Journal of Economic Theory 5 (4): 84-92, 2011
ISSN: 1994-8212

Anticipated and Unanticipated Exchange Rate Changes and Output Performance in Nigeria: An Empirical Analysis

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Abstract: Exchange rate policy is central to improving the economic performance of a nation. It is however, argued that the effect of exchange rate changes on output depends on whether it is anticipated or not. Earlier studies on the effects of exchange rate on the Nigerian economy ignored differences in sectoral output responses to changes in exchange rate and economic agents' expectations. This study therefore, attempt to fill this gap by investigating the effects of anticipated and unanticipated changes in exchange rate on aggregate and sectoral output in Nigeria between 1970 and 2007. The result obtained showed some differences in sectoral output responses to anticipated and unanticipated depreciation. The coefficients of anticipated exchange rate in the equations for aggregate output, agriculture, manufacturing and output of services were -0.05, -0.15, -0.01 and 0.09, respectively. All of these were significant at 5% level. Unanticipated exchange rate had insignificant positive effects on aggregate and sectoral outputs (except for manufacturing). This implied that policy neutrality hypothesis may not hold for the Nigerian environment and more importantly that existing structures could not support an expansionary argument for exchange rate depreciation during the period of study.

Key words: Exchange rate, output, anticipated and unanticipated depreciation, out put, manufacturing, Nigeria

INTRODUCTION

Macroeconomic performance of a nation is determined by a number of factors-exogenous and endogenous. The exogenous factors include changes in terms of trade, a change in economic activity in the industrialized countries and in international interest rates and prices. The endogenous factors include fiscal position and exchange rate policy (Ghura and Greene, 1993). Exchange rate has been singled out as one of the most important factors influencing economic performance of a nation. According to Cottani *et al.* (1990), the dismal economic performance in Latin America, Asia and Africa can be linked to real exchange rate behaviour. It can therefore be argued that a sound exchange rate policy and an appropriate exchange rate are crucial conditions for improving the economic performance of a nation.

Nigeria's exchange rate regimes since, independence to date can be classified into four. These are the fixed rate regime of 1960-1970, the adjustable peg regime of 1974-1978, the managed float regime of 1978-1985 and the flexible exchange rate regime of 1986 to date. The different regimes have implications for exchange rate behaviour in Nigeria. While the period between 1960 and 1986 was characterised by misaligned exchange rate, the flexible exchange rate period is characterised by unprecedented volatile exchange rate which encouraged speculative activities and changing expectations about exchange rate. Despite the adoption of different exchange rate management strategies the performance of the economy has not been very impressive. The growth rate of Nigeria's real output has been low and sluggish especially since the 1970s. The growth rate of total real GDP averaged 3.6% between 1970 and 2006. Similar trend obtains in the non-oil sector where agricultural output grew at the rate of 3.4% on the average during same period and manufacturing output grew at the rate of 2.1%. Although, total export has been on an upward trend, it has largely been dominated by oil.

The share of non-oil exports in total export which was >40% in 1970 gradually decline to about 2% in 2006 (CBN, 2007). In terms of contribution to GDP, the share of manufacturing in total GDP has been declining over time. The share which was 9.3% in 1985 declined to 5.3% in 1995 and went down further to 3.6% in 2000. Agricultural output which was almost 50% of total GDP in 1970 declined to about 32% in 2006 while petroleum which was just about 9% of GDP in 1970 rose to about 38% in 2006. This has implication for employment and income distribution in Nigeria. The trend above showed that the objective of achieving a diversified economy with sustainable growth which is one of the foremost objectives of most economic policy in Nigeria is yet to be achieved. There are three major views in the literature on the impact of exchange rate on output namely the traditional view, the monetarist view and the structuralist

view. The traditional view posits that devaluation is expansionary. The mechanism behind these positive effects is that devaluation switches demand from imports to domestically produced goods by increasing the relative prices of imports and making export industries more competitive in international markets, thus stimulating domestic production of tradable goods and increasing output. In the monetarist view, devaluation has no effect on output in the long run. This believe is based on the assumption that the Purchasing Power Parity (PPP) holds hence depreciation of the currency would only lead to increase in output in the short but in the long run the monetary consequences of depreciation ensures that the increase in output is neutralized by the rise in prices. The structuralist view is that devaluation can be contractionary.

