

Money Market Instruments and Nigeria Inflation Rate: A Time Series Study

Philip Umasom¹

¹Department of Banking and Finance, Rivers State University, Port Harcourt, Nigeria

Correspondence: Philip Umasom, Department of Banking and Finance, Rivers State University, Port Harcourt, Nigeria

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Abstract

This study empirically examined the effectiveness of money market instruments on Nigerian inflation rate. The objective is to investigate the existing relationship between money market instruments and Nigerian inflation rate, data was sourced from Central Bank of Nigeria statistical bulletin. Multivariate model were formulated having Inflation Rate (INFR) as the function of Percentage of Treasury Bills to Gross Domestic Product (TB/GDP), Percentage of Stabilization Securities to Gross Domestic Product (STS/GDP), Percentage of Treasury Certificate to Gross Domestic Product (TC/GDP), Percentage of Eligible Development Stock to Gross Domestic Product (EDS/GDP), Percentage of Central Bank of Nigeria Short Term Fund to Gross Domestic Product (CBNSF/GDP) and Percentage of Call Money Scheme to Gross Domestic Product (CMS/GDP). The Ordinary Least Square (OLS) properties of co integration, Augmented Dickey Fuller Unit Root, Granger Causality Test and Vector Error Correction Model (VECM) were employed to determine the relationship between the money market instruments and Nigerian inflation rate. Findings revealed that money market instruments are statistically significant in explaining variation in Nigerian inflation rate. We therefore recommend that the money market should well be structured, properly managed and its operational efficiency enhanced to achieve the monetary policy objective of price stability.

Keywords: Money Market Instrument, Inflation Rate, Commercial Paper, Treasury Bills, Treasury Certificates.

1. Introduction

The opinion that inflation is a monetary phenomenon is one of the central theses of monetary economics. The traditional view of the classical economist was that money is insignificant and does not matter in the economy. The Keynesian mainstream economists argue that money has indirect effect on the economy, while Neo-classical economists of monetarism assign significant role to money in the economy, and the theory of monetary policy. A growing number of emerging market economies are moving towards inflation targeting as the guiding framework for monetary policy actions (Mukherjee and Bhatta, 2011), thus achieving low inflation is a macroeconomic objective of monetary policy. The importance of the money market can not be overemphasized, to the government, the money market instruments helps in meeting government short-term fall in revenue through sales of securities such as eligible development fund, Treasury certificates. To the business firms like the banks, it bridge the liquidity challenges by making it possible to invest excess liquidity and source shortage of liquidity while to the monetary authority, it is a mechanism for the achievement of monetary policy objective such as price stability.

The money market is a component of financial market and constitutes the market for the short-term financial instruments with maturity of within one year. The existence of the money market facilitates trading in short term debt instruments to needs of large users of funds such as the government, banks and similar institutions (Igbatayo, 2011). It plays key role in bank liquidity management and transmission of monetary policy by providing the appropriate instruments (Nwosu and Hamman, 2008). Unlike the capital market, the money market plays an important role in the mobilization of financial intermediation by meeting short-term cyclical fluctuation in the

economy. The Nigerian money market has been in existence for decades and has grown in the number of instruments and the institutions.

The quantity theory of money states that period of sustained growth and decline in inflation are accompanied by a faster or slower growth of monetary aggregate adjusted for long-term trends of output and money velocity (Lyziaka et al, 2012). There are various stages in which the monetary policy transmission process undergoes. Under inflation targeting, the key monetary policy instrument is the short term interest rate. The transmission process involved variation in monetary policy rate which lead to movement in retail interest rate. Understanding the transmission of monetary policy to inflation and other real economic variables is a key for central bankers to conduct monetary policy effectively. The monetary policy objective of price stability can be tarnished if the policy does not match with other fiscal measures in the economy (Ezirim, 2005).

For a developing economy like Nigeria, it is vital to analyze monetary policy transmission such as the money market instruments and its effect on inflation for several reasons, first to determine the appropriate channel and the effectiveness of monetary policy in managing inflation, second to examine the effect of government fiscal measures on inflation without the monetary policy supply channel, third to measure its effect on the aggregate demand and aggregate supply (Bussimis and Magginas, 2006)

However, the challenges facing the effectiveness of Nigeria money market as effective instrument of managing inflation ranges from inconsistent policy of the regulators and the monetary authorities, for instance, the recent withdrawal of 75% of government fund from the banking institutions to control inflation constrain transaction in the money market macroeconomic and monetary policy shocks and management factors (Omotar, 2007). The divergence between the Monetarist, the Classical and the Neo-classical on inflation as a monetary phenomenon has continue to generate debate as the effectiveness of monetary policy in controlling inflation (Demchuk et al, 2012).

The dent for effectiveness of monetary policy is deepening in an underdeveloped financial market like Nigeria (Andreas, 2010). Despite the application of the monetary policy tools such as the money market instruments, inflation has continued to pose challenges to the monetary authorities. Some blamed it on the inability of the monetary authorities to enforce compliance through the monetary channel in the banking and non-banking institutions (Gogor, 2011), while others traced it to the fiscal imbalance characterized with expansionary fiscal policy with deficit budget (Umeredu, 2007).

