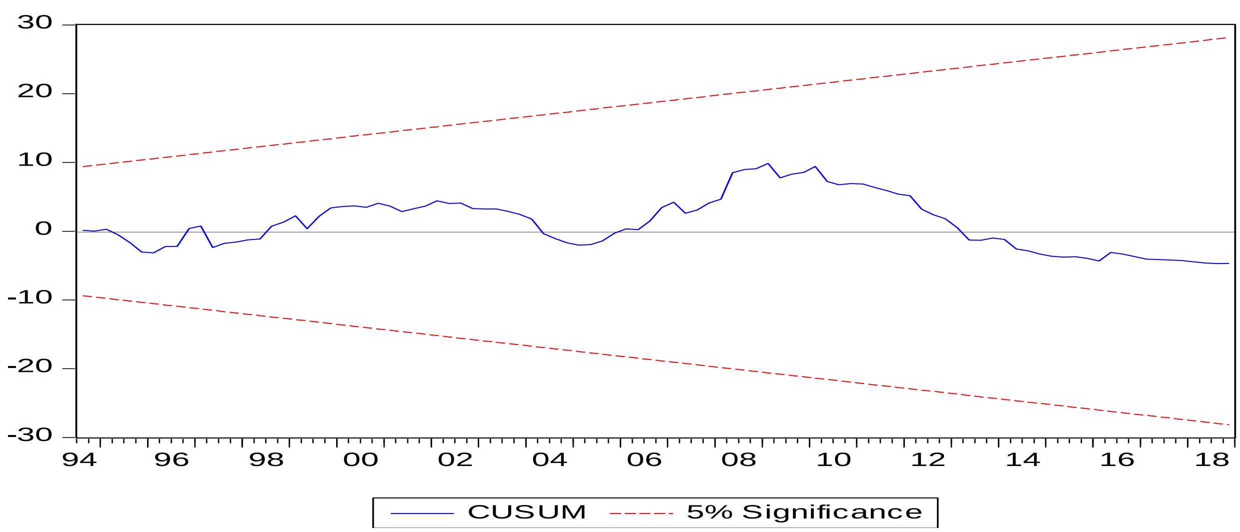

Figure 4.2 shows the result of stability diagnostic test using CUSUM test. The result shows that the trend line lies between the boundary lines indicating that the null hypothesis cannot be rejected. This implies that the model is dynamically stable.

Ramsey Reset Test

This test is used to ensure that the model is correctly specified. The null hypothesis for this test is that the model is correctly specified. The null hypothesis is to be rejected if the probability value of F-statistic is less than 0.05, otherwise the null hypothesis is not to be rejected. This test is presented in table 4.9

Table 4.9: Result of Ramsey Reset Test

	Value	Df	Probability
t-statistic	1.054377	97	0.2943
F-statistic	1.111711	(1, 97)	0.2943

Table 4.9 shows the result of Ramsey Reset Test. It could be observed that the probability value of F-statistic (0.2943) is greater than 0.05. This shows that the null hypothesis is not to be rejected at 5 percent level. Thus, the model is correctly specified.

4.6 Model Estimation for Objective Two

Model Selection based on AIC

The model selection is based on AIC information. The result of the ARDL model selection is presented in figure 4.3.

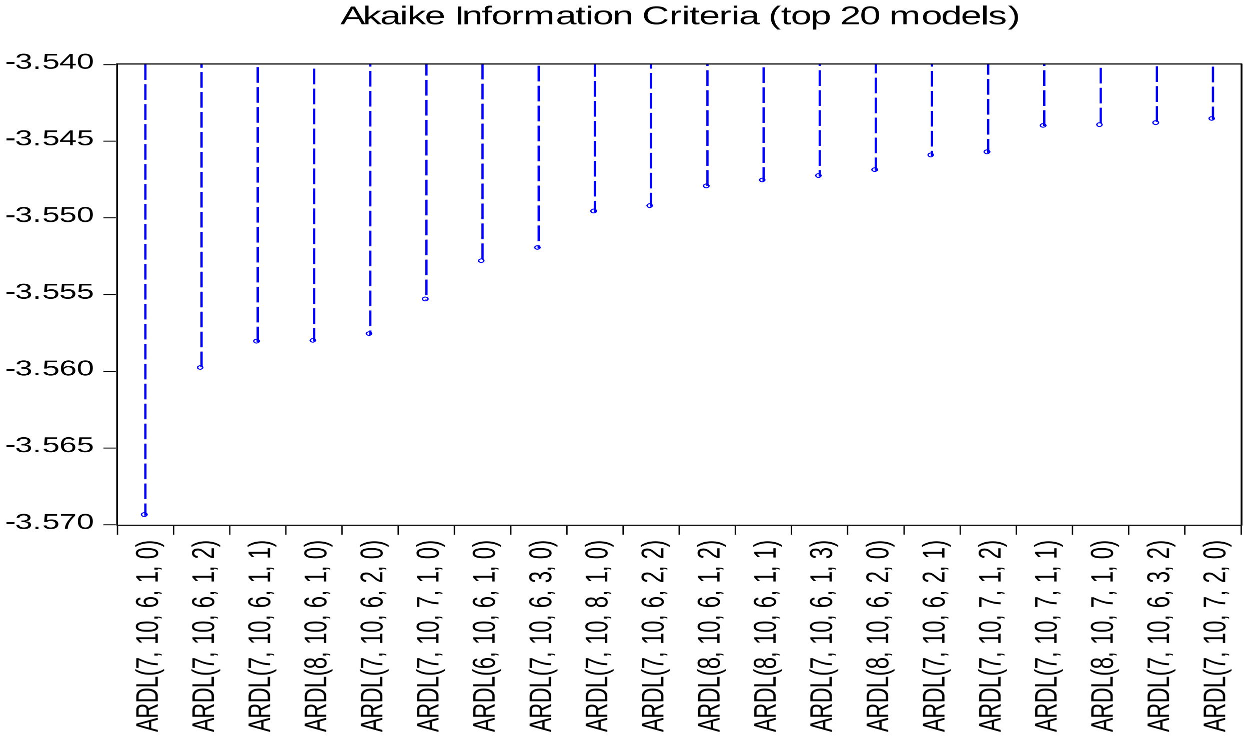

Fig 4.3 Graph of ARDL model lag selection for objective one

The Autoregressive Distributed Lag (ARDL) model selection is presented in figure 4.3. The result of the lag length selection showed that after 20 evaluations, the selected ARDL (7,10,6,1,0) is different from other ARDL such as ARDL (7,10,6,1,2) and ARDL (7,10,6,1,1). Therefore, ARDL (7,10,6,1,0) becomes the suitable model for our analysis.

The Long Run Result of Objective Three

The result of cointegration conducted shows that there exist long run association among the variables. With this, the long run result of objective one is presented in table 4.10.

Table 4.10: The Long Run Result of Objective Three

Dependent Variable: LOG(MGDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(FD)	-2.241277*	0.806341	-2.779563	0.0064
INF*UNEMPR	0.003416	0.003281	1.041195	0.3000

RIR	-0.041676	0.022048	-1.890221	0.0613
LOG(GEXP)	0.500202*	0.087721	5.702222	0.0000
C	7.956114	1.754008	4.535963	0.0000

Source: Author's compilation from the result of ARDL cointegrating and long run form

R-Squared 0.999081 R-Squared Adjusted 0.998854 F-Statistic 4388.834

Prob(F-statistic) 0.000000 Durbin Watson 1.979932

Table 4.10 shows the result of the long run estimation of the interaction of inflation and unemployment rate. This interaction is vital especially in Nigeria economy where inflation and unemployment affect the country at the same time. The study found that when inflation and unemployment were interacted, the behaviour of most of the variables in the model changed. Financial development which was formerly positive and statistically significant was found to be negative. It is an indication that under inflation and unemployment, financial development crowds out manufacturing contribution to gross domestic product. The study found that holding other variables int the model constant, 1 percent change in financial development would lead to about 2.2 percent decrease in manufacturing contribution to gross domestic product. This shows that financial development is futile during the period of inflation and unemployment.

Looking at the impact of impact of government expenditure on manufacturing contribution to gross domestic product, the study found that holding other variables in the model constant, 1 percent change in government expenditure would lead to about 0.5 percent change in manufacturing contribution to gross domestic product. This is not surprising as increase in government expenditure geared towards manufacturing would boost the productivity of manufacturing output and hence its contribution to gross domestic product.

The cointegrating equation is shown in equation 4.2

Cointeq = LOG(MGDP) - (-2.2413*LOG(FD) + 0.0034*INF*UNEMPR -0.0417 *RIR + 0.5002*LOG(GEXP) + 7.9561) ------------------------4.2

Table 4.11: The Short Run Result of Objective Two

Dependent Variable: D(LOG(MGDP))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(MGDP(-1))	0.669819*	0.080354	8.335811	0.0000

DLOG(MGDP(-2))	-0.262444*	0.093131	-2.817997	0.0057
DLOG(MGDP(-3))	0.212341*	0.089861	2.363007	0.0198
DLOG(MGDP(-4))	-0.415459*	0.094095	-4.415306	0.0000
DLOG(MGDP(-5))	0.244891	0.096354	2.541566	0.0124
DLOG(MGDP(-6))	-0.151702	0.080907	-1.875017	0.0634
DLOG(FD)	0.601957*	0.107827	5.582600	0.0000
DLOG(FD(-1))	-0.427505*	0.208749	-2.047940	0.0429
DLOG(FD(-2))	-0.041008	0.202023	-0.202988	0.8395
DLOG(FD(-3))	-0.132070	0.206405	-0.639860	0.5236
DLOG(FD(-4))	0.257618	0.211693	1.216946	0.2262
DLOG(FD(-5))	-0.142494	0.202218	-0.704654	0.4825
DLOG(FD(-6))	-0.130424	0.189862	-0.686939	0.4935
DLOG(FD(-7))	-0.349258	0.192217	-1.816995	0.0719
DLOG(FD(-8))	0.795428*	0.196455	4.048908	0.0001
DLOG(FD(-9))	-0.275278*	0.100908	-2.728003	0.0074
D(INF * UNEMPR)	-0.000633*	0.000208	-3.050297	0.0028
D(INF * UNEMPR(-1))	-0.000253	0.000413	-0.612946	0.5411
D(INF * UNEMPR(-2))	-0.000047	0.000405	-0.115063	0.9086
D(INF * UNEMPR(-3))	-0.001219*	0.000410	-2.970984	0.0036
D(INF * UNEMPR(-4))	0.001918*	0.000402	4.774128	0.0000
D(INF * UNEMPR(-5))	-0.000816*	0.000209	-3.904418	0.0002
D(RIR)	0.002217*	0.000796	2.785825	0.0063
DLOG(GEXP)	0.012025*	0.004020	2.991081	0.0034
CointEq(-1)	-0.024041*	0.009210	-2.610177	0.0103

Source: Author's compilation from the result of ARDL cointegrating and long run form

R-Squared 0.999081 R-Squared Adjusted 0.998854 F-Statistic 4388.834

Prob(F-statistic) 0.000000 Durbin Watson 1.979932

Table 4.11 shows the sort run impact of the interaction of inflation with unemployment on manufacturing output. It could be observed that all the variables assumed their correct a priori sign. It could be observed that financial development exerts positive and statistically significant impact on manufacturing contribution to gross domestic product. the study found that holding other variables in the model constant, 1 percent change in financial development would lead to about 0.6 percent change in manufacturing contribution to gross domestic product.

However, interacting inflation with unemployment was found to exert positive and statistically significant impact on manufacturing contribution to gross domestic product in the short run. The study further shows that holding other variables in the model constant, 1 percent change in the effect of inflation through unemployment would lead to about 0.06 percent change in manufacturing contribution to gross domestic product. This however is different from separate results of inflation and unemployment. With the interaction of inflation and unemployment, 10 percent increase in the interaction variables would lead to 0.6 percent decrease in manufacturing contribution to gross domestic product.

Similarly, real interest rate which measures the real cost of borrowing was found to exert positive and statistically significant impact on manufacturing contribution to gross domestic product. the study found that holding other variables in the model constant, 1 percent change in real interest rate would lead to about 0.002 percent increase in manufacturing contribution to gross domestic product. Again, this is not surprising as capital would always flow to take the advantage of increase in interest rate. Also, government expenditure was found to exert positive and statistically significant impact on manufacturing contribution to gross domestic product. The study found that holding other variables in the model constant, 1 percent change in government expenditure would lead to about 0.01 percent change in manufacturing contribution to gross domestic product. In that, increasing government expenditure by 10 percent would lead to about 0.1 percent increase in manufacturing contribution to gross domestic product.

Looking at the speed of adjustment of the short run model towards long run equilibrium, the study found that this was negative and statistically significant conforming with the a priori expectation. The study found that the fluctuation in the system adjust to long run equilibrium at the speed of 2.4 percent quarterly. This means that annually, about 9.6 percent of the fluctuations get corrected towards long run equilibrium.

Lastly, it could be observed that the R-squared indicates that about 99 percent of the variation in the model is caused by the explanatory variables. The value of the Durbin Watson (1.9799) shows that the model is free from autocorrelation.

Serial Correlation LM

The study examined the presence of serial correlation in the residual of the estimated model using Breusch-Godfrey LM test. The null hypothesis for this test is that there is no serial correlation in the residual. The decision rule is to reject the null hypothesis if the probability Chi-square of the observed residual squared is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level. The result of this test is presented in table 4.12.

Table 4.12: Result of Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.058309	Prob. F (2,111)	0.9434
Obs*R-squared	0.149030	Prob. Chi-Square (2)	0.9282

Table 4.12 shows the result of Breusch-Godfrey serial correlation LM test. It could be observed that the Prob. Chi-Square (2) of Obs*R-squared (0.9282) is greater than 0.05. This implies that the null hypothesis cannot be rejected. Therefore, not rejecting the null hypothesis is an indication that the residual of the model presented in table 4.11 does not suffer serial correlation.

Heteroscedasticity Test

In order to test for heteroscedasticity in the residual, the study conducted Breusch-Pagan-Godfrey heteroscedasticity test. The null hypothesis for this test is that the variance of the residual is homoscedastic. The decision is to reject the null hypothesis if the probability Chi-square of the observed residual squared is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level. The result of this test is presented in table 4.13.

