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Financial Deepening and Inflation in Nigeria: An Open Economy Model Approach*

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Abstract
The purpose of this paper is to evaluate the short-run and long-run impact of financial deepening on inflation in Nigeria from 1980 to 2012 using open economy model. Data was collected from Central Bank of Nigeria Statistical Bulletin (2012) and United Nations Conference on Trade and Development (UNCTAD) Volume index. The study employed the use of Auto-regressive Distributed Lag Model (coefficient Diagnostic Wald test and Variance Decomposition Test), to enable us achieve our objectives. The result shows that import volume index (IMPV) and exchange rate (EXCR) in lags 1 & 2 respectively are significant to explain variations in the consumer price index (CPI) in the short-run while all other variable have no significant impact on CPI. Also the short –run result indicates that financial deepening variables; MS2/GDP ratio (Fd1) and PSC/GDP ratio (Fd2) have no significant impact on consumer price index. While in the long-run, import volume index (impv), prime lending rate (prim) and exchange rate (excr) are significant with P-values of 0.0002, 0.0017 and 0.0010 respectively. The coefficients of FD1(-1) and FD2(-1) designated with C(16) and C(17) was tested together using Wald Coefficient Diagnostic Test to see the impact of financial depth on the price level, and the result indicates a positive and significant impact of financial deepening on Consumer Price Index (CPI). Meaning that, increase in money supply to GDP ratio (MS2/GDP) and private sector credit to GDP ratio (PSC/GDP) together generated consequent increases in price. The variance decomposition test indicates that shocks to FD1 can rarely cause variation in price level while shocks to PSC/GDP ratio (FD2) can cause variations in prices more than any other variable both in the short-run and long – run. Standing on our findings, appropriate monetary and exchange rate policies should be ensured as Nigeria move towards achieving her financial depth goals by the year 2020.
Keywords: financial deepening, Money supply, Private sector credit, Real Gross Domestic Product, Autoregressive model, inflation, Classical Economics, financial Development.

1. Introduction

Inflation remains one of the major economic variables that can distort economic activities in both developed and developing countries. Although it has been argue that moderately rising prices (single digit inflation) initially activates the level of economic activities (Adeoye 2002), but persistent inflation is however a distress to producers, investors and consumers in an economy. Thus, understanding the factors driving inflation is very vital for the formulation and implementation of appropriate macroeconomic policies (Adeoye 2002),

In classical macroeconomics, there has been an old standing debate by renowned economists on the actual causes of inflation, Quantity theory of money developed by Iriving Fisher, solemnly believed that the main and the only factor that contributes to inflation are monetary aggregates. According to Jhingan (2002), the Monetarists emphasized the role of money as the principal cause of demand-pull inflation. They contend that inflation is always a monetary phenomenon. Price tends to rise when the rate of increase in the money supply is greater than the rate of increase in real output of goods and services (Johnson, 1973). Keynesian Economics believes on the money demand function as a strong factor of inflation. On the other hand Monetary-disequilibrium theorists states that output, not (or not only) prices and wages, fluctuate with a change in the money supply, while monetary neutrality theory, affirmed that in the long-run, a one-time percentage rise in the money supply is matched by the same one-time percentage rise in the price level, leaving unchanged the real money supply and all other economic variables such as interest rates. Even till this age the debate on the actual cause of price rise still hold. Many researchers has come up with varied evidences using different models, for example; According to Jose De Gregorio (2004), in the working paper developed for the central Bank of Chile; he explicitly mentioned the factors that can affect inflation in many countries; for example in the case of South African the factors that favours lower inflation and inflation risks are evolution of broad money supply defined as M3. In the other cases such as the Czech Republic, Israeli, and Switzerland, he asserted that the expansion of monetary aggregates has no impact on inflation. Mc Candles and Weber (1995) found that for 110 countries during a 30 year period, inflation and monetary aggregates are positively correlated in the long-run. In Nigeria, a lot of literature has been developed on the issues concerning inflation; the Central Bank of Nigeria has long held the view that the dynamics of inflation in Nigeria, have not been properly understood (CBN, 2007), though some researchers like; (Oyejide 1972, Adeyeye and Fakiyes 1980, Osakwe 1983) have concluded that inflation is