Therefore this paper intends to study the relationship between money market and Nigerian inflation rate. The rest part of this paper are as follows; section two discusses empirical studies on effect of insurance on economic growth, section three discusses the methodology adopted in the study, section four presents and analyze results while section five concludes and make recommendations from the findings of the study.

2. Literature Review

Money Market: Money market means market where money or its equivalent can be traded. Money is synonym of liquidity. Money market consists of financial institutions and dealers in money or credit who wish to generate liquidity. It is better known as a place where large institutions and government manage their short term cash needs. For generation of liquidity, short term borrowing and lending is done by these financial institutions and dealers. Money Market is part of financial market where instruments with high liquidity and very short term maturities are traded. Due to highly liquid nature of securities and their short term maturities, money market is treated as a safe place. Hence, money market is a market where short term obligations such as treasury bills, commercial papers and banker's acceptances are bought and sold.

Benefits and functions of Money Market: Money markets exist to facilitate efficient transfer of short-term funds between holders and borrowers of cash assets. For the lender/investor, it provides a good return on their funds. For the borrower, it enables rapid and relatively inexpensive acquisition of cash to cover short-term liabilities. One of the primary functions of money market is to provide focal point for RBI's intervention for influencing liquidity and general levels of interest rates in the economy. RBI being the main constituent in the money market aims at ensuring that liquidity and short term interest rates are consistent with the monetary policy objectives.

Evaluation of Nigerian Money market Instruments

Treasury Bills

These are money market securities issued by the federal government of Nigeria. They are sold at a discount, mature within 90 days of the date of issue. They provide the government with a highly flexible and relatively cheap means of borrowing cash. The Treasury Bills Ordinance of 1959 authorized the first treasury bills issue in Nigeria. The Ordinance empowered the Federal Minister of Finance to direct CBN to issue treasury bills on behalf of government, provided that the amount of treasury bills outstanding at any one time did not exceed 10 per cent of the estimated revenue of the federal government in the year that the treasury bills were issued. Between 1979 and 1999, especially between 1992 and 1999, the issue of treasury bills experienced a phenomenal increase. For the two decades the Nigerian economy was in limbo and so was the revenue of government.

In the fiscal year 2001, CBN high-yield certificates with 180 and 365 days tenor, and interest rates of between 19% and 20% were issued for the first time, as additional instrument, for combating the persisting excess liquidity in the economy. In April 1999, the authorities announced what seemed to be an innovative and potent policy, for dealing with the menace of excess liquidity. A treasury bill is one of the most important money market instruments used in Nigeria (Ezema, 1993). Treasury bills are issued by the Federal Government through the Central Bank. When the government wants to borrow to meet its budgetary needs, treasury bills are then issued. Treasury bills are particularly important to, and are also popular with commercial banks (Ezema, 1993). Moreover, treasury bills count as liquid assets of commercial banks while at the same time earning handsome interest rate for the holders. Above all, it is easily marketable. Banks that are faced with liquidity problems (needs) can easily sell treasury bills for cash in the money market. A treasury bill is a much secured means of holding short-term assets; it also has a stable price (Ezema, 1993).

Commercial Paper

These are short-term promissory notes issued by the CBN and their maturities vary from 50 to 270 days, with varying denominations. They are debt that arises in the course of commerce. The first recorded commercial papers were issued in Nigeria in 1960. Commercial papers are as old as the treasury bills in Nigeria and constitute to date the third largest money market instrument in the arena of Nigerian money market assets (Onoh, 2002). Produce bills were first issued in 1962 to finance the export of produce. Determined to reduce the Marketing Boards' dependence on the London finance houses for bridging finance, CBN began to fund the difference in the credit provided by Nigerian banks and the total funds required to cover the marketing of major export crops.

Commercial papers are the means by which commercial houses, through their bankers (mostly merchant or investment banks) raise short-term funds of three to six months (Ezema, 1993). This is only possible if such funds attract interest rates less than bank overdrafts. For instance, if the interest on an overdraft is 18%, and the commercial paper rate is between 16% and 17%, the company may opt for commercial paper. In that case, it is the standing of the company that matters and not that of the agent bank, since the paper does not carry the guarantee of the agent bank. This observation will compel companies that want to issue CPs to strive to raise their market value through better performance and other indices of performance rating (Uremadu, 2004). The main attraction to an investor is that interest is paid upfront. It means that the investor only pays the discounted value, while at maturity he receives the face value of the commercial papers. The risk therefore is that if the borrower should go bankrupt suddenly the investor may lose his investment (Ezema, 1993). It is usually for investors in commercial papers to just seek the advice of their bankers and credit rating agencies, before investing in CPs.

