AN ASSESSMENT OF THE RELATIONSHIP BETWEEN MONEY SUPPLY, INFLATION AND OUTPUT IN NIGERIA (1970-2016)

BY

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DECLARATION

I declare that the work in this thesis entitled “An Assessment of the Relationship BetweenMoney Supply, Inflation and Output in Nigeria (1970-2016)” has been carried out by me in the Department of Economics, Faculty of Social Sciences, Ahmadu Bello University, Zaria. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at this or any other institution.

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Signature Date

CERTIFICATION

This thesis entitled “An Assessment of the Relationship BetweenMoney, Inflation and Output in Nigeria (1970-2016)” by ABUBAKAR IsahFuntua, meets the regulations governing the award of the degree of M. Sc. Economics of the Ahmadu Bello University, and is approved for its contribution to knowledge and literacy presentation.

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DEDICATION

This work is dedicated to His excellency, Dr. GoodluckEbele Jonathan GCFR, my former boss Mr. Gabriel A. John and my brother from another mother Mr. Kelvin Samuel.

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In the name of Allah, the beneficent, and the merciful; all praises be to Allah, Master of the Day of Judgment. It is pertinentto start by expressing my gratitude to Almighty Allah for granting me the opportunity to complete this study successfully. The Late Sir, Ahmadu Bello is the icon who built the multi-billion Dollar structures as well as provided the required human capital in the academia in which I was not only taught economics but my life is transformed for the better. I pray may Jannat be his final abode.

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ABSTRACT

This study examined the relationship between Money Supply, Inflation andOutput level in Nigeria with view to ascertaining the existence or otherwise of the Tobin effect. To achieve this, the study employed the ARDL bound testing approach to cointegration on annual series of Money supply, CPI and real GDP growth rate from 1970-2016.After controlling for the observed structural breaks in the series using the dummy variable approach, the short run model shows that Money supplyexerts a positive impact on the output level by of 0.21% while inflation retards output by 0.11%. However, in the long run, both money supply and Inflation were found to have no significant impacton output level. This findings suggest the absence of Tobin effect in Nigeria. The study therefore recommends that:the monetary authority must fasten its braces against inflation as well as its money supply generating mechanisms. Also, in order to consolidate the short run gains in output achieved by the money supply through the long run, effort should be geared towards boosting the productive base in order to meet up with the increase in demand which will consequently tame inflation.

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 Background to the Study

The relationship between money supply, output and prices is a pertinent issue in economics. It is a relationship that has prompted an unending probe by central bankers and academicians from the time of the Classical quantity theorists in the 20th century to the monetarists in the 1950-1960s to date. The classical economists view money supply as the only factor responsible for inflation through the demand channel. They give more importance to monetary policy in stabilizing the economy. The Keynesians on the other hand opine that when thereis under unemployment in the economy an increase inthe money supply leads to an increase in aggregate demand, output and employment only in the short-run (Hussain, Faarooq&Akram, 2010).

While the Classicals' view the aggregate supply (AS) curve as vertical as any increase in money supply leads to increase in prices only, the Keynesians contend that, is an inverted L-shape. As a result, in the long–run there is no effect of money and therefore, the Keynesians recommend the use of fiscal policy in stabilizing the economy (Hussain, et.al. 2010).

According to Waliullah&Fazli-Rabbi (2011), all plausible economic explanations about the relationship between money supply, output and prices have become a debate between two major schools of thought, that is the Keynesian and monetarist schools of thought. According to the Keynesians, in the Hicks-Hansen IS-LM model, money affects output positively through changes in the rate of interest; i.e. changes in money stock are induced by changes in income and not vice versa. In other words, Keynes believes that so long as there is unemployment, output will change with a change in the quantity of money without affecting prices; and contrariwise

when there is full employment (Gatawa, Abdulgafar&Olarinde, 2017). On the other hand, monetarists contend that money has a direct and proportional effect on output. However, in the long-run its effect on income is neutralized, since prices change proportionally to change in money leaving the real value of income unchanged.

It is widely acknowledged that inflation inhibits growth (see: Waliullah&Fazli-Rabbi 2011; Babatunde&Shuaibu 2011). Conversely, Tobin (1965) posits that inflation spurs growth via capital accumulation and interestingly, Mishra, Mishra & Mishra (2010) provide empirical support for Tobin's supposition in India. This raises the question of whether inflation promotes or retards output growth.

In Nigeria, output growth and inflation have exhibited significant fluctuations over the years and have witnessed substantial changes since the country's attainment of political independence in 1960. Boosting the level of output is of utmost importance given its impact on the standard of living. The Nigerian economy is characterized by structural challenges that limit its ability to sustain growth as the economy is highly dependent on a single commodity for economic activities, fiscal revenues and foreign exchange – oil. For example, the high growth recorded during 2011-2015, which averaged 4.8% per annum is mainly driven by higher oil prices (Ministry of Budget & National Planning, 2017). Interestingly, this oil money is also capable of increasing the price level.

Inflation has been an issue ofconcern to policymakers in Nigeria in recent years, given the need to stimulate domestic demandand to meet government's huge fiscal obligations in a post-recessionary period (Babatunde&Shuaibu, 2011). In the Nigerian context, money supply has contributed to the increase in general price level through demand channel ever since the proceeds of oil started flowing into the economy (see: figure 2.1). However, this massive supply

of money has over time failed to translate itself into meaningful development. Inflation is not only a global economic problem but has proven to be very difficult to tackle (CBN, 1974). This is because the forces causing inflation are multifaceted- monetary,demand-pull, cost-push and structural components. As such, difficulty is often encountered in identifying the causes of a particular type of inflation which is the basis for solving the problem.

In Nigeria, one of the cardinal objectives of the Central Bank of Nigeria (CBN) is to maintain price stability (Oyinpreye& Moses, 2014). This is done by ensuring that the rate of inflation is maintained within single digit. This is achieved through the proper management of the quantity of money cost of borrowing, credit expansion capacity of Deposit Money Banks (DMBs) and exchange rate. According to Ojo (2013) the CBN believes that inflation is caused primarily by the persistent expansion in money supply and if there is any apparent solution to the problem of inflation, it lies in the reduction of money supply. But this might adversely affect output growth. Sharew, Wassie&Adugna, (2016) hold similar opinion as they posit that, excessive expansion of the supply of money causes inflation which may in turn inhibit output performance.

In a bid to maintain macroeconomic stability, the apex bank changes the direction of policy in line with emerging developments. For example, during a recession, there is low demand which tends to increase unemployment. This means that the monetary authority responds by increasing money supply in order to boost consumption, production, employment and investment. Therefore monetary aggregate that make up the monetary policy transmission are vital for attaining price stability and increasing output.

Nigeria plunged into recession in the second quarter of 2016 as real GDP growth rate was recorded at –1.58%. In 2017, real GDP turned to positive growth in the second quarter and

sustained its acceleration on a year-on-year basis. Annual real GDP growth rate in 2017 was recorded at 0.82%, signifying economic recovery when compared to corresponding time in 2016 (NBS, 2017). The recovery was due to oil price recovery, fiscal spending and stability in the foreign exchange market (CBN, 2017). On liquidity management, CBN sustained a non-expansionary monetary policy stance in the first half of 2017 to ensure price stability, as high inflation and foreign exchange demand pressure remained the main challenges. As such, Growth in major monetary aggregates was maintained at generally low levels. As broad money supply (M2) and narrow money supply (M1) fell by 7.3 and 10.7 % (CBN, 2018). Hence, the general price level decelerated in the first half of 2017 as the year-on-year headline inflation declined consistently throughout the review period from 18. 7 % in January to 16.1 % at end-June 2017, compared with 18.6 and 16.5 % at end-December and end-June 2016, respectively(NBS, 2017)..

On the whole, there seems to be light at the end of the tunnel as the government rolled out the Economic Recovery and Growth Plan coupled with its renewed effort in trying to diversify the economy, CBN, (2018) believes that the economy will be strengthened.

1.2 Statement of the Research Problem

The Keynesians posit that in an economy that is below full employment level like Nigeria, an increase in money supply will increase output through the demand channel while leaving the level of prices unchanged (Hussain et. al. 2010). It is also thought of as a policy tool to curb inflation (CBN, 2015). In other words, money supply as a CBN policy tool ought to be a driver of output capable of expanding the productive base of the economy particularly in the real sector activities which will consequently reduce the pressure on the overall prices of goods and services in the economy.

However, changes in money supply may not have had any appreciable impact on inflation and the output level in Nigeria over the years. This is because amidst several attempts to achieve a sustained level of output growth and to lower prices, the alteration of money supply seems to be effort in futility. In the words of Babatunde&Shuaibu (2011), Since 1960s, there has been massive injection of liquidity into the economy arising from rapid monetization of oil inflows, minimum wage adjustments e.t.c. For example, the money growth rate was at 29.7 % and 44 % in 1962 and 1969 respectively, the GDP only grew at an average of 2.5 % annually throughout that period (CBN, 2012). However the opportunity cost of this seemingly increases in output was even at the expense of increase in the level of prices. It is on record that inflation increased from 6.4% in 1961 to 12.1% in 1969 and climbed to 33.9% in 1975.

Also, available data from CBN (2012) revealed that on the average, from 1980 to 1990, money supply growth rate and inflation stood at 18.09 and 19.66 respectively, whereas output contracted by 0.13%. In the same vein, during the period 1991 to 2000 money supply grew by 38.4% and this caused the inflation rate to have increased to 30.59% while leaving the output at 1.88% growth rate throughout the period (CBN, 2012).

This trend of sluggish growth amidst high level of inflation has continued to bedevil the Nigerian policy space up till the present time. Most recently, the GDP figures of the first and second quarters of 2016 contracted by 0.4% and 1.58% respectively. During the same periods, the monetary aggregate grew by 10.4% and 19%. Consequently, inflation rose to 17.85 % and 18.55 % in the last two quarters of 2016 (NBS, 2017).

Inflation negatively affects all economic agents. It makes locally produced goods and services less competitive, decreases the value of the local currency and widens income inequality. Conversely, Tobin (1965) argued that inflation spurs growth. In other words inflation hysteria causes money-holders to substitute their monetary asset with capital which in turnbooststhe level of output- the so-called "Tobin effect". Interestingly, Mishra, Mishra & Mishra (2010) study conducted in India empirically supports the Tobin's supposition.

In Nigeria however, it is intriguing as could be empirically seen in figure 2.1 that the level of output as measured by the Gross Domestic Product (GDP) is increasing in the wake of surging level of prices. This gives rise to the following questions: does the "Tobin effect" hold in Nigeria? If yes, by how much?

To answer these questions, the following research questions need to be addressed:

(i) What is the impact of money supply on the output growth in Nigeria?

(ii) What is the impact of inflation on the output growth in Nigeria?

1.3 Research Objectives

The broad objective of the study is to assess the relationship between money supply, inflation and output growth in Nigeria with a view of ascertaining the existence or otherwise of the Tobin effect from 1970-2019. The specific objectives are to examine:

(i) the impact of money supply on the output level in Nigeria; and

(ii) the impact of inflation rate on the output level in Nigeria

1.4 Research Hypotheses

This study seeks to test the following hypotheses;

H_{01}: Money supply has no impact on the output level of Nigeria.

H_{02}: Inflation has no any significant effects on the output growth of Nigeria**.**

1.5 Justification of the Study

Keynesian economists opine that money supply increases output while inflation retrogresses output. On the flip side, Tobin (1965) opined that inflation drives output through increased level of capital stock-"the Tobin effect". Mehrara and Musai (2011) studied ten oil exporting countries including Nigeria, Waliullah and Fazli-Rabbi (2011) studied Malaysia, Sharew*et al* (2016) in Ethiopia are all empirical works carried out in this area. Also, Adesoye(2012), Onayemi (2013), Abiodun (2014), Dan and Zungwe (n.d.) and lastly Gatawa*et. al*(2017) are similar studies conducted in Nigeria but none has paid attention to the existence or otherwise of the "Tobin effect" rather they studied causation, relationship and impact among the variables, primarily through the Quantity Theory of Money (QTM) and the Keynesians monetary theory. Noteworthy is that, these theories have their own inherent weaknesses (see: section 2.3). However, Babatunde&Shuaibu (2011) used the Tobin model as a framework with a view to analyzing the joint impact of both money supply and inflation on the economic growth of

Nigeria. The value addition here to their study is that this work has extended the data from 2011 to 2016 which covers the recent recession that Nigeria has faced.

In terms of estimation techniques, the work of Babatunde&Shuaibu (2011) and all others so far reviewed ignored the structural breaks that are very apparent in the series. This portends great negative consequences on the results gotten. The breaks seen are sturdy enough to generate divergence and wrong inferences. This study complements earlier efforts by taking care of the noticeable breaks in the series in its estimation.

1.6 Scope of the Study

This research examines the relationship between money supply, inflation and output in Nigeria from 1970 to 2016. The choice of period is informed by data availability as well as the fact that it represents the period of significant inflationary pressure as well as several upswings and down swings in the level of economic activity in Nigeria.

1.7 Organization of the Study

This study is divided into five chapters: chapter one is the general introduction and it covers the background of thestudy, statement of research problem, the research objectives, research hypotheses, justification for the study,scope as well as the organization of the study. Chapter two covers; the literature review and it covers monetary policy issues, overview of the performance of money, inflation and output in Nigeria, conceptual, theoretical and empiricalreviews. Chapter three is the researchmethodology and it highlights the theoretical and conceptual frameworks, estimation techniques as well as data issues. Chapter four consists of result presentation and discussion while chapter five outlines the summary, conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

This chapter contains related literature; conceptual, theoretical as well as empirical within the Nigerian economy and that of few other countries. Notwithstanding, a brief highlight of some important policy issues are discussed as well as the historical behavior of Money Supply, Inflation and Output Growth in Nigeria

2.1 Key Monetary Policy Issues in Nigeria

The conduct of monetary policy in Nigeria has been guided by two major policy frameworks since the commencement of the operations of the CBN in July 1959. Historically, the application of an exchange rate targeting regime had existed between 1959 and 1973, while the use of a monetary targeting framework started in 1974 and is still the current practice (Ojo, 2013).Monetary policy instruments used during this period included fixing the exchangerate, interest rate, discount rate control, variable liquid assets and moral suasion toreverse the credit expansion. Here, monetary policy was anchored on a fixed exchange rate regime in which the exchange rate of the Nigerian pound was fixed at par to that of the British pound. This action enabled the Nigerian monetary authorities to have a firm control on the growth of the money supply which had a salutary effect on the nation's growth level and sustenance of price stability (Ojo, 2013).

According to Omotor (2007)in the 1960s and early 1970s the government made borrowing as cheaply as possible for the purpose of financing the Second National Development Plan. Coupled with the civil war in 1970, the Nigerian economy experienced an inflationary spree. Other factors that fueled inflation were the unrealistic wage increase proposed by the Adebo and Udoji Commissions in 1971 and 1974 respectively. The civil war and the devaluation

of the Nigerian pound would have induced inflationary pressures, arising from increased import prices. This led to the pegging of the Nigerian pound to the US dollar while restrictions were imposed on imports through direct controls (Ojo, 2013).

Coincidentally, the global financial crisis in the early 1970s resulted in the devaluation of the US dollar to which the new Nigerian currency (naira) had been pegged and this necessitated the further devaluation of the Nigerian currency in 1973 even when the economic fundamentals did not dictate such action (Ojo, 2013). This is the beginning of the exchange rate pass-through to the inflation rate in Nigeria. This in turn led to the all-time high inflation recorded in the 1970s.Consequently, inflation became a serious problem in Nigeria. Commenting further, Ojo (2013) opined that the Central Bank to this effect embarked on some direct control measures, in an effort to control inflation. These measures include; quantitative interest rate and credit ceilings on the deposit money of banks and sustained the sectoral credit allocation policy to preferred sectors of agriculture, manufacturing, and residential housing. Having lowered the rate of interest through administrative controls, the strategy couldn't suppress prices and boost output.

This according to Ojo (2013) necessitated the change in the framework for monetary policy. Hence, monetary targeting, as a framework for monetary policy, was introduced in1974 and is subsisting till date. However, it is classified into two time horizons, namely, the direct monetary control (1974-1992) and the indirect monetary control (1993-date). The main strategy of monetary policy under the monetary targeting framework is to control the growth of monetary aggregates in the belief that inflation is caused primarily by the persistent expansion in money supply. To maintain internal balance, both inflation and output growth rates are set at levels consistent with the expected expansion in aggregate demand (Ojo, 2013).

During the period of indirect monetary controlwhich commenced in September 1993, the CBN uses only the monetary base as a controlling variable in order to influence the growth rate of money in the economy. Here, the CBN allows the market forces to determine interest rates and credit allocations. The general approach is to estimate the optimal level of the money supply given the pre-determined targets for GDP growth, inflation rate and change in external reserves. Market-based policy instruments were then applied to restrict the credit creating capacity of the Deposit Money Banks (DMBs) (Ojo, 2013).The excessive growth in domestic liquidity attributed to the expansionary fiscal operations of government made the CBN to replace the Minimum Rediscount Rate (MRR) by the Monetary Policy Rate (MPR) in December 2006. The MRR signaled the direction of CBN's interest rate in the economy. It is recognized that inflation is a monetary phenomenon in the medium to long term. In the year 2007, Nigeria was said to have indicated her interest and equally showed readiness to adopt the trending framework in the management of inflation; inflation targeting (Umar, 2018).

