Monetary policy management implications on the movement of agricultural prices in Nigeria

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Price instability is the most serious problem in Nigerian agricultural sector today. Money supply and exchange rate are some perceived factors causing instability in agricultural prices. This study evaluated the long-run neutrality of money supply on agricultural prices; the effect of money supply on agricultural prices; and effect of key macroeconomic indicators on agricultural prices in Nigeria. Using least square estimation, it was observed that money supply had significant impact on agricultural prices and that agricultural prices do not react more sensitively than aggregate price to changes in money supply. Money supply and exchange rate also accounts for 86.2% of variations in agricultural prices. Based on results obtained, it is recommended that the Central Bank of Nigeria should formulate monetary policy that would enhance stability in agricultural prices and also cause a reduction in the level of inflation in the economy.

Key words: Price instability, money supply, exchange rate, key macroeconomic indicators, level of inflation.

INTRODUCTION

The disappointing performance of the agricultural sector in many developing countries of the world is receiving increasing attention of the monetary and exchange rate policy makers. This intervention in agricultural markets is widespread and is practised in rich and poor countries alike. The policies on money supply, nominal exchange rates, interest rates income, international capital flows, fiscal and trade directed at macro economics sector of the economy are of utmost importance to agriculture. Monetary policy uses the monetary authority to control the supply of money in the economy.

Money supply is the total amount of money in the economy. It is synonymous with such terms as money stock, stock of money supply and quantity of money. It conveys the idea of flow overtime. Monetary management occupies a vital place in the process of economic management. The linkages of monetary policy with sectoral policies influence the direction of economic processes. Efforts are usually made by each economy to reduce its technique and content of monetary policy. The CBN plays leading role in terms of initiating and articulating these changes with a view to supporting the objectives of the country’s current economic policy.

The significance of this research is to find ways of ensuring the stability of agricultural prices in Nigeria by studying the impact of money supply on the movement of agricultural prices. It identifies adequate policy measures that would enhance economic stability and promote agricultural production. The desire of policy makers to adopt concrete monetary policies that would reduce the level of inflation in the economy justifies the need for this study.

Despite the continuing debate on the transmission mechanism of money in the economic system, it is generally agreed that under normal circumstances, changes in money supply would influence interest rate as well as output and prices. Consequently, money supply and interest rates are often channels through which activities in the financial sector are transmitted to the real sector. Following the background information, the study seeks to investigate the impact of monetary policy on the movement of agricultural prices in Nigeria. This will ensure that monetary policy that will enhance optimal productivity and contribute meaningfully to economic growth and development be formulated by the Central Bank of Nigeria.
Problems of study

Currently, price instability is the most serious problem in the Nigerian agricultural sector. One of the important factors causing instability in price is the movement of agricultural prices. This price instability leads to very low productivity of the private sector and the lack of diversification of the economy; which makes Nigeria to be basically a mono-economy that depends mainly on the oil sector. This is caused mainly by the inhospitable agricultural business environment which includes: infrastructural deficiencies, poor security of lives and property, competition and rank seeking, low access to and the high cost of finance, weak financial institution and poorly defined property rights and the enforcement of contract coupled with unstable macro economics policies. The effect of macroeconomic policy on the growth of the real sector of the economy, particularly agriculture is quite enormous. The research seeks to answer these questions:
1. Is there any significant relationship between money supply and agricultural prices?
2. How does money supply increase agricultural prices than aggregate prices?

Objectives of study

The broad objective of this study is to determine empirically the effects of money supply on changes in agricultural commodity prices in Nigeria. Specifically, the study intends to:

1. Investigate the impact of the long run neutrality of money supply on the movement of agricultural commodity prices in Nigeria.
2. Analyse the impact of the money supply on agricultural prices in Nigeria.
3. Determine the impact of national income, interest rate and inflation on agricultural prices.

Research hypothesis

1. That there is no significant relationship between money supply and the movement of agricultural prices.
2. That the sizes of national income, interest rate and inflation rate are not significant factors in the movement of agricultural prices.

CONCEPTUAL AND THEORETICAL FRAMEWORK

The supply of money at any moment is the total amount of money in the economy. Money supply is the currency with the public and demand deposits with commercial banks. Currency outside banks indicates the total currency in circulation less bank vault; while demand deposits are saving and current accounts of deposits in a commercial bank.

The theories of money supply are central to macro-economics. They are the subject of the debate between Keynesians and monetarists. The monetarists believe that growth in the money supply is the most important factor that determines economic growth.