The theoretical underpinning for this approach was laid by Diaz-Alejandro (1963), Krugman and Taylor (1978) and Wijnbergen (1986) among others. While Diaz-Alejandro (1963) and Krugman and Taylor (1978) stressed the demand side channels. Wijnbergen (1986) emphasised the supply side channels through which depreciation could be contractionary. Some of the factors that could make depreciation to be contractionary on the demand side include changes in income distribution that favour economic sectors with low marginal propensity to consume, a decline in investment, a decline in real wealth or real balances, an increase in debt and debt service payments (measured in local currency) and low government expenditure out of tax revenue (where ad valorem taxes on imports and exports are in effect). The factors on the supply side include increase in the price of imported production inputs and wage indexation schemes (Taye, 1999). Pierrer-Richard (1991) among others however, submitted that the effect of exchange rate on output depends on whether it was anticipated or not. According to Pierrer-Richard (1991) with the assumption of rational expectation, an anticipated increase in exchange rate (anticipated depreciation) constitutes an adverse supply shock. The adverse supply shock could also come in through higher wages as a result of workers reaction to anticipated depreciation and increase in expected price. As a result of the increase in wage and cost of imported intermediate goods, demand for labour and intermediate goods fall and consequently, output falls.

As for unanticipated exchange rate depreciation, actual price will be higher contrary to workers expectations thus, leading to reduction in real wages. This will lead to increase in demand for labour and subsequently increase in output. On the demand side exchange rate depreciation, whether anticipated or unanticipated increases the price of foreign goods in domestic currency thus, increasing the international competitiveness of locally produced goods. It thus, makes exports less expensive and imports more expensive. This is expected to increase the demand for domestically produced goods by both domestic residents and foreign residents and consequently increase aggregate demand and output. Putting the demand and supply factors together the effect of anticipated exchange rate depreciation could be expansionary or contractionary depending on the strength of the demand and supply factors while unanticipated exchange rate depreciation is expected to be expansionary.

On the empirical front Diaz-Alejandro (1963) who analysed the experience of Argentina over the period 1955-1961, showed that the 1959 devaluation of the peso was contractionary because it induced a shift in income distribution towards high-propensity savers which in turn depressed consumption and real absorption. Other studies which find evidence for contractionary devaluation includes Cooper (1971), Edwards (1986), Ubok-Udom (1999), Taye (1999) and Ghura and Greene (1993). Pierrer-Richard (1991) found out that anticipated depreciation had contrationary effect while unanticipated depreciation had expansionary effect on output. Kandil (2004) however, found evidence for contractionary depreciation with respect to anticipated depreciation while he found that unanticipated depreciation had negligible effect.

Although, a lot of work have been done on the effect of exchange rate changes on output in Nigeria, many of these works ignored the role of expectation which has become important especially after the introduction of market based exchange rate system. Studies in other countries (Pierrer-Richard, 1991; Kandil, 2004) have shown some significant differential responses to anticipated and unanticipated changes in real exchange rate. It therefore, becomes pertinent to ask how exchange rate changes affect output performance in Nigeria, specifically how anticipation of exchange rate changes affects sectoral and aggregate output performances in Nigeria since it has been argued that the effect of exchange rate on output is determined based on whether it is anticipated or not (Pierrer-Richard, 1991).

The objective of this study, therefore is to investigate the effects of exchange rate changes on aggregate and sectoral output, distinguishing between the effects of anticipated and unanticipated exchange rate changes. This study covers the period between 1970 and 2007 and output is disaggregated into agricultural output, manufacturing output, petroleum output and services sector output while the effect of anticipated and unanticipated exchange rate changes on each component is investigated.

MATERIALS AND METHODS

Theoretical framework: The theoretical framework for this study is the modified IS-LM framework which was also adopted by Pierrer-Richard (1991), Kandil (2004) and Kandil *et al.* (2007). In this framework, output is assumed to be demand determined. The demand side of the economy consists of three markets namely, the goods, money and the foreign exchange market, all of which must simultaneously be in equilibrium for the economy to be in equilibrium. Under this condition, the economy attains both internal and external equilibrium which is the objective of exchange rate management. Each market is explained in turn below.