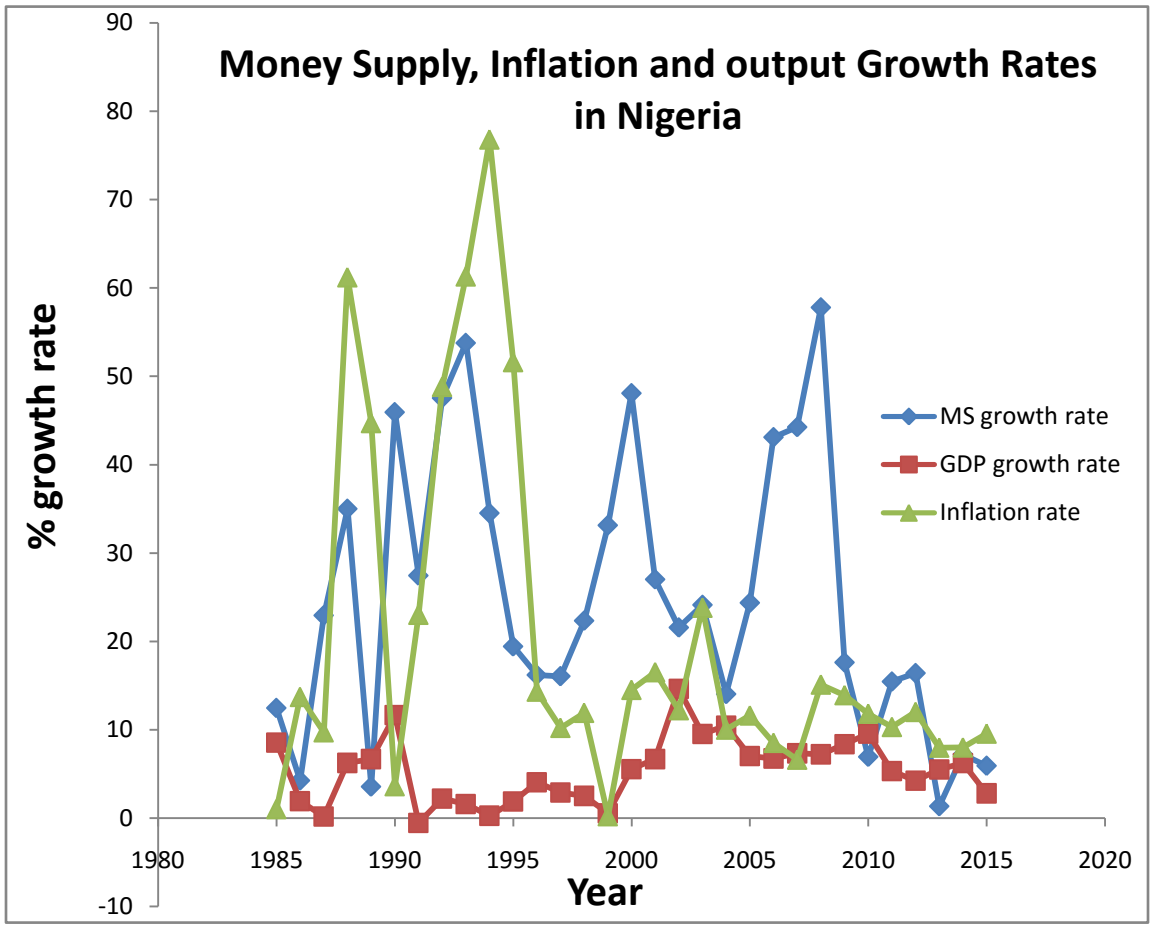
On the whole, the performance of monetary policy in Nigeria is not impressive as targets of inflation and real growth rate have been frequently missed. This is because by definition, price stability in Nigeria refers to the achievement of a single-digit inflation rate on an annual basis (Babatunde&Shuaibu, 2011). Indeed, this objective has not been achieved on a sustained basis. This is not unconnected with the problem of liquidity management faced by the policy maker during the period as a result of the excessive growth in liquidity due to increase in oil price, huge fiscal deficits financing and increased capital inflows.

2.2 An Overview of Money Supply, Inflation and Output Growth in Nigeria

Nigeria had the economic impetus to be among top economies in the world, in less than two decades from independence and still is, given its vast abundance of both human and natural resources, coupled with favorable climatic conditions that support all kinds of agricultural and manufacturing endeavors. This expectation was further strengthened by the oil boom in the 1970s. As a result, massive oil money has been constantly injected into the economy with the view of expanding the productive base of the economy. However, the accompanying effect of this is the surging levels of price overtime.

As a result of the over dependence on oil, the Nigerian economy is therefore exposed to the volatility of the world oil price. Consequently, the macroeconomic variables of money supply, output and the inflation rate among others have being characterized with several cyclical upswings and downswings. This can be seen in figure 2.1 below;

Figure 2.1; the relationship between money, inflation and output growth in Nigeria.



Data source: World Development Indicator, (2017)

Looking at figure 2.1, it could be seen vividly that there are four episodes of cyclical ups and downs in the behavior of the three macroeconomic variables of money supply, inflation and GDP growth in Nigeria. During the 1980s, the high rate of inflation of 61.2 % in 1986 was attributable to the increase in the level of money supply and the foreign exchange crises of the 1980s. The spillover effects of the windfall gains of the oil money flow of the 1970s further aggravated the situation. Whereas, the non-impressive level of output growth experienced was as a result of the crash in the international price of oil and the deregulation policies of the SAP which limited government's participation in the economy (Ojo, 2013).

In the second period, money supply growth rate is seen to have increased to 53.76 % in 1991 and consequently inflation inched up to 76.8 % in 1993. Devaluation, Credit expansion, wage adjustments in addition to the increased liquidity may have influenced the rate of inflation. Consequent upon this, the indirect monetary control was adopted at the beginning of this period (1993-2016)to control the growth of monetary aggregates in the belief that inflation is caused primarily by the persistent expansion in money supply (Ojo, 2013). The output downward trend is seen as a reaction to the surging prices which Babatunde&Shuaibu (2011) labeled as a retardant to growth. The third split shows improvement as money supply remains at averagely 27 %. Here, the inflation rate dropped to 12.7% and at the same time the GDP average growth rate inched up to 7.1% from 2%. The increase in the level of output is not surprising as the era marks the time of democratic dispensation and economic liberalization.

Also in the last episode, all the variables reduced moderately with decrease in money supply being the highest. This is not unconnected with the government's renewed efforts in strengthening its stabilization measures in the economy through several reforms policies, fiscal discipline and good monetary and exchange rate policy etc. The CBN independence granted in 2005 further strengthened it as well as its ability to control the level of prices. Whereas the global financial crises, bad harvest,decreased the output level. Also, the increased activities of the Niger Delta militant are said to have decreased the country's oil production daily which consequently affected the output level.

2.3 Conceptual Review

This section highlights as well as operationalizes the key concepts as used in this work which are; money supply, inflation and output growth.

2.3.1. Money supply

Money supply is the total currency and all other liquid instruments in circulation in any given economy. Basically, monetary aggregate in most economies is categorized into narrow (M_0) and broad (M_1). Whereas the former includes all cash balances in people's hand and demand deposits, the latter consists of M_0 plus time deposits, savings deposits and all other liquid assets such as treasury bills, mutual funds, bonds etc.

According to CBN (2015) Money supply is measured differently by countries depending on the level of development of a country's financial system. For example the U.S. has M3 in addition to M1 and M2, where; M3 includes those financial assets that arerelatively less liquid and may involve time delays besides entailing other costs before they areconverted into transaction balances e.g. mutual funds, shares in money market, large repurchase agreements etc. But in Nigeria however, there are basically, three different measures of money; monetary base (M0), narrow money (M1) and broad money (M2). The base money, high-powered money or reserve money; is the sum of all money balances with the public, those with the DMBs and the cash reserves of the DMBs held by the central bank. The sum of currency outside banks and that which is with the DMBs is called currency in circulation.

The monetary base is the most liquid measure of money supply and the lowest classification of money. The monetary base is easily controlled by the monetary authorities. This is because some of its component (bank reserves) is directly under the apex bank (CBN, 2015). M1 is the sum of all paper notes and coins in circulation and balances in the current accounts for

effecting payments. M2 comprises of M1 plus time and savings deposits with the DMBs. In this study, use is made of the M2 as a measure of the money supply. This is because anything less, say M1 if used, as a measure will lead to underestimation as savings and time deposits with the DMBs and other financial institutions are also put in circulation. Money supply is also thought to play a major role in determining levels of more moderate levels of inflation.

2.3.2. Inflation

Inflation by definition is a general, persistent and appreciable rise in the general level of prices of goods and services over a considerable period of time. (CBN, 1974) opined that a rise in the general price level is considered inflationary if and only if:

i. Such a rise is constant, enduring and sustained.

ii. The rise in the price affects almost every commodity and should not be temporal.

However, the rise in price must not necessarily be general asthe prices of all goods and services do not rise simultaneously or by the same proportion.This implies that not every price increase is termed inflationary; a once-for-all rise in the price level may not be termed an inflationary phenomenon. For some policies designed to control inflation, e.g. increase in indirect taxes and interest rates, which policy makers believe would curtail effective demand, may be manifested in higher consumer prices and higher producer costs (CBN, 1974).It is also referred to as a continuing rise in prices as measured by an index such as the Consumer Price Index (CPI) or by the implicit price deflator for Gross National Product (Jhingan, 2007).

Inflation depreciates the value of a country's currency. This is quite obvious in the case of the value of the Naira (N), as available data from the CBN (2017) show. According to the data, the exchange rate which was N1 to $1 (one US Dollar) in 1981, average of N100 to $1 in

year 2000 and over N128 to $1 in 2003 and in the second quarter of 2017 sold at over N500 to a dollar.

Inflation is very multi-faceted and its effect is not only restricted to surging level of prices or depreciating currency but sometimes, could occur without an increase in the level of prices. This is seen when the government makes effort to intervene directly in form of price control-situation usually referred to as "suppressed" or "repressed" inflation (CBN, 1974). In such circumstances, inflationary pressures are manifest in longqueues of customers at shops anxiously waiting to receive their allocation of thevery limited available supplies (this case recently happened in Venezuela and Zimbabwe).

According to Gordon (1988), there are three major types of inflation, as part of what he calls the "triangle model"

i. Demand-pull inflationis caused by increases in aggregate demand due to increased private and government spending, etc. Demand inflation encourages economic growth since the excess demand and favorable market conditions will stimulate investment and expansion.

ii. Cost-push inflation also called "supply shock inflation," is caused by a drop in aggregate supply (potential output). This may be due to natural disasters, or increased prices of inputs. For example, a sudden decrease in the supply of oil, leading to increased oil prices, can cause cost-push inflation. Producers for whom oil is a part of their costs could then pass this on to consumers in the form of increased prices. Another example stems from unexpectedly high Insured losses, either legitimate (catastrophes) or fraudulent (which might be particularly prevalent in times of recession).

iii. Built-in inflation is induced by adaptive expectations, and is often linked to the "price/wage spiral". It involves workers trying to keep their wages up with prices (above the rate of inflation), and firms passing these higher labor costs on to their customers as higher prices, leading to a 'vicious circle'. Built-in inflation reflects events in the past, and so might be seen as hangover inflation.

According to Akinbobola (2012) there are basically three major explanations of inflation which include fiscal, monetary and balance of payments aspects. In the balance of payments aspect, emphasis is placed on the exchangerate. Simply put, the collapse of exchange rate brings about inflation either through higher import prices (case synonymous with Nigeria in 2016-date) or increases in inflationary expectations. The major among the causes of inflation is money growth rate (CBN, 2012). This is theoretically put forward by the monetarists and also supported by empirical studies like McCandless and Webber (2005), Onayemi (2013), Odiba*et.al* (2013) to mention but a few.

Basically, price changes are usually measured by means of three indexes, namely

i. the wholesale price index (WPI),
ii. the consumer price index (CPI) and,
iii. the implicitprice index (IPI) or the GDP deflator.

Each is a weighted index of prices ofselected commodities in a basket, and the behavior of which is taken as representative of the average behavior of prices of such goods/services in general (CBN, 1974). The CPI is the most used measure. This is because it includes the prices of services which WPI does not and is more available than the GDP deflator. It is on this basis that, this study used the CPI as a measure for inflation. The CPI measures the average change over time in prices of goods and services consumed by people for day-to-day living.Thelack of proper

management of a country's inflation rate by the authorities will jeopardize a nation and hampers its level of output. Whereas the prosperity of a nation largely depends on its level of output or GDP growth.

2.3.3. National output

The concepts national output/income or economic growth are most often than not used interchangeably. This is because; they are more similar and intertwined than they are different and distinct. National output/income is the absolute value of goods and services produced in a nation over the period of one year. Output or income is only said to have expanded if there is an increase in the productive capacity of an economy over time. It is the recorded increase in the inflation-adjusted monetary value of all goods and services produced within an economy as compared to a previous time period. A variety of measures of national income and output are used in economics to estimate total economic activity in a country or region, including Gross Domestic Product (GDP), Gross National Product (GNP), Net National Income (NNI), and Adjusted National Income (ANI) (Australian Bureau of Statistics, 2000).

On the converse, economic growth measures the rate of output expansion or contraction. According to Jhingan (1997), economic growth occurs when an economy's productive capacity increases, which in turn is used to produce more goods and services. It is the increase in the inflation-adjusted market value of the goods and services produced by an economy over time and it is conventionally measured as the percentage rate of increase in real gross domestic product, or real GDP (IMF 2012). A growing economy confers many benefits which include raising the general standard of living of the populace as measured by per capita national income, making income distribution easier to achieve, enhance time frame of accomplishing the basic needs of

man to a substantial majority of the populace (Uwakaeme, 2015). Hence, economic growth could also be accounted for through other indices such as GDP per capita (IMF, 2012).

The level of output determines employment, wealth creation and prosperity.It is importance cannot be over emphasized, given that it is not only the yardstick of measuring the prosperity of both a country and its citizenry, but equally the country's measure of economic independence from imperialism. The factors that determine the GDP growth of every country among others are; a sound technologically driven productive base, the quality as well as the quantity of labor force, foreign direct investment, sound financial system and favorable and investment friendly policies (CBN, 1979). This to a great extent is sadly lacking in Nigeria.

Economic growth in Nigeria faces various supply constraints including fuel, power, foreign exchange, and business unfriendly regulations in addition to the shortage of requisite skills and appropriate technology necessary to drive growth. Hence, the economic backwardness of Nigeria. From the forgoing, it is clear that, output measures productivity only while economic growth accounts for the progress of the productivity. This work is set to assess the productivity of the economy in the wake of increasing levels of money supply and inflation. For this reason, we measured the country's output level using the real GDP.

2.4 Theoretical Literature Review

The explanation about the link among money, inflation and output has been a very controversial one. The debate ranges from the existence of impact, its timing and its degree as well as the transmission mechanism between the variables. The debate presented here is basically between the Classicals, Keynesians and the Monetarists.

According to the monetary economists, money supply has an equi-proportional relationship with the price level in every economy, they therefore view inflation as nothing more than a monetary phenomenon. Totonchi (2011) posits that, the monetarist make use of the quantity theory of money represented by equation of exchange formulated by Irving Fisher (1876-1947) as thus;

$$\boldsymbol{MV = PT} \quad (2.1)$$

Where, M= Money supply; V= the speed with which money changes hands; P = the price level and T= the total transaction during a period of time. MV is therefore, how much money is used to make transactions while PT is the number of money exchanged in a year (Howden, 2013). It is widely agreed to use the GDP (Y) as a proxy for (T) because it is practically impossible to know for certain the number of transactions that take place in a year. This makes the equation to become;

$$\boldsymbol{MV=PY} \quad (2.2)$$

Where **PY** is the nominal GDP. Keeping the velocity constant, makes the equation to become a theory of the effects of money called the Quantity Theory of Money (QTM). Since the velocity is fixed, any change in money supply will eventually lead to changes in the nominal GDP. This means **(M)** determines the value of the economy's output. Worthy of note is that, the output level **(Y)**is determined by external factors such as factors growth, labor force technological progress

etc., whereas the price level **(P)** determines the nominal GDP **(PY).** Inferentially, whenever **(M)** increases, the prices will rise which will eventually leads to a rise in nominal GDP **(PY).** The above rise in price will be termed as inflation; which is calculated as a percentage change in the general price level.

Summarily, when **(V)** and **(Y)** are held constant, due to their exogeneity, any increase in money supply will inevitably increase prices proportionately. A central implication of the QTM is that a given change in the rate of money growth induces an equal change in the inflation rate. Walsh (2003) argued that, any theoretical model not consistent with a roughly one-to-one long run relationship between money growth and inflation is questionable. The increase as seen in equation. 2.2 comes via the increase in the price of the nominal GDP. Although, the monetarists have disassociated the effects of money supply from output directly, it is still important in their analysis since it is the transmission mechanism of the price level increase effects of money. The QTM is therefore a viable theory in explaining the economic relationship between Money, Inflation and Output in any economy. However, it has one fundamental defect as it ignores all the multi-faceted nature and cause of inflation such as external shocks, poor harvest (in the case of agrarian economies like Nigeria), expectations of inflation, imported inflation, cost-push etc. The QTM ignores the structural factors of the economy which are identified either as causal or the propagation causes of inflation. It is on this note therefore, the Keynesians rejected the monetarists' explanation of inflation.