Call Money Scheme

This refers to money lent by the banks on the understanding that it is repayable at the bank's demand or at short notice. Overnight loans are simply bank reserves that are loaned from banks with excess reserves to banks with insufficient reserves (Umeredu, 2006). In July 1962 CBN established a call-money facility to enable commercial banks to lend their surplus funds on an overnight basis. The call-money scheme was administered by CBN.

Treasury Certificate

These are similar to TBS but are issued at par or face value and pay fixed interest rates. These fixed in interest rates are called coupon rates. Accordingly, in the latter part of 1968 two treasury certificates were introduced. One matured in a year, the other in two years. The treasury certificate maturing after one year carried a discount rate of 4% percent, which at that time was equal to the then minimum rediscount rate of CBN (Onoh, 2002).

Treasury certificates are usually issued for a period of one to three years, like treasury bills which have a life span of about 90 days. Treasury certificates yield a much higher interests than treasury bills. They can equally count for liquidity requirements of commercial banks like treasury bills (Ezeama, 1993). Treasury certificates are other avenues through which commercial banks invest their surplus funds without defaulting in liquidity requirements stipulated by the Central Bank. They are a secure investment with no risks of default.

Interbank Market

Interbank lending in Nigeria began in 1962 with the introduction of the call- money market. The call-money market enabled commercial banks to lend or borrow from one another from a few hours, overnight to a few days or longer (Onoh, 2002).

Interbank Market Crisis in the 90s

The introduction of the prudential guidelines, which required banks to make 100% provisioning for bad debts, the adoption of the Basle Accord with its capital risk weights, the distress in the banking system, the advance deposit by banks for the purchase of lucrative foreign exchange, the transfer of major accounts and related accounts of government to the CBN and the reintroduction of the stabilization securities, which retired billions of naira from the money market to the CBN vault, aggravated the tight liquidity position at the money market (Okereke, 2003).

Eligible Development Stocks

Eligible development stocks have made only modest impression as a money market instrument, since the instrument was introduced in 1976. These are usually known as Federal Republic of Nigeria Development Stocks (Ezema, 1993). In most cases, they are issued at par and redeemed at par. Interest thereon is payable half-yearly at fixed rates. The advantage of EDS is that the Central Bank is always ready to buy them back at any time, at market S. O. Uremadu, Determinants of Financial System Liquidity (1980-2005). Besides, commercial banks are allowed to hold some of their assets in development stocks.

Certificates of Deposits (CD)

Nigeria's money market is characterized by a shortage of debt instruments and intensive efforts to find new ones. With the abolition of the call-money scheme of the treasury certificates issue in April 1975, and the stagnating treasury bills market, new debt instruments became imperative, if the money market was to survive. The certificates of deposit were among the new instruments introduced in 1976 to fill the vacuum left by retired treasury bills and treasury certificates, and to increase interbank lending (Osiegbu, 2006). They were issued by the banks themselves as interbank debt instruments. Two types of certificates were approved.

CDs were introduced in Nigeria in 1975 as interbank debit instruments at a time where there was a shortage of government short-term debt instruments and the banking system was also experiencing excess liquidity (Falegan, 1987 and Uremadu, 2005). It was introduced to mop up excess liquidity. The main advantage of CDs are that they can be discounted in the event of urgent needs for cash, the commercial banks invest their excess funds to earn interest returns on them; and they can be purchased by banks, in preference to making interbank loans for fixed terms (Ezema, 1993; Beecham, 1994 and Uremadu, 2005).

Banker& Unit Fund (BUF)

The BUF was introduced in 1976 as CBN's own money-market instrument. It was linked to the federal government loans stocks. Commercial banks and merchant banks, which are statutorily required to hold a certain percentage of their deposits in liquid assets, have found investment in bankers' unit funds very useful, because it is acceptable for the purpose of satisfying the statutory liquid asset requirement.

Bankers Acceptances

Bankers' acceptances were introduced in Nigeria in 1990. The main holders of this instrument are commercial banks, merchant banks and discount houses. When a banker accepts a promissory note or bill of exchange drawn on its customer, the instrument becomes a banker's acceptance. Bankers' acceptances are borrowings by banks on behalf of their customers for which the borrowing bank is liable (Luckett, 1984 and Ezeama, 1993). They are therefore considered generally less risky than commercial papers. They have maturities of three to six months (i.e. 90 – 180 days) as commercial papers. Bankers' acceptance can be issued by individuals, companies or another bank and accepted by a bank on behalf of its customers (Ezema, 1993).

Theories of Inflation

Economic theories reach a variety of conclusions about the responsiveness of output growth to inflation (Adalid and Detken, 2007). Theories are useful, as they account for some observed phenomenon. Historically, in the absence of what is termed 'persistent inflation', the early inflation-growth theories were built on cyclical observations. Persistent inflation is regarded as a post World War II phenomenon. Before then, bouts of inflation were followed by bouts of deflation. Having showed no upward or downward trend, inflation was said to behave like a 'lazy dog'. It stays at a particular level unless and until there is a disturbance, thereafter, it moves to another level, at which it settles. Theory, therefore sought to account for a positive correlation between inflation and growth.

