

THE MONETARY APPROACH TO EXCHANGE RATE DETERMINATION: EVIDENCE FROM NIGERIA

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Floating exchange rate regime and the repercussions of this choice on the whole economy constitute an important issue for the Nigerian economy, just as it is for other economies. In this respect, this study attempts to assess the relevance of the monetary approach to the floating exchange rate regime operable in Nigeria since 1987. To this end, it applies the necessary frame of analysis over the Nigerian data through 1987-2001. It concludes that the monetary approach to exchange rate analysis fits in the Nigerian case over the period of analysis.

1. INTRODUCTION

The Nigerian economy appears prone to external balance disequilibrium¹. During its periods of fixed exchange-rate regime between 1960 and 1986, it recorded balance-of-payments deficits most of the time (Jimoh, 1990; Fajana, 1979; CBN1, 1983, pp. 43-45; CBN2, 1985, pp. 9-10, 3-78). Furthermore, an examination of exchange-rate periods since 1986 suggests a tendency towards continuous exchange-rate depreciation or exchange-rate volatility which may be inimical to monetary stability and beneficial flows of international goods, services and investments, especially foreign direct investments.

The move from fixed to flexible exchange rate regime was itself a desperate attempt to resolve the problem of persistent balance-of-payments deficits. While at the theoretical level the pressure for correcting external imbalances should fall equally on deficit and surplus countries, in practice, the burden falls virtually entirely on the deficit countries because their reserve holdings are limited. It was no wonder

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¹ For a similar observation about the U.K economy, see Hadji-Matheeu and Arestis (1982, pp. 73-78).

then that correcting the persistent Nigerian deficits became topmost on the agenda of its policy makers in the early 1980s when foreign reserves nosedived reaching a crisis level in 1982 and 1983². At that time, the pressure to adjust its persistent external deficits became real and pressing. Eager to fix the associated problems, Nigerian policy-makers moved increasingly to more flexible exchange-rate arrangements in their bid to restore normalcy. For instance, in 1986, a flexible Foreign Exchange Market (FEM) was introduced³ (CBN1, 1983, pp. 43-45; CBN2, 1986). The economy was subsequently progressively deregulated. However, the FEM apparently did not produce satisfactory results and, in 1994, the deregulation programmes were aborted. Interest rates were re-fixed at a maximum of 21 per cent and the exchange rate fixed at 22 Naira per US dollar (NDIC, 1994, pp. 2-5). But these were short-lived. In 1995, the foreign exchange market was partially deregulated again with the introduction of the Autonomous Foreign Exchange Market (AFEM). Under the AFEM, the Central Bank of Nigeria (CBN) could intervene discretionarily within a free market framework. However, a second official market at a fixed rate of 22 Naira per US dollar—solely for government transactions—coexisted with the AFEM (CBN, 1995, p.10). In the second half of 1996, interest rate and exchange rate were fully deregulated with a single and uniform official foreign exchange rate (NDIC, 1996). Furthermore, during the periods of floating rates, virtually all forms of known pricing (auctioning) systems were tried. If one notes that even in 1994 when the exchange rate was fixed at 22 Naira to the US dollar the fixed rate was the prevailing market-determined rate, then, overall, it is safe to say that Nigeria has been operating flexible rates since 1987 to date (a period of about seventeen years) and that floating rates have finally come to stay.

Therefore, it is important to truly understand the economics of floating rates so as to be able to formulate a wise set of fiscal and monetary policies appropriate for the Nigerian economy. Unfortunately, there is no agreement

² The Nigerian foreign reserves fell from ₦2,427.0 million in 1981 to a crisis level of ₦801.0 million in 1982 that could not cover its four-month import bills; the reserve level was ₦747.7 million in 1983.