The arguments of both the Classicals and the Keynsians could be shown in the neo-Keynesians Aggregate Demand-Aggregate Supply (AD-AS) framework.The model as a macroeconomic framework is used to explain both the Classical and the Keynesian positions about the relationship between money, prices and output growth. In the words of *Dutt&Skott,*

(2005), the AD-AS framework provides a better starting point for serious analysis than more recent models in the New Keynesian (NK) or Real Business Cycle (RBC) traditions which have come to dominate modern macroeconomics. Here, an expansion in the money stock is reflected in the shift of the aggregate demand curve. i.e AD = f(MS). The Classicals argue that, both in the short and long run, the AS curve is not only fixed but vertical so that any change in AD(ΔMS) will only lead to a change in the price level only. This is shown in figure 3.1 below

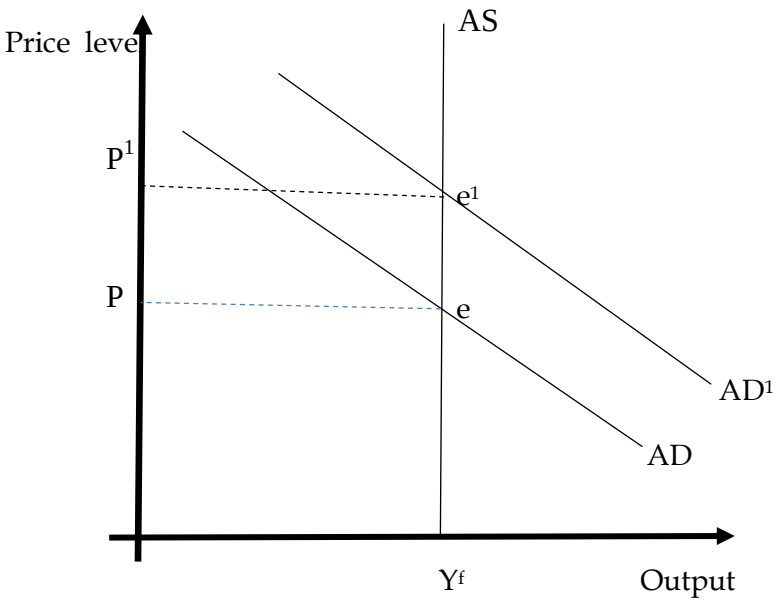


Fig. 3.1.The Classicals' AS curve.

An increase in the money growth causes the AD curve to shift from AD to AD^1 attaining a new equilibrium devoid of output increase but a surge in the price level from P to P^1.

The Keynesianism view of monetary relationship with the level of output and inflation in the short and long run respectively has a starting point from the structural problems of unemployment. According to Keynes when there is under or unemployment in the economy,an increase in the money supply leads to an increase in aggregate demand, output and employment in short-run (Hussain et. al. 2010). However, in the long–run money has no effects what so ever

but to increase the level of prices because if money supply increases beyond the full employment level, output continues to rise and prices rise in proportion with the money supply level (Hussain et. al. 2010). Therefore, the Keynesians' AS curve is an inverted L-shape. This means that in the short run an increase in AD will employ idle resources and increases output while leaving the level of prices stable up till the full employment level where the AS curve becomes vertical. At this level, increase in AD will drive prices up while living output unchanged. Money only matters in the short run as could be seen in figure 3.2

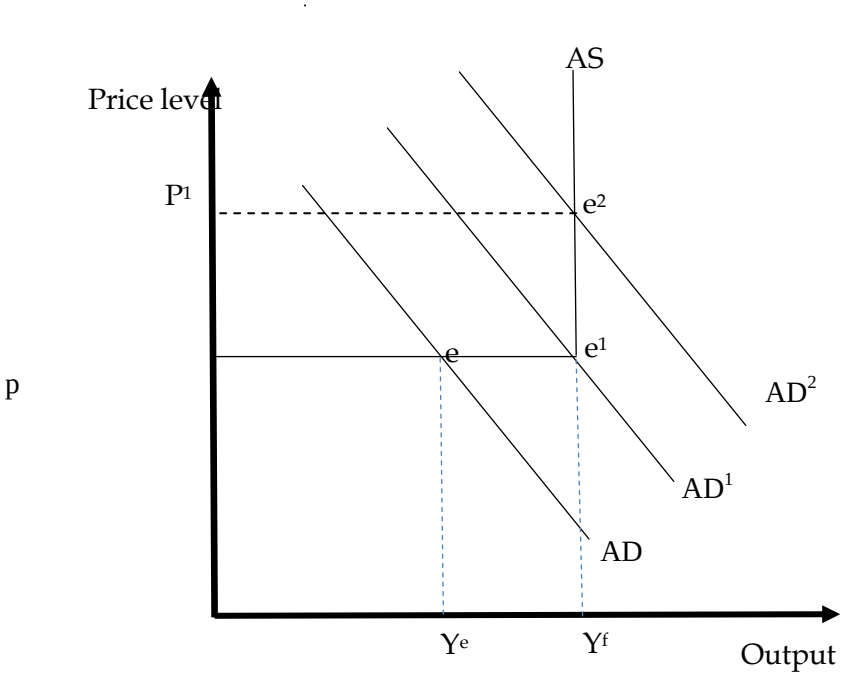


Fig. 3.2 The Keynesian AS curve.

Increase in money growth is reflected by the shift of the AD curve from AD to AD^1 causing output to expand from Y^e to Y^fwhile leaving the price level unaffected at p. But after the full employment level, a further shift of the AD curve to AD^2 yields a surge in the price level from P to P^1 while leaving output unchanged atY^f. Money only matter in the short run.It is

therefore logical to say money is not neutral at least in the short run as it has a positive relationship with the level of output. This assertion is backed empirically at least in the Nigerian economy by Chuku(2009), Dayo&Kemi (2013), among others. Critics claim that the AD-AS model omits many important features of reality and that some of its implications are not consistent with empirical observation. According to Barro(1994) the AD-AS model is not only internally inconsistent but contradictory because its assumption that the price clears the goods market is inconsistent with the Keynesian underpinnings for the aggregate demand curve.Despite this, the model as a macroeconomic model will be useful in this study as it gives a good picture of the interaction between the variables of interest from both the two giant schools of thought in economics.

The Tobin model seems to be an improvement over both the QTM and the AD-AS framework. This is because it is a growth model that incorporates within its tenets the role of money in facilitating productivity via the channels of increasing the level of capital as people free away their money balances to productive assets as a counter measure to the erosive effects of inflation. Babatunde&Shuaibu (2011) are of the opinion that, the seed of contemporary thought on the topic of money and growth was sown in the work of Tobin (1965). The Tobin model agrees with the QTM on the exogeneity of money as well as it causation power on inflation. However, here, money is not restricted only on its ability to facilitate exchange i.e. medium of exchange rather its ability to store one's value. It is a model that explains the portfolio choices facing holders of money as it relates to its cost at any given time. The portfolio behavior is that people will hold the two assets (money and capital) in proportion to their respective yields. But the greater the supply of money relative to that of capital, the higher the yield of money must be relative to that on capital (Tobin, 1965).

The central argument in Tobin's model is that inflationary pressure decreases the returns on money assets and this makes economic agents to prefer holding more of capital assets than their monetary assets. Inflation causes individuals to substitute liquidity for interest earning assets, which leads to greater capital concentration and promotes economic growth(Gatawa et.al. , 2015). And it is a common place economics that an increase in the capital stock will eventually lead to increased productivity. The works Dayo&Kemi (2013) do support this assertion. In other words, monetary deepening increases capital deepening which in turn increases output all due to the hysteria created by increase in the level of prices that erodes the purchasing power of both monetary assets and its yield. This is called the Tobin effect. That is how an increase in the level of prices increases the capital stock due to declining returns on its alternative (monetary assets) which in turn increases productivity. From (Tobin 1965), the transmission mechanism is shown as thus;

↑MONEY SUPPLY →↑INFLATION → ↓ RETURNS ON MONETARY ASSETS → ↑ CAPITAL STOCK → ↑ PRODUCTIVITY → ↑ OUTPUT

From the above theories reviewed it is understood that all of them at some point recognize the fact that money is a factor that affects inflation and output level at least in the short run. Inferentially whatever affects output surely influences the price level directly or indirectly hence, there is a consensus that money, output level and inflation are all intertwined. Notwithstanding, MacCandless& Weber (2005) are of the opinion that the long run effects of money fall entirely on price with no impact on real variables. But some still believe that monetary disturbances can have important effects on real variables such as output in the short run (Walsh, 2003). But there are differences in approach, links between the variables and the span of their analyses. Hence, worthy of note is their areas of divergence. The QTM give a long

run analysis while the AD-AS shows a short and long run analyses. Both QTM and the Tobin model recognize causation running from money to inflation but the Tobin model sees inflationary pressure to be the cause of less cash holdings among the public and vice versa. Both the QTM and the AD-AS frameworks are demand side models but the Tobin model is a supply sided model.

A cursory look at the increasing levels of output in the wake of high inflationary periods amidst tremendous monetary expansion as seen in figure 2.1, one will be susceptible to say that the Tobin effect seems to have worked in the Nigerian economy as economic actors preferred to hold their money in capital assets rather than in liquid form because of the constant erosion of its (monetary assets) purchasing power day-in-day-out. Therefore, this work was hinged upon the Tobin growth model for its theoretical support in order to ascertain the presence or otherwise of the Tobin model during the period under review.

2.5 Empirical Review

In this section, attempt was made to present as well as analyze related empirical studies conducted in Nigeria and other countries. Several works on this area carried out in Nigeria and other countries have been identified and highlighted in tables A1, A2 and A3 in appendix A. These studies were analyzed based on objectives, variables, technique of estimation and conclusions. However, the literature presented is a bit diverse though related. Therefore, it is sub divided according to the objectives and variables of each study.

As evident in column 3 in the tables A1, A2 and A , the majority of the research objectives of the studies reviewed is either to analyze the long run relationship between money, inflation and output growth as well as causality among them or to appraise the impact of oneor two variable(s) over other(s). Having had a harmonized objective of understanding the working

relationship among money supply, inflation and output, it is plausible, to see little difference in the variables employed reflecting in all the studies as independent and dependent variables depending on the specific objective of the work under review. However, the impact of money supply is predominantly investigated over inflation and the output growth level

Looking at the technique of analysis as outlined by column 7, despite the similarities and harmony of the objectives of the studies reviewed, as well as variables employed, column 7 shows a greater divergence in the aspect of their respective estimation techniques. This divergence however could be as a result of individual researchers' differences but not the subject matter of study or the objective(s) pursued there from, since there are no fast and strong rules on methodology/technique usage in economics. Therefore, the individual researchers use their discretion to choose whatever estimation method for whatever study they deem fit. For example, Ngoa&Atangana (2011), Adesoye (2012), Waliullah&Fazli-Rabbi (2011),Gatawa*et. al*(2017) and Mishra et. al. (2010) among others all studied the relationship between Money, Inflation and Output growth but chose diverse methods of analysis. While Ngoa&Atangana (2011) and Adesoye (2012) used VAR,Waliullah&Fazli-Rabbi (2011), Babatunde&Shuaibu (2011) and Mishra et. al. (2010) employed the use of ARDL. Also, as Inam (2014) and Ogunmuyiwa&Ekone (2010) studied the impact of money supply on growth as shown in table A2, the former employed ECM and the latter OLS and VAR. The studies of McCandless&Weber (2005) and that of Zhou (2005) have the same objective of examining the impact of money supply on both inflation and output yet, they employed correlation and Multivariate GARCH methodologies respectively.

Albeit the rampant usage of VAR and ECM in studying the relationship between money, inflation and Output growth as revealed in the literature studied above, ARDL appears to be the best choice for this study. This is because of the inherent weaknesses of the other alternative methodologies- co-integration and the VAR. Co-integration requires that all variables in the system must be of equal order of integration. In the words of Gujarati, (2004) a VAR model is a-

theoretic because it uses less prior information, less suited for policy analysis and the worst of all is the challenge of choosing the appropriate lag length. Whereas the ARDL approach can be applied irrespective of whether the variables are *I*(0) or *I*(1) (Pesaran and Shin, 1995). It also takes sufficient number of lags to capture the data generation process in a general to specific modeling framework (Waliullah&Fazlirabbi, 2011). More so, the error correction model (ECM) which is capable of showing short run relationship is derived there from. This is what informs the judgment about the suitability of the ARDL to this study in addition to the fact that the variables were found to be of mixed order of integration as determined by the unit root test

The last column summarizes the findings of the various studies in all the tables. From table A2, the summary of the studies revealed that the two works of Sola & Peter (2013) and Odiba*et al* (2013) both established that money has a positive and significant impact on the level of prices in Nigeria. They both lend support to the monetarist view of inflation. This is not surprising as virtually all authorities so far reviewed who studied inflation in Nigeria have acknowledged that oil proceeds, wage adjustments, credit expansion (which are all monetary in nature) as the prime causes of inflation.

But on the other hand, when examining the impact of money on the growth rate of the economy as shown in table A1,Ogunmuyiwa and Ekone (2014) and Inam (2014) came to the conclusion that money and output are inversely related and there is no causation whatsoever between them. Their findings conflict with the economic theory as it is expected that as money grows, output should also increase at least in the short run. Never the less, the relationship is still logical and understandable since it is established from the time series data in figure 2.1 that increased level of money supply is always accompanied with high inflation rate particularly,

from the 1960s to 1990s and inflation retards growth. Perhaps, money could be said to have affected growth negatively via the channel of increase in prices. This finding is out rightly in contrast with the studies of Babatunde&Shuaibu(2011) who after acknowledging importance of capital stock as an important factor in the determination of output growth; agree that increase in money supply positively affects output growth.

Furthermore, the studies of Chuku (2009), Oyinpreye& Moses (2014) and that of Zhou (2016) examined the impact of monetary policy on inflation and growth using money supply among others as variable representing policy shock. Having established a significant positive relationship between money supply, inflation and the GDP growth, they found money supply to be the most influential variable that could be used to fine-tune the economy against stagnancy or backwardness and inflation.

The remaining studies contained in table A3 which are; McCandless and Weber (2005), Mishra (2010), Ngoa&Atangana (2011), Mehrara&Musai (2011), Waliullah&Fazli-Rabbi (2011), Adesoye (2012), Onayemi (2013), Abiodun (2014), Sharew*et al* (2016), Dan &Zungwe (n.d.) and lastly Gatawa*et. al.* (2017) all examined the interactions or the relationship that exist among the three macroeconomic variables of money, output and inflation in Nigeria and other countries. McCandlesss& Weber (2005) established an almost one-to-one correlation between money and prices but found no relationship between money and output in all the samples of one hundred and ten countries. Adesoye (2012) agree with McCandlesss& Weber (2005).Therefore, their work aligned with the proposition of the quantity theory of money QTM. Worthy of note is the methodology employed by McCandless& Weber (2005) which is correlation could be deficient here because correlation does not necessarily mean causation. But the findings of

Ngoa&Atangana (2011) and Mehrara&Musai (2011), Onayemi (2013) and Abiodun (2014), show that money is not neutral in its effect and at the same time a driver of prices. But results reported by Dan and Zungwe (n.d.) shows that money is neutral. Commenting further, they also maintained that money has no effect on prices and neither do prices have on either money or output.

Mishra *et. al.*(2010) maintained that, inflation is positively related to the output level. This is the Tobin's supposition. Also, money supply causes output in India. This is in conformity with the works of Gatawa*et. al*(2017), Babatunde&Shuaibu (2011) and that of Waliullah&Fazli-Rabbi (2011) who found that money supply and inflation have significant positive and negative impacts on GDP respectively.

From the foregoing, it is very much glaring that though several works have been conducted in this area, there are conflicting results both on the Nigerian economy and elsewhere ranging from existence and direction of causality, to impacts, its timing and its degree and most importantly interactions among the variables. Perhaps the methodological issues (neglect of the structural breaks inherent in the series) as well as the theoretical issues as the gaps identified in this area of research are some of the contributing factors for this wide-range of inconclusiveness and great divergence. These areas of divergence give room for possible reexamination of the interaction between money, inflation and output in Nigeria in order to gain additional insight.

CHAPTERTHREE

METHODOLOGY

This chapter describes the set of methods as well as the justification of these methods employed in conducting the study. It contains the conceptual framework, estimation techniques, model specification, a priori expectations, data and source of the data.

3.1 Theoretical Framework

Amongst the three economic theories reviewed, the one most suited to form the basis of the underlying economic reasoning of this work is the Tobin (1965) model. This is not unconnected with its ability to relate the three variables of money, inflation and output in a very logical manner. More so, the time series data show increase in money supply accompanied by inflation and output. The upward trend exhibited by output in the wake of inflation over the years portrays possibility of the existence of the Tobin effect. Hence, the choice of the Tobin model, as it is the suitable framework that explains this scenario. Tutumaz (2014) mathematically showed the functional relationship between money supply, inflation and the output level as illustrated in the Tobin model. The relationship is shown as thus:

$$Y = f(K) \tag{3.1}$$

When y = $\frac{Y}{L}$ and k = $\frac{K}{L}$, (3.1) is then expressed as a function of capital intensity as thus;

$$y = f(k) \tag{3.2}$$

The introduction of money into the growth model is a clear distinguishing feature of the model. This inclusion of money according to the portfolio preferences affects the investments which constitute the dynamic structure of the growth models as the change in the rate of real money balances add up to the yield of production to form the disposable income.

$$Y^d = Y + \Delta\frac{M}{P} = Y + \frac{M}{P}(\mu - \pi) \tag{3.3}$$

From the above, μ is change in money supply; π is change in the price level. Equation (3.3) shows how a change in the rate of real money balances changes the level of disposable income.