The goods market: Equilibrium in the goods market is obtained when the demand and supply of goods and services are equal, implying aggregate planned expenditure is equal to income. The equilibrium condition is given as:

$$y = c + g + I + x - m \quad (1)$$

Where:

y = Real income
c = Real consumption
g = Real government expenditure
I = Real investment
x = Real export
im = Real import

The components of the goods market is modelled as Eq. 2-6:

$$c_t = \beta_0 + \beta_1 y_t \quad (2)$$

$$g_t = g \quad (3)$$

$$i_t = i_o + i_1 r_t + i_2 y_t \quad (4)$$

$$x_t = x_0 + x_1 e_t + x_2 y^f + x_3 y_t \quad (5)$$

$$im_t = im_0 + im_1 y_t + im_2 e_t \quad (6)$$

Where:

r = The real interest rate
yf = The income of trading partners
e = The real exchange rate

Equation 2 expresses real consumption as a function of real and income while Eq. 3 shows real government expenditure as being autonomous. Equation 4 shows investment as being determined by real interest rate and real income. Export is shown in Eq. 5 to depend on real exchange rate income of trading partners and domestic income/output while Eq. 6 depicts import as being dependent on real income and real exchange rate. Substituting Eq. 2-6 into Eq. 1 produces the IS equation which shows equilibrium condition in the goods market. This is expressed as Eq. 7:

$$y_t = \frac{(\beta_0 + i_0 + x_0 + im_0) + \bar{g} + i_1 r_t + (x_1 + im_2)e_t}{1 - \beta_1 - i_2 - x_4 - im_1} \quad (7)$$

Money market: The money market is modelled along the standard money demand theories. Real money demand is expressed as a function of real income and interest rate; this is shown as Eq. 8:

$$m^d = \theta_0 + \theta_1 y_t + \theta_2 r_t \quad (8)$$

Money demand may also be influenced by exchange rate because economic agents may hold foreign money for speculative purposes (Kandil, 2004). Therefore, the demand for money is expressed as Eq. 9 to reflect this fact.

$$m^d = \theta_0 + \theta_1 y_t + \theta_2 r_t + \theta_2 e_t \quad (9)$$

Real money supply is equal to the nominal money balances, M which is assumed to be exogenously determined, deflated by Price (P). The money supply is expressed as:

$$m^s = \frac{M_t}{P_t} = \bar{m} \quad (10)$$

At equilibrium, money supply equals money demand, thus the money market equilibrium is modelled as Eq. 11:

$$\bar{m} = \theta_0 + \theta_1 y_t + \theta_2 r_t + \theta_3 e \quad (11)$$

Equation 11 can be expressed as Eq. 12 which is the LM equation.

$$y_t = \frac{\bar{m}_t - \theta_0 - \theta_2 r_t - \theta_3 e_t}{\theta_1} \quad (12)$$

External sector: This sector is captured by the Balance of Payment (BP) equation which shows different combinations of interest rate and income that ensure equilibrium in the balance of payment (Appleyard and Field, 2001). The fundamental identity in the BP equation is expressed as:

$$B = CA + K \quad (13)$$

Where:

B = Balance in the official reserve transactions account
CA = Current account balance
K = Capital account balance

$$CA = x - im \quad (14)$$

From Eq. 5 and 6:

$$CA = x_0 + x_1 e_t + x_2 y^f + x_3 y - (im_0 + im_1 y + im_2 e) \quad (15)$$

The capital account is expressed as Eq. 16:

$$K = a_0 + a_1 r_t \quad (16)$$

Equilibrium in the balance of payment account requires that B is equal to zero. Substituting Eq. 15 and 16 into Eq. 13 and by ssuming B = 0, makes Eq. 13 to becomes:

$$0 = x_0 + x_1 e_t + x_2 y^f + x_3 y_t - im_0 - im_1 y_t - im_2 e_t + a_0 + a_1 r_t \quad (17)$$

Collecting the like terms and simplifying 17, we obtain Eq. 18 which is the BP equation:

$$y_t = \frac{-\pi_0 - \pi_1 e_t - \pi_2 y^f - a_1 r_t}{\pi_2} \quad (18)$$

Where:

$$\pi_0 = x_0 + im_0 + \alpha_0,\ \pi_1 = x_1 - im_2,\ \pi_2 = x_3 - im_1$$

Combining Eq. 7, 12 and 18 which are equilibrium conditions in the goods, money and external sectors, respectively and with series of manipulations, we obtain the equation for output, y which is:

$$y_t = \varphi_0 + \varphi_1 e_t + \varphi_2 y^f + \varphi_3 m_t + \varphi_4 g_t \quad (19)$$