directly related to monetary aggregates.
Consequently, the Research and Statistics Department Central Bank of Nigeria came up with the dynamic study of inflation in Nigeria; using trend model, Autoregressive Integrated Moving Average (ARIMA) models, Structural models, the Phillips curve model and Monetarist models (money gap and open economy model). These models are applied to the different variants of the CPI over past twenty five years and are estimated to cover both the long run steady state relationships and the short-run dynamics. And their findings on average showed that inflation can be attributed to monetary aggregates (CBN, 2007).
Linked to the above assertions, the issue concerning financial deepening and inflation, are without doubt interrelated, since Financial deepening generally means an increased ratio of money supply to GDP or some price indexes. It refers to liquid money, the degree of financial development is generally measured by an economy's depth (that is, the relative size of its banking system or stock market). Another example of common measure is the volume of banking system credit to the private sector as a percentage of gross domestic product (GDP). The more liquid money is available in an economy, the more opportunities exist for continued growth. Financial development enables bigger investments and more productive allocation of capital, which lead to higher income growth. At the same time, better and cheaper services for saving money and making payments allow firms and households to avoid the cost cash transactions, cut the costs of remitting funds, and provide the opportunity to accumulate assets and smooth income (Barajas 2011). While shallow financial systems limit fiscal, monetary, and exchange rate policy choices; hamper macroeconomic policy transmission; and impede opportunities for hedging or diversifying risk. This is of particular concern because developing countries are vulnerable to external shocks, such as sharp swings in commodity prices and fluctuations in external financing. Limited policy space and instruments to mitigate the ensuing macroeconomic volatility often translate into large growth and welfare costs for these countries (IMF-DFID 2014).
Basically, an increased money supply together with increased financial instrument will guarantee financial deepening and consequently economic growth. This study argue based on the classical view on the multifaceted effect of increased money supply in the economy's well being and maintaining macroeconomic variable's stability especially price. A good number of related literature have studied the effect of financial deepening, typically measured by M2, or credit to private sector, and market capitalization as a ratio to GDP, on economic growth; King and Levine (1993) and Levine, Loayza, and Beck (2000) agreed that financial depth is associated positively with subsequent economic growth. Beck, Levine, and Loayza (2000) finds that financial deepening affects growth through an increase in total factor productivity. While there exists, great dearth of literature on the effect of financial deepening on inflation.
If classical economist view stands, and increased monetary aggregates alongside increased financial sector instruments pre-purposes financial deepening and financial sector outcomes depends on expectations (adaptive and rational expectation theories) which may be based on instantaneous and biased reaction due to the unsteady nature of the market. This paper ponders on what will be the impact of financial sector depth on inflation in Nigeria. Therefore, the objectives of this study are of two folds; (1)To evaluate the short and long-run impact of financial deepening on inflation in Nigeria (2)To ascertain how price reacts to shocks or innovations from financial deepening and other explanatory variables in Nigeria.
To achieve the above objective our hypotheses developed are

H_{o1} there is no short and long-run relationship between financial depth and inflation in Nigeria
H_{o2} there is no significant impact of innovations from financial deepening and other explanatory variables on inflation in Nigeria

2. THEORETICAL LITERATURE

The achievement of rapid economic growth and development has been observed to be essentially linked to high levels of monetization of an economy and invariably, financial development. This is particularly true in developing economies where it is believed that the provision of adequate financial resources is a prerequisite for economic transformation. The pace of this transformation will be affected by the degree of financial service industries that is prevalent in the economy. Hence, financial institutions contribute to the real productivity of the economy and to the overall standard of living since they are able to satisfy simultaneously, the needs and preferences for both the surplus and deficit units. This observation has been buttressed by many writers. There are many variables that affect individual household's demand for bank deposits. Among these variables is inflation which may affect the demand for bank deposits through the impact on the rates of interest or directly if real asset is considered an alternative to financial assets.

2.1Concept of Inflation

The maintenance of price stability is one of the principal objectives of macroeconomic management. Inflation has been defined by various economists in different ways which aim at the same meaning. Johnson (1973) maintained that inflation is generally and conveniently defined as a sustained trend in the general price level.
Price changes are generally measured by means of three indices namely; the wholesale price index (WPI), the

consumer price index (CPI) and the implicit price index (IPI) or the Gross Domestic Product (GDP) deflator. Each is a weighted index of prices of selected commodities in a basket, the behavior of which is taken as representatives of the average behavior of prices of such goods and services in general. In Nigeria, the Federal Office of Statistics has the primary responsibility of computing inflation rate. For the purpose of this study, only the Consumer Price Index (CPI) would be taken into consideration as a measure of inflation (CBN 2007).

2.2 THEORIES OF INFLATION

The theoretical basis of this study was anchored on Monetarist and Keynesian schools of thought. The Monetarists hinge their proposition on the quantity theory of money in which they argue that changes in the price level are determined by fluctuations in the level of money supply. Keynesian theory proposes that money is transparent to real forces in the economy, and that visible inflation is the result of pressure in the economy expressed in price.

The Monetarist Quantity Theory of Money

This theory holds that there is a direct and powerful link between the quantity of money and the level of prices. This theory was developed by Alfred de Foville, Irving Fisher and Simon Newcomb in the latter 19th, early 20th century. In the post-Keynesian era, it was restated by Milton Friedman. The Quantity theory can be illustrated by the equation of exchange:

MV = PT, or **MV=$\sum(p_i * q_i) = PT$**

M = money supply

V = velocity of circulation

P = overall price level (transactions for the economy during the period) and

T = total transaction, or the amount of goods and services produced,

p_i = price of the i-th transaction,

q_i= the quantity of the i-th transaction.

This equation also used in the rudimentary theory of inflation. **P = (M*V)/Q,**

The equation of exchange has some compelling implications for monetary policy. First, however, some assumptions must be made regarding velocity (**V**) and output (**T**). Many economists believe that velocity is relatively stable, at least in the short run, and that if the economy is at or near full employment, output also cannot change in the short run. In such a case, changes in the money supply (**M**) will cause a proportionate change in the overall price level, and in the same direction. The task for the Federal Reserve now becomes obvious. If the goal is stable prices, merely increase **M** to finance increases in **T** if and when they occur, as they will in the long run. Even if **V** changes, the direction that monetary policy should take is still obvious. The money supply must now be changed to offset the change in **V** in addition to financing any possible increase in **T**. Although this may sound beautifully simple, the quantity theory came under attack during the 1930s and 1940's. Critics argued that there are lags and imperfections in the system. Money is not the only independent variable in the equation, according to the Keynesians, who led the attack on the quantity theory. **P** and **T**, as well as **V**, could all vary on their own. With the coming of the Great Depression in 1930, the quantity theory was discredited by many economists, who considered monetary policy ineffective (Ayodele and Emmanuel (2005))

The Keynesian View

The Keynesian school of thought is usually referred to as demand side economist. Keynes economic theory proposes that changes in money supply will not directly affect price and that visible inflation is the result of pressure in the economy expressed in price. Keynes emphasizes that increases in aggregate demand are the source of demand-pull inflation. There may be more than one source of demand. Consumers want more goods and services for consumption purposes. Businessmen want more inputs for investment. Government demands more goods and services to meet civil and military requirements of the country. Thus, the aggregate demand comprises consumption, investment and government expenditure.