Since, $S = f(Y^d)$ (3.4)

The savings function can therefore, be written as;

$$S = sY^d = s\left[Y + \frac{M}{P}(\mu - \pi)\right] \quad (3.5)$$

In the Tobin model, the wealth (W) of the economy is either held in physical capital (K) or real money balances (M/P). Wealth owners make their portfolio arrangements according to the return rates of these assets as the return rate, or marginal productivity, of the physical capital (r) is equated to marginal productivity of capital; and the return rate (or real yield) of real money balances is equal to decrease in the general price level ($-\pi$). The argument here is on the price stability concept which hinges on the stability of the portfolio preferences in the economy. In other words, prices stay unchanged if and only if portfolio preferences are in equilibrium otherwise, if the wealth owners prefer to hold more physical capital goods in their wealth than real money balances, it will increase the demand for individuals demand for goods and cause a rise in the general price level Tutumaz (2014).

$$W = K + \frac{M}{P} \quad (3.6)$$

$$\Delta W = S = \Delta\left(K + \frac{M}{P}\right) \quad (3.7)$$

$$\Delta W = S = \Delta K + \Delta\frac{M}{P} \quad (3.8)$$

Substitute, $\frac{M}{P}(\mu - \pi)$ for $\Delta\frac{M}{P}$ in equation (3.8) this yields;

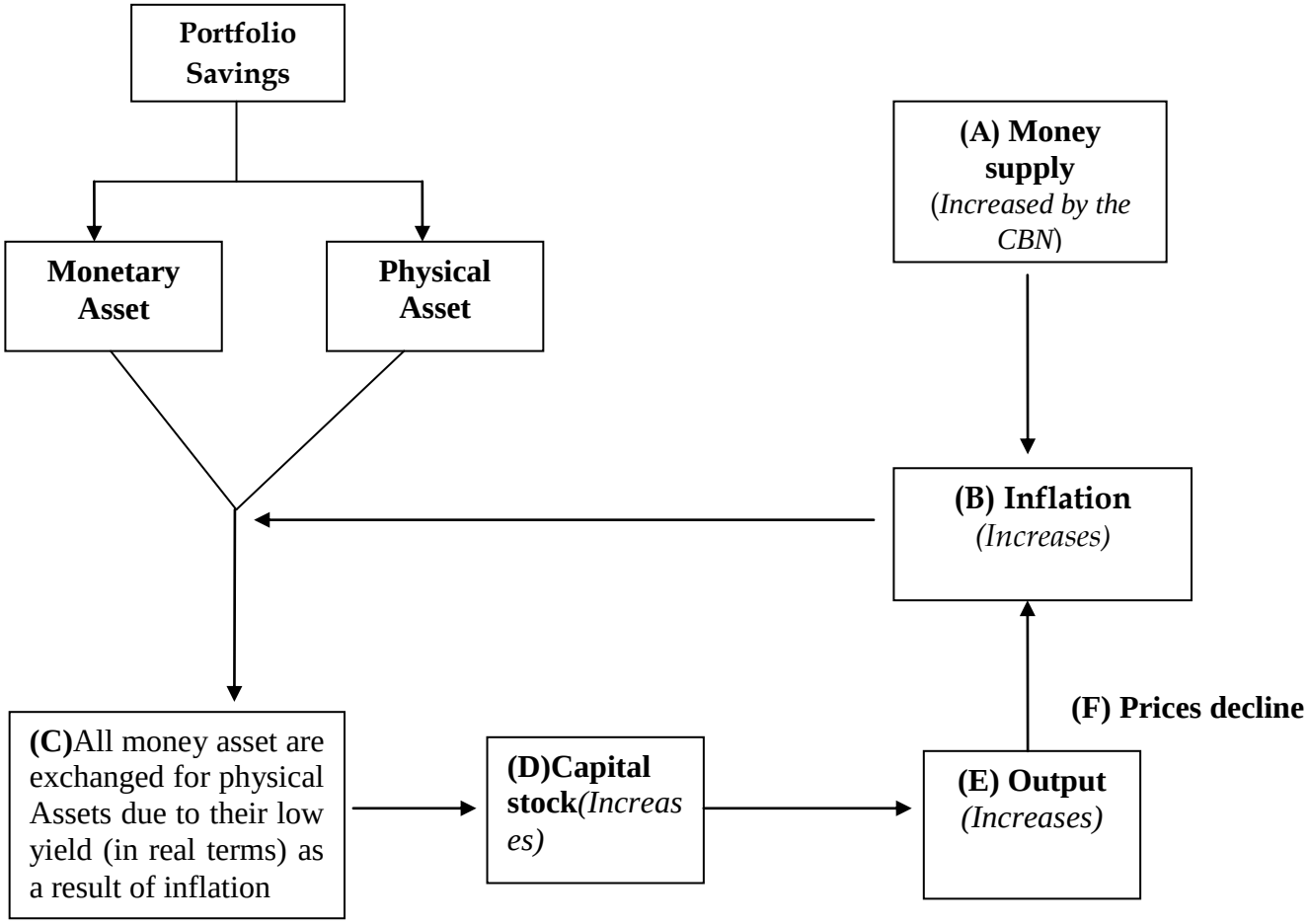
$$S = \Delta K + \frac{M}{P}(\mu - \pi) \quad (3.9)$$

But investment (I) is when there is net increase in the capital stock

$\boldsymbol{I} = \Delta \boldsymbol{K}$, therefore $\Delta \boldsymbol{K} \rightarrow \Delta \boldsymbol{Y}$

From the above it is deduced that Tobin's framework shows that a higher inflation rate via money supply permanently raises the level of output as it induces greater capital accumulation. Alternatively, the Tobin effect suggests that exogenous monetary growth rate increases inflation which in turn causes individuals to substitute out of money and intointerest earning assets, which leads to greater capital intensity and promotes economic growth (Babatunde&Shuaibu, 2011). As could be seen, the Tobin model asserts that there exist a functional relationship between money growth rate, inflation and the output level.

3.2 Conceptual Framework



Source: Adapted from Tobin (1965) model

The above framework shows the channels through which money supplyand inflation can influence the output level. According to the Tobin model (1965), money supply is exogenously determined by the CBN (A). As theory (QTM) and empirics (Adesoye, 2012, Onayemi, 2013, Abiodun, 2014) have it, excessive increase in the supply of money will trigger inflationary pressure (B). When this happens, the returns on monetary assets declines, and as such, people swap their holdings of monetary assets with capital assets (C). This is called 'Tobin effect'. The purchase of capital assets will increase the capital stock (D). Consequently, the output level will be boosted (E) which will in turn tame inflation (F).

3.3 Estimation Techniques

Most time series data analyzed in applied econometrics are found to be non-stationary. Co-integration is a technique used in estimating relationship between non-stationary variables and reconciling the short run dynamics with long run equilibrium (Nkoro& Kelvin, 2016). Commenting further, Nkoro& Kelvin, (2016), assert that, Granger (1981), Engle and Granger (1987), Autoregressive Distributed Lag (ARDL) co-integration technique or bound test of co-integrationPesaran& Shin 1999 and Pesaran et al. 2001) and, Johansen &Juselius(1990) are all co-integration techniques that have become the solution to determining the long run relationship between series.

The deviation of a variable from its long run equilibrium does affect its short run behavior, the Error Correction Mechanism (ECM) is employed to revert co-integrated variables orto re-parameterize the short-run dynamics and long run relationship of the underlying variables (Nkoro& Kelvin, 2016). Although there are a number of co-integration estimation techniques in the analysis of relationships in economics. This study employed the bound testing approach to co integration that was developed by (Pesaran and Shin 1999 and Pesaran et al. 2001). This is because it is not only superior to the rest of the aforementioned co-integration techniques, the unit root test conducted showed that the variables were not of the same order rather of orders $I(0)$ and $I(1)$.

However, the suspicion for the presence of structural breaks in the series is rife. Therefore, the OLS CUSUM test is employed to account for the structural shift. It was found that a major structural shift occurs in the year 2004, hence the dummy variable approach was employed to correct the anomaly.

3.3.1 Bound-Testing approach to Co-integration

According to Peasaran and Shin (1995) the ARDL has numerous advantages over all other methods of testing for co-integration including the two most notable other methods of Johansen's (1991) maximum likelihood approach and Phillips-Hansen's (1990) fully modified OLS procedure. The advantages of the ARDL approach to co-integration developed by Pesaran and Shin (1999) and Pesaran*et al*. (2001) over the other traditional co-integration methods include; flexible to analyze data of variables with different order of integration that is to say it can be applied when the underlying variables are *I*(0), *I*(1) or mutually co-integrated and also has the additional advantage of yielding consistent estimates of the long-run coefficients that are asymptotically normal irrespective of the order of the regressors (Pesaran and Shin, 1995). Theoretically, Pesaran et.al (2001) give the general model as thus;

$$\Delta z_t = \boldsymbol{\alpha}_0 + \boldsymbol{\alpha}_1 t + \Pi z_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta z_{t-i} + \varepsilon_t \quad (3.10)$$

Where Δ is first difference operator, z_t is a vector of both x_t and y_t, y_t is k x1 vector of dependent variables, x_t is k x k matrix which represents a set of explanatory variables,$_0$is an intercept, $\boldsymbol{\alpha}_1$ is trend coefficient, t is time trend, Π is long run multiplier matrix, Γ is short-run coefficients matrix, and $\varepsilon_t$is k x 1 vector of error terms.

3.4 Unit Root Test

Before estimating the models, it is pertinent to start by testing the stationarity of the variables of the study because bound-testing approach cannot be applied to *I*(2) variables. More so, stationarity test is carried out to avoid the problem of spurious result since not all time series data are stationary at level (Granger &Newbold, 1974). Having conducted a study about the various forms of unit root test-ADF, PP, KPSS among others, Arltová&Fedorová (2016) opined

that the ADF test is most suitable than the two others when dealing with large samples of data. It is on this basis that the study employed Augmented Dickey Fuller (ADF)unit root test .The ADF unit root equation is specified as:

$$\Delta y_t = \alpha_0 + \alpha_1 t + \phi y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \varepsilon_t \quad (3.11)$$

Where Δ is first difference operator, α_0 is intercept or constant, α_1 is a trend coefficient, t is trend term, ρ is a lag order of the autoregressive process, and ε_t is the error term.

3.5 Model Specification

To achieve the first as well as the second objectives which are to analyze the impact of money supply and inflation on the level of output, the empirical model is stated as thus:

$$Log\ RGDP_t = \theta + \theta_1 LogMS_t + \theta_2 Log\ CPI_t + \varepsilon_t \quad (3.12)$$

Equation 3.12 is adopted from Waliullah&Fazli-rabbi (2011). It emanates from the theoretical framework - the Tobin (1965) model which considers inflationary pressure arising from exogenously determined money growth as an incentive to substitute liquidity with capital assets which will consequently increase the level of output. The model can be expressed as follows;

$$\Delta\ Log\ RGDP_t = \alpha_{01} + \alpha_{11} t + \sum_{i=1}^{p} \alpha_{2i} \Delta\ Log\ RGDP_{t-i} + \sum_{i=0}^{q} \alpha_{3i} \Delta\ Log\ MS_{t-i} + \sum_{i=0}^{q} \alpha_{4i} \Delta\ Log\ CPI_{t-i} + \lambda_{11} Log\ RGDP_{t-1} + \lambda_{21} Log\ MS_{t-1} + \lambda_{31} Log\ CPI_{t-1} + \varepsilon_{t1} \quad (3.13)$$

Where, RGDP, MS and CPI are proxies for output level, money supply and inflation rate respectively. $\alpha_{01}$is the intercept ,α_{11},α_{2i}, α_{3i} andα_{4i} are the coefficients. The first part of equation 3.13 with the coefficients mentioned above represent the short run dynamics of the model whereas the second part with parameters λ_{11}, λ_{21} andλ_{31}represents the long run relationship.The null hypothesis of the model is;

H_0: $\lambda_{11} = \lambda_{21} = \lambda_{31} = 0$ (There exist no long run relationship)

H_1: $\lambda_{11} \neq \lambda_{21} \neq \lambda_{31} \neq 0$ (There exists a long run relationship)

Based on theoretical economic postulations, the aprioriexpectations about the relationship between money supply, inflation and output are that: the Keynesians through the AD-AS framework argued that, money supply is capable of increasing the output level at least in the short run. The QTM profess a one-to-one relationship between money and inflation. Whereas the Tobin model predicts a positive significant relationship between inflation and output.

3.6 Data and Source of Data

This work makes use of annual time series data of all the variables involved from 1970-2016. Table 3.1 shows the summary of the sets of data used.

Table 3.1; Data Description

Variable definition	Variable description	Measurement unit	Source
RGDP	Real GDP	GDP at 1990 prices	World Bank (2017)
MS	Money Supply	Broad money (M2)	World Bank (2017)
CPI	Consumer Price Index	Percentage increase	World bank (2017)

Use is made of the RGDP as it is the most commonly used index for measuring a country's level of economic activity. Also, M2 is used as to measure money supply as broadest definition of liquidity. It includes savings and time deposits with the DMBs and other financial institutions in addition to M1. Similarly, the CPI is the most used measure among the three measures of inflation. This is because it includes the prices of services which WPI does not and is more available than the GDP deflator.

3.7 Limitations of the Study

Several limitations have been encountered in the course of carrying out this work among which is unavailability of data. A major hindrance is conflicting data from different sources such as the IMF, World Bank and the CBN. It was observed that, these three major data sources sometimes report different values for a particular variable in the same year. It is on this basis that the World Bank data sets were chosen as most researchers rely more on it. The aforementioned are some of the identified bottlenecks to this study. Notwithstanding, the above mentioned and many more efforts have been made to subvert these and any other hindrances.

CHAPTER FOUR

PRESENTATION AND ANALYSES OF RESULT

In an attempt to examine the relations between money supply, output and inflation in Nigeria, it is imperative to carry out some preliminary analysis such as; descriptive statistics, unit root test and co-integration test after which the empirical analysis for the study would be explored. In this chapter, the data sets are presented, described, estimated and analyzed after which inferences are drawn there from. This is all geared towards achieving the aforementioned objectives of the study.

4.1 Descriptive Statistics

Table 4.1 presents a clear description and a good summary of the data sets used in this study at a glance. Looking at the maximum and the minimum values of each of the variables, as well as their large standard deviations from the mean, one will expect nothing other than a large number of JB statistic which shows that the data sets are not normally distributed. However, this is largely as a result of the large outliers seen in the data sets. For example, while the devaluation of the domestic currency as a result of SAP increased the inflation rate to a record high of 72.8% the oil inflow and fiscal deficit expanded the money supply to a tremendous level of 45.92% in 1990. As a result, the data sets could be non-stationary; parameters such as mean and variance being time-variant. Hence, a unit root test is conducted to ascertain the stationarity of the variables prior to estimation.

Table4.1: Descriptive Statistics of money supply, output and inflation

STATISTICS	**RGDP**	**MS**	**CPI**
Observations	47	47	47
Mean	1.95E+11	3.39E+12	18.59030
Median	1.37E+11	1.98E+11	12.87658
Maximum	4.64E+11	2.09E+13	72.83550
Minimum	9.05E+10	9.79E+08	3.457650
Std. Dev.	1.13E+11	6.11E+12	16.06425
Skewness	1.277560	1.731958	1.845081
Kurtosis	3.139188	4.499928	5.533539
Jarque-Bera	12.82319	27.90330	39.23739
Probability	0.001642	0.000001	0.000000

Source: Authors computation from E-Views9

4.2Unit Root Test Result

Before estimating the model, it is pertinent to start by testing the stationarity of the variables of the study because. To this end, the study employed ADF test for stationarityunder the null hypothesis that the variables are not stationary at 5% level of significance. The result also shows that MS is stationary at level while RGDP and CPI are only stationary at first difference all at 5% level of significance. The variables of interest to this study are found to be integrated of orders I(0) and I(1).

Table 4.2. Unit root test results (with intercept and linear trend)

Variables	ADF Statistic	Significance level
MS	-4.956282* *	At level
RGDP	-7.431143**	At first difference
CPI	-5.585618**	At first difference

Source: Authors computation from E-Views9
Note (**) denotes 5% level of significance.

4.3Impact of Money supply and Inflation rate on the Output Growth of Nigeria

An attempt towards achieving the objectives of this study is to answer the research questions as well as to test the hypotheses. This is all achieved by estimating equation 3.13. It is also pertinent to test the long run relationship between the variables as the ARDL modeling technique is only applied to variables that are co-integrated in the long run. Table 4.3 shows a positive bound test result as the F-Statistic of 6.867459 is above the lower and upper critical bounds of 4.89 and5.85 respectively at 5% confidence level.

Table 4.3.ARDL Bound Test for Co-integration.