The pre-Keynes (Classical) believes that the interest rate led to a balance between savings and investment which in turn would cause equilibrium in the goods market. Keynes disagreed and believed that the interest rate was largely a monetary phenomenon. Its chief function was to balance the unpredictable supply and demand for money, not savings and investment. This view explained why the amount of savings was not always correlated with the amount of investment or the interest rate.

Keynesians and Monetarist also disagree about how changes in the money supply affect employment and output. Some economists argue that an increase in the supply of money will tend to reduce interest rate which in turn will stimulate investment and total demand. Therefore an alternative way of reducing unemployment would be to expand the money supply.

Keynesians and Monetarist disagree on how successful this method of raising output would be. Keynesians believe that under conditions of under employment, increased spending will lead to greater output and employment. Monetarists however, generally believe that an increase in the money supply will lead to inflation in the long run.

A serious problem associated with MS analysis is how to separate the natural influences of MS from the effects of official monetary controls explicitly directed towards formulating a particular policy objective. An empirical evidence on the determinants of interest rate in a liberalised financial system for the period 1989 to 2000 using selected banks in Nigeria showed that macro economic and monetary policy/financial regulations factors were more important determinants of commercial banks interest spread, than bank level factors. Inflation rate, gross domestic product (GDP), cash reserve requirement, risk premium, treasury bills rate, loan asset quality, liquidity risk and non-interest expenses were the most important factors that affect commercial banks interest. It must be recognised that the monetary authorities might not be willing to acquiesce in the rate of MS growth which might occur if the monetary system was left to its devices and might therefore leads to private sector creation of money. The authorities may attempt to influence either some measures of MS or the level and structure of interest rates.

It is important to understand that in modern financial system, where using large proportion of money supply is created in the private sector, it is not possible for the authorities to control both the MS and interest rate
It has been proved that monetary management occupies a vital place in the process of economic management. The linkage of monetary policy with sectoral policies together influences the direction of economic progress. Efforts are usually made by each economy to enhance its techniques and content of monetary policy. The CBN plays leading role in terms of initiating and articulating these changes with a view to supporting the objectives of the country’s current economic policies.

In Nigeria, monetary policy administration has undergone several changes since the inception of the CBN. These changes could be grouped broadly into two namely; those which took place when monetary management was largely based on direct controls and those changes which took place in the process of moving away from such controls.

The second categories of changes, started to evolve since the adoption of SAP from 1986. The economic environment that guided monetary policy before 1986 was characterised by the dominance of the oil sector, the expanding role of the public sector in the economy and the dependence on the external sector and little emphasis on developments in the agricultural sector. In order to maintain price stability and a healthy balance of payment position, monetary management focused on the use of direct monetary instruments such as credit ceilings, selective credit controls, administered interest and exchange rates as well as the prescription of cash reserve requirements and special deposits. The use of market based instruments was not feasible at that point because of underdeveloped nature of the financial market and the deliberate restraint on interest rates. The most important instrument of monetary policy was the issuance of credit rationing guidelines, which primarily get the rates of change for the components and aggregate commercial bank loans and advances to the private sector. Besides, the empirical conclusions to the fact that Treasury bills rate, GDP, inflation, 3 months deposits rate and loans to assets ratio turned out to be the important variables that have negative impact on monetary policy in Nigeria was derived. The sectoral allocation of bank credit in CBN guidelines was to stimulate the productive sectors and thereby stem inflationary pressures. The fixing of interest rates of relatively low levels was done mainly to promote investment and growth. Occasionally special deposits were imposed to reduce the amount of free reserves and credit creating capacity of the banks.

**Nigerian monetary policy since 1986**

The Structural Adjustment Programme (SAP) was adopted in July, 1986 against the crash in the international oil market and the resultant deteriorating economic conditions in Nigeria. It was designed to achieve fiscal balance and balance of payment viability by altering and restructuring the production and consumption patterns of the economy, eliminating price distortions reducing the heavy dependence on crude oil exports and consumer goods imports, enhancing the non-oil export base and achieving sustainable growth. Other aims were to rationalize the role of public sector and accelerate the growth potentials of the private sector. The main strategies of the programme were the deregulation of external trade and payment arrangements, the adoption of a market-determined exchange rate for the Nigerian currency (that is, Naira), substantial reduction in complex price and administration controls, and more reliance on market forces as a major determinant of economic activity. The abolition of agricultural commodity boards was part of the arrangement by government to liberalize external trade and encourage massive export of agricultural commodities.