Table 4.13: Result of Breusch-Pagan-Godfrey heteroscedasticity Test

F-statistic	3.118424	Prob. F(28, 113)	0.4352
Obs*R-squared	61.89651	Prob. Chi-Square(28)	0.1342
Scaled explained SS	207.0432	Prob. Chi-Square(28)	0.1230

Table 4.13 shows the result of Breusch-Pagan-Godfrey heteroscedasticity test. It could be observed that the Prob. Chi-Square (0) of Obs*R-squared is more than 0.05. This implies that the null hypothesis that the variance of the residual is homoscedastic cannot be rejected at 5 percent.

Stability Test

The study examined the stability of estimated model using CUSUM test. The null hypothesis for this test is that the model is dynamically stable and it is to be rejected if the trend line lies outside the boundary lines. Otherwise, the model is dynamically stable. This is presented in figure 4.2.

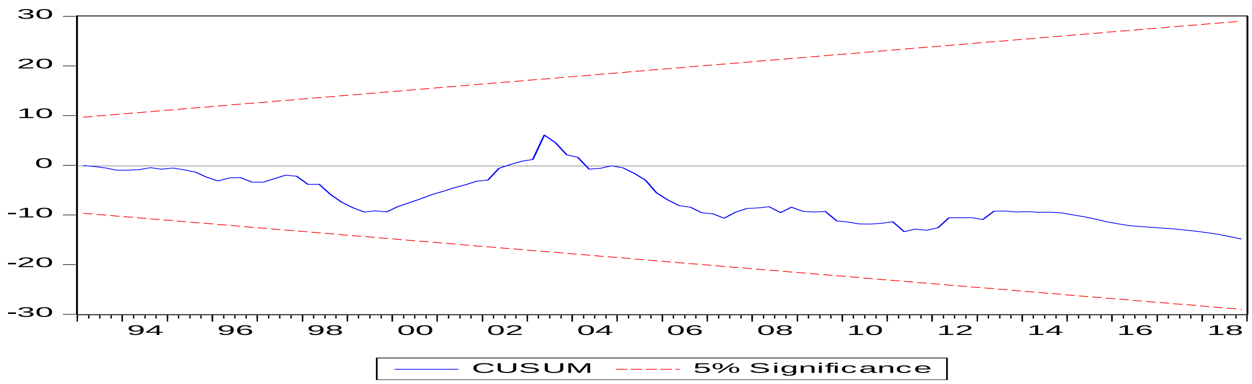

Figure 4.4 shows the result of stability diagnostic test using CUSUM test. The result shows that the trend line lies between the boundary lines indicating that the null hypothesis cannot be rejected. This implies that the model is dynamically stable.

Ramsey Reset Test

This test is used to ensure that the model is correctly specified. The null hypothesis for this test is that the model is correctly specified. The null hypothesis is to be rejected if the probability value of F-statistic is less than 0.05, otherwise the null hypothesis is not to be rejected. This test is presented in table 4.14

Table 4.14: Result of Ramsey Reset Test

	Value	Df	Probability
t-statistic	1.722424	112	0.0878
F-statistic	2.966744	(1, 112)	0.08878

Table 4.14 shows the result of Ramsey Reset Test. It could be observed that the probability value of F-statistic (0.08878) is greater than 0.05. This shows that the null hypothesis is not to be rejected at 5 percent level. Thus, the model is correctly specified.

4.7 Model Estimation for Objective Four

VAR Lag Length Selection

Table 4.15: VAR lag length selection based on AIC

Lag	LogL	LR	FPE	AIC	SC	HQ

0	-2992.464	NA	1.03e+16	45.38582	45.45134	45.41245
1	-2442.721	1066.168	2.85e+12	37.19275	37.45482	37.29924
2	-2323.724	225.3737	5.39e+11	35.52612	35.98475*	35.71249*
3	-2319.760	7.328446	5.82e+11	35.60242	36.25760	35.86865
4	-2315.185	8.248315	6.23e+11	35.66947	36.52120	36.01557
5	-2300.010	26.67108	5.68e+11	35.57591	36.62420	36.00189
6	-2280.639	33.16540*	4.87e+11*	35.41877*	36.66362	35.92462
7	-2278.514	3.541324	5.42e+11	35.52294	36.96434	36.10866
8	-2270.540	12.92736	5.53e+11	35.53849	37.17645	36.20408

* 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

Table 4.15 shows the VAR model lag length selection. It could be observed that AIC favoured lag 6. This implies estimating VAR model with maximum lag length of 6 lags.

VAR Stability Test

The stability test of the selected VAR model is shown in figure 4.5

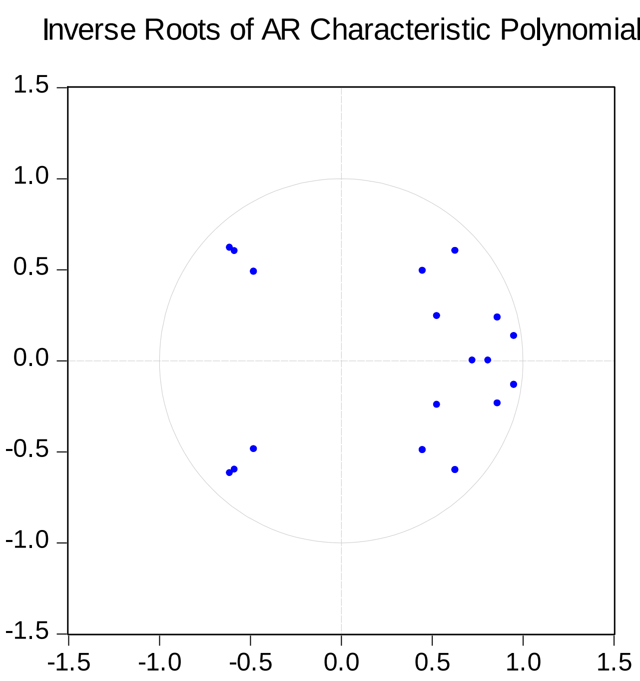

Fig4.5: Stability test of selected VAR

Figure 4.5 shows the stability test of selected VAR model. It could be observed that none of the points falls outside the unit circle. This means that the selected VAR model stable.

Impulse Response Function

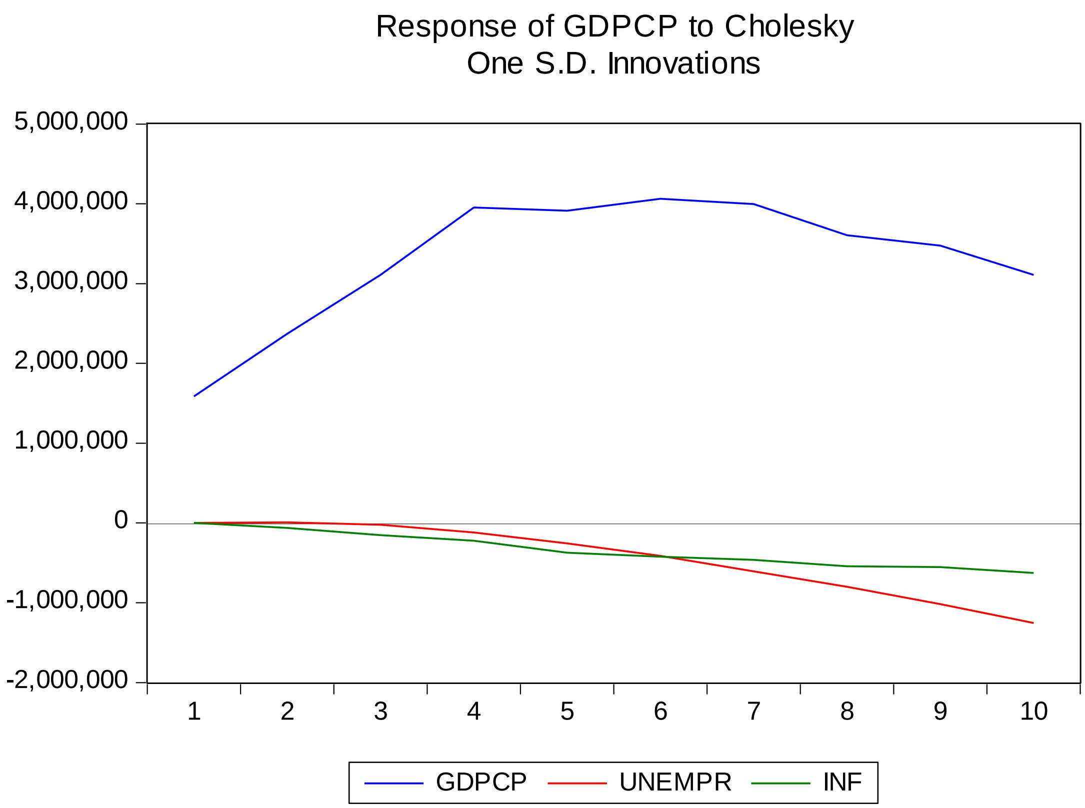

Figure 4.6: Impulse Response Graph

Figure 4.6 shows the response of gross domestic product per capita to own shock, unemployment shock and inflation shock. It could be observed that the trend line of gross domestic product per capita lies above the zero line all through the periods. This indicates that gross domestic product per capita response positively to own shock. This is not surprising as shocks that leads to increase in gross domestic product per capita would lead to further increase in gross domestic product per capita. However, looking at the response of gross domestic product per capita to unemployment shock, the study found that the trend line for unemployment lies below the zero line throughout the periods. This means that gross domestic product response negatively to unemployment shocks. Also, this negative response of gross domestic product per capita to unemployment in Nigeria gets worst towards the long run period. This is not surprising as ordinarily one would expect gross domestic product to response negatively to shocks on unemployment. Thus, increase in unemployment would lead to decrease in gross domestic product per capita.

Lastly, the study observed that gross domestic product per capita response negatively to shocks on inflation. This gets worst towards the long run period. Inflation therefore is not suitable for the country.

Evaluation of Research Hypotheses

Hypothesis 1 (H_{01}): Inflation does not exert significant impact on manufacturing output in Nigeria.

Decision Rule: Reject the null hypothesis if the probability value of inflation is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level of significant.

Conclusion: The result presented in table 4.6 shows probability value of inflation to be less than 0.05. This implies rejection of the null hypothesis. Rejection of the null hypothesis further shows that inflation on it own has significant impact on manufacturing output in the short run only.

Hypothesis 2 (H_{01}): Unemployment has no significant impact on manufacturing output in Nigeria.

Decision Rule: Reject the null hypothesis if the probability value of Unemployment is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level of significant.

Conclusion: The result presented in table 4.6 shows probability value (prob = 0.0003) of unemployment to be less than 0.05. This implies that the null hypothesis is to be rejected in the short run. However, in the long run as shown in table 4.5, the probability value (prob = 0.3171) of unemployment is greater than 0.05. This therefore shows that unemployment has no significant impact on manufacturing output in the long run.

Hypothesis 3 (H_{01}): Inflation through unemployment has no significant impact on manufacturing output in Nigeria.

Decision Rule: Reject the null hypothesis if the probability value of the interaction of inflation with unemployment is less than 0.05.

Conclusion: The result presented in tables 4.10 (long run) and 4.11 (short run) show probability values (0.3000) and 0.0028) of the interaction of inflation and unemployment to be less than 0.05 in the short run and greater than 0.05 in the long run. This implies that the null hypothesis is to be rejected only in the short run. Rejection of the null hypothesis further shows that inflation impact on manufacturing output through unemployment in the short run only.

Hypothesis 4 (H_{01}):per capita output does not response to Unemployment in Nigeria.

Decision Rule: Reject the null hypothesis if the response line of gross domestic product per capita lie outside the zero line. Otherwise, the null hypothesis should not be rejected at one standard deviation.

Conclusion: The result presented in figure 4.6 shows that the trend line for the response of gross domestic product per capita lies outside the zero line. This implies that the rejection of the null hypothesis that gross domestic product per capita does not response to unemployment shocks in both the short run and the long run periods.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of findings

The study set to investigate the effects of inflation and unemployment on the manufacturing sector in Nigeria. In the course of analysis, the study investigated inflation and unemployment separately and later interacted them to find out whether inflation work through unemployment to impact on manufacturing output. Also, the study examined the response of gross domestic product per capita to unemployment and inflation shocks. The core variables included in the models include the real gross domestic product per capita, unemployment rate, inflation and manufacturing contribution to gross domestic product. Other control variables are financial development (FD), government expenditure (GEXP) and real interest rate (RIR). The study adopted an autoregressive distributed lag model to capture objectives one, two and three. However, VAR impulse response was used to address objective four. From the result, the study established that inflation impact positively on manufacturing contribution to gross domestic product in the short run. This finding was somewhat similar to the findings of Kareem (2015) and Mensah et al (2016) who found that inflation has positive influence on manufacturing output. However, this findings is contrary to the findings of Modebe and Ezaku (2016) and Mawufemor et al (2016) who found that inflation has negative but statistically significant impact on manufacturing output in Nigeria.

Also, the study shows that unemployment exerts negative but statistically significant impact on manufacturing output in the short run. This however was contrary to the findings of Nwezi et al (2004) who found positive relationship between structural youth unemployment and manufacturing output.

An important departure of this study from previous study is rooted on the interaction of inflation with unemployment. The study found that inflation impact on manufacturing output through unemployment. Also, gross domestic product was found to response to inflation and unemployment shocks.

5.2 Conclusion

The study examined the effects of inflation and unemployment on manufacturing output in Nigeria. In order to explore on this successfully, the study marshalled out four objectives;to examine the impact of inflation on manufacturing output; to determine the impact of unemployment on manufacturing output; to investigate the impact of inflation on manufacturing output through unemployment and to examine the response of gross domestic product per capita to inflation and unemployment shocks in Nigeria. The stationarity of the variables was determined using Phillips Peron (PP). The study also tested for the existence of cointegration of variables using ARDL bound test approach proposed by Pesaran and Shin (2001). Autoregressive Distributed Lag approach was used to address objectives one, two and three while VAR impulse response was used to check the response of gross domestic product per capita to inflation and unemployment shocks. The use of ARDL to address these objectives was due to the fact that the past value of the explanatory variable has the tendency of affecting its current value due to spillover effect.