Thus, Keynesian model is given as;

Y=C+I+G (for a close economy)

Where;

Y = Aggregate Demand

C = Private Domestic Consumption

I = Investment

G = Government Expenditure

Inflation according to the Keynesian school of thought arises from excessive aggregate demand over aggregate supply, particularly when the economy operates at the level of full employment resources. He argued that an increase in the money supply would not inevitably lead to an increase in the price level. Increasing M may instead lead to a decrease in V, in order words, the average speed of circulation of money could fall because there was more of it in the system.

Alternatively the increase in M may lead to an increase in the number of transactions because as Keynes disputes the assumption that the economy will find its own equilibrium. It may be in the position where there is

insufficient demand for full-employment equilibrium and in that case increasing the money supply will fund extra demand and move the economy closer to full employment. Keynes tends to argue that inflation is more likely to be cost-push or from an excess level of demand. This is usually term demand-pull inflation (Robert 1988).

Monetary-disequilibrium theory

Monetary-disequilibrium theory states that output, not (or not only) prices and wages, fluctuate with a change in the money supply. To that degree, prices are represented as sticky. It is this "monetary disequilibrium," that, the theory contends, affects the economy in real terms. Thus, changes in the money supply will result first in a change of output in the same direction, as distinct from merely a change in prices. Consequently, an increase in the money supply will induce workers and businesses to supply more, without being fooled into doing so. In a situation where the money supply contracts, businesses will respond by laying off workers. In this way, the theory accounts for involuntary unemployment. The disequilibrium between the supply and demand for money exists as long as nominal supply does not adjust automatically to meet the nominal demand. Monetary-disequilibrium is a short-run phenomenon as it contains within itself the process by which a new equilibrium is established i.e. through changes in the price level. Now, if the demand for real balances change either the nominal money supply or price level can adjust the monetary equilibrium in the long run.

Theory of Monetary Neutrality

A basic proposition in monetary theory, called monetary neutrality, states that in the long-run, a one-time percentage rise in the money supply is matched by the same one-time percentage rise in the price level, leaving unchanged the real money supply and all other economic variables such as interest rates. Money is said to be neutral if exogenous changes in the supply of money have no effect on real quantities and real prices. Monetary neutrality tells us that in the long run, the rise in the money supply would not lead to a change in the domestic interest rate. The fact that the increase in the money supply has left output and interest rate unchanged in the long-run is referred to as long-run monetary neutrality. The only result of the increase in the money supply is a higher price level, which has increased proportionally to the increase in the money supply so that real money balances M/Pare unchanged. If the Fisherian quantity theory is correct, then any change in money supply would lead to a corresponding change in prices, while the real variables, Y and V, remain unchanged. This is known as the neutrality of money, a condition whereby changes to the money supply affect only nominal variables.

2.3 Empirical Literature

Basically two strands of literature were reviewed; first is the relationship between inflation, money aggregates and other macro economic variables were checked and in addition literature on the impact of financial deepening on price level and economic growth were also examined.

2.3.1 Relationship between Inflation, Monetary Aggregates, Exchange rate, Import Volume Index and Prime Lending rate

Many researchers have tried to find out the actual causes of inflation in Nigeria using different approaches among such researches are the revolutionary work of Oyejide's (1972), He tried to provide an explanation of the causes of inflation in Nigeria, most especially from the structuralist perspective. Specifically, he examined the impact of deficit financing in transmiting inflation processes in Nigeria and concluded that there was a very strong direct relationship between inflation and the various measures of deficit financing that were in use between 1957 and 1970.

Adeyeye and Fakiyesi (1980) used annual time series data spanning 1960–1977; to test the hypothesis that the rate of inflation in Nigeria is linearly related to the rate of growth of money stock, government expenditure, especially deficit, and growth of government revenue. The result established some significant positive relationships between inflation rate and growth in bank credit, growth of money supply and growth in government expenditure, while the relationship with growth of government revenue was uncertain. Osakwe (1983) used quarterly data to verify the relationship between government expenditure and money supply in the ten-year period 1970–1980. The result showed strong relationships between increases in net current expenditure and growth in money supply, on the one hand, and growth in money supply and inflation. Further increases in money wage rate and money supply (with a lag in effect) were identified as the two most important factors that influenced the movement of prices during the period. Callen and Chang (1999) revealed in their study on modeling and forecasting inflation in India that the Reserve Bank of India had shifted from broad money target towards a multiple indicator approach in the conduct of monetary policy. They used percentage changes in three different price indices; the wholesale price index (WPI); the consumer price index (CPI); and the GDP deflator as measures of inflation in order to determine which of them provided the most useful information about future inflationary trends. The WPI was used in the analysis because it had a broader coverage and was published on a more frequent and timely basis than the CPI. However, the CPI remained important because it was used for indexation purposes for many wage and salary earners (including government employees). The authors adopted a simple monetarist equation for the price level, applied the co-integration technique and derived a dynamic equation for inflation. The findings indicated that exchange rate and import prices were relevant for inflation. It

was concluded that while the broad money target has been de-emphasized, developments in the monetary aggregates remain an important indicator of future inflation.