The objectives of monetary policy since 1986 have remained the same as in the earlier period; resulting in the stimulation of output and employment, and the promotion of domestic and external stability. In line with the general philosophy of economic management under SAP, monetary policy was aimed at inducing the emergency of a market-oriented financial system for effective mobilization of financial savings and efficient resource allocation particularly in the agricultural sector. The main instrument of the market-based framework is the Open Market Operations (OMO). This is complemented by reserve requirements and discount window operations. In order to improve macroeconomic stability, efforts are directed at the management of excess liquidity. These include the reduction in the maximum ceiling on credit growth allowed for banks, the recall of special deposit requirements against outstanding external payment arrears to CBN from banks, abolition of the use of foreign guarantees/currency deposits as collaterals for Naira loans and the withdrawal of public sector deposits from the banks to CBN. Also effective August, 1990, the use of stabilization securities for purposes of reducing the bulk size of excess liquidity in banks was re-introduced. Commercial banks cash reserve requirements were increased in 1989, 1990, 1992, 1996, and 1999. The raising level of fiscal deficit was identified as a major source of macroeconomic instability. Consequently, government agreed not only to reduce the size of its deficit but also to synchronize fiscal and monetary policies. By way of inducing efficiency and encouraging a good measure of flexibility in bank credit operations, the regulatory environment was improved. The sector-specific credit allocation targets were compressed into four sectors in 1986, and to only two in 1987. From October, 1996, all mandatory credit allocation mechanisms were abolished. The commercial and merchant banks were subjected to equal treatment since
reforms commenced with the announcement of a 13-point reform agenda by the CBN on July 6, 2004. A major element of the reform programme was the requirement for banks to achieve minimum shareholders’ funds of 25.0 billion Naira by end of December, 2005. A major objective of the reform is to enable Nigerian banks become active domestic and global players in the financial market. At the expiration of the deadline on 31st December 2005, twenty five (25) groups emerged from seventy-five (75) banks out of the eighty-nine (89) banks that existed at the end of December 2004. The successful banks accounted for 93.5% of the deposit liabilities of the banking system. Fourteen banks which had negative shareholder’ funds and therefore, insolvent had their licenses revoked by CBN. All the twenty five (25) banks in Nigeria today, have mobilized a lot of money capable of influencing productive activities in agriculture. The high interest rate charged by banks is sincerely the bane of low investment in Nigerian agriculture today.

**Nigerian monetary policy issues**

The primary objective of monetary policy is the achievement of price and exchange rate stability. The central focus is to effectively control anticipated liquidity injection that may arise from excessive government spending that may have negative impact on domestic prices of agricultural commodities, aggregate price and exchange rate. Some monetary policy issues introduced by CBN aimed at creating money to support investment in agricultural production and stimulate economic growth as reported in CBN Bullion of July to September, 2006 include among others the following:

**Open market operations**

Open Market Operations (OMO) was conducted weekly in the secondary market, mainly in short-term government securities of varying maturities, in order to meet the various preference of participant in the market. OMO was complemented by reserve requirements and discount window operations, including repurchase agreements (REPOS) while discount houses continued to play the role of principal dealers in the market.

**Reserve requirement**

Reserve requirements continued to serve prudential and liquidity management policy objectives.

**Cash reserve ratio (CRR)**

As in the preceding years, the cash reserve requirement
was used to complement OMO in achieving monetary policy objectives. In this regard, the authorities recognized the need to reduce the current high CRR in order to moderate banks’ cost of funds and thus bring down banks’ lending rates. However, this was achieved only in the medium to long term, when the monetary conditions improved. Meanwhile, the existing ratio of 12.5% remained in force. The calculation of the CRR was based on deposit money banks’ total deposit liabilities (that is, demand, savings and time deposit), certificates of deposit, promissory notes held by the non-banking public, and other deposit items. The CBN continued to ensure efficient administration of the CRR. In this regard, the lag for debiting banks’ account to meet the specified CRR would not exceed two weeks. For this purpose, the mid month returns by banks complemented monthly returns. All deposit money of banks was subjected to CRR. The CBN continued to impose strict sanctions for non-compliance. However, in order to moderate the adverse effects of CRR on cost of funds of banks, the policy of payment of interest on deposit above the 8.0 percent rate were retained.