The result of model one revealed that inflation and unemployment impact on manufacturing output in the short run. Also, the result of model for objective three shows that inflation impact on manufacturing output through unemployment in the short run. However, the result of impulse response of gross domestic product per capita to inflation and unemployment shocks was found to be negative and significant.

5.3 Policy Implications of the Findings and Policy Recommendation

The findings of this study have policy implications in the economy. This could be viewed in terms of:

1. Inflation impact manufacturing output through unemployment. So, in order to increase manufacturing output, policy makers should address the problem of inflation and unemployment.
2. Any policy measure to increase financial development during unemployment and inflation would rather decrease manufacturing contribution to gross domestic product per capita.

5.4 Limitations of the Study

This study made effort to examine the best approach through which inflation and unemployment affect manufacturing output in Nigeria. However, in the process of producing robust result, the study faced a number of limitations. This include data sourcing problem. The fact that the data used was sourced from different area is a big drawback on the study since the data generating process of these sources differ considerably.

5.5 Research Recommendation for Further Studies

The study was constructed using secondary data set gotten from central bank of Nigeria and Index mundi. It

(i) Researchers could consider researching on the impact of inflation and unemployment on the living standard of household.

(ii) Comparative analysis of this study would help to buttress on the findings for better decision.

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APPENDIX

UNIT ROOT TEST

Null Hypothesis: MGDP has a unit root
Exogenous: Constant
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		2.318573	0.0000
Test critical values:	1% level	-3.473967	
	5% level	-2.880591	
	10% level	-2.577008	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	83.48459
HAC corrected variance (Bartlett kernel)	390.6202

Phillips-Perron Test Equation
Dependent Variable: D(MGDP)
Method: Least Squares
Date: 11/03/19 Time: 07:13
Sample (adjusted): 1981Q2 2018Q4
Included observations: 151 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MGDP(-1)	0.013675	0.002408	5.679622	0.0000
C	1.989190	1.209198	1.645049	0.1021

R-squared	0.177968	Mean dependent var	7.382921
Adjusted R-squared	0.172451	S.D. dependent var	10.11117
S.E. of regression	9.198108	Akaike info criterion	7.289029
Sum squared resid	12606.17	Schwarz criterion	7.328993
Log likelihood	-548.3217	Hannan-Quinn criter.	7.305265
F-statistic	32.25811	Durbin-Watson stat	0.416073
Prob(F-statistic)	0.000000		

Null Hypothesis: D(MGDP) has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.655906	0.0057
Test critical values:	1% level	-3.474265	
	5% level	-2.880722	
	10% level	-2.577077	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	31.66195
HAC corrected variance (Bartlett kernel)	32.11704

Phillips-Perron Test Equation
Dependent Variable: D(MGDP,2)
Method: Least Squares
Date: 11/03/19 Time: 07:13
Sample (adjusted): 1981Q3 2018Q4
Included observations: 150 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MGDP(-1))	-0.166926	0.045949	-3.632885	0.0004
C	1.337764	0.571497	2.340808	0.0206

R-squared	0.081874	Mean dependent var	0.118303
Adjusted R-squared	0.075670	S.D. dependent var	5.892099
S.E. of regression	5.664787	Akaike info criterion	6.319659
Sum squared resid	4749.292	Schwarz criterion	6.359801
Log likelihood	-471.9744	Hannan-Quinn criter.	6.335968
F-statistic	13.19785	Durbin-Watson stat	2.054373
Prob(F-statistic)	0.000386		

Null Hypothesis: FD has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.923963	0.3206
Test critical values:	1% level	-3.473967	
	5% level	-2.880591	
	10% level	-2.577008	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.053209
HAC corrected variance (Bartlett kernel)	3.416636

Phillips-Perron Test Equation
Dependent Variable: D(FD)
Method: Least Squares
Date: 11/03/19 Time: 07:14
Sample (adjusted): 1981Q2 2018Q4

Included observations: 151 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FD(-1)	-0.015627	0.013920	-1.122639	0.2634
C	0.259685	0.206233	1.259185	0.2099

R-squared	0.008388	Mean dependent var	0.048273
Adjusted R-squared	0.001732	S.D. dependent var	1.034020
S.E. of regression	1.033124	Akaike info criterion	2.916209
Sum squared resid	159.0345	Schwarz criterion	2.956173
Log likelihood	-218.1738	Hannan-Quinn criter.	2.932444
F-statistic	1.260319	Durbin-Watson stat	0.491214
Prob(F-statistic)	0.263397		

Null Hypothesis: D(FD) has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.760354	0.0001
Test critical values:	1% level	-3.474265	
	5% level	-2.880722	
	10% level	-2.577077	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.463276
HAC corrected variance (Bartlett kernel)	0.513336

Phillips-Perron Test Equation
Dependent Variable: D(FD,2)
Method: Least Squares
Date: 11/03/19 Time: 07:14
Sample (adjusted): 1981Q3 2018Q4
Included observations: 150 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FD(-1))	-0.247583	0.054112	-4.575346	0.0000
C	0.008954	0.056012	0.159854	0.8732

R-squared	0.123917	Mean dependent var	-0.003267
Adjusted R-squared	0.117998	S.D. dependent var	0.729625
S.E. of regression	0.685227	Akaike info criterion	2.095112
Sum squared resid	69.49141	Schwarz criterion	2.135253
Log likelihood	-155.1334	Hannan-Quinn criter.	2.111420
F-statistic	20.93379	Durbin-Watson stat	1.815123
Prob(F-statistic)	0.000010		

Null Hypothesis: INF has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.640333	0.0872
Test critical values:	1% level	-3.473967	
	5% level	-2.880591	
	10% level	-2.577008	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	14.37001
HAC corrected variance (Bartlett kernel)	44.35978

Phillips-Perron Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 11/03/19 Time: 07:15
Sample (adjusted): 1981Q2 2018Q4
Included observations: 151 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.030141	0.020019	-1.505578	0.1343
C	0.601567	0.497207	1.209894	0.2282

R-squared	0.014985	Mean dependent var	0.016962
Adjusted R-squared	0.008374	S.D. dependent var	3.832216
S.E. of regression	3.816136	Akaike info criterion	5.529511
Sum squared resid	2169.872	Schwarz criterion	5.569475
Log likelihood	-415.4781	Hannan-Quinn criter.	5.545746
F-statistic	2.266766	Durbin-Watson stat	0.507125
Prob(F-statistic)	0.134292		

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.415856	0.0004
Test critical values:	1% level	-3.474265	
	5% level	-2.880722	
	10% level	-2.577077	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	6.558998
HAC corrected variance (Bartlett kernel)	5.389383

Phillips-Perron Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 11/03/19 Time: 07:15
Sample (adjusted): 1981Q3 2018Q4
Included observations: 150 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-0.260067	0.054950	-4.732810	0.0000
C	0.034606	0.210518	0.164383	0.8697

R-squared	0.131453	Mean dependent var	0.032172
Adjusted R-squared	0.125584	S.D. dependent var	2.757240
S.E. of regression	2.578300	Akaike info criterion	4.745382
Sum squared resid	983.8497	Schwarz criterion	4.785523
Log likelihood	-353.9036	Hannan-Quinn criter.	4.761690
F-statistic	22.39949	Durbin-Watson stat	1.781920
Prob(F-statistic)	0.000005		

Null Hypothesis: RIR has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.480786	0.0098
Test critical values:	1% level	-3.473967	
	5% level	-2.880591	
	10% level	-2.577008	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	31.12458
HAC corrected variance (Bartlett kernel)	61.09846

Phillips-Perron Test Equation
Dependent Variable: D(RIR)
Method: Least Squares
Date: 11/03/19 Time: 07:16
Sample (adjusted): 1981Q2 2018Q4
Included observations: 151 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RIR(-1)	-0.082301	0.033190	-2.479728	0.0143
C	0.252851	0.458311	0.551703	0.5820

R-squared	0.039633	Mean dependent var	0.168440
Adjusted R-squared	0.033188	S.D. dependent var	5.711840
S.E. of regression	5.616259	Akaike info criterion	6.302365
Sum squared resid	4699.812	Schwarz criterion	6.342329
Log likelihood	-473.8286	Hannan-Quinn criter.	6.318600
F-statistic	6.149049	Durbin-Watson stat	0.710222
Prob(F-statistic)	0.014262		

Null Hypothesis: GEXP has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		3.687755	0.0000
Test critical values:	1% level	-3.473967	
	5% level	-2.880591	
	10% level	-2.577008	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	8.85E+08
HAC corrected variance (Bartlett kernel)	5.20E+08

Phillips-Perron Test Equation
Dependent Variable: D(GEXP)
Method: Least Squares
Date: 11/03/19 Time: 07:16
Sample (adjusted): 1981Q2 2018Q4
Included observations: 151 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GEXP(-1)	0.043425	0.019536	2.222790	0.0277
C	1699.946	2704.590	0.628541	0.5306

R-squared	0.032095	Mean dependent var	4307.243
Adjusted R-squared	0.025599	S.D. dependent var	30337.04
S.E. of regression	29946.22	Akaike info criterion	23.46535
Sum squared resid	1.34E+11	Schwarz criterion	23.50531
Log likelihood	-1769.634	Hannan-Quinn criter.	23.48159
F-statistic	4.940797	Durbin-Watson stat	2.673896
Prob(F-statistic)	0.027736		

Null Hypothesis: UNEMPR has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.990179	0.2910
Test critical values:	1% level	-3.473967	
	5% level	-2.880591	
	10% level	-2.577008	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.087368
HAC corrected variance (Bartlett kernel)	0.300114

Phillips-Perron Test Equation
Dependent Variable: D(UNEMPR)
Method: Least Squares
Date: 11/03/19 Time: 07:17
Sample (adjusted): 1981Q2 2018Q4
Included observations: 151 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMPR(-1)	0.006480	0.021823	0.296934	0.7669
C	-0.020218	0.146165	-0.138322	0.8902

R-squared	0.000591	Mean dependent var	0.022584
Adjusted R-squared	-0.006116	S.D. dependent var	0.296653
S.E. of regression	0.297558	Akaike info criterion	0.426743
Sum squared resid	13.19260	Schwarz criterion	0.466707
Log likelihood	-30.21913	Hannan-Quinn criter.	0.442979
F-statistic	0.088170	Durbin-Watson stat	0.467088
Prob(F-statistic)	0.766930		

Null Hypothesis: D(UNEMPR) has a unit root
Exogenous: Constant
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.929220	0.0024
Test critical values:	1% level	-3.474265	
	5% level	-2.880722	
	10% level	-2.577077	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.036582
HAC corrected variance (Bartlett kernel)	0.032870

Phillips-Perron Test Equation
Dependent Variable: D(UNEMPR,2)
Method: Least Squares
Date: 11/03/19 Time: 07:17
Sample (adjusted): 1981Q3 2018Q4
Included observations: 150 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UNEMPR(-1))	-0.222946	0.053951	-4.132350	0.0001
C	0.009531	0.015752	0.605063	0.5461

R-squared	0.103445	Mean dependent var	0.005504
Adjusted R-squared	0.097387	S.D. dependent var	0.202674
S.E. of regression	0.192552	Akaike info criterion	-0.443658
Sum squared resid	5.487283	Schwarz criterion	-0.403516
Log likelihood	35.27437	Hannan-Quinn criter.	-0.427350
F-statistic	17.07631	Durbin-Watson stat	1.762785
Prob(F-statistic)	0.000060		

Null Hypothesis: GDPCP has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.575146	0.4926
Test critical values:	1% level	-3.477835	
	5% level	-2.882279	
	10% level	-2.577908	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	3.04E+12
HAC corrected variance (Bartlett kernel)	5.47E+12

Phillips-Perron Test Equation
Dependent Variable: D(GDPCP)
Method: Least Squares
Date: 11/03/19 Time: 07:18
Sample (adjusted): 1981Q2 2015Q4
Included observations: 139 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPCP(-1)	-0.018307	0.024956	-0.733581	0.4645
C	214585.6	177553.1	1.208571	0.2289

R-squared	0.003913	Mean dependent var	143578.2
Adjusted R-squared	-0.003358	S.D. dependent var	1751953.
S.E. of regression	1754892.	Akaike info criterion	31.60800
Sum squared resid	4.22E+14	Schwarz criterion	31.65022
Log likelihood	-2194.756	Hannan-Quinn criter.	31.62516
F-statistic	0.538141	Durbin-Watson stat	1.013697
Prob(F-statistic)	0.464458		

Null Hypothesis: D(GDPCP) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.127964	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	2.68E+12
HAC corrected variance (Bartlett kernel)	2.90E+12

Phillips-Perron Test Equation
Dependent Variable: D(GDPCP,2)
Method: Least Squares
Date: 11/03/19 Time: 07:18
Sample (adjusted): 1981Q3 2015Q4
Included observations: 138 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPCP(-1))	-0.515148	0.109168	-4.718835	0.0000
C	123931.2	140465.9	0.882287	0.3792

R-squared	0.140695	Mean dependent var	101954.0
Adjusted R-squared	0.134376	S.D. dependent var	1772585.
S.E. of regression	1649194.	Akaike info criterion	31.48386
Sum squared resid	3.70E+14	Schwarz criterion	31.52628
Log likelihood	-2170.386	Hannan-Quinn criter.	31.50110
F-statistic	22.26741	Durbin-Watson stat	1.744829
Prob(F-statistic)	0.000006		

Summary statistic

	MGDP	FD	INF	UNEMPR	RIR	GDPCP	GEXP
Mean	399.3286	13.54776	19.42028	6.631404	1.133195	3993795.	63925.90
Median	393.0450	11.30000	13.19450	6.717875	2.697500	551520.8	406.1076
Maximum	1141.411	36.90000	72.72900	10.61015	25.28000	23842126	650401.3
Minimum	26.59000	5.900000	3.226000	4.275000	-43.57000	47619.70	7.584340
Std. Dev.	316.7293	6.044452	15.51549	1.156160	13.83443	6118094.	133617.9
Skewness	0.535900	1.429052	1.686361	0.703474	-0.906235	1.714780	2.337915
Kurtosis	2.326665	5.320437	4.931968	4.432900	3.688925	4.724009	7.885852
Jarque-Bera	10.14686	85.83683	95.68242	25.54046	23.81120	85.94887	289.6547
Probability	0.006261	0.000000	0.000000	0.000003	0.000007	0.000000	0.000000
Sum	60697.95	2059.260	2951.883	1007.973	172.2456	5.59E+08	9716736.
Sum Sq. Dev.	15147935	5516.846	36350.30	201.8425	28900.11	5.20E+15	2.70E+12
Observations	152	152	152	152	152	140	152