The aggregate supply-aggregate demand (AS-AD) framework also postulated a positive relationship between inflation and growth where, as growth increased, so did inflation. In the 1970s, however, the concept of stagflation gained prominence, and the validity of the positive relationship was questioned. Widely accepted at that time, the Phillips Curve relationship had appeared to not hold. This was evidenced by periods of low or negative output growth, and inflation rates that were historically high. During this period, prices rose sharply, while the economies around the world experienced massive unemployment.

Money and Monetarism

Monetarism has several essential features, with its focus on the long-run supply-side properties of the economy as opposed to short-run dynamics. Milton Friedman, who coined the term "Monetarism", emphasized several key long-run properties of the economy, including the quantity theory of money and the Neutrality of Money. The Quantity Theory of Money linked inflation and economic growth by simply equating the total amount of spending in the economy to the total amount of money in existence (Aksoy et al, 2009) and also suggests that control in the money supply will help in the fight against inflation.

Friedman proposed that inflation was the product of an increase in the supply or velocity of money at a rate greater than the rate of growth in the economy. Friedman also challenged the concept of the Phillips Curve. His argument

was based on the premise of an economy where the cost of everything doubles and where individuals have to pay twice as much for goods and services, but they don't mind, because their wages are also twice as large.

Individuals anticipate the rate of future inflation and incorporate its effects into their behaviour. As such, employment and output is not affected. Economists call this concept the neutrality of money. Neutrality holds if the equilibrium values of real variables -including the level of GDP – are independent of the level of the money supply in the long-run. Superneutrality holds when real variables - including the rate of growth of GDP - are independent of the rate of growth in the money supply in the long-run. If inflation worked this way, then it would be harmless. In summary, Monetarism suggests that in the long-run, prices are mainly affected by the growth rate in money, while having no real effect on growth. If the growth in the money supply is higher than the economic growth rate, inflation will result (Assenmacher and Gerlach, 2006).

Empirical Review

Ajakaiye (2002), using a cross-section of 80 countries during the period 1960-1989 found that financial development promotes economic growth when other growth conditioning variables are taken into account.

Mordi (2010) provides country specific evidence in a study that focuses on the economies of Argentina, Brazil, Chile, Germany, Indonesia, Korea, and Taiwan during the post-World War II period. Examining the relationship between adopted financial policies and economic growth in these countries, McKinnon concluded that better functioning financial system aid faster growth.

Khan et al (2006) employed a dataset comprising 159 countries over 1960-1999 and their analysis confirm a strongly positive and statistically significant relationship between financial depth indicators covering banking system and securities market and economic growth.

Shan & Morris (2002) used a Granger causality procedure to investigate the relationship between financial development and economic growth for nine OECD countries and China by estimating a vector autoregression (VAR) model. The results of their study show that five out of ten countries have a bilateral Granger causality; three of them have reverse causality with economic growth leading to financial development while two countries do not have a causal effect at all.

Schoar (2009) agrees that a competitive banking sector is necessary in facilitating firm growth and competition, and that equity markets constitute only a small portion of overall financing in developing countries. The author underscores the importance of scale for banks, and tiny banks will not garner sufficient capital to finance small businesses for expansion. In particular, the banking sector should be established and tailored to improve the real economy and, as a tool to create jobs and opportunities.

Schoar (2009) proposes a two-tier banking system where one tier consist of small banks that serve basic financial needs and the other tier should consist of larger banks that serve medium firms that can create jobs for many others and will grow to large scales.

Agha et al (2005) in a study of the transmission mechanism of monetary policy in Pakistan asserted that the role of bank lending is prominent because of the dominance of the banking sector. Other factors that might have enhanced the banks' role included financial reforms, market-based credit allocation and crowding-in of private sector credit due to the decline in fiscal dominance. The extant literature shows that the bank lending channel is an important medium through which monetary policy permeates the real sector of the economy. Therefore, in the pursuit of price stability by monetary authorities, the consideration of the impact of lending on monetary aggregates is a necessary condition for attaining macroeconomic stability. A major implication of the credit view is that monetary policy will have a greater effect on expenditure by smaller firms, which are more dependent on bank loans than it will on large firms, which can access the credit markets directly through stocks and bond markets.

Nzotta and Okereke (2009) the form and function of financial institutions are country-specific and would rely on the legal and political system as well as the evolving economic activities. He, therefore, argues that a suitable policy objective would be to craft laws, regulations, and institutions that would create an enabling environment to engender competition among financial institutions in the provision of essential credit, risk, and liquidity services to the real economy. He states that although the stock markets do not provide much capital to firms, they provide complementary risk diversification services that facilitate the efficient allocation of credit.

Zingales (2001) favors a more fragmented and competitive banking sector, which according to him creates a fluid transition from a pure banking system to a system that relies both on markets and banks, as economic activities expand.