From the derivation above, a change in exchange rate, e, affect output directly through the import and export channels and indirectly though the response of import and export to changes in income brought about by changes in exchange rate. But whether the effect of exchange rate depreciation on output would be negative or positive depends on the strength of the income elasticities of import and export. Where elasticity of export with respect to income is greater than the elasticity of import with respect to income, researchers may have positive response; otherwise, have a negative response. Output is expected to respond positively to government expenditure provided there is no crowding-out effect of government spending. Income of trading partners is expected to impact positively on output since, this would promote demand for export (all else being equal). Money supply is also expected to promote output growth through reduction in interest rate and stimulation of investment. In order to separate the effect of anticipated exchange rate changes from that of unanticipated exchange rate changes, we need to decompose the exchange rate into its anticipated and unanticipated components. To identify the unanticipated component of exchange rate there is need to construct an empirical proxy since, the unanticipated component is not observable. Two main methods are used in empirical studies to identify the unanticipated components namely time series and structural models. Meese and Rogoff (1983) among others observed that the time series outperforms the structural model thus in this study, the time series model is adopted. As suggested by Blenman, the real effective exchange rate is modelled as an Autoregressive Moving Average (ARMA) process and the residual from this equation is used as the unanticipated components of exchange rate. To obtain the anticipated component, we subtracted the unanticipated component from the actual series. The anticipated and unanticipated exchange rate changes, antr and unantr, respectively are used as the exchange rate variables in the empirical model.

The empirical model: Equation 19 is modified to by including the stochastic disturbance term and replacing the exchange rate variable with its components namely anticipated and unanticipated exchange rate changes. Moreover, because we are interested in sectoral analysis, we modelled the output equations for the agricultural, manufacturing and services sectors. The equation for each sector reflects the peculiar characteristics of each and this is reflected in Eq. 20 through Eq. 22 with Eq. 23 being the aggregate output equation. Thus, Eq. 20-23 constitute the empirical model.

Agricultural output equation: Agricultural output is hypothesized to respond to factors in the theoretical model of Eq. 19. Apart from this, agricultural output is also assumed to respond to rainfall since agriculture in Nigeria is mainly rain fed. Government expenditure in agricultural equation is represented by government capital expenditure to reflect spending on infrastructure. In linear form, the agricultural output equation is specified as:

$$\ln GDP_A = \beta_0 + \beta_1 antr + \beta_2 unatr + \beta_3 \ln y^f + \beta_4 \ln m^s + \beta_5 \ln GOVTEXP + u_1 \quad (20)$$

Where:

GDP_A = Stands for output of agricultural output
antr = Stands for anticipated exchange rate
unantr = Stands for unanticipated exchange rate
y^f = Stands for foreign income
M^S = The money supply
GOVTEXP = Stands for government expenditure

In = Logarithm
u = Stochastic error term

Manufacturing output equation: For the manufacturing output equation, the basic Eq. 19 is modified by including the level of imports (im) and components of exchange rate variable. Import is included in the model to reflect the fact that the manufacturing sector depends to a large extent on imported intermediate inputs. Intermediate inputs constitute over 50% of imports in Nigeria (CBN, 2002). The manufacturing sector's output is modelled as (Eq. 21):

$$\ln GDP_M = \beta_0 + \beta_1 antr + \beta_2 unatr + \beta_3 \ln y^f + \beta_4 \ln M^s + \beta_5 \ln GOVTEXP + \beta_6 \ln IM + u_2 \quad (21)$$

Government expenditure here is proxied by government capital expenditure on social and economic services since, this goes directly to affect the output of the manufacturing sector.

Services sector output equation: The basic equation is modified by using government expenditure on social and economic services as proxy for government expenditure:

$$\ln GDP_s = \beta_0 + \beta_1 antr + \beta_2 unatr + \beta_3 \ln y^f + \beta_4 \ln M^s + \beta_5 \ln GOVTEXP + \beta_6 \ln IM + u_3 \quad (22)$$

GDP_M, GDP_S, y^f, M^S and IM stand for output of manufacturing, output of services sectors, foreign income, money supply and imports, respectively. The other variables are as defined before.