Liquidity ratio (LR)

The minimum liquidity ratio of 40.0% for all deposit money of banks is also maintained, but in line with developments in monetary conditions during the programme period. The base of calculating the LR requirement is, as in the previous years, comprised of all deposits liabilities (demand, savings, and time) as well as certificates of deposit (CDs), promissory notes held by the non-bank public and other deposit items. Placements with the takings from discount houses offset against each other and any surplus of assets or liabilities, applied as the case would be in computing the LR requirement. Only inter-bank placement, which are fully collateralized by eligible instruments and readily rediscounted at the CBN, are qualified as eligible instrument liquid assets. Uncollateralized placement as well as money-at-call never constituted part of liquid assets, but were treated as loans and advances. The requirements that discount houses should invest at least 60.0% of their total deposit liabilities in treasury bills continued.

The concept of neutrality and non-neutrality of money

Neutrality of money means that money is neutral in its effect on the economy. A change in the money stock can have no long run influence on the level of real output, employment, rate of interest, or the composition of final output. The only lasting impact of a change in the money stock is the alteration of the general price level.

Neutrality of money is a situation when uniformly introduced increases in the quantity of money causes a proportionate increase in the equilibrium price of commodities and leaves the equilibrium rate of interest unaffected, provided there is absence of money illusion and distribution effects. Money is neutral if it does not affect relative prices and leaves the LR unaffected while all prices move proportionately. If this happens without a time lag, the neutrality of money is instantaneous. If there is a time lag, there is long run neutrality. Using co integration method, a generous consensus of log run neutrality of money supply is confirmed and it gives practical evidence of the real impact of exchange rate on the long run variation of relative agricultural price. In the United States, especially during the 1974 to 1988 periods. It was discovered that a 1% real appreciation of the U.S dollar is associated with a 0.131% decrease of food prices compared to the aggregate price level in the long run.

In the Keynesian system, so long as there is unemployment, changes in the money supply produce permanent non-neutral effects on the rates of interest, the level of unemployment, income, output and the rate of capital formation. Thus, Keynes emphasized non-neutral money and for this he invokes the monetary theory of interest rate. Some post-Keynesians economists have shown that money is non-neutral in the short run. Some believe also that MS may be non neutral in the long run if there is a permanent acceleration in the growth rate of money supply.

The impact of Nigerian modern policies on agricultural prices

The rate of money supply in the economy has significant influence on the movement of Agricultural prices. For every unit increase in money supply, these results to an increase in Agricultural prices. The total money supply in Nigeria from 1980 to 2003 was N5.6B, the trend of supply moved steadily upwards with the lowest N9.2m recorded in 1980 and the highest N1.2b recorded in 2003. The agricultural prices do not react more sensitively than aggregate prices in response to changes in money supply. The Nigerian monetary policies should be directed towards regular money supply in a way that it may not cause injury to the economy.

Money supply is determined exogenously by the CBN and also endogenously by changes in the economic activity which affects people’s desire to hold currency relative to deposit and the rate of interest. Consistent in its core mandate, the CBN in 2003 pursued the goal of achieving price stability and financial sector soundness by adopting policy measures aimed at promoting a stable macroeconomic environment.

CBN (2003) defined minimum rediscount rate as the interest rate that the Central Bank charges when the commercial banks want to borrow money. It is the
instrument of monetary control available to the Central Bank. The MPR has an influence on what level of interest rate the commercial banks would charge. A special technical committee recommended in 2002 that one of the ways of addressing the issue of high interest rate in the country was to ensure that the lending rates of commercial banks should not be more than 4.0 base points above the MRR. On its part the CBN was advised to ensure that MRR was reviewed forward in line with macro economic conditions.

The trend of average interest rates shows a lot of fluctuation, indicative of the level of inflation instability. The interest rate policy in 2003 was market based and anchored on the discretionary adjustment of the minimum rediscount rate (MRR) to signal the direction of interest rate movement as directed by monetary conditions. As part of its effort to reduce the persistent wide spread between bank deposits and maximum lending rates, the CBN in 2003 pursued a policy of enhancing the competitive of the financial markets in order to promote savings and investment growth.

The movement of interest rates is a reflection of the movement of other macro economic variables. Interest rate policies in Nigeria have been based on the need to ensure stability in the financial sector through effective mobilisation and availability of funds to the productive sectors of the economy.

Interest rate represents the price of money like all other prices; it is influenced by the dynamics with the economic system. It influences the level of saving and investment which are crucial for economic growth and development. The effects of interest rates on the growth of the real sector of the economy have remained a subject of debate in Nigeria for some time. When the general level of interest rates alters; whether this is due to government policy actions or desired changes in financial or economic behaviour within the private sector, these are likely to have pervasive effects throughout the nation’s economy.