Thoma (2009) developing countries require not only small banks and microfinance institutions that support small borrowers, but could also do with relatively sophisticated financial instruments such as hedging price risks through futures markets, insuring against crop failures, purchasing farm equipment through pooling arrangements, and managing the problem brought about by seasonality. He acknowledges inadequate information on the financial

history and worthiness of potential borrowers as a challenge and that small banks were better positioned to collect such information.

Demirguc and Maksimovic (2002) use firm level data and a financial planning model to show that more developed financial system-as a proxy by larger banking systems and more liquid stock markets allow firms to grow faster than the rates they finance internally. Demirguc and Maksimovic (2002), Love (2003) also uses firm level data and shows that the sensitivity of investment to internal funds is greater in countries with less developed financial systems.

Beck *et al.* (2005) use firm level survey data for a broad set of countries and shows that financial development eases the obstacles that firm face to grow faster; and this effect is stronger particularly for smaller firms. Recent evidence also suggests that access to finance is associated with a faster rate of innovation and firm dynamism consistent with the cross – country finding that finance promotes growth through productivity increases.

Wurgler (2000) shows that countries with higher levels of financial development increase investments more in growing industries and decrease investment more in declining industries, compared to underdeveloped financial systems. Similarly Guiso *et al.* (2002) examine the individual regions of Italy. It finds that local financial development enhances the probability that an individual starts a business, increases industrial competition and promotes growth of firms. And these results are stronger for smaller firms which cannot easily raise funds outside of the local area.

Bertrand *et al.* (2007) provide firm level evidence from France that shows the impact of 1985 deregulation, eliminating government intervention in bank lending decision fostered greater competition in the credit market, inducing an increase in allocation efficiency across firms. Honohan (2004) shows that even at the same average income, economies with deeper financial system have fewer poor people.

Ndebbio (2004) studied the relationship between financial deepening and economic growth and development using selected sub-Saharan African countries for just one decade (from 1980-1989). He used M2/GDP and growth rate of per capita real money balances (PCRMB) to represent financial deepening and other control variables which affect economic growth such as the rate of inflation, human capital and the growth rate of labor as explanatory variables as against real per capita GDP which is dependent variables. His regression results showed that financial deepening does positively affect per capita growth of output in these selected SSA countries, even though his parameter estimate of the variable of financial deepening was insignificant in one of his equations and he attributed this to shallow finance and the absence of well functioning capital market in most SSA countries.

Ojo (1992) discovered that movement in monetary aggregates indicates wide variations from the stipulated targets in most instances. He attributed this to excessive government spending covered by high powered money, which adversely affects macroeconomic stability. Iyoha (1995) in his critical assessment of the success of indirect tools of liquidity management concludes that it has not actually met the expectation of the monetary authorities.

Oke (1993) in his empirical study of the indirect tools of monetary controls discovers that the policy has raised the number and diversity of the financial institution as well as the scope of financial services they offer. At the level of other indices such as money supply growth, bank credit, interest rate, domestic output and exchange rate, he observes that while money supply and bank credit increased dramatically, interest rate structure was seriously distorted due to a number of factors, which include: the transfer of government deposits from commercial banks to the CBN in 1989; the emergence of distressed banks in 1990; introduction of stabilization securities; etc. The period of rising inflation, that is, 1992 and 1993, however, saw an unprecedented rise in the level of interest rates and the widening of the gap between the deposit and the lending rates. Exchange rate, on the other hand, depreciated persistently while marginal changes were recorded in the gross domestic product (GDP) within the period under review.

Jibia (2005) discovers that the unattractiveness of the OMO instruments as reflected in the treasury bills rate and the high level of fiscal indiscipline across the three tiers of government impair the effectiveness of the OMO operations as an instrument of liquidity management. At the theoretical level, the rule of allowing money to grow at 4 – 5%, or at a rate consistent with the economic growth of a nation is the lever of not only monetary management, but also of the entire economy under the monetarists' school of thought. This sustains and promotes a non-inflationary growth and economic stability.

Gittins (2003) argues that while monetary policy can be implemented almost instantly, the implementation of fiscal policy is delayed by the time it takes to design an effective intervention, and the time it takes to put administrative apparatus required to implement it. On the channel of policy transmission, liquidity, credit and exchange rate were identified as the main conduits through which the policy works in an economy. The liquidity channel otherwise called the interest rate channel exists when short term interest rates react to changes in liquidity or money supply to influence the operations of the economy.

Friedman and Schwartz (1963) state that an expansionary OMO operation, (purchase of treasury bills in the open market) increases the stock of money in circulation and the ability of the banks to create more credits due to the positive effect of OMO on of level of their reserves. To achieve an efficient allocation, the bank and the non-bank public will reorder their portfolios in favor of the real sector and thereby increase the level of gross domestic product (GDP). Okun (1963) emphasizes the view that changes in money supply affect economic activities just as changes in economic activities affect money supply through the concept of credit availability.