Holod (2000) explores vector-autoregression to model the relationship between CPI, money supply and exchange rate in Ukraine. The results show that exchange rate shocks significantly influence price level behaviour. In addition, the study also found that money supply responds to positive shocks in price level. The study contributes to the sizable literature on IT using overly sophisticated vector error correction model with complex identification structure. There is however an element of data mining in the generation of impulse response functions. While Mahamadu and Philip (2003), explore the relationship between monetary growth, exchange rates and inflation in Ghana using Error Correcting Mechanism. The empirical result confirms the existence of a long run equilibrium relationship between inflation, money supply, exchange rate and real income. In line with theory, the findings demonstrate that in the long-run, inflation in Ghana is positively related to the money supply and the exchange rate, while it is negatively related to real income. Disaggregated econometric model that considers both monetary and structural

Bailliu, et al. (2002) applying existing inflation models that have worked well in industrialized countries to Mexico, over the period 1983 to 2001, the performance of these models was compared to a mark-up model that had been used extensively for the analysis of inflation in Mexico. Each model was estimated using quarterly data. The estimation and forecasting results suggests that the evolution of the exchange rate remained a very important factor for explaining inflation. Indeed, the best performing model, the mark-up model, was the one in which the exchange rate played the most significant role. The Philips curve performed better when using actual values than forecasted values as explanatory variables. And Fakiyesi (1996) investigated the determinants of inflation in Nigeria between 1981 and 2003. The study made use of non-linear multiple regression models. He posited that the causes of inflation in Nigeria are multi-dimensional and dynamic, requiring full knowledge at any point in time to be able to proffer solutions to the inflationary trends in the country.

Williams and Adedeji (2004) examined price dynamics in the Dominican Republic by exploring the joint effects of distortions in the money and traded-goods market on inflation, holding other potential influences constant. The study captured the remarkable macroeconomic stability and growth for the period 1991 to 2002. Using a parsimonious and empirically stable error-correction model, the paper found that the major determinants of inflation were changes in monetary aggregates, real output, foreign inflation and the exchange rate. The authors established a long-run relationship in the money and traded-goods markets, observing that inflation was influenced only by disequilibrium in the money market. Examining the relative importance of monetary factors and structuralist supply-side factors for inflation in Pakistan. Khan and Schimmelpfenning (2006) showed that monetary factors were the main drivers of inflation, while “wheat support price” affects inflation in the short-run. Using monthly data from 1998 to June 2005, a monetary perspective was considered by specifying a stylized inflation model that includes monetary variables such as money supply, credit to private sector, the exchange rate, as well as the “wheat support price” as a supply-side factor. A vector-error correction model (VECM) was estimated in growth rates as well as in log levels. The findings indicated that monetary factors played a dominant role in recent inflation, affecting inflation with a lag of about one year and increases in the wheat support price influences inflation in the short-run. The conclusion of the study was that wheat support price mattered for inflation over the medium term only if accommodated by monetary policy. The study confirmed that a long-run relationship existed between the CPI and private sector credit. in the same manner, Akinbobola (2012) aims at providing quantitative analysis of the dynamics of money supply, exchange rate and inflation in Nigeria. The paper utilizes secondary data that were obtained from the International Financial Statistics (IFS), of all variables investigated in the model. The sample covers quarterly data from 1986:01 to 2008:04. The model was estimated using Vector Error Correction Mechanism (VECM). And the empirical results confirms that in the long run, money supply and exchange rate have significant inverse effects on inflationary pressure, while real output growth and foreign price changes have direct effects on inflationary pressure. The possible justification for the inverse effect of money supply on price level is that inflation may not be due to aggregate demand pressure but rather due to hiccups in the supply chain of goods both from the domestic and foreign supply outlets. However, there exists a causal linkage between inflation, money supply and exchange rate in Nigeria.

2.3.2 Nexus between Financial Deepening, Inflation and Economic Growth

There are now substantial theoretical literatures arguing that inflation impedes financial deepening. Hyubens and Gylfason and Herbertsson (2001), Bose (2002), and Rousseau and Wachtel (2002) have demonstrated that the level of inflation is an important factor in affecting the relationship between financial development and growth. Moreover, these studies provide empirical evidence indicating that under a low or moderate inflation rate, financial development promotes economic growth. On the contrary, under higher inflation environments, financial development does not have any impact on economic growth.

Chien-Chang and Wong (2005) employs a threshold regression model to investigate the existence of inflation threshold effects in the relationship between financial development and economic growth. A specific question

that is addressed in the paper is what the threshold inflation rates are for Taiwan and Japan. Results indicate that there is one inflation threshold value in Taiwan, whereas there are two in Japan. Earlier studies support the view that financial development may promote economic growth. However, the conclusion drawn from the empirical findings suggests that it can only be achieved under low and moderate inflation. In addition, the threshold level of inflation below which financial development significantly promotes growth is estimated at 7.25% for Taiwan and 9.66% for Japan. The empirical findings from the threshold regression model indicate that inflationary threshold for both countries occurred in the high inflation period of the world energy crises in the 70s.

Shouyong and Aleksander (2008) develop a general equilibrium framework to analyze the relationship between the operation of the financial system, inflation and economic growth. They first investigate the dynamic interactions between financial development and growth by analyzing how financial innovations affect real growth, and, in turn, growth affects the financial system. Also they study how inflation affects financial deepening and economic growth.