Aggregate output: Aggregate output is modelled as Eq. 23. It is obtained by replacing exchange rate variable in Eq. 19 with anticipated and unanticipated components where GDP_T stands for aggregate output:

$$\ln GDP_T = \beta_0 + \beta_1 antr + \beta_2 unatr + \beta_3 \ln y^f + \beta_4 \ln M^s + \beta_5 \ln GOVTEXP + \beta_6 \ln IM + u_4 \quad (23)$$

Trends in exchange rate and output in Nigeria: The macroeconomic performance in Nigeria started on a good note in the 1970s, as the period coincided with the end of the civil war which necessitated the need for massive reconstruction activities. During this period, the total GDP grew at an average rate of 6.2%. The average figure hid the trend in sectoral performances as the total GDP grew at the rate of 21.4% between 1970 and 1971. The growth in the total GDP during this period was mainly driven by petroleum since, growth in this sector was 32.4% on the average with manufacturing sector growing at an average rate of 4.8% and agricultural sector actually declining at a rate of 2% on the average. The period also witnessed an upsurge in the demand for goods and services due to the reconstruction exercise and the increased salary and wages granted on the basis of the Adebo commission's recommendation (The Adebo commission recommended increase in salaries and wages in order to relieve the high cost of living. This increase in salaries and wages was paid in December 1971). As shown in Fig. 1, the growth rate of real total GDP was negative in 1975, 1978, 1982 through 1984 as well as in 1987. The drought that occurred in the Northern Nigeria was linked to the negative growth rate in 1975. During this year, the total real GDP declined by 2.96% while agricultural output declined by 8.6% in the same year, showing that agriculture was a drag on growth for that year.

The decline in the real total GDP in 1978 could be linked to the liberalisation of import controls in 1976 which threatened the domestic production of the agricultural and manufacturing sectors. Various policies were put in place to reverse the negative growth rate of GDP in 1979. Such measures included increase in import duties on various commodities, the placing of some commodities under licence or outright ban. Others included concessions to local manufacturers to encourage them to expand their productive capacities and the liberalization of the terms and the availability of credit to farmers.

Following the adoption of the Structural Adjustment Programme (SAP) and the subsequent improvement in the management of the foreign exchange market, the persistent downward pressure on the domestic currency was stemmed for a while. Some improvements were recorded in the growth of GDP between 1988 and 1990. The main drivers of growth during this time were

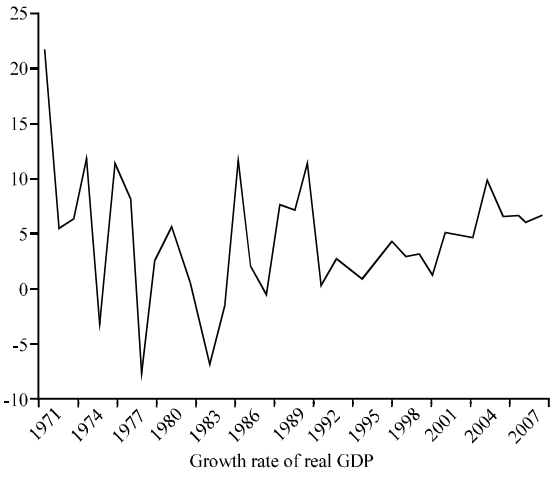

Fig. 1: Growth rate of real GDP in Nigeria (1970-2007); Constructed by the researcher from CBN Statistical Bulletin, 2007

manufacturing, trading and services. The average growth rate of the total GDP which was <1% in the first half of the 1980s increased to 3.9% on the average between 1986 and 1993 with the highest growth rates occurring in 1988 through 1990.

The improved performance of output during this period might be linked to the expansionary fiscal and monetary policies of the government during this period. There was an increased government spending on the development of the rural areas and infrastructural development through the establishment and financing of the Directorate of Food, Roads and Rural Infrastructure (DFRRI) and the National Directorate of Employment (NDE) among others. The total GDP growth rate however, nosedived after 1990 with growth rate being <3% except in 1996 when it was slightly >4%. It however, picked up from the year 2000 with an average growth rate of 6.4% between 2004 and 2007.

Figure 2 showed that there is some correlation between exchange rate changes and growth rate of GDP. Between 1971 and 1979, the average growth rate of GDP was 6.3%; this was associated with a negative change in exchange rate (appreciation) of 2.5%. The same scenario was repeated between 2004 and 2007 when an average GDP growth rate of 6.4% was associated with appreciation of exchange rate. In other sub periods when the exchange rate depreciated, it was associated with a reduced average growth rate of GDP. As shown in Fig. 2, higher growth rate is associated with appreciation in 1971-1979 and 2004-2007 periods while the periods of depreciation of exchange rate are associated with lower growth rates.