³ In September 1986, a two-tier foreign exchange market was introduced. The first-tier market operated a fixed rate for debt servicing transactions while the second-tier foreign exchange market (SFEM) a floating rate. However, since the bulk of foreign exchange transactions was in the SFEM, the exchange regime was a floating one.

as to what constitutes a set of wise exchange rate policies in general. This is because different approaches to external balance analysis have given rise to different and, sometimes, conflicting policy recommendations. These approaches are the Keynesian approaches (consisting of the elasticity-cum-multiplier approach and policy approach) and absorption and monetary approaches⁴. However, these approaches—income (elasticity-cum-multiplier), absorption, policy and monetary approaches—can be categorised into two contesting schools of thought. This is because the income, absorption and policy approaches to exchange rate determination constitute an internally consistent or complimentary system of thought. These three approaches may be called the “traditional” or “orthodox” approaches to exchange rate analysis. The monetary approach stands in contrast to the traditional approaches. An acceptance of the traditional approach is a rejection of the monetary approach and its framework for the formulation of monetary and exchange rate policies.

While the relevance of monetary approach to floating rate analysis has been the subject of many studies, these are mostly concerned with the developed countries. A comprehensive survey of studies concerned with developed economies can be found in Frenkel and Mussa (1985), Levich (1985), MacDonald (1988), and MacDonald and Taylor (1992). These show that the monetary approach to floating rates remains a controversial issue. The only few ones concerned with the developing countries are Edwards (1983) and Lyons (1992), both of which examined the data for Peru, Fry (1976) which examined the data for Afghanistan and Odedokun (1997) which examined the data for Sub-Saharan African countries. While Fry (1976), Edwards (1983) and Odedokun (1997) found strong support for the monetary approach to floating exchange rates, Lyons (1992) did not. Thus, the outcomes still remain mixed.

Odedokun’s (1997) study is mainly a cross-sectional one that includes Nigerian monthly data for October 1986 to June 1991. It also includes country-specific results for Nigeria. These results, as in Jimoh (1990) which investigate the relevance of the monetary approach to the Nigerian balance of payments using the 1960-1983 data, find support for the relevance of monetary approach to external balance analysis in Nigeria. But there is a

⁴ Because the elasticity approach to the balance of payments does not explain exchange rates, it is excluded from the traditional approaches to exchange rates.

need to re-examine the Nigerian data, first, because since June 1991—the endpoint of the period covered by Odedokun (1997)—more data have accumulated in respect of the Nigerian floating rate experience, more than that used by his study. Secondly, because we now have substantial annual data, it is possible to determine whether monthly data convey different results from those of annual data. This is particularly important because the use of annual data obviates the need to estimate monthly data of variables whose data is only available on annual or quarterly basis, e.g. national income. The objective of this study is to re-examine the enlarged Nigerian data with a view to confirming or contradicting existing preliminary results. To this end, the rest of this study consists of the following: Section 2: Literature Review; Section 3: Methodology; Section 4: Empirical Results; and Section 5: Conclusion.

2. LITERATURE REVIEW

The traditional approaches to exchange rate determination have their origin in the traditional approaches to the balance of payments which can be viewed as a succession of approaches—the elasticity approach (J. Robinson, 1937), the Keynesian multiplier or income approach, the absorption approach (S. Sydney, 1952) and the policy approach (J. Tinbergen, 1952, J. E. Meade, 1951 and R. A. Mundell, 1968).

A common feature of the traditional approaches to the balance of payments is the general belief in the ability of exchange rate or domestic price changes to effect a change in relative prices and the balance of payments. Within this framework, a deficit economy would be advised to pursue fiscal and monetary policies that would relatively reduce the domestic price to foreign price, thereby restoring external balance simultaneously with an internal balance (Jimoh, 1990). The monetary approach emerged in the 1950s, first as an approach to balance of payments analysis and later refocused on exchange rates. It was originated by Polak (1957) and refined by Mundell (1968, 1971), Johnson (1972, 1975, 1976a, b, c, 1977a, b, c), Johnson and Frenkel (1976) and their followers. Talking about the monetary approach to the balance of payments, Johnson (1976c, pp. 282-283) said:

The central point of the monetary approach to balance-of-payments policy theory is that balance-of-payments deficits or surpluses reflect

stock disequilibrium between demand and supply in the market for money⁵.