CORRELATION MATRIX

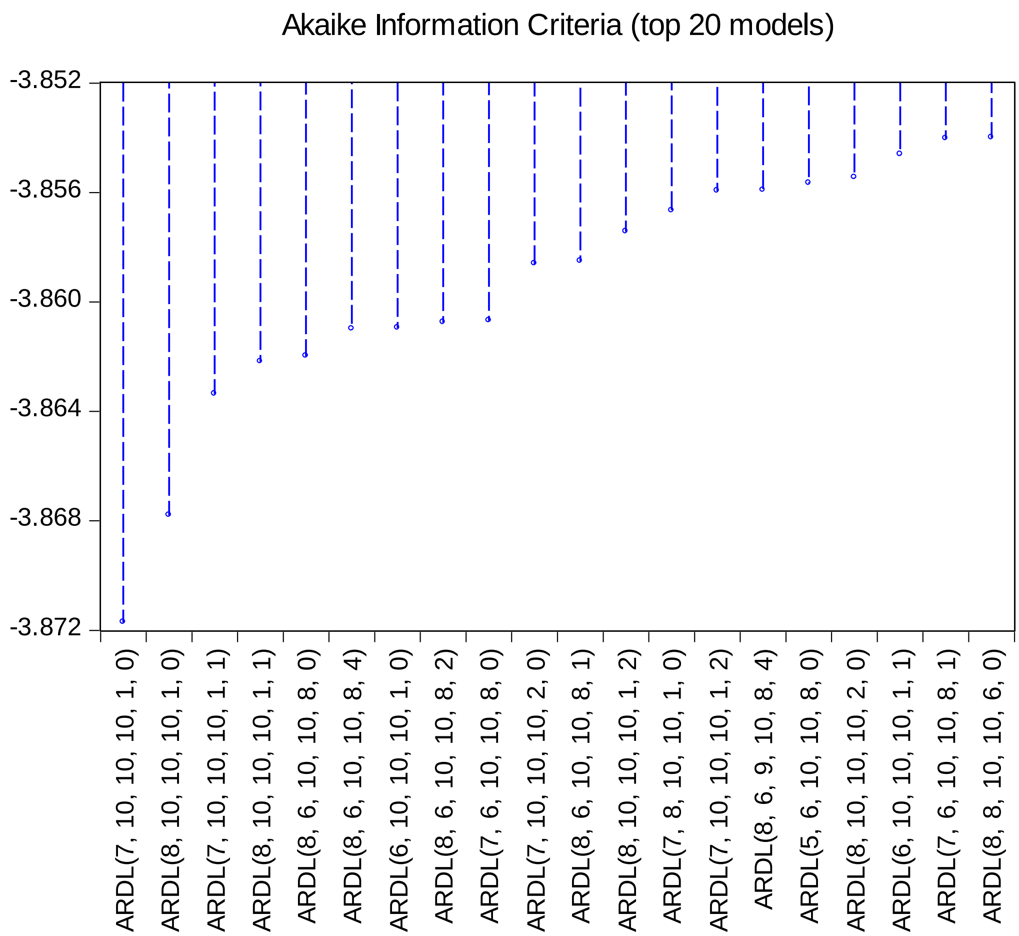
	MGDP	FD	INF	UNEMPR	RIR	GDPCP	GEXP
MGDP	1.000000	0.620294	-0.406717	-0.149910	0.399883	0.311911	0.703052
FD	0.620294	1.000000	-0.424526	0.197432	0.299217	0.583399	0.416595
INF	-0.406717	-0.424526	1.000000	0.011203	-0.548070	-0.255603	-0.244728
UNEMPR	-0.149910	0.197432	0.011203	1.000000	-0.157828	0.138014	-0.332445
RIR	0.399883	0.299217	-0.548070	-0.157828	1.000000	0.268006	0.271284
GDPCP	0.311911	0.583399	-0.255603	0.138014	0.268006	1.000000	-0.065015
GEXP	0.703052	0.416595	-0.244728	-0.332445	0.271284	-0.065015	1.000000

Dependent Variable: LOG(MGDP)
Method: ARDL
Date: 10/29/19 Time: 11:22
Sample (adjusted): 1983Q3 2018Q4
Included observations: 142 after adjustments
Maximum dependent lags: 8 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (10 lags, automatic): INF LOG(FD) UNEMPR RIR
LOG(GEXP)
Fixed regressors: C
Number of models evalulated: 1288408
Selected Model: ARDL(7, 10, 10, 10, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(MGDP(-1))	1.680333	0.080729	20.81437	0.0000
LOG(MGDP(-2))	-0.825567	0.148522	-5.558566	0.0000
LOG(MGDP(-3))	0.229432	0.155990	1.470819	0.1445
LOG(MGDP(-4))	-0.484502	0.152895	-3.168848	0.0020
LOG(MGDP(-5))	0.617954	0.161921	3.816403	0.0002
LOG(MGDP(-6))	-0.345670	0.139253	-2.482314	0.0148
LOG(MGDP(-7))	0.110522	0.070398	1.569955	0.1196
INF	0.008464	0.001433	5.904856	0.0000
INF(-1)	-0.014340	0.002835	-5.058926	0.0000
INF(-2)	0.003942	0.002845	1.385313	0.1691
INF(-3)	0.003433	0.002746	1.250256	0.2142
INF(-4)	0.014944	0.002913	5.129538	0.0000
INF(-5)	-0.028247	0.003534	-7.992267	0.0000
INF(-6)	0.009859	0.003266	3.018815	0.0032
INF(-7)	0.005227	0.003015	1.733554	0.0861
INF(-8)	0.001781	0.003306	0.538760	0.5913
INF(-9)	-0.008046	0.003897	-2.064914	0.0416
INF(-10)	0.003959	0.001986	1.993681	0.0490
LOG(FD)	0.763603	0.095984	7.955490	0.0000
LOG(FD(-1))	-1.361646	0.189909	-7.169986	0.0000
LOG(FD(-2))	0.510441	0.191238	2.669144	0.0089
LOG(FD(-3))	0.135559	0.183458	0.738912	0.4617
LOG(FD(-4))	0.132263	0.192380	0.687509	0.4934
LOG(FD(-5))	-0.396197	0.204430	-1.938061	0.0555
LOG(FD(-6))	0.178839	0.175967	1.016321	0.3120
LOG(FD(-7))	0.149092	0.158552	0.940332	0.3494
LOG(FD(-8))	0.354720	0.162607	2.181456	0.0315
LOG(FD(-9))	-0.755075	0.169771	-4.447620	0.0000
LOG(FD(-10))	0.277062	0.087738	3.157821	0.0021
UNEMPR	-0.112075	0.030116	-3.721438	0.0003
UNEMPR(-1)	0.225179	0.061637	3.653300	0.0004
UNEMPR(-2)	-0.091364	0.050515	-1.808655	0.0736
UNEMPR(-3)	-0.049477	0.044608	-1.109155	0.2701
UNEMPR(-4)	-0.081660	0.044737	-1.825342	0.0710
UNEMPR(-5)	0.210245	0.049875	4.215434	0.0001
UNEMPR(-6)	-0.101185	0.043821	-2.309049	0.0230
UNEMPR(-7)	-0.012015	0.039962	-0.300659	0.7643
UNEMPR(-8)	-0.088358	0.039609	-2.230741	0.0280
UNEMPR(-9)	0.192979	0.039108	4.934560	0.0000
UNEMPR(-10)	-0.099649	0.020162	-4.942322	0.0000
RIR	0.002135	0.000773	2.762440	0.0069
RIR(-1)	-0.002487	0.000780	-3.187009	0.0019
LOG(GEXP)	0.007103	0.004253	1.670060	0.0981
C	0.119575	0.081580	1.465738	0.1459

R-squared	0.999450	Mean dependent var	5.617124
Adjusted R-squared	0.999209	S.D. dependent var	1.096308
S.E. of regression	0.030831	Akaike info criterion	-3.871703
Sum squared resid	0.093157	Schwarz criterion	-2.955813
Log likelihood	318.8909	Hannan-Quinn criter.	-3.499523
F-statistic	4143.703	Durbin-Watson stat	2.132693
Prob(F-statistic)	0.000000		

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



ARDL Bounds Test
Date: 10/29/19 Time: 11:57
Sample: 1983Q3 2018Q4
Included observations: 142
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	4.743109	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79

2.5%	2.96	4.18
1%	3.41	4.68

Test Equation:
Dependent Variable: DLOG(MGDP)
Method: Least Squares
Date: 10/29/19 Time: 11:57
Sample: 1983Q3 2018Q4
Included observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(MGDP(-1))	0.602767	0.088994	6.773150	0.0000
DLOG(MGDP(-2))	-0.297365	0.103053	-2.885566	0.0047
DLOG(MGDP(-3))	0.199340	0.100257	1.988279	0.0493
DLOG(MGDP(-4))	-0.406230	0.105378	-3.854979	0.0002
DLOG(MGDP(-5))	0.202323	0.105524	1.917316	0.0579
DLOG(MGDP(-6))	-0.146329	0.086659	-1.688563	0.0942
D(INF)	0.000634	0.001253	0.506054	0.6139
DLOG(FD)	0.548416	0.118156	4.641463	0.0000
DLOG(FD(-1))	-0.332001	0.142938	-2.322690	0.0221
DLOG(FD(-2))	-0.016107	0.131687	-0.122309	0.9029
DLOG(FD(-3))	0.014628	0.130640	0.111973	0.9111
DLOG(FD(-4))	0.199014	0.142133	1.400190	0.1643
DLOG(FD(-5))	-0.132762	0.135799	-0.977642	0.3305
DLOG(FD(-6))	0.054650	0.130027	0.420302	0.6751
DLOG(FD(-7))	0.112521	0.122893	0.915603	0.3619
DLOG(FD(-8))	0.506819	0.139915	3.622330	0.0004
DLOG(FD(-9))	-0.216027	0.111759	-1.932978	0.0559
D(UNEMPR)	-0.012805	0.029850	-0.428971	0.6688
D(UNEMPR(-1))	0.024742	0.035795	0.691210	0.4909
D(UNEMPR(-2))	-0.009658	0.031675	-0.304908	0.7610
D(UNEMPR(-3))	0.002104	0.031201	0.067439	0.9464
D(UNEMPR(-4))	0.000472	0.033407	0.014140	0.9887
D(UNEMPR(-5))	0.013429	0.034166	0.393053	0.6951
D(UNEMPR(-6))	-0.005992	0.028814	-0.207950	0.8357
D(UNEMPR(-7))	0.000957	0.028055	0.034097	0.9729
D(UNEMPR(-8))	-0.021139	0.028736	-0.735650	0.4636
D(UNEMPR(-9))	0.038713	0.024153	1.602843	0.1119
D(RIR)	0.002080	0.000983	2.116825	0.0366
C	0.198220	0.082177	2.412107	0.0176
INF	0.000998	0.000457	2.182822	0.0312
LOG(FD(-1))	-0.033890	0.028998	-1.168679	0.2451
UNEMPR(-1)	-0.007986	0.006875	-1.161681	0.2479
RIR(-1)	-0.000836	0.000488	-1.712969	0.0896
LOG(GEXP(-1))	0.011351	0.004507	2.518571	0.0133
LOG(MGDP(-1))	-0.025034	0.010200	-2.454404	0.0157

R-squared	0.667323	Mean dependent var	0.023938
Adjusted R-squared	0.561613	S.D. dependent var	0.061622
S.E. of regression	0.040801	Akaike info criterion	-3.350283
Sum squared resid	0.178121	Schwarz criterion	-2.621734
Log likelihood	272.8701	Hannan-Quinn criter.	-3.054231
F-statistic	6.312750	Durbin-Watson stat	2.055766

Prob(F-statistic)	0.000000

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(MGDP)
Selected Model: ARDL(7, 10, 10, 10, 1, 0)
Date: 10/29/19 Time: 11:58
Sample: 1981Q1 2018Q4
Included observations: 142