Inflation is a rise in the average prices of goods over time. It is caused by too much money chasing few goods. This is attributed to excess demand for goods to an average in the nominal money supply. This provides a link between the rate of growth of the nominal money supply and inflation, or the rate of growth of the price level. People demand money because of its purchasing power in terms of goods. Monetary policy accommodates a stock when a change in price induces the government to provide a maturing change in the nominal money supply to avoid any change in the real money supply. When a rise in price is accommodated by an average in the money supply, the real money stock remains consistent.

RESEARCH METHODOLOGY

Data source

Data sourced for this study was directed towards achieving the three specific objectives. These data were obtained from the National Bureau of Statistics (NBS), the Central Bank of Nigeria (CBN) and the United States Federal Reserves.

Model specification

Appropriate models have been developed to analyze the specific objectives. The various models so specified are highlighted under separate headings in line with the objectives.

First objective

To evaluate the long-run neutrality or otherwise of money supply and exchange rates and their impact on the movement of agricultural prices in Nigeria.

The model

The model applied to this objective was used to test the long-run neutrality of money and exchange rates. The model specifies that:

\[ \ln P^*_t = \alpha_0 + \alpha_1 \ln M_t + \alpha_2 \ln R_t + \varepsilon_t \]  
\[ \ln P_t = \beta_0 + \beta_1 \ln M_t + \beta_2 \ln R_t + \nu_t \]

Where, \( P^*_t \) is for all agricultural commodity prices, \( P_t \) is for all commodity prices, \( M_t \) is money supply \((M1)\) and \( R_t \) is the exchange rate of the Naira.

\( \alpha_1 = \beta_1 \) is a condition of long run money neutrality. That is, one percent increase in the money supply should generate increase in agricultural and overall prices.

However, an increase in money supply caused an increase in average price level in an economy, and long-run relative prices between commodities can be determined by the movements of relative price underlying supply and demand conditions of their products. This indicates that it is possible for agricultural prices to move disproportionately with aggregate prices, regardless of changes in money supply in the long-run. Thus, if nominal agricultural prices are observed to increase disproportionately compared to aggregate prices, the impact of money supply \((\ln M_t)\) on food and agricultural prices \((\ln P^*_t)\) will be seemingly different from the impact on aggregate prices. \(\ln P^*_t\). Included in this study is an additional long-run equilibrium relationship between nominal food, agricultural prices and general price by adopting the idea of the rational expectation model, which suggests that variation of relative price affects supply and demand overtime, especially in the long-run.

Assuming that there exist long-run relationship between food and agricultural price and general price, which is determined by unobservable real factors:

\[ \ln P^*_t = \gamma_0 + \gamma_1 \ln P_t + \eta_t \]

Pre – multiply equation (2) by \(-\gamma_1\), and add (1) and (2)

To obtain the following long-run relationship:

\[ \ln P^*_t + \gamma_1 \ln P_t = \alpha_0 + \gamma_1 \beta_0 + (\alpha_1 - \gamma_1 \beta_1) \ln M_t + (\alpha_2 - \gamma_1 \beta_2) \ln R_t + (\varepsilon_t - \gamma_1 \nu_t) \]  

or equivalently,

\[ \ln P^*_t = \delta_0 + \gamma_1 + \ln P_t + \delta_1 \ln M_t + \delta_2 \ln R_t + \xi \]
Table 1. Spread sheet of variables entered for the analysis of the first objectives.

<table>
<thead>
<tr>
<th>Year (P&lt;sub&gt;i&lt;/sub&gt;)</th>
<th>Agricultural prices</th>
<th>Aggregate prices (P&lt;sub&gt;i&lt;/sub&gt;)</th>
<th>Money supply (M&lt;sub&gt;i&lt;/sub&gt;)</th>
<th>Exchange rate (R&lt;sub&gt;i&lt;/sub&gt;)</th>
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</thead>
<tbody>
<tr>
<td>1980</td>
<td>40.1</td>
<td>42.4</td>
<td>9226.8</td>
<td>54.7</td>
</tr>
<tr>
<td>1981</td>
<td>50.2</td>
<td>51.4</td>
<td>9744.9</td>
<td>62.4</td>
</tr>
<tr>
<td>1982</td>
<td>54.6</td>
<td>55.1</td>
<td>10048.5</td>
<td>74.9</td>
</tr>
<tr>
<td>1983</td>
<td>67.3</td>
<td>67.9</td>
<td>11282.4</td>
<td>104.2</td>
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<td>1984</td>
<td>100</td>
<td>100.0</td>
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<td>92.9</td>
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<td>100.1</td>
<td>105.4</td>
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<td>14726.2</td>
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<td>1987</td>
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<td>19.6</td>
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<td>49364.5</td>
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<td>3295.5</td>
<td>3357.6</td>
<td>393078.8</td>
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<td>1998</td>
<td>3213.8</td>
<td>3923.8</td>
<td>637731.2</td>
<td>4.6</td>
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</table>