3. Material and Methodology

Econometrics methodology is employed in this study as the analytical tool for the examination of the relationship between money market and inflation in Nigeria. Consequently, the Ordinary Least Squares method is adopted to investigate the long-run relationship between money market and inflation. The Error Correction Model is also adopted to examine the short-run dynamics. The model states that inflation is a function of monetary phenomenon is captured in the monetary theory of inflation. To further examine the relationship between money market instruments and inflation, the study employed Johanson’s Cointegration Test. The secondary data used for this study covering the period 1981-2014 were obtained from the Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics.

Model Specification

In order to examine the impact of money market on inflation, we formulate the model below:

$$INFR = f(TB/GDP, STS/GDP, TC/GDP, EDS/GDP, BA/GDP, CMS/GDP)..... 1$$

$$INFR = \beta_0 + \beta_1TB/GDP + \beta_2CP/GDP + \beta_3TC/GDP + \beta_4EDS/GDP + \beta_5CBNSF/GDP + \beta_6CMS/GDP + \mu.....2$$

Where:

- RGDP/GDP = Real Gross Domestic Product
- TB/GDP= Percentage of Treasury Bills to Gross Domestic Product
- STS/GDP = Percentage of Stabilization Security to Gross Domestic Product
- TC/GDP= Percentage of Treasury certificate to Gross Domestic Product
- EDS/GDP = Percentage of Eligible Development Stocks to Gross Domestic Product
- CBNSF/GDP = Percentage of Central Bank of Nigeria Intervention Fund to Gross Domestic Product
- CMS/GDP = Percentage of Call Money Scheme to Gross Domestic Product
- μ = Error term

Unit Root Test

Most of time series have unit root as demonstrated by many studies including Nelson and Plosser (1982), Stock and Watson (1988) and Campbell and Peron (1991). Therefore, their means of variance of such time series are not independent of time. Conventional regression technique based on non-stationary time series produce spurious regression and statistic may simply indicate only correlated trends rather true relationship Granger and Newbold (1974). Spurious regression can be detected in regression model by low Durbin Watson and relatively moderate R². Therefore, to distinguish between correlation that arises from share trend and one associated with an underlying causal relationship; we use both the augmented Dickey fuller (Dickey and Fuller, 1979, 1981) Test. Thus, the limitation of the ADF statistics in deciding whether $\Theta = 1$ or $\Theta = 0.98$, in a model like;

$$X_t = \mu + \Theta X_{t-1} + \varepsilon_t3$$

has been remedied by the application of the E-view statistic simultaneously. The null hypotheses for the ADFstatistic test are H₀.

Non stationary (unit root) and H₀: Stationary respectively

Cointegration

To search for possible long run relationship amongst the variables, the study employs the Johansen and Juselius (1990) approach. Thus, the study constructed a p-dimensional (4x1) vector auto regression model with Gaussian errors that can be expressed by its first differenced error correction form as

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + + \Gamma_{k-1} \Delta Y_{t-k+1} - \Pi Y_{t-1} + \mu + \varepsilon_t4$$

Where Y_t are the data series studied, ε_t is i. i. d, $N(0, \Sigma)$ $\Gamma_i + -1 + A_1 + A_1 + A_2 + A_3 + \dots + A_i$ for $i = 1, 2, 3, \dots, k-1$, $\Pi = I - A_1 - A_2 - \dots - A_k$. The Π matrix conveys information about the long term relationship among the Y_t variables studied. Hence, testing the cointegration entails testing for the rank r of matrix Π by examine whether the eigenvalues of Π are significantly different from zero.

Johansen and Juselius (1990) proposed two tests statistics to determine the number of cointegrating vectors (or the rank of Π), namely the trace and the maximum eigen-value (λ -trace) is computed as;

$$\lambda_{trace} = -T \sum_{j=r+1}^n \ln(1 - \lambda_j) \dots \dots \dots 5$$

The trace tests the null hypothesis that “at most” r cointegration vector, with “more than” r vectors being the alternative hypothesis. The maximum eigenvalue test is given as:

$$\lambda_{max} = -T \ln(1 - \lambda_{r+1}) \dots \dots \dots 6$$

It tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of $r + 1$ cointegration vectors. In the equation (3) and (4), is the sample size and λ is the largest canonical correlation.