Test Statistic	Value	K
F-statistic	6.867459	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	4.19	5.06
5%	4.89	5.85
2.5%	5.49	6.59
1%	6.34	7.52

Source: Author's Computation from E-Views9, whereas the critical value bounds for the F-statistic are from Peasaranet. al. (2001)

4.3.1Lag Selection Criteria to Estimate the Impact of Money supply and Inflation rate on the Output Growth of Nigeria

Having ascertainedthe co-integration relationship between the variables, the next stage is to determine the appropriate lags to be selected in estimating model 3.14.The issue of finding the appropriate lag length for each of the underlying variables in the ARDL model is very important because we want to have Gaussian error terms (i.e. standard normal error terms that do not suffer from non-normality, autocorrelation, heteroskedasticity etc.)(Nkoro& Kelvin, 2016).The result as shown in table 4.4 shows different lag selection lengths. However, it is worthy of note that Peasaran and Shin (1995) opined that among all the lag selection criteria, the Schwarz

information Criterion performs better. Hence, the study adopts the SC as it suggests choosing lag one as the appropriate lag length for the estimation of the impact of money supply and inflation on the output level of Nigeria. Table 4.4 shows the lag selection criteria as thus:

Table 4.4: Lag Selection Criteria for RGDP, MS and the CPI

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2600.421	NA	7.78e+48	121.0893	121.2122	121.1346
1	-2445.675	280.7012	8.87e+45	114.3105	114.8020*	114.4917
2	-2432.503	22.05577	7.35e+45	114.1164	114.9765	114.4336*
3	-2421.066	17.55417*	6.68e+45*	114.0031*	115.2318	114.4562
4	-2416.025	7.033886	8.30e+45	114.1872	115.7846	114.7763

Source: Author's Computation from E-views9

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

Having determined the lag selection criterion between the variables, the next stage is to estimate the co-integrating and long-run model. Table 4.5 shows the estimated result of equation 3.13. However, the equation was estimated in two ways; one that includes the dummy variable to take correct for structural breaks and the other one without the dummy variable. This will enable easy comprehension as to the effects of the structural breaks on the estimated results of the earlier works on this area. Ruling out the possibility of structural breaks in the time series data could negatively affect the validity of the results and the inferences drawn there from. This study takes care of that. A cursory look at the table 4.4, a clear divergence between the two estimation results (with and without dummy) could be easily spotted. While the model with the dummy reports non significanteffects of both money supply and inflation on the output level, in the long run, the model without the dummy variable reports the exact opposite. The result without the dummy fail several diagnostics test as the structural breaks experienced in the series are sturdy enough to create such consequential effects. Hence, the result gotten from this model is refuted. Another interesting observation with the results of the two models is that; the model does not correct for structural breaks is in close conformity with the results of several related studies all of which neglected the presence of structural breaks in the series in Nigeria and other countries

alike. These studies include, (Babatunde and Shuaibu 2011; Gatawa, et. al. 2017; Zhou, 2014 etc). While the model that correct for the structural break reports contradicts them. However, having passed all the diagnostics, the result of the model with the dummy is considered more robust and valid, hence, its adoption

The result shows that in the short-run, there is a positive and significant relationship between RGDP in the current period and MS at 5% level of significance. A percentage increase in MS led to an increase in the current value of the output level by 0.21%.The result further indicates that there is a negative and significant relationship between RGDP and the level of CPI at 5% significance level in the last period. That is to say, a percentage point increase in last year inflation rate leads to the contraction of current output by 0.11% This could be as a result of the mounted demand pressure arising from the increased money supply. This means that, the short run result of this model supports the theoretical postulations of theKeynesians in the AD-AS framework who believe that money supply increased output level in the short-run via increased demand.It is a stylized fact that, over short periods, increasedmoney supply raises the output level through aggregate demand (Jagdish, 2009). Over the years, increase in the monetary aggregate has translated itself into increase in both output and the price levels as shown in table 2.1. This could be because of the high consuming nature of the economy as increase in money supply is converted into effective demand and given the limited and inefficient productive capacity of the economy; the increased demand will lead to increased prices.

Table 4.5: The Impact of Money Supply and Inflation on the output level of Nigeria.

RGDP = Dependent Variable

	BREAKS			**NO BREAKS**	
Variable	**Coefficient**	**Prob.**	**Variable**	**Coefficient**	**Prob.**
LONG-RUN MODEL					
LOGMS	0.146625	0.2577	**LOGMS**	0.194723	0.0000
LOGCPI	-0.336920	0.4478	**LOGCPI**	-0.522168	0.0006
DUM04	0.750077	0.0714	**C**	22.270669	0.0000
C	22.617548	0.0000			
SHORT-RUN MODEL					
D(LOGMS)	0.214797	0.0010	**D(LOGMS)**	0.039859	0.0001
D(LOGMS(-1))	-0.220794	0.0640	**D(LOGCPI)**	-0.030824	0.0687
D(LOGMS(-2))	0.081684	0.2069	**D(LOGCPI(1))**	-0.001719	0.9323
D(LOGCPI)	-0.018957	0.2037	**D(LOGCPI(2))**	0.025556	0.2126
D(LOGCPI(-1))	-0.116152	0.0275	**D(LOGCPI(3))**	0.012300	0.5498
D(LOGCPI(-2))	0.032682	0.0129	**D(LOGCPI(4))**	0.018100	0.3630
DUM04	0.271946	0.0000	**D(LOGCPI(5))**	0.021133	0.2379
ECT(-1)	-0.347448	0.0000	**D(LOGCPI(6))**	0.025815	0.1206
			ECT(-1)	-0.204697	0.0014
DIAGNOSTICS					
R^2	0.99			0.98	
F-Statistic	516.88	0.00		312.58	0.00
D.W. Statistic	1.89			2.13	
Serial Correlation (LM Test)	2.333941	0.1143		0.754426	0.1143
Ramsey (RESET Test)	0.334403	0.7407		0.247633	0.7407
Heteroskedasticity Test	2.145016	0.0672		1.828707	0.0997
Jarque-Bera	3.119150	0.210225		15.42100	0.0004

Source: Author's computation from E-Views9

In the long run, both MS and CPI were found to have statistically insignificant impact on the level of output in Nigeria during the period under study. This result is in conformity with that of McCandless& Weber (2005) conducted across over 110 countries and that of Adesoye (2012) conducted in Nigeria who reported that money has no influence or impact on the level of output. Conversely, it contradictsthe results gotten by Abiodun (2014),Onayemi (2013) both in Nigeria and that of Mehrara&Musai (2011) conducted across ten (10) oil exporting countries who in their respective studies reported that money is non-neutral over the long term period. But the result

affirms the supposition of the QTM that money supply has no long run effects on the output level rather its effect falls entirely on the price level. In the Nigerian economy, the insignificance of MS to the RGDP in the long run is not surprising. This is because the economy is structurally challenged in the sense that the productive base is inefficient to match the ever increasing level of monetized oil inflow. Also, available data from previous budgets show that, could be because more than 60% of this large amount of monetized oil revenues which is a major source of monetary growth in Nigeria goes to recurrent expenditure rather than capital and other investment driven projects. This has low impact in boosting the output base of the economy. In a nutshell, the monetary growth in Nigeria increases demand without a corresponding increase in the productive base. Hence, the fleeting effect in the long run. This result reveals that money is neutral in its effect in Nigeria as it has no long run effects on the output level.

On the effect of inflation on the output level, inflation has a negative significant effect on the output level in the short run but has no significant relationship with the output level in the short run. This is contrary to the basic economic postulations of the QTM and the Tobin's proposition.The result is not surprising as it is apparent in figure 2.1 which shows increased levels of output even during the periods of highest levels of inflation in Nigeria. The reason is not far-fetched; as inflation erodes the purchasing power of the local currency, therefore, for people to maintain their standard of living they need to work harder, diversify their income base, save more and invest more. This will reverse the accompanying negative effects of inflation on output and depending on the intensity of the above stated counter inflationary measures taken by the people, their income base could be boosted rather than to succumb to the effects of inflation.

Summarily, based on the evidence gotten from the results of this study, the Tobin effect is not ascertained. Also, the widespread proposition that inflation retards growth in the long run could not be established. However, the result obtained suggests that money has significant positive relationship on the output level only in the short run.Theoretically, the evidence gotten suggests that the shape of the AS curve is an inverted L-shape as postulated by the Keynesians. This means that increase in money supply will derive output in the short run only but will generate inflation pressure in the long run. This is the supposition of the Keynesians view of the AS curve only that in Nigeria's case, full employment is far from being the reason for the

seemingly inverted L-shaped AS curve. Thereason could not be unconnected with the fact that the short run expansionary effect on output comes via the demand channel. An increased demand levels in the wake of structurally challenged economy like Nigeria will be consequential on the level of prices.This could limit the ability of the increased money supply to yield the desired positive result on the output level in the long run.

The result shows that the coefficient of error correction term (ECT) is negative and statistically significant at 5% level of significance. This implies that the deviation from the long-term equilibrium is corrected at the speed of 34.7% over each year. In addition to a positive CUSUM and CUSUM of Squares tests, other diagnostic tests were carried out. The observed probability of 0.1143 recorded from the Breusch-Godfrey Serial Correlation (LM Test)is very far from being zero. This affirms the null hypothesis that there is no serial correlation.Similarly, consequent upon the recorded probability figure of the Ramsey (RESET Test) of 0.7407 the null hypothesis that the coefficients on the powers of fitted values are all zero is hereby rejected at 5% level of significance. The results from these diagnostics have therefore cleared the model from any specification errors arising from omitted variables, non-inclusion of all relevant variables and incorrect functional form among others. Also, the model has no hetroskedasticity as we could not reject H_0at5% level of significance, meaning that the residuals of the model have constant variance. Lastly, the CUSUM and CUSUM of squares testreveals that of the parameters of the model are stable as both the curves fall within the 5% confidence bounds.

Figure 4.1 CUSUM test plot

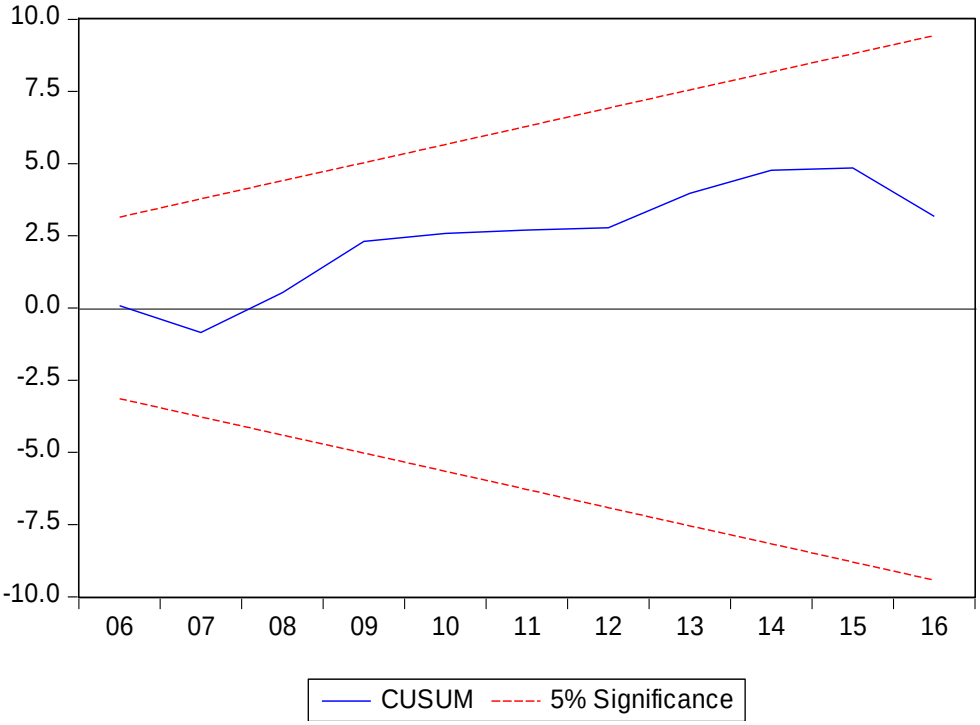
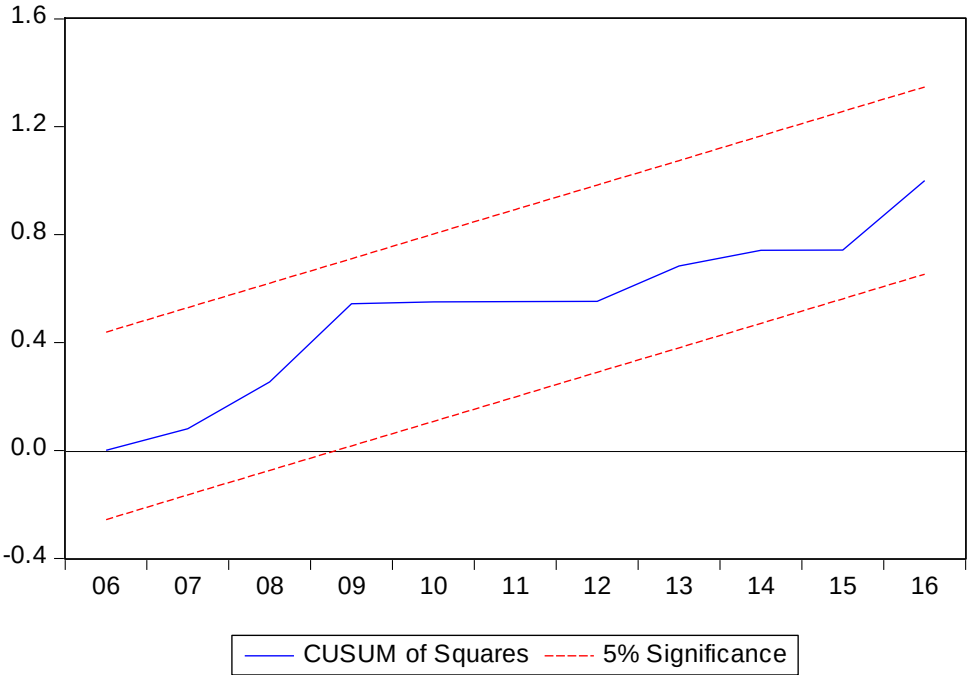


Figure 4.2 CUSUM of Squares test for stability



4.5Summary of Findings

Below is the summary of the findings of this study:

i. In the short run model, the estimated elasticity for Money supply of 0.214 indicates that a 100% increase in the volume of money in circulation brings about output expansion by 215 on the average. Therefore, Money supply increases the level of output significantly in the short run only.

ii. Also, inflation coefficient of -0.116 is an indication that for every percentage rise in the general price level, the effects will be a reduction of output by 0.11% in the short run. Hence, inflation harms output significantly while in the long run it effects is considered non-significant

iii. Both money supply and inflation were found to be statistically zero or no significant effects on the level of output in the long run. For money supply increase to have a positive influence on the output level, the economy must be able to utilize or employ its idle resources. If not, there will be more money chasing too few goods. Because nigeria is a consumption economy not a producing one, an increase in money supply is more often than note an increased demand pressure on the goods and services. Hence, it non-significance in the longer term.

iv. A positive and significant relationship is a necessary and sufficient condition for the establishment of the existence of the Tobin Effect; this was not recorded, hence, the absence of Tobin effect in Nigeria during the period under study.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the Study

There is a wide spread economic understanding and a near consensus that inflation harms the level of economic activity in any economy. Notwithstanding, Tobin (1965) presented a theoretical explanation contrary to the above. That is inflation increases the level of output through what is termed as the Tobin effect. Interestingly, the Nigerian output measured by the GDP figures has been growing in the wake of ever increasing levels of prices. This begs the question: Does the Tobin effect hold in Nigeria? This study is therefore an attempt to unravel the relationship between the three macroeconomic variables of money supply, inflation and output in Nigeria from 1970-2016. The justification or reason for this study is to ascertain the existence or otherwise of the Tobin effect in Nigeria as well as to address some methodological gaps. Therefore, question as to what the impact of money supply and inflation could be on the output level forms the research questions of this work. The next chapter gives an overview of the Nigerian monetary policy issues as they relate to the study's variables of interest. Here, the exchange rate targeting was first introduced before it was later substituted with monetary targeting framework in 1974 by the CBN in trying to better anchor prices as well as boost output. The latter was introduced due to the former's perceived failure to achieve the policy goals. The trend behavior of the time series data of the variables of interest as examined portrays high levels of cyclical upswings and downswings particularly the rate of inflation as money supply was seen to be moving in tandem with the rate of inflation as output exhibits greater divergence. The

empirical literature reviewed shows contrasting results from the existence to the degree as well as direction of impact among the variables. For example, while Babatunde&Shuaibu (2011) opined that inflation has negative effects on the output level, McCandless& Weber (2005) recorded no effect whatsoever. Among the three monetary related theories reviewed, the Tobin (1965) model appears to be a better suited one for the study. Chapter three presents both the econometrics methods and the justification for the deployment of the methods. In order to see the long run relationship between the money supply, inflation and output, the bound testing approach to co-integration was chosen as the econometric method since the variables are of different order of integration in addition to other advantages of the ARDL over other competing co-integration methods earlier stated. However, as the time series were found to have structural breaks, the break problem was settled using a dummy variable. Use is made of annual time series data gotten from the World Bank data base.

In chapter four, the result estimated is presented and analyzed. It was found that: money supply impacts on output only in the short run. In the short run, inflation decreases output by a significant amount. Also, Inflation in the long run, has no significant positive impact on the output level, hence, no presence of Tobin effect. In chapter five, it is advised that the monetary authority must fasten its braces against inflation as well as its money supply generating mechanisms.