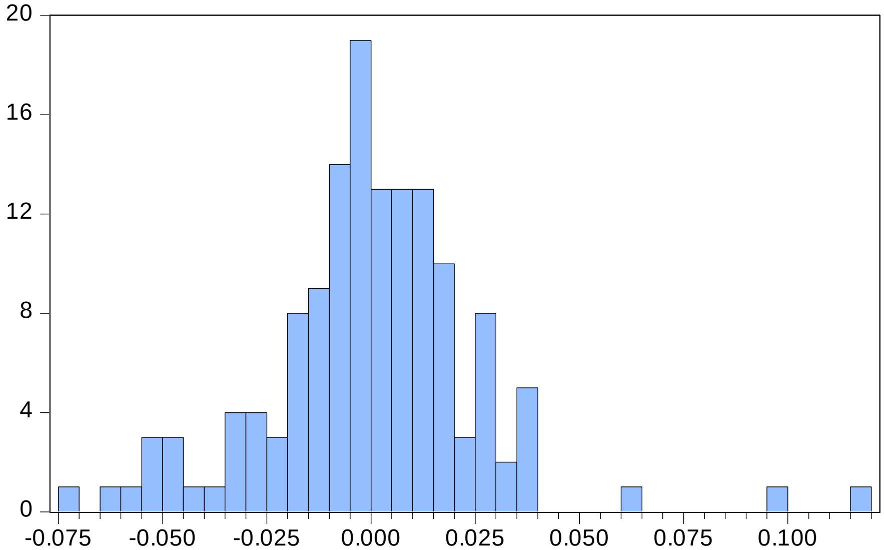
Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(MGDP(-1))	0.697831	0.079413	8.787360	0.0000
DLOG(MGDP(-2))	-0.127736	0.091165	-1.401145	0.1643
DLOG(MGDP(-3))	0.101697	0.085529	1.189024	0.2373
DLOG(MGDP(-4))	-0.382806	0.089756	-4.264952	0.0000
DLOG(MGDP(-5))	0.235148	0.090400	2.601191	0.0107
DLOG(MGDP(-6))	-0.110522	0.070398	-1.569955	0.1196
D(INF)	0.008464	0.001433	5.904856	0.0000
D(INF)	-0.003942	0.002845	-1.385313	0.1691
D(INF)	-0.003433	0.002746	-1.250256	0.2142
D(INF)	-0.014944	0.002913	-5.129538	0.0000
D(INF)	0.028247	0.003534	7.992267	0.0000
D(INF)	-0.009859	0.003266	-3.018815	0.0032
D(INF)	-0.005227	0.003015	-1.733554	0.0861
D(INF)	-0.001781	0.003306	-0.538760	0.5913
D(INF)	0.008046	0.003897	2.064914	0.0416
D(INF)	-0.003959	0.001986	-1.993681	0.0490
DLOG(FD)	0.763603	0.095984	7.955490	0.0000
DLOG(FD(-1))	-0.510441	0.191238	-2.669144	0.0089
DLOG(FD(-2))	-0.135559	0.183458	-0.738912	0.4617
DLOG(FD(-3))	-0.132263	0.192380	-0.687509	0.4934
DLOG(FD(-4))	0.396197	0.204430	1.938061	0.0555
DLOG(FD(-5))	-0.178839	0.175967	-1.016321	0.3120
DLOG(FD(-6))	-0.149092	0.158552	-0.940332	0.3494
DLOG(FD(-7))	-0.354720	0.162607	-2.181456	0.0315
DLOG(FD(-8))	0.755075	0.169771	4.447620	0.0000
DLOG(FD(-9))	-0.277062	0.087738	-3.157821	0.0021
D(UNEMPR)	-0.112075	0.030116	-3.721438	0.0003
D(UNEMPR(-1))	0.091364	0.050515	1.808655	0.0736
D(UNEMPR(-2))	0.049477	0.044608	1.109155	0.2701
D(UNEMPR(-3))	0.081660	0.044737	1.825342	0.0710
D(UNEMPR(-4))	-0.210245	0.049875	-4.215434	0.0001
D(UNEMPR(-5))	0.101185	0.043821	2.309049	0.0230
D(UNEMPR(-6))	0.012015	0.039962	0.300659	0.7643
D(UNEMPR(-7))	0.088358	0.039609	2.230741	0.0280
D(UNEMPR(-8))	-0.192979	0.039108	-4.934560	0.0000
D(UNEMPR(-9))	0.099649	0.020162	4.942322	0.0000
D(RIR)	0.002135	0.000773	2.762440	0.0069
DLOG(GEXP)	0.007103	0.004253	1.670060	0.0981
CointEq(-1)	-0.017498	0.008341	-2.097839	0.0385

Cointeq = LOG(MGDP) - (0.0558*INF -0.6480*LOG(FD) -0.4218*UNEMPR -0.0201*RIR + 0.4059*LOG(GEXP) + 6.8335)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	0.055795	0.046432	1.201646	0.2324
LOG(FD)	-0.648038	1.689070	-0.383665	0.7021
UNEMPR	-0.421836	0.419468	-1.005644	0.3171
RIR	-0.020129	0.022721	-0.885940	0.3778
LOG(GEXP)	0.405939	0.125229	3.241565	0.0016
C	6.833547	2.682144	2.547792	0.0124



Series: Residuals
Sample 1983Q3 2018Q4
Observations 142

Mean	-1.90e-15
Median	-1.89e-05
Maximum	0.116589
Minimum	-0.070664
Std. Dev.	0.025704
Skewness	0.607031
Kurtosis	6.667846
Jarque-Bera	88.31832
Probability	0.000000

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.751310	Prob. F(2,96)	0.0689
Obs*R-squared	7.698049	Prob. Chi-Square(2)	0.0813

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 10/29/19 Time: 12:00
Sample: 1983Q3 2018Q4
Included observations: 142
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MGDP(-1))	0.171877	0.133806	1.284525	0.2020
LOG(MGDP(-2))	-0.091788	0.225711	-0.406660	0.6852
LOG(MGDP(-3))	-0.152767	0.211610	-0.721929	0.4721
LOG(MGDP(-4))	0.073057	0.166341	0.439201	0.6615
LOG(MGDP(-5))	0.056449	0.172906	0.326473	0.7448
LOG(MGDP(-6))	-0.013979	0.151197	-0.092453	0.9265
LOG(MGDP(-7))	-0.037178	0.074977	-0.495855	0.6211
INF	-0.000372	0.001423	-0.261837	0.7940
INF(-1)	-0.000870	0.002815	-0.308954	0.7580
INF(-2)	0.000900	0.002920	0.308198	0.7586
INF(-3)	0.001100	0.002790	0.394376	0.6942
INF(-4)	-0.000944	0.002892	-0.326389	0.7448
INF(-5)	-0.002570	0.003696	-0.695326	0.4885
INF(-6)	0.001704	0.003672	0.463959	0.6437
INF(-7)	0.002111	0.003239	0.651569	0.5162
INF(-8)	-0.001046	0.003280	-0.318960	0.7505
INF(-9)	-0.001469	0.003881	-0.378515	0.7059
INF(-10)	0.000981	0.001997	0.491410	0.6243
LOG(FD)	-0.011871	0.094455	-0.125679	0.9002
LOG(FD(-1))	-0.100067	0.195371	-0.512189	0.6097
LOG(FD(-2))	0.085783	0.210438	0.407643	0.6844
LOG(FD(-3))	0.103633	0.194679	0.532328	0.5957
LOG(FD(-4))	-0.034200	0.190527	-0.179501	0.8579
LOG(FD(-5))	-0.098145	0.207221	-0.473625	0.6368
LOG(FD(-6))	0.048377	0.178105	0.271621	0.7865
LOG(FD(-7))	0.028407	0.156579	0.181422	0.8564
LOG(FD(-8))	-0.032315	0.160943	-0.200787	0.8413
LOG(FD(-9))	-0.051447	0.168263	-0.305754	0.7605
LOG(FD(-10))	0.072504	0.092103	0.787200	0.4331
UNEMPR	0.003315	0.029628	0.111900	0.9111
UNEMPR(-1)	0.007871	0.060746	0.129580	0.8972
UNEMPR(-2)	-0.008980	0.050781	-0.176834	0.8600
UNEMPR(-3)	-0.014307	0.044952	-0.318265	0.7510
UNEMPR(-4)	0.015876	0.044477	0.356954	0.7219
UNEMPR(-5)	0.008591	0.049144	0.174822	0.8616
UNEMPR(-6)	-0.010982	0.043474	-0.252619	0.8011
UNEMPR(-7)	-0.006137	0.039355	-0.155934	0.8764
UNEMPR(-8)	0.004587	0.039202	0.117000	0.9071
UNEMPR(-9)	0.011512	0.038850	0.296332	0.7676
UNEMPR(-10)	-0.010405	0.020302	-0.512504	0.6095
RIR	-0.000553	0.000799	-0.692326	0.4904
RIR(-1)	0.000450	0.000797	0.564461	0.5738
LOG(GEXP)	-0.002895	0.004407	-0.656994	0.5128
C	-0.039954	0.082591	-0.483762	0.6297
RESID(-1)	-0.262850	0.169335	-1.552252	0.1239
RESID(-2)	-0.323747	0.157284	-2.058359	0.0723

R-squared	0.054212	Mean dependent var	-1.90E-15
Adjusted R-squared	-0.389127	S.D. dependent var	0.025704
S.E. of regression	0.030295	Akaike info criterion	-3.899271
Sum squared resid	0.088107	Schwarz criterion	-2.941749
Log likelihood	322.8482	Hannan-Quinn criter.	-3.510173
F-statistic	0.122280	Durbin-Watson stat	2.106184

Prob(F-statistic)	1.000000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.223777	Prob. F(43,98)	0.5106
Obs*R-squared	70.12816	Prob. Chi-Square(43)	0.1256
Scaled explained SS	94.65770	Prob. Chi-Square(43)	0.1123

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/29/19 Time: 12:02
Sample: 1983Q3 2018Q4
Included observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000511	0.003539	0.144378	0.8855
LOG(MGDP(-1))	-0.003889	0.003502	-1.110381	0.2696
LOG(MGDP(-2))	0.001982	0.006443	0.307567	0.7591
LOG(MGDP(-3))	-0.000332	0.006767	-0.048992	0.9610
LOG(MGDP(-4))	0.001733	0.006633	0.261314	0.7944
LOG(MGDP(-5))	-0.001798	0.007024	-0.256026	0.7985
LOG(MGDP(-6))	0.001154	0.006041	0.191009	0.8489
LOG(MGDP(-7))	0.000933	0.003054	0.305588	0.7606
INF	0.000141	6.22E-05	2.262733	0.0259
INF(-1)	-0.000279	0.000123	-2.268259	0.0255
INF(-2)	0.000158	0.000123	1.280827	0.2033
INF(-3)	-8.25E-06	0.000119	-0.069268	0.9449
INF(-4)	0.000260	0.000126	2.059991	0.0421
INF(-5)	-0.000561	0.000153	-3.657062	0.0004
INF(-6)	0.000300	0.000142	2.114223	0.0370
INF(-7)	1.46E-05	0.000131	0.111529	0.9114
INF(-8)	-2.80E-05	0.000143	-0.194934	0.8458
INF(-9)	5.26E-05	0.000169	0.311388	0.7562
INF(-10)	-1.86E-05	8.61E-05	-0.215911	0.8295
LOG(FD)	0.007304	0.004164	1.753980	0.0826
LOG(FD(-1))	-0.014399	0.008239	-1.747690	0.0836
LOG(FD(-2))	0.009474	0.008296	1.141930	0.2563
LOG(FD(-3))	-0.000816	0.007959	-0.102494	0.9186
LOG(FD(-4))	0.002361	0.008346	0.282945	0.7778
LOG(FD(-5))	-0.004330	0.008869	-0.488208	0.6265
LOG(FD(-6))	0.004893	0.007634	0.640997	0.5230
LOG(FD(-7))	-0.004842	0.006878	-0.703925	0.4831
LOG(FD(-8))	0.009998	0.007054	1.417353	0.1596
LOG(FD(-9))	-0.013565	0.007365	-1.841849	0.0685
LOG(FD(-10))	0.007164	0.003806	1.882213	0.0628
UNEMPR	-0.001325	0.001306	-1.014097	0.3130
UNEMPR(-1)	0.001934	0.002674	0.723366	0.4712
UNEMPR(-2)	-0.000357	0.002191	-0.163033	0.8708
UNEMPR(-3)	-0.001226	0.001935	-0.633718	0.5277
UNEMPR(-4)	-0.002149	0.001941	-1.107442	0.2708

UNEMPR(-5)	0.006685	0.002164	3.089644	0.0026
UNEMPR(-6)	-0.004476	0.001901	-2.354761	0.0205
UNEMPR(-7)	0.000746	0.001734	0.430141	0.6680
UNEMPR(-8)	-0.002123	0.001718	-1.235507	0.2196
UNEMPR(-9)	0.003925	0.001697	2.313572	0.0228
UNEMPR(-10)	-0.002468	0.000875	-2.822106	0.0058
RIR	-6.16E-06	3.35E-05	-0.183813	0.8545
RIR(-1)	4.71E-06	3.39E-05	0.139105	0.8897
LOG(GEXP)	-0.000240	0.000185	-1.301694	0.1961

R-squared	0.493860	Mean dependent var	0.000656
Adjusted R-squared	0.271779	S.D. dependent var	0.001567
S.E. of regression	0.001338	Akaike info criterion	-10.14714
Sum squared resid	0.000175	Schwarz criterion	-9.231246
Log likelihood	764.4466	Hannan-Quinn criter.	-9.774955
F-statistic	2.223777	Durbin-Watson stat	2.247562
Prob(F-statistic)	0.000600		

Ramsey RESET Test
Equation: UNTITLED
Specification: LOG(MGDP) LOG(MGDP(-1)) LOG(MGDP(-2)) LOG(MGDP(-3)) LOG(MGDP(-4)) LOG(MGDP(-5)) LOG(MGDP(-6)) LOG(MGDP(-7)) INF INF(-1) INF(-2) INF(-3) INF(-4) INF(-5) INF(-6) INF(-7) INF(-8) INF(-9) INF(-10) LOG(FD) LOG(FD(-1)) LOG(FD(-2)) LOG(FD(-3)) LOG(FD(-4)) LOG(FD(-5)) LOG(FD(-6)) LOG(FD(-7)) LOG(FD(-8)) LOG(FD(-9)) LOG(FD(-10)) UNEMPR UNEMPR(-1) UNEMPR(-2) UNEMPR(-3) UNEMPR(-4) UNEMPR(-5) UNEMPR(-6) UNEMPR(-7) UNEMPR(-8) UNEMPR(-9) UNEMPR(-10) RIR RIR(-1) LOG(GEXP) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.054377	97	0.2943
F-statistic	1.111711	(1, 97)	0.2943

F-test summary:

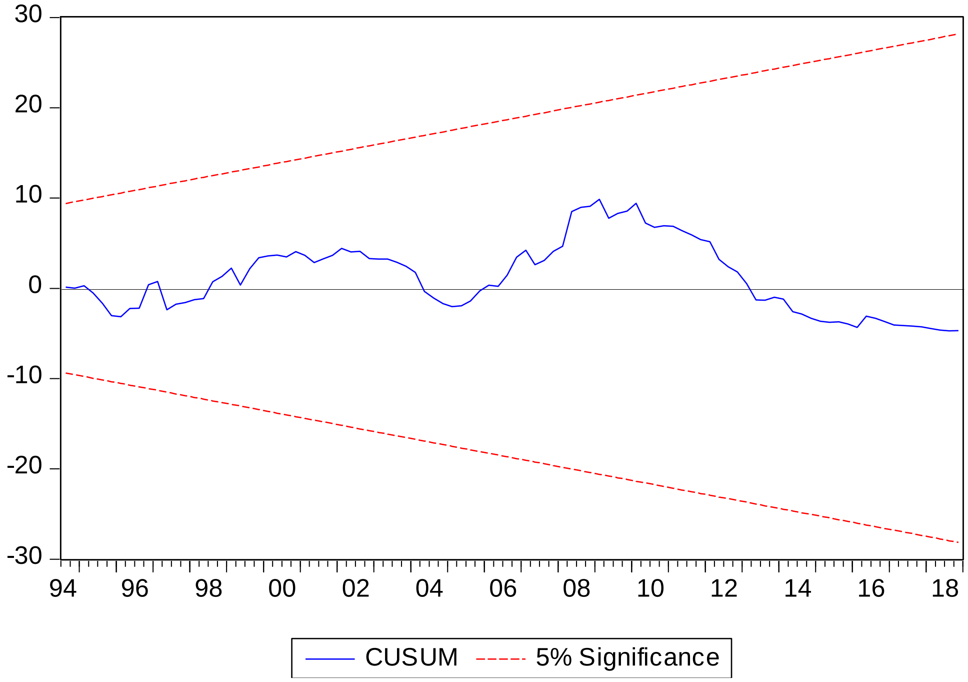
	Sum of Sq.	df	Mean Squares
Test SSR	0.001056	1	0.001056
Restricted SSR	0.093157	98	0.000951
Unrestricted SSR	0.092101	97	0.000949