Table 2. Multiple regression of the impact of monetary supply and exchange rate on agricultural prices.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>t-ratio</th>
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</thead>
<tbody>
<tr>
<td>Constant</td>
<td>348.642</td>
<td>234.128</td>
<td>1.489</td>
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<td>Money supply</td>
<td>0.0063</td>
<td>0.001</td>
<td>8.257*</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>-4.358</td>
<td>4.212</td>
<td>-1.035</td>
</tr>
<tr>
<td>R²</td>
<td>0.862</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>56.237*</td>
<td></td>
<td></td>
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<tr>
<td>N</td>
<td>21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 1%. Source: Field Results, 2008.

Table 3. Multiple regression of the impact of monetary supply and exchange rate on aggregate prices.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>225.031</td>
<td>199.643</td>
<td>1.127</td>
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<tr>
<td>Money supply</td>
<td>0.0073</td>
<td>0.001</td>
<td>11.42*</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>-2.982</td>
<td>3.591</td>
<td>-1.035</td>
</tr>
<tr>
<td>R²</td>
<td>0.916</td>
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</tr>
<tr>
<td>F-statistic</td>
<td>98.204*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 1%. Source: Field Results, 2008.

Where $\delta_0 = \alpha_0 - \gamma_1 \beta_1$; $\delta_1 = \alpha_1 - \gamma_1 \beta_1$; $\delta_2 = \alpha_2 - \gamma_1 \beta_2$; and $\xi_i = x_i - y_i$. If food and agricultural prices have reacted more sensitively than the aggregate price level in response to changes in the money supply, $\delta_1 > 0$ and $\alpha_1 > \gamma_1 \beta_1$; $\delta_2 < 0$ and $\alpha_2 < \gamma_1 \beta_2$, otherwise. If food and agricultural prices have reacted more sensitively than aggregate price in response to changes in exchange rates, $\delta_2 < 0$ and $\alpha_2 < \gamma_1 \beta_2$; $\delta_1 > 0$ and $\alpha_1 > \gamma_1 \beta_1$, otherwise. Under the assumption of money and real exchange neutrality, $\delta_1$ and $\delta_2$ are expected to be zero, meaning that $\alpha_1 = \gamma_1 \beta_1$ and $\alpha_2 = \gamma_1 \beta_2$.

RESULTS

Table 1 is the spread sheet reflecting data of variables entered for regression analysis (which results are indicated in Tables 2, 3 and 4). The main objective of this study is to test the long-run neutrality or otherwise of money supply and exchange rates and their impact on the movements of agricultural prices in Nigeria over the
1980 to 2000 period. Previous studies by Grennes and Lapp (1986), Robertson and Orden (1990) and Zanias (1998) consider \( \alpha_1 = \beta_1 (0.00073) \). Therefore \( \alpha = \beta_1 \) is not equal to \( \beta_1 \).

An increase in money supply causes an increase in average price level in an economy and long-run prices between commodities would be determined by the movements of underlying supply and demand conditions of their product. This indicates that it is possible for agricultural prices to move disproportionately to aggregate prices regardless of changes in money supply in the long-run. Thus if agricultural prices were observed to increase disproportionately compared to aggregate prices, the impact of money supply \( \text{ln}(M_t) \) on agricultural prices \( (P_t^A) \) would be seemingly different from the impact on aggregate prices \( (P_t) \).

The impact of money supply in Nigeria on agricultural prices is different from its impact on aggregate prices. For every unit increase in money supply, there is 0.0063 unit increase in predicted agricultural prices. However, every unit increase in money supply, results in 0.0073 unit increase in predicted aggregate prices. For both cases, the impact of money supply was positively significant at 0.01 levels.

The impact of exchange rate on both agricultural and aggregate prices was recorded to be negative and insignificant. It is also important to note that, the impact of money supply on agricultural prices is less than its impact on aggregate prices. Aggregate prices have a significant tendency to influence predicted increase in agricultural prices. Based on these findings, we were comfortable to reject the null hypotheses that aggregate price had no significant impact on agricultural prices, since aggregate price had significant impact of 0.910 on agricultural prices.