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5.2 Conclusion

From the econometrics results obtained in this study, it is hereby concluded that:

i. Money supply and inflation in Nigeria were found be positively and negatively related to the output level respectively in the short run only. This relationship follows the argument of Keynesian view of the shape of the AS curve -inverted L-shaped AS curve. Because increase in money supply increases the output level through the demand channel but after some time, it effect becomes inflationary.

ii. Furthermore, as one year lag of inflation was found to be influential on the current inflation rate.Here, it is deduced that people's expectations about what the macroeconomic future portends are adaptive or backward ward-looking.

iii. Though the output growth rate appears to be resilient in the wake of high inflationary pressure characterized by the period under review, the money supply short term positive effect is counterproductive as it comes at the opportunity cost of increasing the level of prices in the long run. That is to say that the monetary policy target of maintainig price stability and improved level of output is not achieved. Hence, CBN present policy regime is inefficient in anchoring prices as well as boosting output.

iv. On the existence of the Tobin effect, two necessary and sufficient conditions must be satisfied as thus:inflation impacts positively on output and the impact should be significant. In this study however, none of the two conditions were met. Hence, the conclusion that there exist no Tobin effect in Nigeria as far as money supply, inflation and output relationship is concerned during the period under

review.However, despite the insignificant statistical relationship between inflation and the output level, it is still considered harmful to the output level, because of its erosive effect on the income level of the people.

5.3 Recommendations

Based on the above stated findings, the following recommendations are made:

I. As money supply spurs growth, it is also capable of raising prices; therefore, the government needs to put in more effective measures in controlling the monetary growth level.

II. In order to consolidate the short run gains in output achieved by the money supply through the long run, effort should be intensified to boost the productive base of the economy, so as to meet up with the increase in demand which will keep inflation at reasonably low levels.

III. As inflation hampers output growth level, it is advised that the monetary authority must fasten its braces against inflation.

REFERENCES

Abiodun D.M. (2014) *"*Empirical Modeling of Money Shocks, Price and Output Behavior in Nigeria (1961 To 2011)"*Journal of Economics and International Business Management Vol2*(2), pp. 42-49

ADB (2016) *"African Economic Outlook"* (15th ed.) OECDPublishing.

Adesoye.B.A. (2012) "Price, Money and Output in Nigeria: A Cointegration-Causality Analysis*" African Journal of Scientific Research, Vol. 8* (1)pp 428-442.

Agwu, C. (2015) "Factors that Contribute to Economic Growth in Nigeria" *International Journal of Management and Commerce Innovations Vol. 2*(2) pp 487-495

Arltová, M.&Fedorová, D. (2016),"Selection of Unit Root Test on the Basis of Length of the Time Series and Value of AR(1) Parameter"*Statistika Vol. 96*(3)pp 47-64

Australian Bureau of Statistics (2000), Australian National Accounts: Concepts, Sources and Methods. Retrieved from: www.wikipedia.com on 22/03/2018

Babatunde M. A. and Shuaibu M.I. (2011) "Money Supply, Inflation And Economic Growth In Nigeria*" Asian-African Journal of Economics and Econometrics, Vol. 11*(1) 147-163.

Barro, R.J. (1994) "The Aggregate-Supply/ Aggregate demand Model" *Eastern Economic Journal, Vol.20*(1)

Bayo F. (n.d.) "Determinants of Inflation in Nigeria: An Empirical Analysis*"International Journal of Humanities and Social Sciences, Vol. 1 (18)*pp 262-271

CBN, (1974) "Origin and Development of Inflationary Trends in African Countries (Impacts on their Growth)*"* Being a paper presented at the second seminar of the Association of African Central Banks at Addis Ababa, 5th-16th August, 1974.

CBN, (2012).Statistical Bulletin.Retreievedfrom www.cbn.gov.ng

CBN (2015).CBN Monetary Policy Series.Retreievedfrom www.cbn.gov.ng

CBN (2017) "Economic Report for the First Half of 2017" Retreievedfrom www.cbn.gov.ng on 8/8/2018

CBN (2018),"Central Bank Of Nigeria Communiqué No 119 of the Monetary Policy Committee Meeting of Monday, 23rd and Tuesday, 24th July, 2018".Retreievedfrom www.cbn.gov.ng on 8/8/2018

Chuku, (2009) "Measuring the Effects of Monetary Policy Innovations in Nigeria: A Structural Vector Autoregressive (SVAR) Approach*" African Journal of Accounting, Economics, Finance and Banking Research, Vol. 5(5)*pp 112-129

Dan U.R. and Zungwe L.W (n.d.)"Interaction Among Money Supply, Inflation And Output in Nigeria: A Necessity for Sustainable Economic Growth, 50 Years of Nigeria's Nationhood: Issues and Challenges for Sustainable Development"A CBN publication Ch. 13 pp 257-266.

David. D. (2013) "The Quantity Theory of Money"*Journal of Prices & Markets (2013) Vol.1*(1) pp 17-30

Davidson, R. MacKinnon, J. (2004)*"*Econometric Theory and Methods" *New York: Oxford University Press. p. 623*

Dayo B.O. and Kemi F.A. (2013) *"*Money Supply, Inflation and Capital Accumulation in Nigeria*"Journal of Economics and Sustainable Development, Vol.4*(4),pp 173-181

Dutt, A. K. &Skott, P. (2005). "Keynesian Theory and the AD-AS Framework:

A Reconsideration" *Department Of Economics, University Of Massachusetts Amherst,Working Paper2005-11*

Ebiringa O.T. Apeh A.S., and Daniel E.J.(2014)*"*Behavioral Pattern of Monetary Policy Variables and Effects onEconomic Growth: An Econometric Investigation of Nigeria*" Journal of Economics and Sustainable Development Vol.5(1)*pp 11-20

Gatawa N.M., Abdulgafar A. and Olarinde M.O., "Impact of Money Supply and Inflation on Economic Growth in Nigeria (1973-2013)" *Journal of Economics and Finance. Vol., 8(3)* pp26-37

Gordon, R.J. (1988), Macroeconomics: Theory and Policy, 2nd ed, *McGraw-Hill*

Handa J. (2009) *"Monetary Economics" (2nd Ed)* .Routledge,New York: Taylor and Francis Group.

Hussain Z. J., Farooq M. and Akram S. (2010) "Cost-push shocks and inflation: An empirical analysis from the economy of Pakistan"*Journal of Economics and International Finance, Vol. 2* (12), pp. 308-312

IMF, (2012), "Statistics on the Growth of the Global Gross Domestic Product (GDP) from 2003 to 2013" from: IMF website.

Inam U. (2014) "Money Supply and Economic Growth in Nigeria: An Econometric Analysis (1985-2011)*"Journal of Economics and Sustainable Development Vol 5,* (12)pp149-156

Jhingan M.L. (2007) "*Macro-Economic Theory"* Delhi: Vrinda Publications

Ludwig, V.M. (1912).The Theory of Money and Credit *Yale University Press.*

MacCandless G.T and Weber W.E. (2005) "Some Monetary Facts"*Federal Reserve Bank of Minneapolis; Quarterly Review, Vol.19*(3)pp 2-11.

Mehrara M. and Musai M. (2011) "Links among Money Prices and Output in Oil exporting Countries"*British Journal of Economics, Finance and Management Sciences Vol. 2*(1) pp 14-21

Mishra P.K., Mishra U.S. and Mishra S.K. (2010) "Money, Output and Prices: A Causality Test forIndia*"International Research Journal of Finance and Economics* No. 53 pp 26-37

Ministry of Budgeting and National Planning (2017) Economic Recovery and Growth Plan

Moses, K. Tule, E.C. Obioma, U.M. Okpanachi, S.O. Odeniran, and O.J. Olaoye (2015) "Monetary Growth and Inflation Dynamics in Nigeria*"CBNworking paper series CBN/WPS/01/2015/02*

NBS (2017), "Annual Abstract of Statistics" Vol.1Retrieved from www.nigerianstat.gov.ng on 8/8/2018

Ngoa H.T. and Atangana H.O. (2011) "Inflation, Money and Economic Growth in Cameroon" *International Journal of Financial Research Vol. 2*(1); pp 45-56

NkoroE.and Kelvin A.U. (2016) "Autoregressive Distributed Lag (ARDL) Cointegration Technique: Application and Interpretation"*Journal of Statistical and Econometric Methods,Vol.5(4),* pp 63-91.

Odiba E.O. Apeh A.S. and Daniel E.J(2013) "Money Supply and Inflation in Nigeria 1986-2009"*Journal ofBusiness and Organizational Development Vol.5*(1)pp 35-53

Ogunmuyiwa M.S. and Ekone F.A. (2010) "Money Supply and Economic Growth Nexus in Nigeria" *Journal of Social sciences,Vol. 22*(3) pp. 199-204.

Ojo, M.O. (2013) "*Transition to Full-Fledged Inflation Targeting: A ProposedProgrammefor Implementation by the Central Bank of Nigeria*" CBN Occasional paper No. 44

Olalere S.S. (2016) "The Impacts of Inflation on Economic Growth: Empirical Evidence from Nigeria*"Journal of Scientific and Engineering Research,Vol. 3(3)*: pp 328-334

Omotor, D.G. (2007) "Monetary Policy and Economic Growth: Theoretical and Conceptual Issues*" CBN Economic and Financial Review Vol. 45(4)*pp 39-68

Onayemi S.O. (2013) "Price Stability effect of Monetary Policy and Output Growth in Nigeria:A Time Series Analysis" *Journal of African Macroeconomic Review Vol. 4 (1)* pp. 247-263

Oyinpreye, T.O. and Moses T.K. (2014) "Monetary Policy Effectiveness, Output Growth and Inflation in Nigeria*" International Journal of Economics, Finance and Management, Vol 3(6)*pp 301-307.

Pesaran, M. H. and Shin, Y (1995) " An Autoregressive Distributed Lag Modelling Approach to Co-integeration Analysis" *Centennial Volume of Ragner Frisch.* Cambridge University Press, Cambridge.

Pesaran, M. H., Shin, Y., Smith, R. J., (2001) "Bounds Testing Approaches to the Analysis of Level Relationships" *Journal of Applied Econometrics, Vol. 16(3),*pp 289–326.

Sloman, T., Garatt, D., &Wride, A. (2015) *Economics* 9th ed. Pearson Education Limited, England

Sola and Peter (2013) "Money Supply and Inflation in Nigeria: Implications for National Development*" Journal of Scientific Research, Vol.* 4 (1),pp 161-170

Sharew F.D., Wassie Y.A. and Adugna T.R.(2016) "The Relationship Between Inflation, Money Supply and Economic Growth In Ethiopia: Cointegeration and Causality Analysis" International *Journal of Scientific and Research Publications, Vol. 6*(1)pp 556-565

Taylor, Timothy (2008),*Principles of Economics.* Freeload Press.

Tutulmaz, O. (2014) "Monetary Growth Models; An Evaluation on Tobin Model" *Journal of Social Science Research, Vol. 6* (2), pp 1029-1035

Tobin, J. (1965) "Money and Economic Growth" *Econometrica, Vol. 33*(4), pp. 671-684.

Totonchi J.(2011) "Macroeconomic Theories of Inflation" *International Conference on on Economics and Finance Research IPEDR vol.4,* IACSIT Press, Singapore

Uwakaeme O. S.(2015)Economic Growth in Nigeria: An Empirical Investigation of Determinants and Causal Relationship (1980 – 2012) *"American Journal of Economics", Vol 5*(1) pp9-20

Walsch C.E. (2003) "*Monetary policy and Theory"* (3rd ed.) Massachusetts: The MIT press.

Waliullah and Fazli Rabbi (2011)*"*Effectiveness of Monetary Policy in Pakistan: Empirical Evidences based on Bound Test Approach*"International Journal of Business and Social Science Vol. 2* (1)pp 190-199

Zhou H. (2015) "*Effectiveness Study of Chinese Monetary Policy Regulation on Economic Growth and Inflation*" Springer-Verlag,Berlin, Heidelberg chp.2Economics and Finance

APPENDIX

Appendix A: Summary of Empirical Studies

Appendix A1 Summary of Empirical studies on money supply and output growth

S/N	AUTHOUR (S)	COUNTRY	OBJECTIVE	DEPENDENT VARIBLE	INDEPENDENT VARIABLE(S)	ESTIMATION TECHNIQUE	FINDINGS
1	Ogunmuyiwa and Ekone (2010)	Nigeria	To examine the impact of money supply on economic growth	GDP growth rate	money supply	OLS and VAR	The growth rate of money does not have any impact on the real GDP of the economy as there exist a negative relationship between the two variables.
2	Inam (2014)	Nigeria	To examine the role of money supply on economic growth in Nigeria	Growth rate of GDP	Money Supply, real gross investment and labour force.	Co-integration and ECM.	Money supply and output growth were found to be inversely related

Appendix A2 Summary of Empirical studies on money supply and inflation.

S/N	AUTHOUR (S)	COUNTRY	OBJECTIVE	DEPENDENT VARIBLE(S)	INDEPENDENT VARIABLE(S)	ESTIMATION TECHNIQUE	FINDINGS
1	Odiba et al (2013)	Nigeria	To investigate the effect of the money supply on inflation	Inflation	Money Supply (M2), Import, Budget deficit ,Aggregate ,demand and Population	OLS	The study shows that changes in the level of money supply exert positive and significant influence on the inflation rate of Nigeria.

2	Sola and Peter (2013)	Nigeria	To analyse the effect(s) of increase in money supply on inflation	Inflation rate, Money growth rate, government expenditure, exchange rate, interest rate and oil revenue differentials.	Lagged values of inflation, Money growth rate, government expenditure, exchange rate, interest rate and oil revenue	VAR model	Whereas no causality was traced between money and inflation, there exist a significant positive relationship between money and the level of prices in Nigeria.

Appendix A3 Summary of Empirical studies on money supply, GDP and inflation.

S/N	AUTHOUR (S)	COUNTRY	OBJECTIVES	DEPENDENT VARIBLE(S)	INDEPENDENT VARIABLE(S)	ESTIMATION TECHNIQUE	FINDINGS
1	MacCandless and Weber(2005)	A hundred and ten (110) countries	To examine the possible effect of money growth rate on inflation rate and output.	Inflation and output	Money supply growth rate	Correlation analysis	While no correlation was found between money and output and inflation and output, a strong correlation of almost one-to-one was ascertained between money growth rate and price levels across all countries
2	Chuku (2009)	Nigeria	To trace the effects of monetary policy shocks on output and prices	GDP and CPI	Money supply, Minimum Rediscount Rate (MRR) and the Real Effective Exchange Rate (REER)	Structural Vector Autoregression SVAR	Money supply does not only have positive and significant effects on output and prices it is also the most influential among the other policy variables- (MRR) and the (REER)
3	Mishra (2010)	India	To investigate the relationship between Money, inflation and economic Output.	Real GDP, Wholesale Price Index (WPI) and money supply	Real GDP, Wholesale Price Index (WPI) and money supply	VECM	The long-run bi-directional causality found between money supply and real output infers that money is not neutral in its effect

				differentials			and also as inflation cause ,both output and money supply will change.
4	Ngoa and Atangana (2011)	Cameroon	To analyse the relationship between economic growth, inflation and money	Money supply, inflation and GDP differentials	Lagged values of Money supply, inflation and GDP	VAR	Increase in money supply spurs growth which in turn causes inflation
5	Mehrara and Musai (2011)	Eleven oil exporting countries	To assess the relationship among income, money, prices and oil revenues.	Money supply and output, differentials	Lagged values of money supply, output, inflation and oil revenue	Panel co-integration analysis	The co-integration and causal relationships detected among the variables indicate that money supply is not neutral in both the short and long run as it causes both output and prices
6	Waliullah and Fazlirabbi (2011).	Pakistan	To examine the long run relationship amongst money, price level and the GDP	GDP differential	Lagged values of money, price and GDP	ARDL and Error Correction Mechanism (ECM)	All variables are co-integrated. An increase in money supply is positively and significantly affected by output while contrariwise is the case between prices and output.
7	Babatunde and Shuaibu (2011)	Nigeria	To examine the impact of money supply and inflation on economic growth	GDP differential	Lagged values of Money supply, inflation and capital stock	ARDL and Error Correction Mechanism (ECM)	That money supply positively affects prices which in turn reduces the level of income. The capital stock positively influence real income in the long run. Inflation harms growth.
8	Adesoye (2012)	Nigeria	To examined the long run relationship and causality between price, money	Money, GDP and Price level differentials	Lagged values of price level , money supply and output	VAR	All variables exhibit long run relationship but causality was only found to have run from money supply to price.

			and output				
9	Onayemi (2013)	Nigeria	To analyze the causal relationship between money Supply, output level and prices	Inflation	money supply and GDP and inflation gaps.	Co-integration technique.	Money supply and output gapswere found to have exhibited a positive influence over the inflationary pressure in Nigeria
10	Abiodun (2014)	Nigeria	To examine the nature of interaction between money shocks, price and output	GDP, money supply and inflation differentials	Lagged values of GDP, money supply and inflation	VAR	That money supply has positive effects on both output and price both in the long and short run.
11	Oyinpreye and Moses (2014)	Nigeria	To examine the effectiveness of monetary policy on economic growth and inflation in Nigeria.	GDP, interest rate Money Supply and inflation differentials	First lag of the dependent variables	VAR	It was ascertained money supply as a policy variable has a long run positive effects on both the output and price levels.
12	Zhou (2015)	China	To ascertain the impact of money on economic growth and the inflation	Output and price level	Money supply	Multivariate GARCH (MGARCH) model	It was established that money supply exert a positive influence over inflation and economic growth
13	Ebiringa et al (2014)	Nigeria	To examine the effects of monetary policy variables on economic growth.	GDP	Money supply, inflation, exchange rate and interest rate	VAR	The results show that there is a significant negative relationship between the GDP and the explanatory variables of interest rate, inflation and money supply, but the opposite is the case between the rate of growth of the economy and the exchange rate. No independent variable causes the GDP.
14	Sharew et al (2016)	Ethiopia	To examine the causal relationship between	Money supply Inflation and	Lagged values of Money supply	Vector Error Correction	Money has positive and significant influence over prices

			price level and both Money supply and economic growth.	GDP differentials	Inflation and GDP	Mechanism (VECM)	while economic growth suppresses prices.
15	Dan and Zungwe (n.d.)	Nigeria	To examine the interaction between money, output and inflation in Nigeria	Output differential	Lagged values of output, inflation and money supply	Vector Error Correction Mechansm (VECM)	That money supply impacts positively on output level significantly, but impacts nothing on the level of prices . Inflation does not influence either output or money supply.
16	Gatawa*et. al* (2017)	Nigeria	To examine the impact of Money supply on inflation and economic growth.	GDP	Money supply, inflation and interest rate	Vector Error Correction Mechansm (VECM)	Money supply is positively related to growth as inflation retards growth.