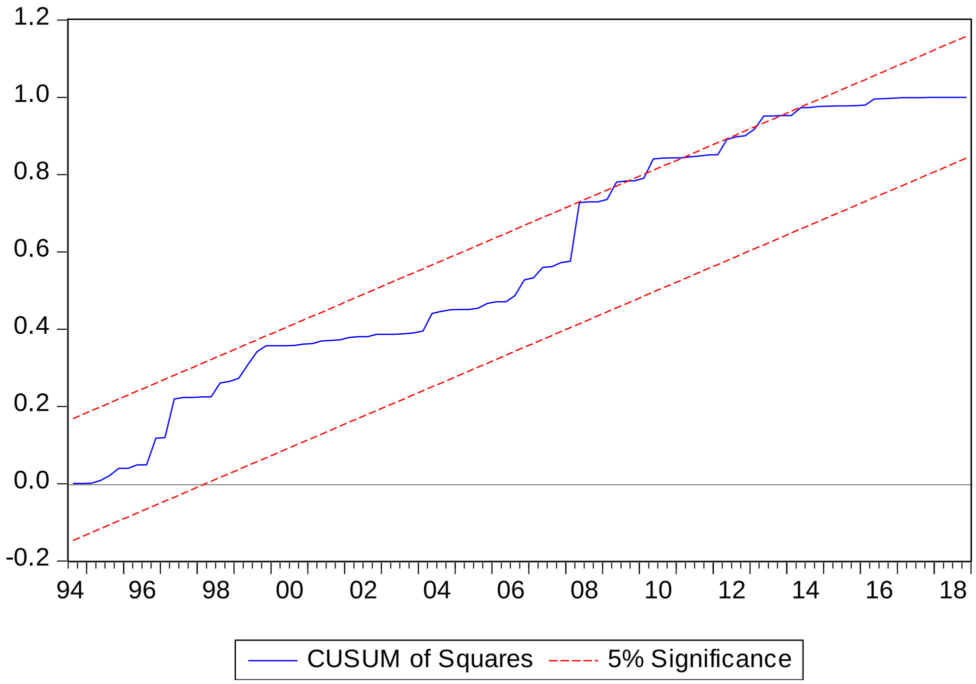
Unrestricted Test Equation:
Dependent Variable: LOG(MGDP)
Method: ARDL
Date: 10/29/19 Time: 12:06
Sample: 1983Q3 2018Q4
Included observations: 142
Maximum dependent lags: 8 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (10 lags, automatic):
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(MGDP(-1))	1.785105	0.128000	13.94614	0.0000
LOG(MGDP(-2))	-0.869815	0.154255	-5.638804	0.0000
LOG(MGDP(-3))	0.241157	0.156297	1.542945	0.1261
LOG(MGDP(-4))	-0.514644	0.155459	-3.310471	0.0013
LOG(MGDP(-5))	0.653857	0.165372	3.953854	0.0001
LOG(MGDP(-6))	-0.362183	0.140052	-2.586053	0.0112
LOG(MGDP(-7))	0.115095	0.070492	1.632745	0.1058
INF	0.008846	0.001478	5.986596	0.0000
INF(-1)	-0.015130	0.002930	-5.163169	0.0000
INF(-2)	0.004078	0.002847	1.432505	0.1552
INF(-3)	0.003669	0.002754	1.332312	0.1859
INF(-4)	0.015738	0.003007	5.233005	0.0000
INF(-5)	-0.029807	0.003829	-7.783682	0.0000
INF(-6)	0.010229	0.003283	3.115827	0.0024
INF(-7)	0.005574	0.003032	1.838719	0.0690
INF(-8)	0.001869	0.003305	0.565564	0.5730
INF(-9)	-0.008399	0.003909	-2.148719	0.0341
INF(-10)	0.003910	0.001985	1.969830	0.0517
LOG(FD)	0.811895	0.106303	7.637576	0.0000
LOG(FD(-1))	-1.457149	0.210306	-6.928705	0.0000
LOG(FD(-2))	0.534812	0.192521	2.777937	0.0066
LOG(FD(-3))	0.149291	0.183815	0.812183	0.4187
LOG(FD(-4))	0.128444	0.192304	0.667922	0.5058
LOG(FD(-5))	-0.410156	0.204742	-2.003284	0.0479
LOG(FD(-6))	0.181557	0.175886	1.032244	0.3045
LOG(FD(-7))	0.168642	0.159543	1.057029	0.2931
LOG(FD(-8))	0.379699	0.164232	2.311964	0.0229
LOG(FD(-9))	-0.820918	0.180801	-4.540458	0.0000
LOG(FD(-10))	0.295476	0.089411	3.304708	0.0013
UNEMPR	-0.112969	0.030111	-3.751766	0.0003
UNEMPR(-1)	0.233658	0.062125	3.761114	0.0003
UNEMPR(-2)	-0.096657	0.050735	-1.905129	0.0597
UNEMPR(-3)	-0.052389	0.044668	-1.172866	0.2437
UNEMPR(-4)	-0.086099	0.044909	-1.917181	0.0582
UNEMPR(-5)	0.221375	0.050952	4.344767	0.0000
UNEMPR(-6)	-0.104942	0.043941	-2.388261	0.0189
UNEMPR(-7)	-0.013618	0.039968	-0.340722	0.7340
UNEMPR(-8)	-0.092656	0.039796	-2.328272	0.0220
UNEMPR(-9)	0.202533	0.040122	5.047931	0.0000
UNEMPR(-10)	-0.103352	0.020455	-5.052729	0.0000
RIR	0.002456	0.000830	2.958115	0.0039
RIR(-1)	-0.002817	0.000840	-3.352080	0.0011
LOG(GEXP)	0.013366	0.007304	1.829930	0.0703
C	0.021489	0.123700	0.173721	0.8624
FITTED^2	-0.007783	0.007382	-1.054377	0.2943

R-squared	0.999457	Mean dependent var	5.617124
Adjusted R-squared	0.999210	S.D. dependent var	1.096308
S.E. of regression	0.030814	Akaike info criterion	-3.869015
Sum squared resid	0.092101	Schwarz criterion	-2.932309
Log likelihood	319.7000	Hannan-Quinn criter.	-3.488376
F-statistic	4054.169	Durbin-Watson stat	2.101906
Prob(F-statistic)	0.000000		

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





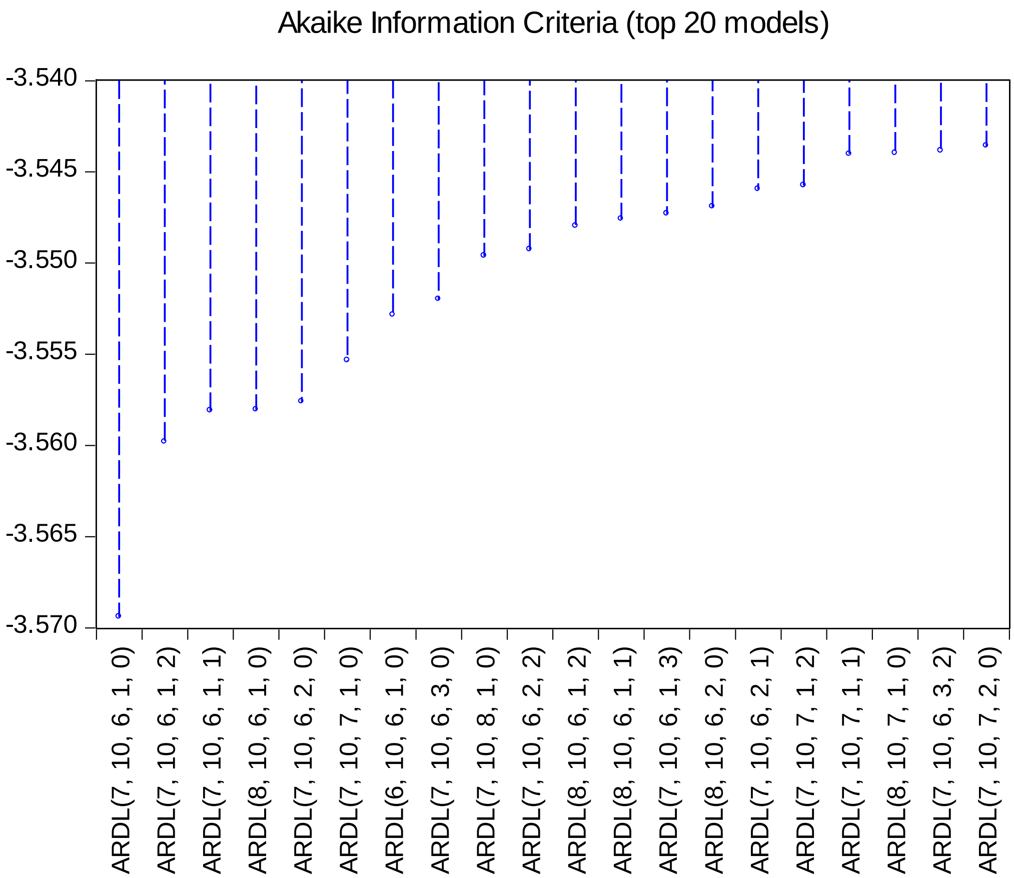
INTERACTION OF INF AND UNEMPLOYMENT

Dependent Variable: LOG(MGDP)
Method: ARDL
Date: 10/29/19 Time: 12:14
Sample (adjusted): 1983Q3 2018Q4
Included observations: 142 after adjustments
Maximum dependent lags: 8 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (10 lags, automatic): LOG(FD) INF*UNEMPR RIR LOG(GEXP)
Fixed regressors: C
Number of models evalulated: 117128
Selected Model: ARDL(7, 10, 6, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(MGDP(-1))	1.645779	0.082464	19.95766	0.0000
LOG(MGDP(-2))	-0.932263	0.152915	-6.096627	0.0000
LOG(MGDP(-3))	0.474785	0.163009	2.912635	0.0043
LOG(MGDP(-4))	-0.627800	0.164016	-3.827683	0.0002
LOG(MGDP(-5))	0.660350	0.170495	3.873125	0.0002
LOG(MGDP(-6))	-0.396593	0.156678	-2.531257	0.0127
LOG(MGDP(-7))	0.151702	0.080907	1.875017	0.0634
LOG(FD)	0.601957	0.107827	5.582600	0.0000
LOG(FD(-1))	-1.100829	0.209441	-5.256030	0.0000
LOG(FD(-2))	0.427505	0.208749	2.047940	0.0429
LOG(FD(-3))	0.041008	0.202023	0.202988	0.8395
LOG(FD(-4))	0.132070	0.206405	0.639860	0.5236
LOG(FD(-5))	-0.257618	0.211693	-1.216946	0.2262
LOG(FD(-6))	0.142494	0.202218	0.704654	0.4825
LOG(FD(-7))	0.130424	0.189862	0.686939	0.4935
LOG(FD(-8))	0.349258	0.192217	1.816995	0.0719
LOG(FD(-9))	-0.795428	0.196455	-4.048908	0.0001
LOG(FD(-10))	0.275278	0.100908	2.728003	0.0074
INF*UNEMPR	0.000633	0.000208	3.050297	0.0028
INF(-1)*UNEMPR(-1)	-0.000968	0.000400	-2.420466	0.0171
INF(-2)*UNEMPR(-2)	0.000253	0.000413	0.612946	0.5411
INF(-3)*UNEMPR(-3)	4.66E-05	0.000405	0.115063	0.9086
INF(-4)*UNEMPR(-4)	0.001219	0.000410	2.970984	0.0036
INF(-5)*UNEMPR(-5)	-0.001918	0.000402	-4.774128	0.0000
INF(-6)*UNEMPR(-6)	0.000816	0.000209	3.904418	0.0002
RIR	0.002217	0.000796	2.785825	0.0063
RIR(-1)	-0.003219	0.000811	-3.967882	0.0001
LOG(GEXP)	0.012025	0.004020	2.991081	0.0034
C	0.191270	0.078353	2.441145	0.0162

R-squared	0.999081	Mean dependent var	5.617124
Adjusted R-squared	0.998854	S.D. dependent var	1.096308
S.E. of regression	0.037118	Akaike info criterion	-3.569398
Sum squared resid	0.155688	Schwarz criterion	-2.965744
Log likelihood	282.4273	Hannan-Quinn criter.	-3.324098
F-statistic	4388.834	Durbin-Watson stat	1.979932
Prob(F-statistic)	0.000000		

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



ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(MGDP)
Selected Model: ARDL(7, 10, 6, 1, 0)
Date: 10/29/19 Time: 12:17
Sample: 1981Q1 2018Q4
Included observations: 142

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(MGDP(-1))	0.669819	0.080354	8.335811	0.0000
DLOG(MGDP(-2))	-0.262444	0.093131	-2.817997	0.0057
DLOG(MGDP(-3))	0.212341	0.089861	2.363007	0.0198
DLOG(MGDP(-4))	-0.415459	0.094095	-4.415306	0.0000
DLOG(MGDP(-5))	0.244891	0.096354	2.541566	0.0124
DLOG(MGDP(-6))	-0.151702	0.080907	-1.875017	0.0634
DLOG(FD)	0.601957	0.107827	5.582600	0.0000
DLOG(FD(-1))	-0.427505	0.208749	-2.047940	0.0429