3. Theoretical Model

There are three basic classes of structural models deriving from the major causes of inflation and these models are (Mark-up Model, Monetarist Models, and Philip Curve Model). The first views inflation as a cost- push phenomenon in the context of a long-term constant mark-up over costs. The second treats inflation primarily as a monetary phenomenon and attempts to link changes in prices directly to changes in monetary aggregates or to both developments in the monetary and traded goods sector. The third class views inflation as arising from real factors, in particular imbalances between aggregate demand and aggregate supply (CBN, 2007).

This Paper is adopting Open Economy Model of Inflation developed by Central Bank of Nigeria**;** this is an extension of the monetarist framework in small open economies. This Model is based on the concept that inflation is always and everywhere a monetary phenomenon. And it considers disequilibria not only in the money market but also in the traded goods market. In other words, inflation process in an open economy is determined by developments in the two markets.

Generally, the framework begins with the assumption that the price level, P_t, is a weighted average of tradable prices, P_t^T, and non-tradable prices, P_t^N :

$$\mathbf{P_t = qP_t + (1\text{-}q)P_t^T} \quad \text{..... (1)}$$

And q is the weight on non-tradable prices in the price index. The price of tradable goods is determined in the world market, with their price in the domestic economy being a function of the foreign currency price, P_t^f, and the exchange rate, E_t (with an increase representing a depreciation). The price of non-tradable is determined in the domestic money market;

$$\mathbf{LogP_t^N = a\,(LogM_t - LogM_t^d)} \quad \text{..... (2)}$$

Where M_t is the outstanding stock of money, M_t^d is the demand for real money balances, and is a scale factor representing the relationship between economy wide demand and demand for non-tradable goods. The demand for real money balances is assumed to be determined by the level of real income, Y_t, and the opportunity cost of holding money vis-à-vis other assets (real or financial) , i_t. Consequently, the price of non-tradables can be rewritten as:

$$\mathbf{LogP_t^N = a\,(LogM_t - a_1LogY_t + a_2i_t)} \quad \text{..... (3)}$$

An increase in the outstanding money stock is expected to result in higher prices, while an increase in real income is expected to expand the demand for money for transactions and, in turn, lead to a decline in prices. An increase in the opportunity cost of holding money, by reducing the demand for money balances, will result in an increase in prices or by increasing aggregate demand would generate inflationary pressures. So, with lower case letters representing logs, prices, P_t, can be written as:

$$\mathbf{p_t = aq(m_1 - a_1y_t - a_2i_t) + (1 - q)(e_t + P_t^f)} \quad \text{..... (4)}$$

Equation (4) posits that the price level or inflation is determined by the stock of money or level of financial deepening, real income (or output), interest rate, exchange rate, and foreign price level.

Empirical Model Specification

The long-run estimable determinants of inflation are expressed as follows:

$$\mathbf{Cpi_t = a_1 + a_2fd1_t + a_3fd2_t + a_4imv_t + a_6rgdpt + a_7excr_t + a_5prm_t + y_t} \quad \text{..... (5)}$$

In the models presented above,

Cpi = Consumer Price Index
Fd1 = Broad Money Supply/GDP
Fd2 = Credit to private sector/GDP
imv =Import volume index
rgdp = Real Gross Domestic Product
excr = exchange rate
prm = Prime Lending Rate
, a, are parameters to be estimated, y is error terms and t is period.
Therefore, estimated model is as specified below:

CPI = C(1) + C(2)*D(CPI(-1)) + C(3)*D(CPI(-2)) + C(4)*D(FD1(-1)) + C(5)*D(FD1(-2)) + C(6)*D(FD2(-1)) + C(7)*D(FD2(-2)) + C(8)*D(RGDP(-1)) + C(9)*D(RGDP(-2)) + C(10)*D(IMPV(-1)) + C(11)*D(IMPV(-2)) + C(12)*D(PRIM(-1)) + C(13)*D(PRIM(-2)) + C(14)*D(EXCR(-1)) + C(15)*D(EXCR(-2)) + C(16)*FD1(-1) + C(17)*FD2(-1) + C(18)*RGDP(-1) + C(19)*IMPV(-1) + C(20)*PRIM(-1)+C(21)*EXCR(-1)+C(22)*ECT(-1) …… …….. (6)

3.1 Method of Data Analyses and Time Series Property of Data Used

The methodology applied in this study following the literature is based on time series data sets. The estimation procedure adopted in deriving the estimates of the parameters of economic relationships is the **Ordinary Least Squares (OLS).** E-View 5 is used to run the regression while Microsoft Excel 2013 is used to enter the data.

Unit-Root Test:

There often exists the problem of non-stationarity in empirical research involving time series data and this renders the traditional tools of econometrics (like OLS) inappropriate. To overcome unit-root problem, we test for stationarity of the series in use. The Augmented Dickey-Fuller test (ADF) is of choice in this study because of its efficiency in detecting unit root. It is specified as follows:

$$\Delta Y_t = \theta_o + \theta_1 Y_{t-1} + \sum_{i=1}^{k} b_i \Delta Y_{t-i} + \mu_t \quad \text{..... (7)}$$

where, $Y_t$is a vector of all variables in the model $\theta_i$and b_i are parameters of the model, $\mu_t$is thewhite noise at time while k and Δ remain as defined in equation (6) above. This we will achieve, conducting the test by first or second level difference if the series are integrated of order one or order two (i.e. I(1) or I(2)). The null hypothesis here is that Y_t has a unit root (that is, non-stationary) and the alternative is that there is no unit root (that is, stationary). If the variables turn out to contain unit roots, we will therefore, conclude that they are non-stationary.