Trends in sectoral output performance: Agricultural output performance was unimpressive in the early 1970's,

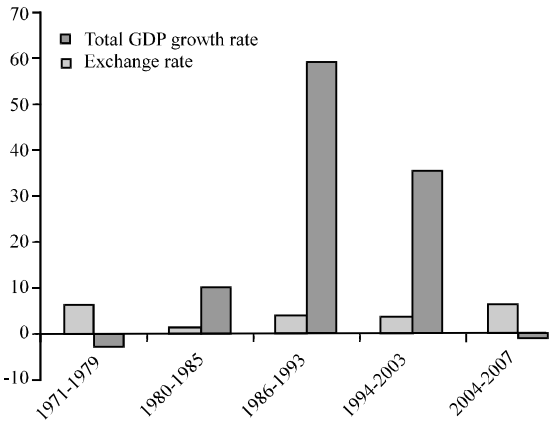

Fig. 2: Exchange rate and growth rate of total GDP in Nigeria (1970-2007). Values are averages over selected periods. Calculated by the researcher from CBN Statistical Bulletin, 2007

declining at an annual average rate of 2.2% between 1971 and 1979. The poor performance of agriculture during this period was caused by various factors, amongst which was inadequate mechanisation of agriculture, vagaries of weather and inefficiencies in the marketing process. In particular, the determination of producer-prices and the practices of licensed buying agents did not provide the much needed incentives for the expansion of output. Another contributory factor in the non-impressive performance of the agricultural sector was the credit policy. Several reform policies were put in place to promote productivity in the agricultural sector. One of such policies was the centralization of the fixing of producer prices and the replacement of the two-stage tax on marketing boards by a single tax of 10%. The government also embarked on campaigns to boost agricultural production in addition to other supportive roles of the government. Some government policies indirectly contributed to improved agricultural performance. Such policies included the ban on importation of poultry and related products.

The performance of the sector was however, hampered by tardiness in the supply and distribution of fertilizers and other farming inputs, pests and diseases as well as flood. For instance, the decline in 2001 and 2002 was attributed to the attack of Quelea birds in some Northern states as well as the outbreak of Cassava mosaic disease in some Southern states (CBN, 2002). The growth rate of manufacturing output was slow and sluggish in the early 1970s. This was due to the fact that this sector was at its infancy. However, the performance of the sector picked up in the latter part of the decade. The improved performance of the sector during this period could be linked to improved availability of inputs as a result of increased inflow of foreign exchange. Three decline episodes were discernable for the manufacturing sector. The first occurred between 1983 and 1985. This decline episode was attributable to the glut in the international oil market which constrained the availability of foreign exchange for the importation of necessary inputs for the manufacturing.

The second one was between 1993 and 1995 and could be attributed to the prolonged political and labour unrest which engulfed the nation during this time. The third episode occurred between 2003 and 2004. The capacity utilization rate during this time was 30.7% on the average while the output of the sector declined on the average by 9.5%. The poor performance has since persisted with moderate improvement occurring from 2000 onwards. Although, several measures were put in place to facilitate improved performance in the manufacturing sector, the effects of such measures were negligible if

they ever had any. Some of the measures put in place included the establishment of Small and Medium Industries Equity Investment Scheme and 100% physical inspection of goods at the ports which compelled importers to pay appropriate duties leading to improved competitiveness of local manufactures.

Most of the policies put in place failed to achieve the desired results because of the evolving macroeconomic developments. The expectations would be met only if economic structures are right and flexible. Overall, economic structures and institutions are rigid and indeed dualized in Nigeria. For instance, the agricultural and industrial production base, the money markets and financial institutions are fragmented and somewhat unorganised. Even where they are not fragmented, they cannot be altered easily and are often externally dependent and characterised by widespread interventions and regulatory controls which made it difficult to ensure consistency within and between macroeconomic accounts and policy instruments.

Sources and description of data: The data used in this study are obtained mainly from the Central Bank of Nigeria Statistical Bulletin for 2007 as well as the Annual Abstracts of Statistics (various issues) published by the National Bureau of Statistics. Data on trade with Nigeria's trading partners used to compute the Real Effective Exchange Rate (REER) was collected from the IMF Direction of Trade Statistics (various issues). The REER is constructed as a weighted average of the real value of the Nigerian currency in terms of those of her major trading partners (The major trading partners used in this study accounted for >70% of Nigeria's total trade during the period of study. These countries are Belgium, France, Switzerland, Italy, Japan, Netherlands, Spain, Germany, United Kingdom and United States of America). The weights adopted in this study represent the relative share of each trading partner in Nigerian total trade. The figure for foreign income is the weighted average income of the major importers of Nigerian goods. The narrow definition of money supply is used in this study which is currency plus demand deposit. The real output variables were obtained by deflating the nominal variables by the GDP deflator.