This version of the monetary approach, associated with Johnson and his followers, which maintains that the balance of payments is essentially a monetary phenomenon and that the payments imbalances are rooted in the relationship between the demand for and supply of money to the total exclusion of other elements, is often called the “strong version of the monetary approach”, following Rabin and Yeager (1982)⁶.

One of the major conclusions of the monetary approach to external balance analysis is that exchange flexibility is unnecessary and that balance-of-payments disequilibrium can only be corrected by policies that rectify the disequilibrium in the domestic money markets. In any event, balance-of-payments imbalance is said to be self-limiting (Krelnin and Officer (1978, p.13)⁷.

Since the mid 1970s when floating rates became widely adopted, more attention was given by the proponents of the monetary approach to developing its parallel for free rates (see, among others, Myhrman, 1976; Dornbusch, 1976; Frenkel, 1976; Humprey, 1977; and Mussa, 1976; Isard, 1978; and Frenkel, 1978). The outputs of such efforts constitute what has become known as the monetary approach to exchange rate determination. Thus, traditional approaches to exchange rate determination are the

⁵ Clarifying this point further, Johnson (1977c, p. 7) said: “A balance-of-payments deficit or surplus represents a transient stock-adjustment process evoked by initial inequality between actual and desired money stocks”.

⁶ A weaker version would just add monetary considerations to the traditional analysis. But since the policy implications of this weaker version of the monetary approach to the balance of payments are in line with those of the traditional approaches, it cannot be distinguished from them. Consequently, it is better grouped with them.

⁷ In particular, the strong version of the monetary approach predicts that within a fixed exchange framework, the change in international reserves and the induced change in the domestic component of the monetary base are equal in magnitude but opposite in sign. This prediction conflicts with the traditional position associated with the income-absorption-policy approach that an increase in money supply (resulting from an increase in the domestic components of the monetary base) worsens the balance of payments, but not to a degree that would cancel out, completely, the initial change in the money supply. Hence, while the monetary approach predicts a one-for-one increase in domestic credits and decrease in foreign reserves, the traditional approach predicts a less than one-for-one relationship.

Keynesian multiplier or income approach, the absorption approach and the policy approach⁸. As is the case with the balance of payments, the conclusions of the monetary approach to exchange rate determination conflict with those of the traditional approaches. The conceptual underpinning of the monetary approach to exchange rate determination, as in the case of the balance of payments, is that changes in exchange rates are responses to disequilibrium in the money (assets) markets. While under fixed rates, adjustments occur gradually through reserve flows across national borders, under floating rates—because reserve flow is zero—adjustments occur quickly and virtually instantaneously through domestic or foreign prices to maintain equilibrium in the money markets both domestically and abroad. A major conclusion of the monetary approach to exchange rate determination is that whatever causes balance of payments deficits under a fixed rate would cause exchange rate depreciation under floating rates, and whatever causes a surplus would cause currency appreciation under flexible rates. Thus, within the monetary approach, an increase in domestic income, other factors being equal, would, by increasing domestic demand for money, lead to reduced domestic expenditures (to build up money balances) resulting in a reduced domestic price that would restore equilibrium to the domestic money market but, via the “law of one price”, lead to exchange rate appreciation. In contrast, traditional approaches would predict that an increase in domestic income by increasing domestic imports would worsen the current account balance which would need an exchange rate depreciation to correct. By a similar mechanism, increasing domestic money supply by increasing domestic prices leads to currency depreciation within the monetary approach. Within the traditional approaches, an expansion in money supply gives the same result but via a different adjustment mechanism—increased domestic money supply leads to increased domestic income and reduced domestic interest rate which respectively worsen current and capital accounts that require exchange rate depreciation to restore a balance. In an analogous manner, an increased domestic interest rate, other factors remaining equal, would, within the monetary approach, depreciate the domestic currency because it would reduce domestic demand for money and increase domestic prices. In contrast, the traditional approaches would lead us to say that an increased domestic interest rate would, by attracting capital inflows, appreciate the domestic currency.