Granger Causality

In case we do not find any evidence for cointegration among the variables, the specification of the Granger causality will be a vector auto regression (VAR) in the first difference form. However, if will find evidence of cointegration, there is the need to augment the Granger-type causality test model with a one period lagged error term. This is a crucial step because as noted by Engel and Granger (1987).

$$Y_t = \alpha_o + \sum_{i=1}^n \alpha_i^y Y_{t-1} \sum_{i=1}^n X_{ai} X\mu \dots \dots \dots 7$$

and

$$X_t = \beta_o + \sum_{i=1}^n \beta_i^y Y_{t-1} \sum_{i=1}^n X_{\beta i} X Y_t \dots \dots \dots 8$$

Error Correction Model (ECM)

Co-integration is a prerequisite for the error correction mechanism. Since co-integration has been established, it is pertinent to proceed to the error correction model.

$$INFR = \beta_0 + \beta_1 TB/GDP + \beta_2 STS/GDP + \beta_3 TC/GDP + \beta_4 EDS/GDP + \beta_5 CBSF/GDP + \beta_6 CMS/GDP + \beta_7 ECM/INFR + \mu \dots \dots \dots 9$$

ECM represents the Error Correction Model

Table 1: Presentation of Short run regression result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TB_GDP	0.543244	1.421442	4.865412	0.0001
CP_GDP	3.556878	2.531214	3.745214	0.0002
STS_GDP	2.887624	4.564545	2.875142	0.0014
EDS_GDP	-5.815471	6.345174	0.541275	0.6854
CBNSF_GDP	-0.613222	2.635112	0.205414	0.3514
CMS_GDP	-1.543164	7.865421	0.521421	0.3357
C	345.5114	247.6244	0.356214	0.1586
R-squared	0.742452	Mean dependent var		13541451
Adjusted squared	0.604214	S.D. dependent var		3512.352
S.E. of regression	6451.342	Akaike info criterion		34.54245
Sum squared resid	54120401	Schwarz criterion		52.35411
Log likelihood	-365.5144	F-statistic		38.351224
Durbin-Watson stat	1.654335	Prob(F-statistic)		0.000000

The estimated regression result revealed the relationship between the independent variables and the dependent variable. The coefficient of determination (R^2) shows that only 74.2% variation in Nigerian Inflation Rate can be explained by variation in the independent variables formulated in the model. F-statistics indicates the significant relationship between the dependent and the independent variables. This means the null hypothesis is rejected while the alternate accepted that there is significant relationship between the dependent and the independent variables.

The Durbin Watson statistics proved that there is negative serial auto correlation. The T-statistics and the probability value revealed that all the variables are statistically not significant in inducing change to the dependent variable.

Table 2: Presentation of ADF Unit Root Test Result

Variables	ADF Statistics	Critical value at 5%	At 1%	Order of Integration
INFR	-3.017	-2.959	-3.657	1(1)
TB_GDP	0.095	-2.959	-3.657	1(0)
STS_GDP	-2.101	-2.959	-3.657	1(1)
TC_GDP	-3.272	-2.959	-3.657	1(1)
EDS_GDP	-0.562	-2.959	-3.657	1(1)
CBNSF_GDP	3.435	-2.959	-3.657	1(1)
CMS_GDP	0.122	-2.959	-3.657	1(0)

Source: E-view windows 7.0

Unit Root Test The analysis begins with the test of stationarity of the data (unit root) using the ADF. The results are presented in the table above. All the variables, except TB/GDP and CMS/GDP are stationary at level in the ADF test. Note that variables that are stationary at level are both stationary without and with trend.

Table 3: Cointegration Test

Series: INFR TB_GDP STS_GDP TC_GDP EDS_GDP CBNSF_GDP CMS_GDP
Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.521141	301.3543	540.35	654.21	e **
0.354125	20.34251	24.25	354.54	At most 1 *
0.854534	16.35414	65.54	54.45	At most 2
0.385415	12.35421	35.52	21.44	At most 3
0.814241	65.54311	21.44	47.14	At most 4
0.832423	4.354514	24.63	54.34	At most 5
0.354534	5.545715	7.31	5.25	At most 6

Table 4: Normalized Cointegrating Coefficients

INFR	TB_GDP	STS_GDP	TC_GDP	EDS_GDP	CBNSF_GDP	CMS_GDP	C_GDP
1.000000	-4.283838	2.847510	-	-	- 1.563292	-	98.201
		0	5.191261	2.901261		3.921647	7
	(0.43558)	(2.12933)	(1.44621)	(0.13216)	(0.10377)	(1.28173)	
Log likelihood	-910.471						

To test the long run relationship among the variables the study utilizes the Johansen and Juselius (1990) maximum likelihood procedure. The results are reported in the tables above. From the Tables there appears to exist a long-run relationship commercial paper and banker's acceptance while other variables have negative long run relationship.