RESULTS AND DISCUSSION

Estimation techniques and model validation: Time series data on Nigeria from 1970-2007 were used in the model. The model was estimated as a system in order to ensure that all information was captured. The estimation was done using Seemingly Unrelated Regression Estimation (SURE) Technique. This becomes necessary in view of the fact that the endogenous variables, though distinct from one another, may be affected by one another. For instance if an error is committed in the measurement of the manufacturing and agricultural output, this may affect the measurement of services output since, this is taken as a residual.

Moreover, estimating each equation individually may lead to loss of information which may be contained in the interaction among the vital variables in the model. The diagnostic test results in Table 1 indicated the overall performance of the model was good as the coefficients of determination for the four equations are >80%. This implies that the variables included in each equation are able to explain >80% of variation in the dependent variables. The Durbin-Watson statistics do not indicate the presence of autocorrelation in any of the equation. The Jarque-Bera statistics show that the error terms are normally distributed except for the manufacturing sector output where the hypothesis of normal distribution could not be accepted. The Breusch-Geofrey LM test statistics do not show that there is the presence of serial

Table 1: Estimated results

Parameters	Agricultural sector output	Manufacturing output	Services sector output	Aggregate output
Constant	-0.72 (-1.90)	2.26 (2.73)	1.95 (2.28)	1.54 (2.35)
ANTR	-0.15 (-1.96)**	-0.01 (2.23)**	0.09 (2.01)**	-0.05 (-2.73)***
UNANTR	0.01 (1.46)	-0.001 (-1.1)	0.04 (0.45)	0.02 (0.75)
Money supply	0.25 (4.90)***	0.09 (0.78)	0.22 (2.26)**	0.57 (1.87)*
Govt. exp.	0.02 (0.50)	-0.07 (-1.06)	0.05 (1.97)**	0.08 (1.69)*
Rainfall	0.18 (1.73)*	-	-	-
Import	-0.14 (-2.34)**	-0.11 (-1.53)	-0.11 (-1.71)*	
Diagnostic tests				
Adj. R^2	0.92	0.82	0.84	0.87
DW	2.24	2.04	2.08	1.99
Jarque-Bera	2.05 (0.43)	15.16 (0.001)	0.96 (0.62)	7.18 (0.16)
B-G LM test stat.	0.85 (0.44)	0.40 (0.68)	1.36 (0.20)	4.23 (0.21)
B-P-G	0.47 (0.80)	1.08 (0.40)	1.43 (0.25)	2.56 (0.56)
Ramsey RESET	1.56 (0.17)	0.04 (0.85)	0.04 (0.84)	1.45 (0.62)

Estimated results, B-G = Breusch-Geofrey, B-P-G = Breusch-Pagan-Godfreyt-values are in parentheses for coefficients while probabilities are in parentheses for the diagnostic tests. ***, ** and * indicate coefficient is significant at 1, 5 and 10%, respectively

autocorrelation in the error terms. Moreover, the Breusch-Pagan-Godfrey test statistics indicate that there is no heterosedticity problem which implies that the variances of the error terms are constant over time. The Ramsey RESET test statistics do not support the existence of misspecification of equation.

The agricultural output equation: As shown in Table 1, the result for the agricultural sector shows that anticipated exchange rate change is negatively related to agricultural output, implying that anticipated exchange rate depreciation has contractionary effect on agricultural output. Aticipated exchange rate is significant at 5% level. However, unanticipated exchange rate change has positive but insignificant effect. The coefficients of anticipated and unanticipated exchange rate changes are 0.15 and 0.01, respectively. Money supply and government expenditure have positive effects on agricultural output, implying that expansionary fiscal and monetary policies would promote the output of agricultural sector.

The coefficients of money supply and government expenditure are 0.25 and 0.02, respectively. The result shows that there is no crowding out effect of government expenditure in the agricultural sector. This may due to the fact that government does not directly get involved in agricultural production in Nigeria but rather provides enabling environment through policies and provision of infrastructure. Money supply is significant at 5% while government expenditure is insignificant. Rainfall is found to have positive and significant effect on agricultural output in Nigeria during the period of study with a coefficient of 0.18 showing the high dependence of agricultural on rainfall.