Autoregressive Distributed Lag Model for Objective 1

In statistics and econometrics, a distributed lag model is a model for time series data in which a regression equation is used to predict current values of a dependent variable based on both the current values of an explanatory variable and the lagged (past period) values of this explanatory variable. (http://en.wikipedia.org/wiki/Distributed_lag)

The starting point for a distributed lag model is an assumed structure of the form

$$y_t = a + w_0 x_t + w_1 x_{t-1} + w_2 x_{t-2} + \ldots + \text{error term} \quad \text{..... (8)}$$

or the form

$$y_t = a + w_0 x_t + w_1 x_{t-1} + w_2 x_{t-2} + \ldots + w_n x_{t-n} + \text{error term}, \quad \text{..... (9)}$$

where y_t is the value at time period t of the dependent variable y, a is the intercept term to be estimated, and w_i is called the lag weight (also to be estimated) placed on the value I periods previously of the explanatory variable x. In the first equation, the dependent variable is assumed to be affected by values of the independent variable arbitrarily far in the past, so the number of lag weights is infinite and the model is called an *infinite distributed lag model*. In the alternative, second, equation, there are only a finite number of lag weights, indicating an assumption that there is a maximum lag beyond which values of the independent variable do not affect the dependent variable; a model based on this assumption is called a *finite distributed lag model*. (http://en.wikipedia.org/wiki/Distributed_lag)

Variance Decomposition for objective 2

In econometrics and other applications of multivariate time series analysis, a variance decomposition or forecast error variance decomposition (FEVD) is used to aid in the interpretation of a vector autoregression (VAR) model once it has been fitted. The variance decomposition indicates the amount of information each variable contributes to the other variables in the autoregression. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. It contains E(Var[Y|X]) = explained variation directly due to changes in X

Var(E[Y|X]) = unexplained variation comes from somewhere other than X

E(Var[Y|X]) = explained variation directly due to changes in X; and Var(E[Y|X]) = unexplained variation comes from somewhere other than X.

The result helps the researcher to isolate or to appreciate the fact that the response in Y has variation; this variation is comprised of 2 components. When these components are decomposed they are one type of variation that is explained by the changes of X (independent variable) and another variance that is completely due to chance stance, i.e. unexplained. Another meaning of this is that Var(E[Y | X]) = randomness; after all, randomness is defined as unpredictable pattern. (Paul Louangrath 2013)

For the VAR (p) of form

$$y_t = \nu + A_1 y_{t-1} + \ldots + A_p y_{t-p} + u_t. \quad \text{…… (10)}$$

3.3 Variable Description

Data for this study was obtained from the central Bank of Nigeria's publications (Statistical Bulletin, and annual reports and statement of Accounts, 2012).

Financial Development Variables

To ensure robustness, we use two different measures of financial deepening. The measures are positively associated with financial deepening, although each captures a different aspect of the financial deepening process. The first proxy (FD1) is the inverse of the broad-money income velocity, i.e., the ratio of M2 to nominal GDP and is often called the monetization ratio. King and Levine (1993) use this monetization ratio which reflects the depth (size) of the financial market relative to the overall economy. Increases in FD1 indicate further expansion in the financial sector relative to the rest of the economy.

The second measure of financial deepening is (FD2), this is credit issued by financial institutions to the non-financial private sector as a share of GDP. FD2 reflects the extent to which financial services are provided to the private sector. Researchers have recommended the use of FD2 since it is more inclusive than other measures of financial development, and it also captures an important activity of the financial sector; namely, channeling funds from savers to investors in the private sector.

Exchange Rate

There has been resounding debate for decades now on the actual relationship between exchange rate and inflation in the developing economies. There have been also arguments on the choice of different type of exchange rate regime in relations to targeting inflation. Based on this nominal exchange rate has been used as a tool to bring down inflation, until after the currency crisis of the late 1990s and early 2000, however, a growing number of emerging economies moved away from exchange rate rigidity and adopted a combination of flexible exchange rates and "inflation targeting." Because of this move the exchange rate has become less central in economic policy debate in most emerging markets. Based on credibility-based theories many authors argued that developing and transition countries should have hard peg regimes preferably currency boards or dollarization (Edward, 2006).

Much of the recent literature has ignored this "exchange rate effectiveness" question, and has focused on the inflationary effects of exchange rate changes. If the inflationary effects of exchange rate changes are large, the authorities will have to implement monetary and fiscal policies that offset the inflationary consequences of exchange rate changes (Edward, 2006).

Prime Lending Rate

The relationship between lending rates and inflation is drawn from the puzzle of demand and supply of credit. Interest rates are payment on borrowed funds. Real interest rates play an important role in the economy because real interest rates affect the demand for goods and services through borrowing costs. Changes in real interest rates affect the public's demand for goods and services mainly by altering borrowing costs, the availability of bank loans, the wealth of households, and foreign exchange rates (Catáo and Terrones, 2001). Most economies experience some inflationary trends due to failure to anticipate future inflation when lending, especially on long-term securities or loans, can be costly either in terms of cost of interest (CBN, 2000).

Accordingly, the central monetary authority, that is, the Central Bank of Nigeria (CBN) should persistently vary the prime lending rate in order to check inflation expectations in the country. As part of the CBN's statutory duties, there is need for the CBN to embark on the implementation of policies that reduce adverse inflationary trends in the economy and this it does by raising the cost of borrowing to commercial banks and thereby curtailing the capacity of commercial banks to expand credit (Umoru and Oseme 2013).