APPENDIX

Appendix B: Preliminary Tests
Appendix B1; Descriptive Statistic

	CPI	MS	RGDP
Mean	18.59030	3.39E+12	1.95E+11
Median	12.87658	1.98E+11	1.37E+11
Maximum	72.83550	2.09E+13	4.64E+11
Minimum	3.457650	9.79E+08	9.05E+10
Std. Dev.	16.06425	6.11E+12	1.13E+11
Skewness	1.845081	1.731958	1.277560
Kurtosis	5.533539	4.499928	3.139188
Jarque-Bera	39.23739	27.90330	12.82319
Probability	0.000000	0.000001	0.001642
Sum	873.7439	1.59E+14	9.16E+12
Sum Sq. Dev.	11870.77	1.72E+27	5.90E+23
Observations	47	47	47

VAR Lag Order Selection Criteria
Endogenous variables: RGDP MS CPI
Exogenous variables: C
Date: 08/06/18 Time: 02:18
Sample: 1970 2016
Included observations: 43

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2600.421	NA	7.78e+48	121.0893	121.2122	121.1346
1	-2445.675	280.7012	8.87e+45	114.3105	114.8020*	114.4917
2	-2432.503	22.05577	7.35e+45	114.1164	114.9765	114.4336*
3	-2421.066	17.55417*	6.68e+45*	114.0031*	115.2318	114.4562
4	-2416.025	7.033886	8.30e+45	114.1872	115.7846	114.7763

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

Appendix B2 : ADF Unit Root Test with Structural Breaks

Null Hypothesis: D(LNMS) has a unit root
Trend Specification: Trend and intercept
Break Specification: Intercept only
Break Type: Innovational outlier

Break Date: 1989
Break Selection: Minimize Dickey-Fuller t-statistic
Lag Length: 1 (Automatic - based on Schwarz information criterion, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.956282	0.0376
Test critical values:	1% level	-5.347598	
	5% level	-4.859812	
	10% level	-4.607324	

*Vogelsang (1993) asymptotic one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNMS)
Method: Least Squares
Date: 08/02/18 Time: 23:12
Sample (adjusted): 1973 2016
Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNMS(-1))	0.175612	0.166332	1.055795	0.2977
D(LNMS(-1), 2)	0.282983	0.148273	1.908523	0.0639
C	0.246553	0.059495	4.144127	0.0002
TREND	-0.008130	0.003080	-2.639788	0.0120
INCPTBREAK	0.196697	0.081463	2.414566	0.0207
BREAKDUM	-0.256723	0.133424	-1.924111	0.0619

R-squared	0.384561	Mean dependent var	0.221866
Adjusted R-squared	0.303583	S.D. dependent var	0.148560
S.E. of regression	0.123976	Akaike info criterion	-1.211340
Sum squared resid	0.584058	Schwarz criterion	-0.968042
Log likelihood	32.64949	Hannan-Quinn criter.	-1.121114
F-statistic	4.748915	Durbin-Watson stat	2.106053
Prob(F-statistic)	0.001815		

Null Hypothesis: LNCPI has a unit root
Trend Specification: Trend and intercept
Break Specification: Intercept only
Break Type: Innovational outlier

Break Date: 1998
Break Selection: Minimize Dickey-Fuller t-statistic
Lag Length: 1 (Automatic - based on Schwarz information criterion, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.585618	< 0.01
Test critical values:	1% level	-5.347598	
	5% level	-4.859812	
	10% level	-4.607324	

*Vogelsang (1993) asymptotic one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: LNCPI
Method: Least Squares
Date: 08/02/18 Time: 23:14
Sample (adjusted): 1972 2016
Included observations: 45 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCPI(-1)	0.024239	0.174692	0.138750	0.8904
D(LNCPI(-1))	0.453997	0.152141	2.984051	0.0049
C	2.281418	0.453341	5.032461	0.0000
TREND	0.036222	0.014822	2.443863	0.0192
INCPTBREAK	-1.277700	0.428905	-2.978980	0.0050
BREAKDUM	0.828292	0.634859	1.304687	0.1996

R-squared	0.434410	Mean dependent var	2.653531
Adjusted R-squared	0.361899	S.D. dependent var	0.715629
S.E. of regression	0.571653	Akaike info criterion	1.842998
Sum squared resid	12.74472	Schwarz criterion	2.083886
Log likelihood	-35.46746	Hannan-Quinn criter.	1.932799
F-statistic	5.990915	Durbin-Watson stat	1.822335
Prob(F-statistic)	0.000333		

Null Hypothesis: D(LNRGDP) has a unit root
Trend Specification: Trend and intercept
Break Specification: Intercept only
Break Type: Innovational outlier

Break Date: 2004
Break Selection: Minimize Dickey-Fuller t-statistic
Lag Length: 0 (Automatic - based on Schwarz information criterion, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.431143	< 0.01
Test critical values:	1% level	-5.347598	
	5% level	-4.859812	
	10% level	-4.607324	

*Vogelsang (1993) asymptotic one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNRGDP)
Method: Least Squares
Date: 08/02/18 Time: 23:16
Sample (adjusted): 1972 2016
Included observations: 45 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNRGDP(-1))	0.007686	0.133535	0.057557	0.9544
C	0.009214	0.020596	0.447356	0.6570
TREND	0.000569	0.001062	0.535105	0.5955
INCPTBREAK	0.017367	0.032508	0.534248	0.5961
BREAKDUM	0.244598	0.059381	4.119095	0.0002

R-squared	0.375592	Mean dependent var	0.033022
Adjusted R-squared	0.313152	S.D. dependent var	0.068321
S.E. of regression	0.056622	Akaike info criterion	-2.800397
Sum squared resid	0.128242	Schwarz criterion	-2.599657
Log likelihood	68.00893	Hannan-Quinn criter.	-2.725563
F-statistic	6.015182	Durbin-Watson stat	1.947555
Prob(F-statistic)	0.000691		

Appendix C: The Impact of Money Supply and Inflation on output (Model without Breaks)

Appendix C1: Short-Run and Long-Run Estimations Results

ARDL Cointegrating And Long Run Form
Dependent Variable: LNRGPD
Selected Model: ARDL(1, 0, 7)
Date: 08/02/18 Time: 23:46
Sample: 1970 2016
Included observations: 40

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNMS)	0.039859	0.009109	4.375984	0.0001
D(LNCPI)	-0.030824	0.016303	-1.890685	0.0687
D(LNCPI(-1))	-0.001719	0.020057	-0.085708	0.9323
D(LNCPI(-2))	0.025556	0.020051	1.274534	0.2126
D(LNCPI(-3))	0.012300	0.020326	0.605144	0.5498
D(LNCPI(-4))	0.018100	0.019585	0.924176	0.3630
D(LNCPI(-5))	0.021133	0.017534	1.205242	0.2379
D(LNCPI(-6))	0.025815	0.016142	1.599314	0.1206
CointEq(-1)	-0.204697	0.058148	-3.520294	0.0014

Cointeq = LNRGPD - (0.1947*LNMS -0.5222*LNCPI + 22.2707)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNMS	0.194723	0.022740	8.563073	0.0000
LNCPI	-0.522168	0.136369	-3.829087	0.0006
C	22.270669	0.732945	30.385167	0.0000

Appendix C2: Breusch-Godfrey Serial Correlation LM Test Estimation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.754426	Prob. F(2,27)	0.4799
Obs*R-squared	2.117029	Prob. Chi-Square(2)	0.3470

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 08/02/18 Time: 23:48
Sample: 1977 2016
Included observations: 40
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNRGPD(-1)	0.025134	0.063928	0.393156	0.6973
LNMS	-0.004041	0.009976	-0.405095	0.6886
LNCPI	-0.009117	0.018189	-0.501235	0.6203
LNCPI(-1)	0.006591	0.020457	0.322181	0.7498
LNCPI(-2)	-0.002617	0.020342	-0.128630	0.8986
LNCPI(-3)	0.002286	0.020313	0.112531	0.9112
LNCPI(-4)	-0.000813	0.020516	-0.039644	0.9687
LNCPI(-5)	0.003413	0.019997	0.170649	0.8658
LNCPI(-6)	-0.000204	0.017687	-0.011527	0.9909
LNCPI(-7)	0.003807	0.016680	0.228260	0.8212
C	-0.552087	1.485937	-0.371541	0.7131
RESID(-1)	-0.134454	0.205187	-0.655275	0.5178
RESID(-2)	-0.249908	0.217674	-1.148082	0.2610

R-squared	0.052926	Mean dependent var	2.51E-15
Adjusted R-squared	-0.367996	S.D. dependent var	0.047742
S.E. of regression	0.055840	Akaike info criterion	-2.675712

Sum squared resid	0.084187	Schwarz criterion	-2.126826
Log likelihood	66.51424	Hannan-Quinn criter.	-2.477252
F-statistic	0.125738	Durbin-Watson stat	1.884701
Prob(F-statistic)	0.999722		

Appendix C3: Heteroskedasticity Test Result

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.828707	Prob. F(10,29)	0.0997
Obs*R-squared	15.46898	Prob. Chi-Square(10)	0.1159
Scaled explained SS	19.67084	Prob. Chi-Square(10)	0.0325

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/02/18 Time: 23:51
Sample: 1977 2016
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.378536	0.110349	3.430364	0.0018
LNRGPD(-1)	-0.015294	0.004722	-3.238898	0.0030
LNMS	0.001840	0.000740	2.487023	0.0189
LNCPI	-0.001343	0.001324	-1.014351	0.3188
LNCPI(-1)	-0.001601	0.001588	-1.008049	0.3218
LNCPI(-2)	-0.001656	0.001629	-1.016459	0.3178
LNCPI(-3)	0.001171	0.001628	0.718927	0.4779
LNCPI(-4)	-0.002010	0.001651	-1.217758	0.2331
LNCPI(-5)	-0.002164	0.001590	-1.360905	0.1840
LNCPI(-6)	0.000423	0.001424	0.297068	0.7685
LNCPI(-7)	-0.003657	0.001311	-2.790020	0.0092

R-squared	0.386724	Mean dependent var	0.002222
Adjusted R-squared	0.175250	S.D. dependent var	0.004951
S.E. of regression	0.004496	Akaike info criterion	-7.742872
Sum squared resid	0.000586	Schwarz criterion	-7.278430
Log likelihood	165.8574	Hannan-Quinn criter.	-7.574945
F-statistic	1.828707	Durbin-Watson stat	1.871002
Prob(F-statistic)	0.099744		

Appendix C4: Ramsey RESET Test Estimation

Ramsey RESET Test
Equation: UNTITLED

Specification: RGDP RGDP(-1) MS MS(-1) CPI CPI(-1) CPI(-2) CPI(-3) CPI(-4) CPI(-5) CPI(-6) C
Omitted Variables: Powers of fitted values from 2 to 3

	Value	df	Probability
F-statistic	0.247633	(2, 28)	0.7823

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.001531	2	0.000766
Restricted SSR	0.088088	30	0.002936
Unrestricted SSR	0.086557	28	0.003091

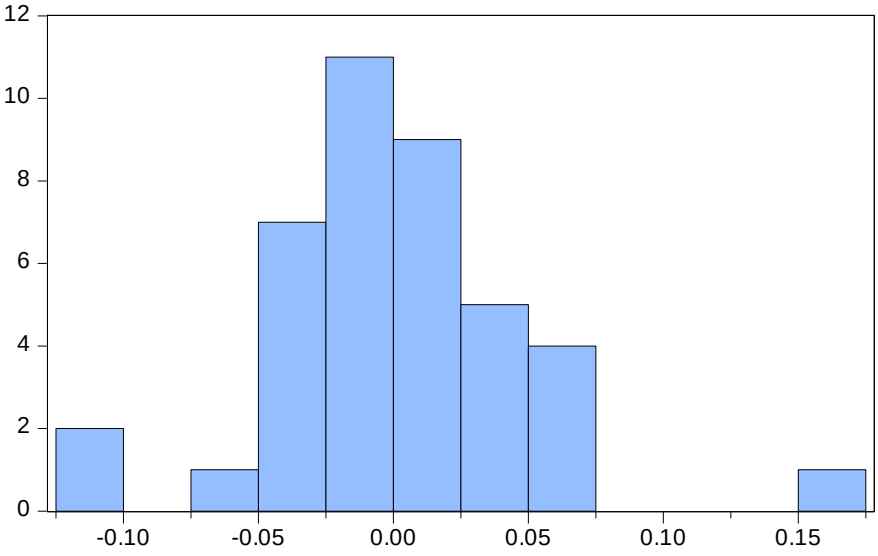
Unrestricted Test Equation:
Dependent Variable: RGDP
Method: ARDL
Date: 08/05/18 Time: 23:42
Sample: 1976 2016
Included observations: 41
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (7 lags, automatic):
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDP(-1)	78.84530	272.2933	0.289560	0.7743
MS	15.65370	54.14343	0.289116	0.7746
MS(-1)	-13.10464	45.32760	-0.289110	0.7746
CPI	-3.131731	10.82916	-0.289194	0.7746
CPI(-1)	3.528574	12.19328	0.289387	0.7744
CPI(-2)	-0.580746	2.004744	-0.289686	0.7742
CPI(-3)	-1.449683	5.002615	-0.289785	0.7741
CPI(-4)	-2.512499	8.686613	-0.289238	0.7745
CPI(-5)	-0.164694	0.568417	-0.289741	0.7741
CPI(-6)	-3.101058	10.71507	-0.289411	0.7744
C	-534.2274	1834.434	-0.291222	0.7730
FITTED^2	-3.380833	11.98602	-0.282065	0.7800
FITTED^3	0.042491	0.152947	0.277816	0.7832

R-squared	0.990918	Mean dependent var	25.92937
Adjusted R-squared	0.987026	S.D. dependent var	0.488129
S.E. of regression	0.055600	Akaike info criterion	-2.688499
Sum squared resid	0.086557	Schwarz criterion	-2.145171
Log likelihood	68.11423	Hannan-Quinn criter.	-2.490649
F-statistic	254.5894	Durbin-Watson stat	2.160783
Prob(F-statistic)	0.000000		

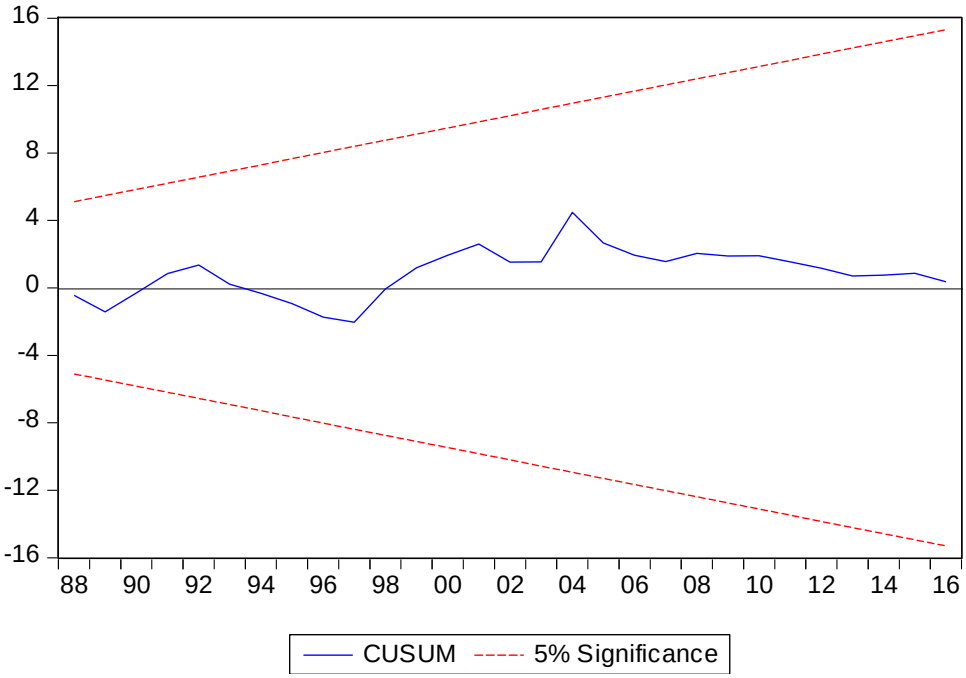
*Note: p-values and any subsequent tests do not account for model selection.