DLOG(FD(-2))	-0.041008	0.202023	-0.202988	0.8395
DLOG(FD(-3))	-0.132070	0.206405	-0.639860	0.5236
DLOG(FD(-4))	0.257618	0.211693	1.216946	0.2262
DLOG(FD(-5))	-0.142494	0.202218	-0.704654	0.4825
DLOG(FD(-6))	-0.130424	0.189862	-0.686939	0.4935
DLOG(FD(-7))	-0.349258	0.192217	-1.816995	0.0719
DLOG(FD(-8))	0.795428	0.196455	4.048908	0.0001
DLOG(FD(-9))	-0.275278	0.100908	-2.728003	0.0074
D(INF * UNEMPR)	-0.000633	0.000208	-3.050297	0.0028
D(INF * UNEMPR(-1))	-0.000253	0.000413	-0.612946	0.5411
D(INF * UNEMPR(-2))	-0.000047	0.000405	-0.115063	0.9086
D(INF * UNEMPR(-3))	-0.001219	0.000410	-2.970984	0.0036
D(INF * UNEMPR(-4))	0.001918	0.000402	4.774128	0.0000
D(INF * UNEMPR(-5))	-0.000816	0.000209	-3.904418	0.0002
D(RIR)	0.002217	0.000796	2.785825	0.0063
DLOG(GEXP)	0.012025	0.004020	2.991081	0.0034
CointEq(-1)	-0.024041	0.009210	-2.610177	0.0103

Cointeq = LOG(MGDP) - (-2.2413*LOG(FD) + 0.0034*INF*UNEMPR -0.0417 *RIR + 0.5002*LOG(GEXP) + 7.9561)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(FD)	-2.241277	0.806341	-2.779563	0.0064
INF*UNEMPR	0.003416	0.003281	1.041195	0.3000
RIR	-0.041676	0.022048	-1.890221	0.0613
LOG(GEXP)	0.500202	0.087721	5.702222	0.0000
C	7.956114	1.754008	4.535963	0.0000

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.058309	Prob. F(2,111)	0.9434
Obs*R-squared	0.149030	Prob. Chi-Square(2)	0.9282

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 10/29/19 Time: 12:20
Sample: 1983Q3 2018Q4
Included observations: 142
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MGDP(-1))	-0.006025	0.174906	-0.034448	0.9726
LOG(MGDP(-2))	0.046064	0.291772	0.157876	0.8748
LOG(MGDP(-3))	-0.064012	0.260932	-0.245322	0.8067
LOG(MGDP(-4))	0.035665	0.201037	0.177403	0.8595
LOG(MGDP(-5))	-0.020757	0.201923	-0.102798	0.9183

LOG(MGDP(-6))	0.022757	0.184560	0.123306	0.9021
LOG(MGDP(-7))	-0.013037	0.090795	-0.143585	0.8861
LOG(FD)	0.002592	0.109149	0.023752	0.9811
LOG(FD(-1))	-0.004892	0.220373	-0.022198	0.9823
LOG(FD(-2))	-0.011484	0.235622	-0.048738	0.9612
LOG(FD(-3))	0.026553	0.218512	0.121518	0.9035
LOG(FD(-4))	-0.010852	0.210714	-0.051502	0.9590
LOG(FD(-5))	0.000110	0.223880	0.000491	0.9996
LOG(FD(-6))	-0.009338	0.212948	-0.043852	0.9651
LOG(FD(-7))	0.009047	0.193302	0.046800	0.9628
LOG(FD(-8))	0.000500	0.195471	0.002558	0.9980
LOG(FD(-9))	-0.007117	0.199803	-0.035621	0.9716
LOG(FD(-10))	0.006165	0.110983	0.055551	0.9558
INF*UNEMPR	-1.30E-06	0.000211	-0.006177	0.9951
INF(-1)*UNEMPR(-1)	-1.55E-06	0.000404	-0.003834	0.9969
INF(-2)*UNEMPR(-2)	-7.24E-06	0.000422	-0.017176	0.9863
INF(-3)*UNEMPR(-3)	1.67E-05	0.000411	0.040647	0.9676
INF(-4)*UNEMPR(-4)	-7.26E-06	0.000414	-0.017514	0.9861
INF(-5)*UNEMPR(-5)	-1.22E-05	0.000418	-0.029096	0.9768
INF(-6)*UNEMPR(-6)	8.57E-06	0.000230	0.037281	0.9703
RIR	-3.87E-05	0.000866	-0.044695	0.9644
RIR(-1)	3.91E-05	0.000910	0.042940	0.9658
LOG(GEXP)	-0.000286	0.004861	-0.058861	0.9532
C	-0.004817	0.092505	-0.052075	0.9586
RESID(-1)	0.011493	0.199062	0.057736	0.9541
RESID(-2)	-0.054467	0.168792	-0.322687	0.7475

R-squared	0.001050	Mean dependent var	1.22E-16
Adjusted R-squared	-0.268937	S.D. dependent var	0.033229
S.E. of regression	0.037432	Akaike info criterion	-3.542279
Sum squared resid	0.155525	Schwarz criterion	-2.896993
Log likelihood	282.5018	Hannan-Quinn criter.	-3.280061
F-statistic	0.003887	Durbin-Watson stat	1.989587
Prob(F-statistic)	1.000000		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	3.118424	Prob. F(28,113)	0.4352
Obs*R-squared	61.89651	Prob. Chi-Square(28)	0.1342
Scaled explained SS	207.0432	Prob. Chi-Square(28)	0.1230

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/29/19 Time: 12:23
Sample: 1983Q3 2018Q4
Included observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012834	0.006333	2.026397	0.0451
LOG(MGDP(-1))	-0.012528	0.006666	-1.879487	0.0628

LOG(MGDP(-2))	0.005715	0.012361	0.462364	0.6447
LOG(MGDP(-3))	0.002288	0.013176	0.173652	0.8624
LOG(MGDP(-4))	-0.003826	0.013258	-0.288589	0.7734
LOG(MGDP(-5))	0.010208	0.013782	0.740678	0.4604
LOG(MGDP(-6))	-0.003787	0.012665	-0.299004	0.7655
LOG(MGDP(-7))	-0.000126	0.006540	-0.019281	0.9847
LOG(FD)	0.021804	0.008716	2.501560	0.0138
LOG(FD(-1))	-0.039682	0.016930	-2.343929	0.0208
LOG(FD(-2))	0.015459	0.016874	0.916134	0.3615
LOG(FD(-3))	0.005901	0.016330	0.361336	0.7185
LOG(FD(-4))	0.014734	0.016684	0.883083	0.3791
LOG(FD(-5))	-0.034711	0.017112	-2.028490	0.0449
LOG(FD(-6))	0.015338	0.016346	0.938335	0.3501
LOG(FD(-7))	-0.000274	0.015347	-0.017862	0.9858
LOG(FD(-8))	0.013734	0.015537	0.883896	0.3786
LOG(FD(-9))	-0.024995	0.015880	-1.573974	0.1183
LOG(FD(-10))	0.011612	0.008157	1.423645	0.1573
INF*UNEMPR	5.04E-05	1.68E-05	3.000960	0.0033
INF(-1)*UNEMPR(-1)	-9.42E-05	3.23E-05	-2.914305	0.0043
INF(-2)*UNEMPR(-2)	4.98E-05	3.34E-05	1.493752	0.1380
INF(-3)*UNEMPR(-3)	-7.17E-06	3.27E-05	-0.219127	0.8269
INF(-4)*UNEMPR(-4)	5.78E-05	3.32E-05	1.743658	0.0839
INF(-5)*UNEMPR(-5)	-0.000102	3.25E-05	-3.137367	0.0022
INF(-6)*UNEMPR(-6)	4.77E-05	1.69E-05	2.824990	0.0056
RIR	-5.05E-05	6.43E-05	-0.784867	0.4342
RIR(-1)	6.97E-05	6.56E-05	1.062895	0.2901
LOG(GEXP)	0.000372	0.000325	1.145494	0.2544

R-squared	0.435891	Mean dependent var	0.001096
Adjusted R-squared	0.296112	S.D. dependent var	0.003576
S.E. of regression	0.003000	Akaike info criterion	-8.600143
Sum squared resid	0.001017	Schwarz criterion	-7.996488
Log likelihood	639.6102	Hannan-Quinn criter.	-8.354842
F-statistic	3.118424	Durbin-Watson stat	2.402557
Prob(F-statistic)	0.000011		

Ramsey RESET Test
Equation: UNTITLED
Specification: LOG(MGDP) LOG(MGDP(-1)) LOG(MGDP(-2)) LOG(MGDP(-3)) LOG(MGDP(-4)) LOG(MGDP(-5)) LOG(MGDP(-6)) LOG(MGDP(-7)) LOG(FD) LOG(FD(-1)) LOG(FD(-2)) LOG(FD(-3)) LOG(FD(-4)) LOG(FD(-5)) LOG(FD(-6)) LOG(FD(-7)) LOG(FD(-8)) LOG(FD(-9)) LOG(FD(-10)) INF*UNEMPR INF(-1)*UNEMPR(-1) INF(-2)*UNEMPR(-2) INF(-3)*UNEMPR(-3) INF(-4)*UNEMPR(-4) INF(-5)*UNEMPR(-5) INF(-6)*UNEMPR(-6) RIR RIR(-1) LOG(GEXP) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.722424	112	0.0878
F-statistic	2.966744	(1, 112)	0.0878

F-test summary:

	Sum of Sq.	df	Mean

			Squares
Test SSR	0.004018	1	0.004018
Restricted SSR	0.155688	113	0.001378
Unrestricted SSR	0.151671	112	0.001354

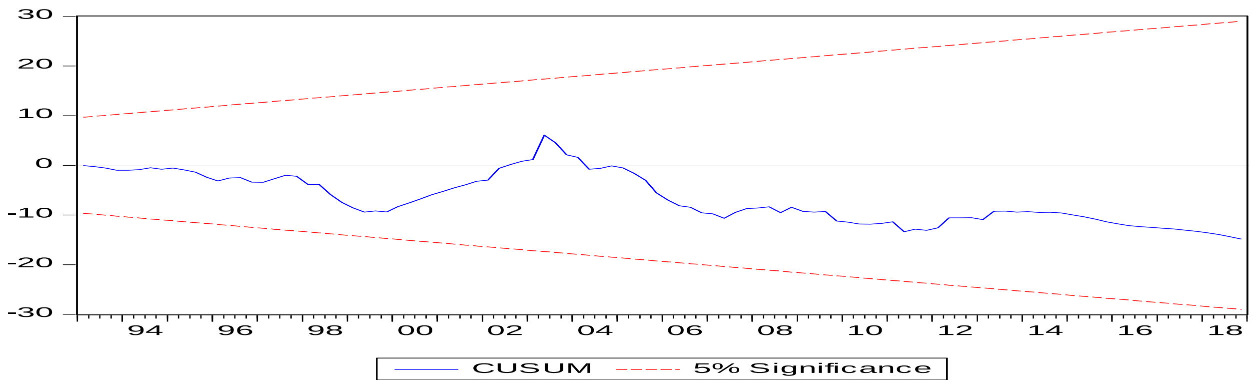
Unrestricted Test Equation:
Dependent Variable: LOG(MGDP)
Method: ARDL
Date: 10/29/19 Time: 12:25
Sample: 1983Q3 2018Q4
Included observations: 142
Maximum dependent lags: 8 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (10 lags, automatic):
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(MGDP(-1))	1.784669	0.114831	15.54170	0.0000
LOG(MGDP(-2))	-0.997019	0.156193	-6.383244	0.0000
LOG(MGDP(-3))	0.515803	0.163354	3.157584	0.0020
LOG(MGDP(-4))	-0.680722	0.165484	-4.113519	0.0001
LOG(MGDP(-5))	0.717835	0.172294	4.166336	0.0001
LOG(MGDP(-6))	-0.438219	0.157201	-2.787632	0.0062
LOG(MGDP(-7))	0.175288	0.081372	2.154144	0.0334
LOG(FD)	0.670759	0.114120	5.877651	0.0000
LOG(FD(-1))	-1.215934	0.218131	-5.574333	0.0000
LOG(FD(-2))	0.454139	0.207532	2.188280	0.0307
LOG(FD(-3))	0.052598	0.200401	0.262463	0.7934
LOG(FD(-4))	0.124261	0.204682	0.607094	0.5450
LOG(FD(-5))	-0.272902	0.210062	-1.299154	0.1966
LOG(FD(-6))	0.157825	0.200679	0.786456	0.4333
LOG(FD(-7))	0.149096	0.188543	0.790782	0.4307
LOG(FD(-8))	0.393742	0.192308	2.047452	0.0430
LOG(FD(-9))	-0.892841	0.202812	-4.402301	0.0000
LOG(FD(-10))	0.306984	0.101721	3.017909	0.0032
INF*UNEMPR	0.000680	0.000208	3.277207	0.0014
INF(-1)*UNEMPR(-1)	-0.001036	0.000398	-2.600484	0.0106
INF(-2)*UNEMPR(-2)	0.000248	0.000409	0.606555	0.5454
INF(-3)*UNEMPR(-3)	5.30E-05	0.000401	0.132050	0.8952
INF(-4)*UNEMPR(-4)	0.001331	0.000412	3.230576	0.0016
INF(-5)*UNEMPR(-5)	-0.002031	0.000404	-5.031138	0.0000
INF(-6)*UNEMPR(-6)	0.000802	0.000207	3.869439	0.0002
RIR	0.002760	0.000850	3.248505	0.0015
RIR(-1)	-0.003690	0.000849	-4.343657	0.0000
LOG(GEXP)	0.019214	0.005771	3.329314	0.0012
C	0.004241	0.133509	0.031764	0.9747
FITTED^2	-0.011642	0.006759	-1.722424	0.0878

R-squared	0.999105	Mean dependent var	5.617124
Adjusted R-squared	0.998873	S.D. dependent var	1.096308
S.E. of regression	0.036800	Akaike info criterion	-3.581458
Sum squared resid	0.151671	Schwarz criterion	-2.956987
Log likelihood	284.2835	Hannan-Quinn criter.	-3.327698

F-statistic	4311.350	Durbin-Watson stat	1.963303
Prob(F-statistic)	0.000000		

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



OBJECTIVE THREE

LAG SELECTION

VAR Lag Order Selection Criteria
Endogenous variables: GDPCP UNEMPR INF
Exogenous variables: C
Date: 10/29/19 Time: 12:45
Sample: 1981Q1 2018Q4
Included observations: 132