Import Volume Prices

Import volume indexes are derived from the United Nations Conference on Trade and Development (UNCTAD's) volume index series and are the ratio of the import value indexes to the corresponding unit value indexes. Export and Import Price Indices (XMPIs) are used for a variety of different purposes. There is a general public interest in knowing the extent to which the prices of goods and services have risen. Also, it has long been customary in many countries to adjust levels of wages, pensions, and payments in long-term contracts in proportion to changes in relevant prices, a procedure known as index linking or contract escalation. Price indices have a long history for this reason. Due to the direct link import prices have with general increase or decrease in the prices, countries in the decades ago established some form of barriers to trade across nations in form of tariff and non-tariff payments. This is basically to control the effect of imported prices on the economy. Therefore, imported prices still remained a strong variables that contributes to inflation.

4. Result Presentations and Interpretation

4.1 Unit Root Test

As indicated in the literature, most time series variables are non-stationary and using non-stationary variables in the model might lead to spurious regressions. The first or second differenced terms of the most variables will

usually be stationary. Hence, the variables were found significant at first differences. See appendix below.
The first step is VAR estimation to select the suitable lag order for the unrestricted VAR. In this respect, lag length criteria test computes various criteria to select the lag order of an unrestricted VAR. In selecting the appropriate lag number, the VAR lag order selection criteria test was employed and lag of 2 is selected for subsequent test based on the minimum Final Prediction Error (FPE) and Akaike information Criteria (AIC).

4.2 AutoRegressive Distributed Lag Model for Objective 1

Table 4.1 AutoRegressive Distributed Lag Model Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.85098	9.038943	3.966279	0.0074
D(CPI(-1))	0.671741	0.451141	1.488984	0.1871
D(CPI(-2))	0.224486	0.432258	0.519333	0.6221
D(FD1(-1))	-1.226401	0.928181	-1.321295	0.2346
D(FD1(-2))	-0.539460	0.985190	-0.547570	0.6037
D(FD2(-1))	0.274404	0.842067	0.325869	0.7556
D(FD2(-2))	1.342892	0.903932	1.485612	0.1879
D(RGDP(-1))	-0.117095	0.331053	-0.353705	0.7357
D(RGDP(-2))	-0.043932	0.307154	-0.143028	0.8910
D(IMPV(-1))	-0.461619	0.073866	-6.249399	0.0008
D(IMPV(-2))	-0.274982	0.064134	-4.287644	0.0052
D(PRIM(-1))	0.432229	0.435185	0.993208	0.3590
D(PRIM(-2))	-0.513477	0.306931	-1.672937	0.1454
D(EXCR(-1))	-0.218371	0.104158	-2.096541	0.0409
D(EXCR(-2))	-0.221903	0.111303	-1.993688	0.0532
FD1(-1)	-0.824836	1.219766	-0.676225	0.5241
FD2(-1)	-0.831843	1.486733	-0.559511	0.5961
RGDP(-1)	0.009423	0.629444	0.014970	0.9885
IMPV(-1)	0.455572	0.056107	8.119659	0.0002
PRIM(-1)	-2.198917	0.408916	-5.377429	0.0017
EXCR(-1)	0.489463	0.082805	5.911054	0.0010
ECT(-1)	-2.18E+12	1.31E+12	-1.663528	0.0473
Rsquared	0.999214			
Adjusted R-squared	0.996464			
Fstatistic	363.2699			
Prob(Fstatistic)	0.000000			
Durbin-Watson	2.587142			

Source: own Computation (E-View Anaysis).

Short-run Result

The result presented in the table 4.1 represents both short-run and long-run dynamics and the corresponding P-values, the result shows that at five (5) percent level of confidence, import volume index (DIMPV) and exchange rate (DEXCR) in lags 1 & 2 respectively are significant to explain variations in the consumer price index (CPI) in the short-run while all other variable have no significant impact on CPI. Meaning that the explanatory variables (financial deepening (M2/GDP, CPI/GDP) real gross domestic product and prime rate), does not have short run impact individually with the consumer price index.
Using Wald Coefficient Diagnostic Test to check if the lags of each explanatory variable if joined can impact on the consumer price index (CPI) and we found that lags of import volume index and prime rate represented by (C10 & C11 and C12 & C13) are significant with P-values (0.0022 and 0.0246). This means that in the short-run the lags (1 & 2) of import volume index and prime rate can influence the price level. See appendix for the Wald Test result.
Most importantly, the short –run result shows that financial deepening variables Fd1 and Fd2 have no significant impact on consumer price index.

Long-run Result

While in the long-run, import volume index (impv), prime rate and exchange rate (excr) are significant with P-values of 0.0002, 0.0017 and 0.0010 respectively.
The coefficients of FD1(-1) and FD2(-2) designated with C(16) and C(17) was tested together using Wald Coefficient Diagnostic Test to see the impact of financial depth on the price level, and the result indicate a positive and significant impact of financial depth on CPI with the P-value of 0.0177. Meaning that, whenever

the financial authority increases money supply ratio and credit to private sector ratio together it generates price increase.

Also coefficient diagnostic test was carried out to find out the overall impact of the explanatory variables on CPI. And we found that in the long-run the coefficients (C16 – C21) together are strongly significant with P-values of 0.0000 to explain variations in price level (CPI).

Finally the error term (ECT (-1)) indicates negative coefficient with significant p-value meaning that in the long-run our explanatory variables can influence the price level. The coefficient = -2.17887 signifies that the speed of adjustment is 217 percent.

The R2 = 0.9992, shows that the regression line is perfectly fitted, and F-statistic probability = 0.0000 signify very strong and perfect overall significance of the model.