Table 5: Vector Error Correction Model

	INFR	TB_GDP	CP_GDP	TC_GDP	EDS_GDP	BA_GDP	CMS_GDP
INFR(-1)	-1.545544 (4.6854)	687.9352 (282.884)	119.1418 (33.7260)	-1.498511 (1.55973)	-18.78371 (38.7242)	59.37980 (19.3503)	0.871574 (13.8316)
	(-4.23341)	(2.43187)	(3.53264)	(-0.96075)	(-0.48506)	(3.06868)	(0.06301)
INFR(-2)	-3.141347 (0.346547)	543.351 (227574)	186.0949 (27.1593)	7.479776 (1.25604)	-26.31535 (31.1842)	45.11844 (15.5826)	2.273147 (11.1385)
	(-2.42114)	(2.30411)	(6.85199)	(5.95507)	(-0.84387)	(2.89544)	(0.20408)
C	5411.654 (654.854)	-853241.0 (254101.)	-23042.6 (74521.4)	-1541.412 (964.404)	41531.00 (52101.4)	-5421.15 (51021.4)	-4102.521 (1428.01)
	(6.85212)	(-2.85421)	(-1.21101)	(-2.42551)	(1.12010)	(-4.32212)	(-0.12714)
R-squared	0.993436	0.993733	0.999644	0.999565	0.999950	0.992064	0.999102
Adj. R-squared	0.978119	0.979111	0.998814	0.998551	0.999832	0.973548	0.997007
Sum sq. resids	145627.0	2.14E+10	3.04E+08	649455.5	4.00E+08	99959781	51073690
S.E. equation	155.7921	59670.17	7114.021	329.0024	8168.303	4081.662	2917.581
F-statistic	64.86102	67.95922	1204.606	985.1656	8491.881	53.57711	476.8129
Log likelihood	-122.6627	-247.5720	-202.9100	-138.3611	-205.8120	-191.2431	-184.1924
Akaike AIC	13.11073	25.00686	20.75333	14.60582	21.02972	19.64220	18.97071
Schwarz SC	13.85682	25.75295	21.49942	15.35190	21.77581	20.38829	19.71679
Mean dependent	768.4071	400084.6	140853.9	2002.462	394836.7	32671.29	28131.15
S.D. dependent	1053.213	412853.2	206616.0	8641.660	629787.1	25096.07	53326.26
Determinant Residual Covariance	0.000000						

The objective of the vector error correction is to examine the speed of adjustment in case of shocks. From the above, the TB_GDP model has a good speed of adjustment.

Table 6: Presentation of Granger Causality

Null Hypothesis:	Obs	F-Statistic	Probability
TB_GDP does not Granger Cause INFR	32	0.54210	0.42102
INFR does not Granger Cause TB_GDP		4.45754	0.45320
CP_GDP does not Granger Cause INFR	32	0.85441	0.45114
INFR does not Granger Cause CP_GDP		14.740	1.9E-75
STS_GDP does not Granger Cause INFR	32	0.01191	0.14870
INFR does not Granger Cause STS_GDP		814.041	0.37541
EDS_GDP does not Granger Cause INFR	32	0.04471	0.75211
INFR does not Granger Cause EDS_GDP		2.41524	0.54577
CBNSF_GDP does not Granger Cause INFR	32	7.91014	0.45744
INFR does not Granger Cause CBNSF_GDP		4.54201	0.27745
CMS_GDP does not Granger Cause INFR	32	0.52411	0.45757
INFR does not Granger Cause CMS_GDP		0.52111	0.66451

The result of the Granger causality test above shows a multivariate relationship running through the variables.

4. Discussion of Findings

The money market is a market for source and investment of liquid financial instruments required to meet liquidity needs of individual and corporate organizations. The objective of this study is to investigate the effectiveness of money market instruments in inflation. It is expected from theory, principle and empirical findings that effective monetary policy management through various instruments will enhance the ability to control inflation in an economy. However, findings of this study revealed that Nigerian money market instrument is statistically

significant to the inflation. The regression result indicates that TB_GDP, STS_GDP CBSF_GDP have positive and significant relationship. The insignificant relationship can be traced to shocks in the system and the ineffectiveness of the money market. However, TC_GDP, EDS_GDP and CMS_GDP have negative relationship which is contrary to the expectation of the result and the theory of monetary policy. The negative relationship can also be traced to the marginal performance of the money market. The long run cointegration result indicate that TB_GDP,TC_GDP,EDS_GDP and CMS_GDP have negative long run relationship, this shows that there is bivariate relationship running through the variables.

5. Conclusion and Recommendation

This study attempts to explore the link between money market instrument and Nigerian inflation rate. The study examines the relationship between money market instruments and inflation rate variable by analyzing their long run properties and short run dynamics. The econometric results from the error correction mechanisms show that money market instrument has significant relationship on inflation rate in Nigeria. The negative signs of the coefficients of the money market instruments imply that the TB_GDP, CP_GDP, CBNSF_GDP is not enough to raise the inflation to the desired level. In all, the study reinstates that the literature on money and finance is quite vocal on the role of the supply of financial assets on the economy. If the money market is well structured and effectively functioning, the macroeconomic goals of the economy are likely to be achieved effectively and efficiently. From the above, the study concludes that the Nigerian money market and its instrument are effective in controlling the inflation. From the above, the study makes the following recommendations;

- There is need to deepen the operational efficiency of the money market by the regulatory authorities to achieve the macroeconomic goals.
- The business environment requires proper examination and reform to enhance operational efficiency of the financial market.
- The money market institutions should be reformed beyond recapitalization.
- Macroeconomic goals should be integrated with the monetary policy objectives.
- The money market instrument and the interest rate should be deregulated to attract investors.

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