Considering the long-run relationship of agricultural prices, money supply and exchange rate:

\[
\ln P_t^A = \delta_0 + \gamma_1 \ln P_t + \delta_1 \ln M_t + \delta_2 \ln R_t + \xi_t
\]

Given, \( \delta_0 = \alpha_0 - \gamma_1 \beta_0 \), \( \delta_1 = \alpha_1 - \gamma_1 \beta_1 \), \( \delta_2 = \alpha_2 - \gamma_1 \beta_2 \)

Where:

\[
\alpha_0 = 348.642 \quad \gamma_1 = 0.910 \quad \beta_0 = 225.031
\]

The long run relationship between aggregate price, money supply and exchange rate is:

\[
\text{Agricultural price} = 143.864 + 0.910(\text{Aggregate Price}) - 0.0003(\text{Money Supply}) - 2.286(\text{exchange rate} 0 + \xi_t)
\]

It means that agricultural prices have not reacted more sensitively than aggregate price in response to changes in money supply. Also -2.286 < 0 > 2.286 < 0 - 2.072 or \( \alpha_2 < \gamma_1 \beta_2 \). It means that agricultural prices have reacted more sensitivity than aggregate prices in response to changes in exchange rate.

Finally, under the assumption of money and exchange rate neutrality, \( \delta_1 \) and \( \delta_2 \) are expected to be zero, meaning that \( \delta_1 = \gamma_1 \beta_1 \) and \( \delta_2 = \gamma_1 \beta_2 \). In this study, it was observed that both \( \delta_1 \) and \( \delta_2 \) are not equal to zero. We have therefore concluded that, the assumption of long-run money and exchange rate neutrality does not hold in Nigeria. A case of long-run non-neutrality of money supply and exchange rate has therefore been established in Nigeria.

**DISCUSSION**

The impact of Nigerian monetary policies on agricultural prices as shown in Table 2 is 0.0063 and statistically significant at 1% level. It implies that the rate of money supply in the economy has a significant influence on variations in agricultural prices. The conclusion drawn from this analysis is that every unit increase in money supply results to an increase in agricultural price by 0.0063. Results of analysis of the impact of money supply on agricultural and aggregate prices show that 0.0063 < 0 => \( \delta_1 < 0 \) and 0.0063 < 0.0166 or \( \alpha_1 < \gamma_1 \beta_1 \), it means that prices do not react more sensitively than aggregate price in response to changes in money supply.

The empirical results show that the impact of money supply on agricultural prices (0.0063) is less than the impact of money supply on aggregate prices (0.0073) as shown in Tables 1 and 2. It therefore means that agricultural prices and aggregate prices move disproportionately in response to increases in money supply; since our result as indicated in Table 3 shows that aggregate prices have significant impact of 0.910 on agricultural prices is a reflection of changes in aggregate

**Table 4.** Multiple regression of the impact of aggregate price agricultural prices.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>43.954</td>
<td>36.009</td>
<td>1.221</td>
</tr>
<tr>
<td>Aggregate Price</td>
<td>0.910</td>
<td>0.222</td>
<td>42.161*</td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 1%. Source: Field Results, 2008.
The study found significant effects of changes in microeconomic variables for monetary policy and exchange rate in the short run. In this study, it is observed that agricultural prices do not react more sensitivity than aggregate prices in response to changes in money supply.

Conclusion

This study tested the long-run neutrality of domestic money supply and exchange rates on the long-term movements of agricultural prices in Nigeria using time series data over the period 1980 to 2000. A simple and new empirical model was used to test the long-run neutrality of money and the Naira exchange rate was used for this analysis. The least square estimation (LSE) was implemented for estimation. The main findings of this investigation revealed that the assumption of long-run neutrality of money and exchange rate does not hold in Nigeria. In other words, money supply and exchange rate do not have a neutral effect on the economy. It was also observed that while money supply had a significant impact on agricultural prices. Exchange rate had no significant impact of 0.0063 on agricultural prices. Money supply and exchange rate however accounts for 86.2% variations in agricultural prices in Nigeria. The investigation revealed that aggregate price has significant impact of 0.910 on agricultural prices. It is therefore convenient to reject the hypothesis that the impact of aggregate price on agricultural prices is not significant.

It was discovered from results of this study that both foreign investment, Agricultural Credit Guarantee Scheme Fund (ACGSF) and commercial bank loans to agriculture had no significant impacts on agricultural prices in Nigeria. The implication of this result is that the level of capital flow in Nigerian agriculture is inadequate to influence variations in agricultural prices.