Manufacturing sector output: The result in Table 1 shows that both anticipated and unanticipated exchange rate changes have negative effect on manufacturing output but it is only anticipated change that is significant at the 5% level. This implies that anticipated exchange rate change has significant contractionary effect on manufacturing output for the period under consideration. The coefficients of anticipated and unanticipated exchange rate changes are 0.01 and 0.001, respectively. Money supply has positive but insignificant effect on manufacturing output while government expenditure has negative but insignificant effects on manufacturing output in Nigeria during the period of study. This implies that monetary policy has expansionary effect while government expenditure has contractionary effect on manufacturing sector's output. The coefficient of money supply is 0.09 while the coefficient of government expenditure is 0.07. Import has negative and significant effect on manufacturing output. The coefficient of import is 0.14 and it is significant at 5% level. The negative and significant effect of import on manufacturing output during the period of study may reflect the fact that imports crowds out domestic production of manufacture goods. This is not unexpected given the fact virtually all kinds of goods that could be manufactured locally are imported into Nigeria legally or illegally. Moreover, there is the perception that imported goods are superior to the locally made ones hence, the high demand for the imported goods to the detriment of the locally produced.

Services sector output: As shown in Table 1, the coefficients of anticipated and unanticipated exchange rate changes are 0.09 and 0.04, respectively. This implies that anticipated exchange rate depreciation would lead to a decrease in the output of the services sector while unanticipated depreciation would promote it. However, it is only anticipated depreciation that is significant at 5%. Both money supply and government expenditure have positive and significant effects on services' sector output. This implies that expansionary monetary and fiscal policy would promote services sector's output. Both money supply and government expenditure are significant at 5% with coefficients of 0.22 and 0.05, respectively. The positive relationship between government expenditure and services sector's output is not surprising given the components of that sector which includes government sector output. Government expenditure goes directly to finance government sector. Import is found to have a negative and insignificant relationship with services sector output reflecting the possible crowding output effect of importation.

Aggregate output: As shown in Table 1, the coefficients of anticipated and unanticipated exchange rate changes are 0.05 and 0.02, respectively which implies that anticipated exchange rate depreciation has contractionary effect on aggregate output while unanticipated exchange rate deprecation has expansionary effect. However, it is only anticipated exchange rate change that is significant at 5%. Both money supply and government expenditure have positive and significant effects on aggregate output with coefficients of 0.57 and 0.08, respectively. Both variables are significant at 10% level. Import has negative and significant effect on aggregate output at the 10% level. The coefficient of import is 0.11. This show there is crowding out effect of importation on aggregate output in Nigeria during the period of study. Moreover, it shows that the supply side effect of import is greater than the demand side effects. It could be inferred from the above

analysis that anticipated and unanticipated exchange rate changes have different effects on the different sectors examined. While anticipated exchange rate depreciation has contractionary effects on all sectors, unanticipated exchange rate depreciation has expansionary effect except in the manufacturing sector where it is contractionary. The contractioanry effect of anticipated exchange rate depreciation found in this study concurs with the findings of Kandil (2004) with respect to a group of developing countries while the expansionary effect of unanticipated exchange rate depreciation is in harmony with the theoretical expectation of Pierrer-Richard (1991).

The insignificance of unanticipated exchange rate depreciation is in line with the findings of Kandil (2004). Monetary and fiscal policies are found to have positive effects on all sectors but the effect of monetary policy is greater than that of fiscal policy in all cases indicating the relative importance of monetary policy in promoting output. The relative importance of monetary policy may also indicate the less productive nature of government expenditure in Nigeria which may be a reflection of corruption in that sector.

CONCLUSION

It could be fairly observed from this study that although there is need to have a realistic exchange rate in place, the role of expectation cannot be ignored. For exchange rate to promote output, it must be unanticipated where exchange rate depreciation is correctly anticipated by economic agents, it would have contractionary effects on sectoral and aggregate output. Moreover, efforts must be geared towards reducing corruption substantially so as to make the government expenditure more productive as both monetary and fiscal policies are found to promote output. In addition, efforts should be put in place to check the importation of goods that could be locally produced so as to improve the performance of the manufacturing sector. The significance of anticipated exchange rate depreciation found in this study implies that anticipated depreciation would worsen the unemployment situation in Nigeria with adverse consequence on poverty which is already at a precarious level. The significance of the effect of anticipated exchange rate changes also implies that the policy neutrality hypothesis may not hold for the Nigerian environment and more importantly that existing structures could not support an expansionary argument for exchange rate depreciation during the period of study.

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