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2992.464	NA	1.03e+16	45.38582	45.45134	45.41245
1	-2442.721	1066.168	2.85e+12	37.19275	37.45482	37.29924
2	-2323.724	225.3737	5.39e+11	35.52612	35.98475*	35.71249*
3	-2319.760	7.328446	5.82e+11	35.60242	36.25760	35.86865
4	-2315.185	8.248315	6.23e+11	35.66947	36.52120	36.01557
5	-2300.010	26.67108	5.68e+11	35.57591	36.62420	36.00189
6	-2280.639	33.16540*	4.87e+11*	35.41877*	36.66362	35.92462
7	-2278.514	3.541324	5.42e+11	35.52294	36.96434	36.10866
8	-2270.540	12.92736	5.53e+11	35.53849	37.17645	36.20408

* 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

SELECTED VAR MODEL

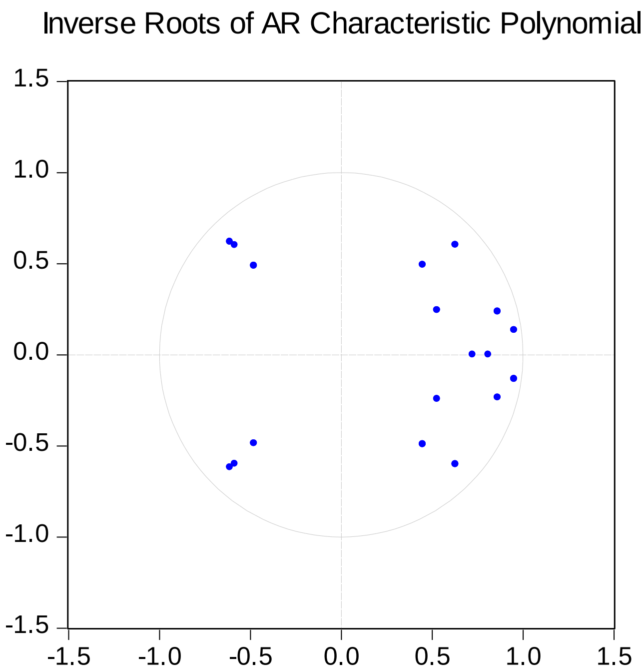
Vector Autoregression Estimates
Date: 10/29/19 Time: 12:46
Sample (adjusted): 1982Q3 2015Q4
Included observations: 134 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDPCP	UNEMPR	INF
GDPCP(-1)	1.492578	5.77E-10	-3.53E-08
	(0.12477)	(1.2E-08)	(2.0E-07)
	[11.9631]	[0.04951]	[-0.17832]
GDPCP(-2)	-0.275166	2.80E-09	-3.13E-08
	(0.19296)	(1.8E-08)	(3.1E-07)
	[-1.42605]	[0.15571]	[-0.10247]
GDPCP(-3)	-0.022937	-2.55E-09	2.61E-08
	(0.17673)	(1.6E-08)	(2.8E-07)
	[-0.12979]	[-0.15455]	[0.09330]
GDPCP(-4)	-0.685170	-2.46E-09	1.78E-08
	(0.17698)	(1.7E-08)	(2.8E-07)
	[-3.87144]	[-0.14907]	[0.06345]
GDPCP(-5)	0.632953	7.49E-10	6.66E-08
	(0.19448)	(1.8E-08)	(3.1E-07)
	[3.25457]	[0.04124]	[0.21608]
GDPCP(-6)	-0.173024	4.33E-09	-8.29E-08
	(0.13034)	(1.2E-08)	(2.1E-07)
	[-1.32743]	[0.35543]	[-0.40141]
UNEMPR(-1)	137147.9	1.796129	-0.177592
	(811300.)	(0.07574)	(1.28580)
	[0.16905]	[23.7146]	[-0.13812]
UNEMPR(-2)	-375167.2	-0.863152	0.209532
	(1610867)	(0.15038)	(2.55301)
	[-0.23290]	[-5.73967]	[0.08207]
UNEMPR(-3)	-214992.7	0.044375	-0.313302
	(1709096)	(0.15955)	(2.70869)
	[-0.12579]	[0.27812]	[-0.11567]
UNEMPR(-4)	441877.7	-0.465897	2.082859
	(1657221)	(0.15471)	(2.62647)
	[0.26664]	[-3.01141]	[0.79303]

UNEMPR(-5)	153.7769	0.787227	-3.065914
	(1541935)	(0.14395)	(2.44376)
	[0.00010]	[5.46881]	[-1.25459]
UNEMPR(-6)	-337280.8	-0.357273	0.906539
	(805745.)	(0.07522)	(1.27700)
	[-0.41859]	[-4.74965]	[0.70990]
INF(-1)	-25127.73	-0.000803	1.742701
	(57108.0)	(0.00533)	(0.09051)
	[-0.44000]	[-0.15053]	[19.2545]
INF(-2)	19382.39	-0.001126	-0.763349
	(110864.)	(0.01035)	(0.17570)
	[0.17483]	[-0.10880]	[-4.34449]
INF(-3)	19167.97	0.003582	-0.012050
	(117050.)	(0.01093)	(0.18551)
	[0.16376]	[0.32778]	[-0.06496]
INF(-4)	-46694.81	0.010460	-0.350398
	(116875.)	(0.01091)	(0.18523)
	[-0.39953]	[0.95869]	[-1.89168]
INF(-5)	55647.80	-0.025042	0.572280
	(110271.)	(0.01029)	(0.17477)
	[0.50464]	[-2.43262]	[3.27456]
INF(-6)	-33813.66	0.012319	-0.243615
	(55990.1)	(0.00523)	(0.08874)
	[-0.60392]	[2.35682]	[-2.74536]
C	2780174.	0.374245	3.607438
	(1151493)	(0.10750)	(1.82496)
	[2.41441]	[3.48140]	[1.97672]
R-squared	0.943252	0.983485	0.979646
Adj. R-squared	0.934369	0.980900	0.976460
Sum sq. resids	2.90E+14	2.524994	727.7201
S.E. equation	1587234.	0.148177	2.515552
F-statistic	106.1939	380.4662	307.5007
Log likelihood	-2093.078	75.95950	-303.5069
Akaike AIC	31.52356	-0.850142	4.813536
Schwarz SC	31.93445	-0.439254	5.224424
Mean dependent	4170439.	6.533584	19.87614
S.D. dependent	6195656.	1.072175	16.39578

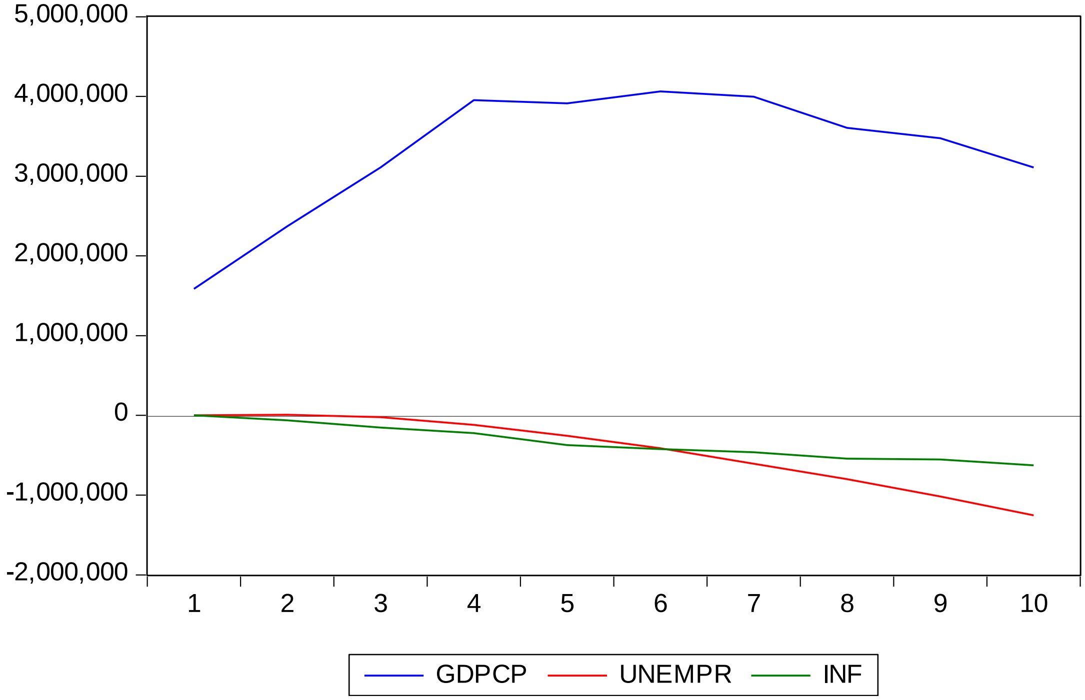
Determinant resid covariance (dof adj.)	3.33E+11
Determinant resid covariance	2.10E+11
Log likelihood	-2317.192
Akaike information criterion	35.43570
Schwarz criterion	36.66836

STABILITY TEST OF THE SELECTED VAR MODEL

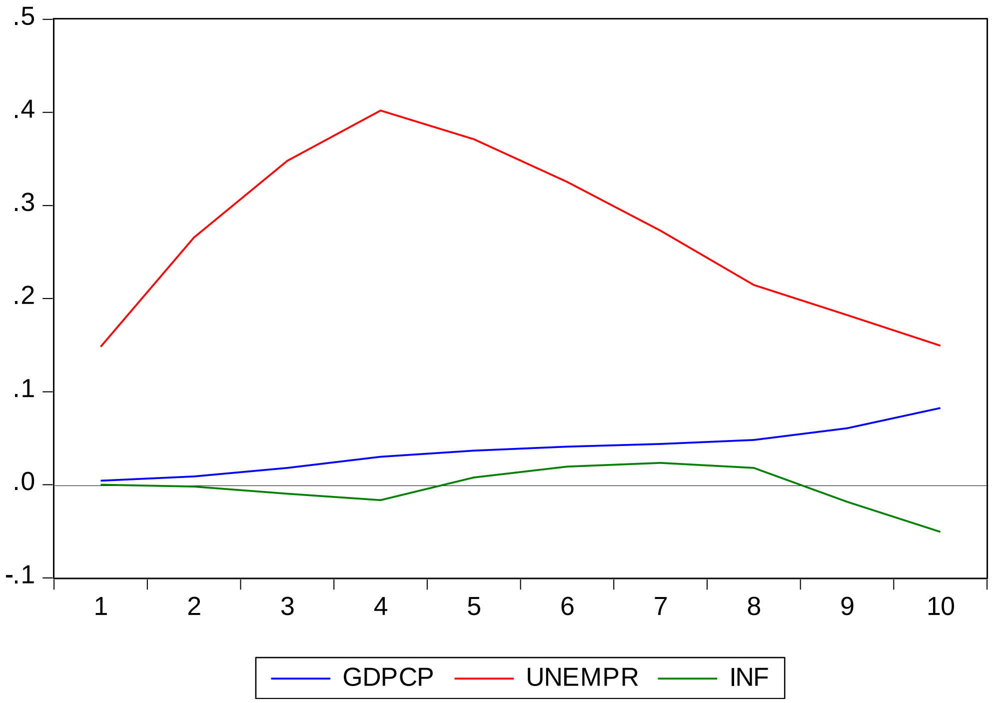


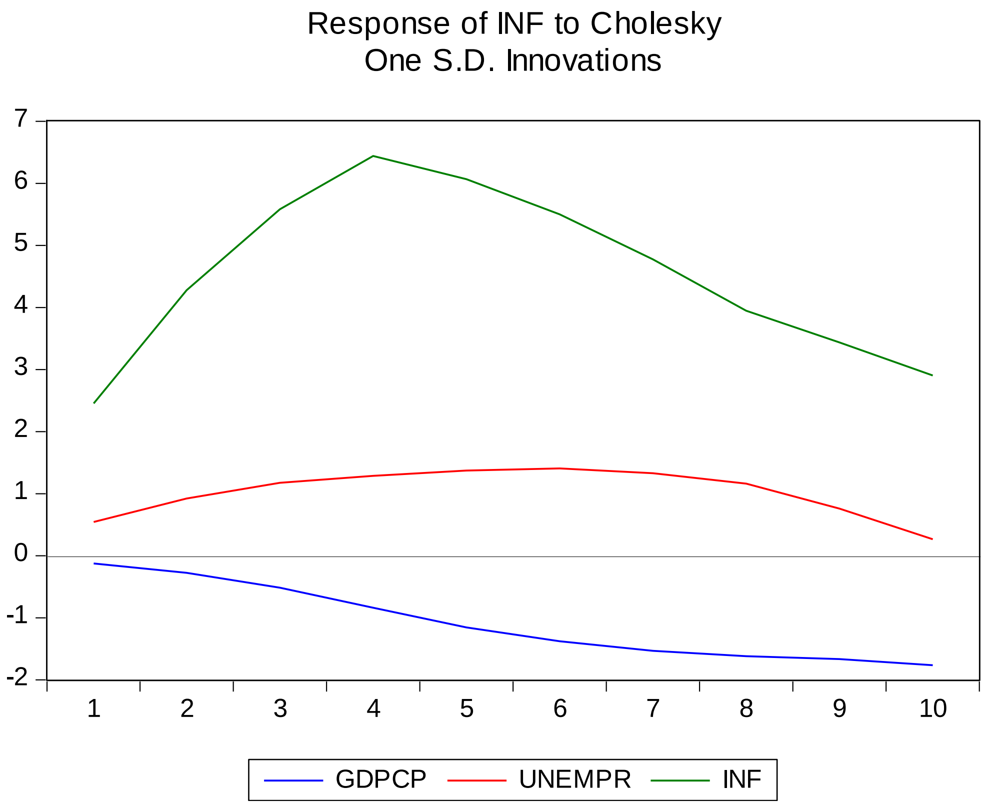
IMPULSE RESPONSE GRAPH

Response of GDPCP to Cholesky
One S.D. Innovations



Response of UNEMPR to Cholesky
One S.D. Innovations




Response of INF to Cholesky
One S.D. Innovations
7
6
5
4
3
2
1
0
-1
-2
1
2
3
4
5
6
7
8
9
10
GDPCP
UNEMPR
INF