Residual Test: the stability test result denotes that the model is perfectly stable, no auto correlation/serial correlation and the model is normally distributed. See appendix to view the result

4.3 Variance Decomposition

The variance decomposition indicates the amount of information each variable contributes to the other variables in the autoregression. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables.

Table 4.2 Variance Decomposition Result

PERIOD	S.E.	CPI	FD1	FD2	RGDP	IMPV	PRIM	EXCR
1	3.018188	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	5.463761	95.24276	0.372695	2.678815	0.531266	0.006435	1.154315	0.013718
3	7.710079	86.49656	1.040522	6.531303	0.990729	0.028785	4.117787	0.794312
4	10.07676	71.36580	2.319036	13.59528	0.682052	1.738578	7.085278	3.213979
5	13.09121	53.16915	2.456199	23.47675	0.433140	5.134070	9.697196	5.633493
6	16.68164	40.39132	1.979477	30.37855	0.345614	6.758784	12.18879	7.957466
7	20.63503	33.43901	1.515855	33.34313	0.317837	6.683378	14.31438	10.38641
8	24.87630	30.31167	1.135424	33.79470	0.319766	5.745834	16.03750	12.65510
9	29.40832	29.56768	0.842478	32.69642	0.306014	4.529252	17.43616	14.62199
10	34.29934	30.17072	0.627159	30.87008	0.272364	3.432704	18.43388	16.19310
11	39.60359	31.35954	0.471159	29.03277	0.235430	2.592279	19.00872	17.30010
12	45.30742	32.62528	0.360485	27.58610	0.203970	1.983798	19.25502	17.98534

Source: own Computation (E-View Anaysis)

The result above showed that in the short run, that is period one to nine, innovation or shock to CPI account for 59.99 percent variation of the fluctuation in the variance of CPI (own shock).

Shock to FD1 can cause 1.29 percent fluctuation in CPI, shock to FD2 can cause 19.61 percent of variations in CPI, while RGDP and IMPV can cause 0.39 and 3.41 percent respectively and Shocks to PRIM and EXCR leads to 9.11 and 6.14 percent variations in the CPI respectively, all in the short- run.

But in the long-run innovations or shock to CPI causes 31.38 percent of its own shock, FD1and FD2 can cause 0.48 and 29.16 fluctuation to CPI respectively. While shocks to RGDP and IMPV leads to 0.23 and 2.66 of variations in CPI. And finally shocks to PRIM and EXCR can cause 18.89 and 17.15 of variations in CPI, all in the long-run.

Therefore focusing on financial deepening variables, shocks to FD1 can rarely cause variation in price level while shocks to FD2 can cause variations in prices more than any other variable both in the short-run and long – run.

4.4 Policy Implication

Against our strong expectations and following the classical postulation that at all levels, any minute increase in money supply will generate the same proportional effect in the price levels. The study result reveals that in the short run, financial deepening have no effect on the prices level rather import volume index, exchange rate and prime rate are strong variables that significantly can affect the consumer's price index in the short-run. And this is accepted because the country's desire to achieve financial depth is a long-run phenomenon and is expected to generate negative ripple effect on prices in the long-run.

The long-run result still showed that individually, import volume index, exchange rate and prime rate can influence the price level significantly. This agrees with other previous researches for examples; (callen and chang (1999), William and Adedeji (2004), Bailliu et al (2002), Akinbobola (2012), Holod (2000))

While financial deepening variables (money supply and credit to private sector ratios) can only influence prices when joined together in the long-run. And this indicates that alongside the desire of the government to achieve financial depth, measures have to be ensured by the financial authorities/government to neutralize the ripple effect on prices.

In addition, the coefficient diagnostic Wald test also indicates that all the study variables have strong significant effect on price index in the long-run, meaning that (fd1, fd2, rgdp, impv, prim and excr) are all strong variable that can influence price level.

The variance decomposition test reveals that it is only innovations to private sector credit ratios (FD2) that can generate significant though not high variations in the price index both in the short and long run. While shocks to prime rate and exchange rate can cause 18.89 and 17.15 variations in prices in the long-run. Moreover, consumer price index accounts significantly for its own shock or innovations both in the short and long- run.

5. Conclusion

The main goals of economic/financial reforms are to achieve the macroeconomic objectives of price stability, full employment, high economic growth via financial deepening effects, and internal and external balances. Thus, financial deepening refers to the improvement/increase in the pool of financial services that are tailored to all the levels in the society. It also refers to the increase in the ratio of money supply to GDP/Other price index which eventually suggests that the more liquid money is available in the economy, the more opportunities exist in that economy for continued and sustainable economic growth. Consequently drawing from the definition above and based on the classical theory, the relationship between increase in money supply and other credit indexes and inflation should be put under scrutiny.

Therefore two objectives was set to be achieved, which are (1)To evaluate the short and long-run impact of financial deepening on inflation in Nigeria (2)To ascertain how prices reacts to shocks or innovations from financial deepening and other explanatory variables in Nigeria. It was discovered that import volume index, prime lending rate and exchange rate are significant variables both in the short-run and long-run to influence prices. Individually, the financial deepening variables could not affect the consumer price index, but when joined together they became significant to influence prices in the long run. All the study variables when joined together through coefficient diagnostic test can influence price level.

But most importantly, private sector credit to GDP ratio which is according to Gregorio and Guidotti (1995), a more direct measure of financial intermediation, because it excludes the credit to public sector, represents more accurately the role of financial intermediaries in channeling funds to private sector was found the only variable that have much impact on the prices, while CPI contributes majorly to its own shocks.

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