Appendix C5: Jarque-Bera Normality Test

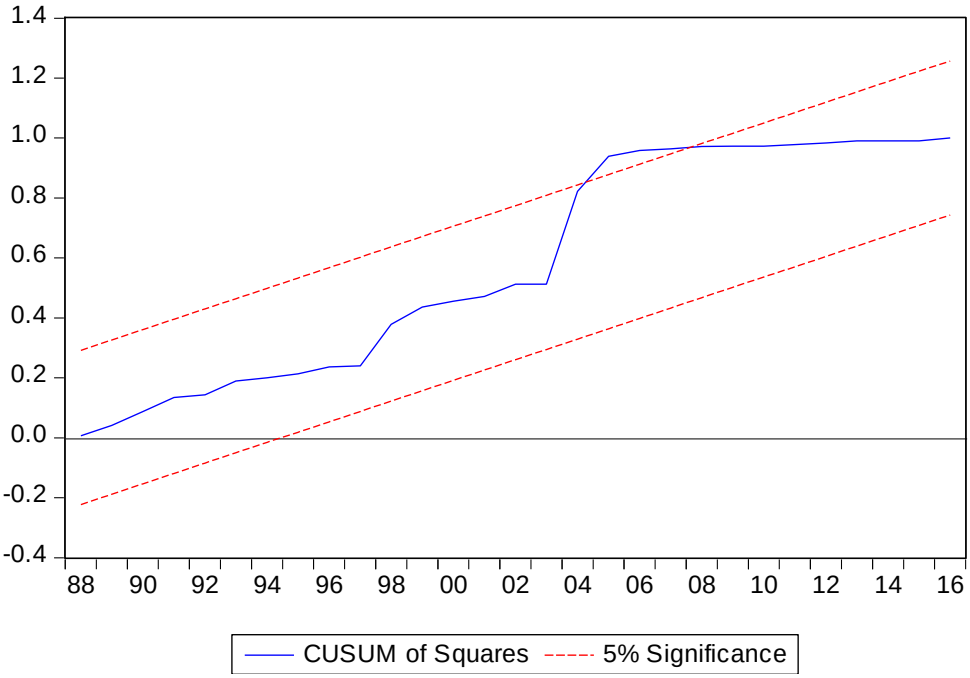


Series: Residuals	
Sample 1977 2016	
Observations 40	
Mean	2.51e-15
Median	-0.002756
Maximum	0.164470
Minimum	-0.121543
Std. Dev.	0.047742
Skewness	0.546635
Kurtosis	5.838549
Jarque-Bera	15.42100
Probability	0.000448

Appendix C6: CUSUM Test Plot



Appendix C6: CUSUM Of Squares Test Plot



Appendix D: ARDL Model after Correcting for Structural Breaks

Appendix D1: Bounds Test for Cointegration

ARDL Bounds Test
Date: 08/02/18 Time: 23:47
Sample: 1977 2016
Included observations: 40
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	6.867459	2

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Test Equation:
Dependent Variable: D(LNRGPD)
Method: Least Squares
Date: 08/02/18 Time: 23:47
Sample: 1977 2016
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNCPI)	-0.029456	0.016709	-1.762904	0.0885
D(LNCPI(-1))	0.099134	0.032301	3.069053	0.0046
D(LNCPI(-2))	0.102183	0.030142	3.390105	0.0020
D(LNCPI(-3))	0.075077	0.026922	2.788661	0.0092
D(LNCPI(-4))	0.065944	0.024377	2.705207	0.0113
D(LNCPI(-5))	0.047007	0.018241	2.577009	0.0153
D(LNCPI(-6))	0.027459	0.016883	1.626490	0.1147
C	4.605566	1.452391	3.171023	0.0036
LNMS(-1)	0.039925	0.009774	4.084762	0.0003
LNCPI(-1)	-0.105260	0.038796	-2.713168	0.0111
LNRGPD(-1)	-0.206428	0.062287	-3.314124	0.0025

R-squared	0.504911	Mean dependent var	0.031542
Adjusted R-squared	0.334190	S.D. dependent var	0.069657
S.E. of regression	0.056838	Akaike info criterion	-2.668805
Sum squared resid	0.093686	Schwarz criterion	-2.204364
Log likelihood	64.37611	Hannan-Quinn criter.	-2.500878
F-statistic	2.957529	Durbin-Watson stat	2.115228
Prob(F-statistic)	0.010932		

Appendix D2: ARDL Short-run and Long-run result

ARDL Cointegrating And Long Run Form
Dependent Variable: LNRGPD
Selected Model: ARDL(1, 3, 3, 1)
Date: 08/03/18 Time: 00:04
Sample: 1970 2016
Included observations: 44

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNMS)	0.214797	0.059388	3.616831	0.0010
D(LNMS(-1))	-0.220794	0.115069	-1.918801	0.0640
D(LNMS(-2))	0.081684	0.063410	1.288197	0.2069
D(LNCPI)	-0.018957	0.014610	-1.297528	0.2037
D(LNCPI(-1))	-0.116152	0.044562	-2.606525	0.0275
D(LNCPI(-2))	0.032682	0.012403	2.635072	0.0129
D(DUM04)	0.271946	0.050326	5.403695	0.0000
CointEq(-1)	-0.347448	0.065846	-5.276700	0.0000

Cointeq = LNRGPD - (0.1466*LNMS -0.3369*LNCPI + 0.7501*DUM04 +
22.6175)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNMS	0.146625	0.127234	1.152409	0.2577
LNCPI	-0.336920	0.438400	-0.768520	0.4478
DUM04	0.750077	0.501536	1.495559	0.0714
C	22.617548	2.789798	8.107235	0.0000

Appendix D3: Breusch-Godfrey Serial Correlation LM Test Estimation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.333941	Prob. F(2,30)	0.1143
Obs*R-squared	5.924412	Prob. Chi-Square(2)	0.0517

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 08/03/18 Time: 00:06
Sample: 1973 2016
Included observations: 44
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNRGPD(-1)	0.034919	0.075464	0.462717	0.6469
LNMS	0.032966	0.059893	0.550420	0.5861
LNMS(-1)	-0.047470	0.109640	-0.432964	0.6681
LNMS(-2)	0.031006	0.113210	0.273883	0.7861
LNMS(-3)	-0.018244	0.061984	-0.294340	0.7705

LNCPI	-0.001136	0.015358	-0.073982	0.9415
LNCPI(-1)	-0.006880	0.016965	-0.405567	0.6879
LNCPI(-2)	0.006208	0.014310	0.433828	0.6675
LNCPI(-3)	-0.002418	0.011976	-0.201903	0.8414
DUM04	-0.018301	0.049300	-0.371211	0.7131
DUM04(-1)	-0.004818	0.063692	-0.075642	0.9402
C	-0.848313	1.841344	-0.460703	0.6483
RESID(-1)	0.124422	0.208548	0.596609	0.5552
RESID(-2)	-0.413298	0.203598	-2.029973	0.0513

R-squared	0.134646	Mean dependent var	8.07E-15
Adjusted R-squared	-0.240341	S.D. dependent var	0.039379
S.E. of regression	0.043857	Akaike info criterion	-3.162399
Sum squared resid	0.057703	Schwarz criterion	-2.594702
Log likelihood	83.57278	Hannan-Quinn criter.	-2.951870
F-statistic	0.359068	Durbin-Watson stat	1.931623
Prob(F-statistic)	0.973016		

Appendix D4: Heteroskedasticity Test Estimation

Heteroskedasticity Test: Breusch-Pagan-Godfrey

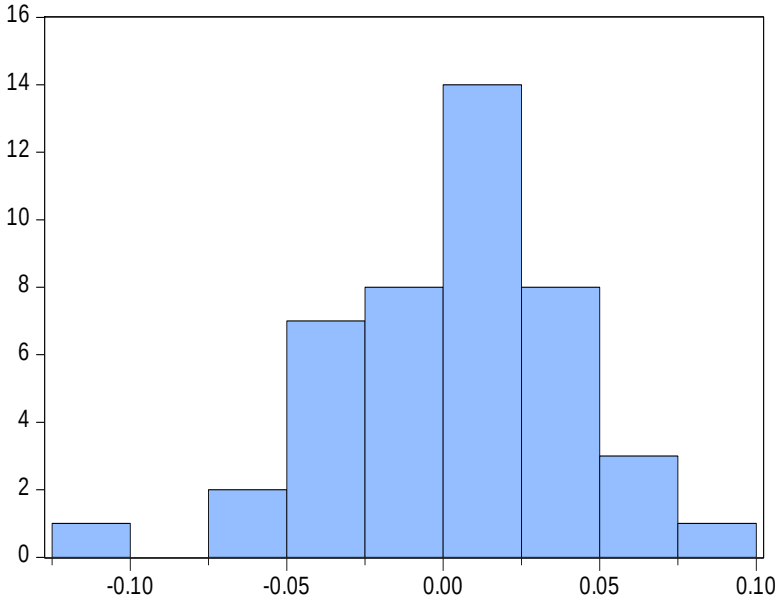
F-statistic	2.145016	Prob. F(11,32)	0.0457
Obs*R-squared	18.67406	Prob. Chi-Square(11)	0.0672
Scaled explained SS	12.49793	Prob. Chi-Square(11)	0.3274

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/18 Time: 00:07
Sample: 1973 2016
Included observations: 44

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.167965	0.076009	2.209811	0.0344
LNRGPD(-1)	-0.006386	0.003100	-2.059985	0.0476
LNMS	-0.003372	0.002790	-1.208411	0.2357
LNMS(-1)	-0.000348	0.005253	-0.066228	0.9476
LNMS(-2)	0.004361	0.005406	0.806605	0.4258
LNMS(-3)	-0.000484	0.002979	-0.162327	0.8721
LNCPI	0.000772	0.000686	1.125216	0.2689
LNCPI(-1)	-0.001953	0.000780	-2.505182	0.0175
LNCPI(-2)	-0.000111	0.000684	-0.162816	0.8717
LNCPI(-3)	-0.000501	0.000583	-0.859707	0.3963
DUM04	-0.000755	0.002365	-0.319297	0.7516
DUM04(-1)	0.004027	0.002782	1.447877	0.1574

R-squared	0.424410	Mean dependent var	0.001515
Adjusted R-squared	0.226552	S.D. dependent var	0.002439
S.E. of regression	0.002145	Akaike info criterion	-9.224594
Sum squared resid	0.000147	Schwarz criterion	-8.737996
Log likelihood	214.9411	Hannan-Quinn criter.	-9.044140
F-statistic	2.145016	Durbin-Watson stat	1.771411
Prob(F-statistic)	0.045711		

Appendix D4: Jarque-Bera Normality Test



Series: Residuals
Sample 1973 2016
Observations 44

Mean	8.07e-15
Median	0.002015
Maximum	0.076224
Minimum	-0.120126
Std. Dev.	0.039379
Skewness	-0.595766
Kurtosis	3.530665
Jarque-Bera	3.119150
Probability	0.210225

Appendix D5: Ramsey RESET Test

Ramsey RESET Test
Equation: UNTITLED
Specification: RGDP RGDP(-1) MS MS(-1) CPI CPI(-1) CPI(-2) CPI(-3) CPI(-4) CPI(-5) CPI(-6) DUM04 DUM04(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.334403	27	0.7407
F-statistic	0.111825	(1, 27)	0.7407

F-test summary:

	Sum of Sq.	df	Mean Squares

Test SSR	0.000177	1	0.000177
Restricted SSR	0.042831	28	0.001530
Unrestricted SSR	0.042654	27	0.001580

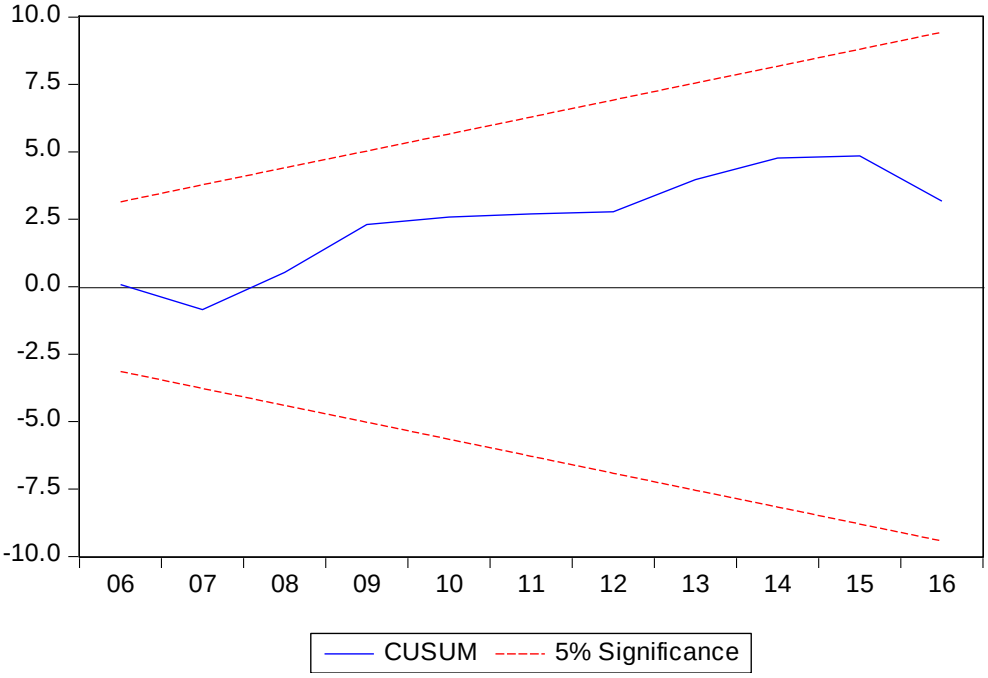
Unrestricted Test Equation:
Dependent Variable: RGDP
Method: ARDL
Date: 08/05/18 Time: 23:51
Sample: 1976 2016
Included observations: 41
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (7 lags, automatic):
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDP(-1)	0.026184	2.768564	0.009458	0.9925
MS	0.013375	0.484043	0.027632	0.9782
MS(-1)	-0.011991	0.437631	-0.027400	0.9783
CPI	-0.002072	0.082490	-0.025123	0.9801
CPI(-1)	0.001634	0.104503	0.015637	0.9876
CPI(-2)	0.000795	0.025415	0.031262	0.9753
CPI(-3)	-0.000978	0.097453	-0.010041	0.9921
CPI(-4)	-0.000495	0.023572	-0.021006	0.9834
CPI(-5)	0.000135	0.012701	0.010625	0.9916
CPI(-6)	-0.000826	0.069663	-0.011857	0.9906
DUM04	0.011077	0.661641	0.016742	0.9868
DUM04(-1)	-0.011719	0.708371	-0.016544	0.9869
C	12.75509	35.39957	0.360318	0.7214
FITTED^2	0.018529	0.055408	0.334402	0.7407

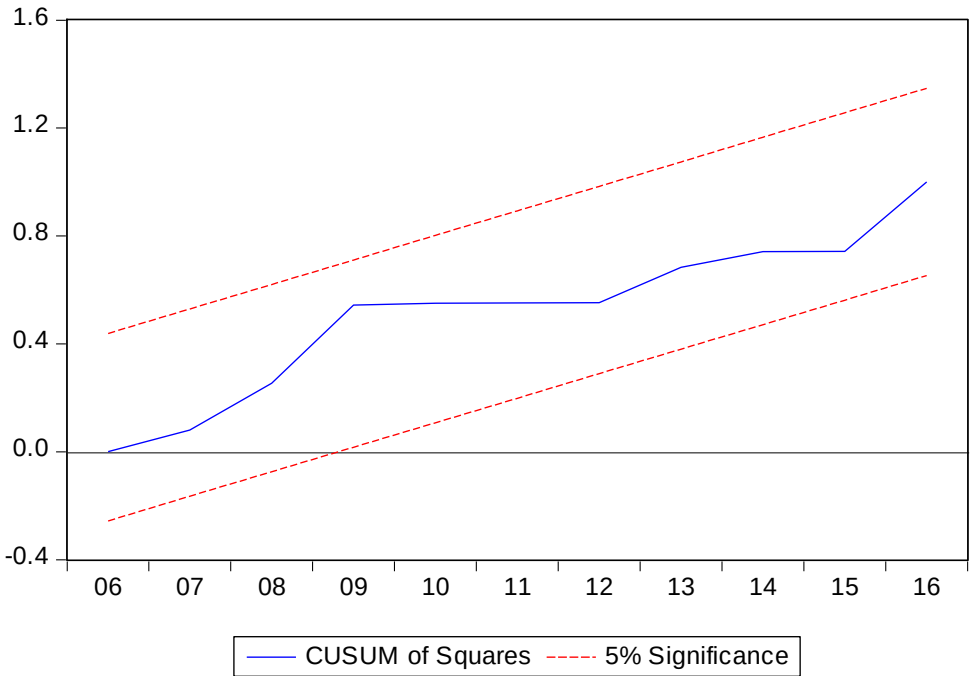
R-squared	0.995525	Mean dependent var	25.92937
Adjusted R-squared	0.993370	S.D. dependent var	0.488129
S.E. of regression	0.039746	Akaike info criterion	-3.347405
Sum squared resid	0.042654	Schwarz criterion	-2.762283
Log likelihood	82.62181	Hannan-Quinn criter.	-3.134336
F-statistic	462.0008	Durbin-Watson stat	1.865752
Prob(F-statistic)	0.000000		

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

Appendix D6: CUSUSM Test



Appendix D7: CUSUSM of Squares Test


1.6
1.2
0.8
0.4
0.0
-0.4
06
07
08
09
10
11
12
13
14
15
16
CUSUM of Squares
5% Significance