This research extends its investigation to agricultural exports from Nigeria. A linear regression equation model was adopted and least square estimation (LSE) was used for estimation. The results of this investigation indicate that world prices of agricultural commodities had significant impact of 4.258 on agricultural exports in Nigeria. This means that world price of agricultural products reliably predict the level of agricultural exports, we are left with no alternative than to accept the hypothesis that exchange rate has insignificant effect on agricultural exports in Nigeria.

A simultaneous equation model was used to study the determination of exchange rate using traditional variables such as national income, money supply, prices, and interest rate. The question of external debt and the world price of agricultural commodities in exchange rate determination, which has received little attention, was also captured in this model and the result shows that world price of agricultural commodities had significant impact of -0.0113 on exchange rate determination while external debt had insignificant impact. National income and interest rate had significant impact of 99.081 and -387.769 respectively on agricultural prices.

RECOMMENDATIONS

Results obtained from various issues investigated in this study and the conclusions drawn have provided the basis for us to make the following recommendations.

1. The non-neutrality of money supply and exchange rate indicates that macroeconomic factors like income, interest rate; inflation and price do not have neutral effects in the event of changes in money supply and exchange rate. If money supply index is more than the production index, the economy is likely to experience a higher inflation rate. It is important for the Central Bank of Nigeria to develop monetary and exchange rate policies that will be capable of regulating macroeconomic indicators particularly inflation rate and interest rate to enhance price stability so that the economy will grow and generate more income and also provide more employment.

2. The strong relationship between aggregate prices and agricultural prices indicate that the general price level in the economy has an influence on the movement of agricultural prices. Policy makers must pay particular attention to what is happening to the general price level; since agricultural prices do not react more sensitively than aggregate prices to changes in money supply.

3. In the management of exchange rates in Nigeria, the monetary authorities must in addition to the traditional variables (money supply, interest rate and income) of exchange rate determination, pay particular attention to developments in the world price of agricultural commodities; bearing in mind that agricultural prices react more sensitivity than aggregate prices to changes in exchange rate.

4. The level of capital flow in Nigeria agriculture is too low and may not be able to positively influence agricultural prices. The environment must be made attractive for foreign investors. Operations of Agricultural Credit Guarantee Scheme Funds (ACGSF) need to be expanded while commercial banks should be directed and compelled to increase the level of agricultural loans to farmers.

5. Government must introduce deliberate policies to increase agricultural production and regulate domestic prices to enhance a strong exchange rate of the Naira to stimulate exports. Agriculture is an important sub-unit of the entire macroeconomic environment. Thus, policy makers should adopt efficient policies that would translate into high production in agriculture. If properly managed, agriculture can be an effective tool of
moderating interest rate, inflation rate, exchange rate and cause a general improvement in Nigeria’s gross domestic product (GDP).

CONTRIBUTION TO KNOWLEDGE

This study focused on the impact of monetary policy on agricultural prices with regard to the evaluation of the long-run neutrality of money supply on agricultural prices and the effect of key macro-economic indicators on agricultural prices in Nigeria. The study has gone further to contribute to knowledge in the following ways:

1. Firstly, earlier researchers such as Schuh (1974), Ihimodu (1993), Ogiogio (1993), Osuntogun (1993) and Obadan (1994) conducted empirical studies on the effect of price and exchange rate on trade. However, the likely relationship between price and exchange rate volatility was ignored in their estimation and a possible impact of money supply and exchange rate on variations in agricultural prices was not studied. Most of these studies were concentrated on the price and export effects in static setting. These studies, either econometric or judgemental, are thus incapable of portraying the dynamic adjustment to agricultural price variations. This study bridges this existing gap by studying the impact of money supply and exchange rate on variation in agricultural prices in Nigeria.

2. Secondly, this study addressed the existing bias in previous study on impact of monetary policies on agricultural prices in Nigeria which emphasized on the short-run rather than going further to study the impact in the long-run. The works of Devadoss and Meyss (1987), Zanias (1998) and Saghaian et al. (2002) find empirically over-shooting of relative agricultural prices in response to money supply. However, these studies concentrated on the issues of short-term changes in agricultural price due to the prevailing belief of long-run neutrality. This study goes further to empirically study the impact of money supply on changes in agricultural prices in Nigeria in the long-run and empirically proved that the impact is not neutral in the long-run.

3. In addition, this study was able to develop a unique conceptual model; using Least Square Estimator (LSE) and a modified version of monetary model of exchange rates to analyse the interactions of exchange rate, national income, interest rate, price inflation and their impacts on agricultural prices in Nigeria. This will serve as a paradigm for further studies in the area of the impact of macro-economic variables on agricultural prices in Nigeria.

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