⁸ These are best represented by the standard Mundell-Fleming model.

In summary, while the monetary approach regards exchange rates as relative prices of currencies which are determined by stock equilibrium in the currency markets, the traditional approaches consider that an exchange rate is determined by the flow (as opposed to stock) currency markets.

3. METHODOLOGY

From the discussions in the previous Section, it is clear that the major building blocks of the monetary approach to exchange rates are the Purchasing Power Parity Theory (PPPT) and money market equilibrium conditions.

3.1. The Monetary Model

The major features of the monetary approach can be outlined as follows. First, we have the PPPT that says that domestic prices “P” must equal foreign prices “P*” multiplied by the exchange rate “e” –the domestic currency price of foreign currency:

$$(1) \quad P = eP^*$$

Then, if the domestic nominal money supply “M^s” and real money demand “M^d” respectively can be written as:

$$(2a) \quad M^s = M;$$

$$(2b) \quad M^d = L(y, r, k); \text{ and}$$

The foreign nominal money supply “M^{s*}” and real money demand “M^{d*}” respectively can be written as:

$$(3a) \quad M^{s*} = M^*;$$

$$(3b) \quad M^{d*} = L^*(y^*, r^*, k^*);$$

Where y = domestic real income; r = domestic interest rate; K = other domestic variables (e.g. real money balances in the previous period); L is the very-familiar demand function for real cash balances in the domestic economy; and the starred variables are the foreign counterparts of domestic ones,

Then, money market equilibrium in both domestic and foreign money markets implies:

$$(4a) \quad M/P = M^d$$

$$(4b) \quad M^*/P^* = M^{d*}$$

Equations (1), (4a&b) imply:

$$(5a) \quad e = [M/M^d] / [M^*/M^{d*}]$$

$$(5b) \quad e = [M/M^*] [L^*(y^*, r^*, k^*) / L(y, r, k)]$$

Suppose further, as is commonly assumed, that income elasticity 'a' and interest-rate elasticity 'b' of demand for money, respectively, are the same in both countries and the functional form is Cobb-Douglas, then:

$$(6a) \quad L(y, r, k) = Ky^a r^b; \text{ and}$$

$$(6b) \quad L^*(y^*, r^*, k^*) = K^* y^{*a} r^{*b}$$

Then equation (5b) becomes:

$$(7a) \quad e = [M/M^*] [K^* y^{*a} r^{*b} / Ky^a r^b]; \text{ or}$$

$$(7b) \quad e = [K^*/K] [M/M^*] [y^{*a}/y^a] [r^{*b}/r^b]$$

Taking the logarithm, we have:

$$(8) \quad \ln e = \ln [K^*/K] + \ln [M/M^*] - a \ln [y/y^*] - b \ln [r/r^*]$$

In existing studies, equation (8) is commonly employed to test the relevance of monetary approach to exchange rate determination (Hodrick, 1978; Putnam and Van Belle, 1978; among others). If this equation is rewritten as:

$$(8b) \quad \ln e = \ln [K^*/K] + a_1 \ln [M/M^*] + a_2 \ln [y/y^*] + a_3 \ln [r/r^*]$$

For the monetary approach to exchange rate determination to be true,

$$a_1 = 1; \text{ while } -a_2, a_3 > 0$$

In contrast, the predictions of traditional approaches are:

$$a_1 > 0; a_2 > 0; \text{ and } a_3 < 0.$$

Consequently, to test for the relevance of the monetary approach to exchange rate determination in Nigeria, all we need to do is to estimate equation (8b) using the Nigerian data. Thereafter, the estimates of a_1, a_2 and a_3 are evaluated to see if they are significantly different from their predicted values.

It is worth noting that while equation (8b) is commonly estimated to evaluate the relevance of the monetary approach to exchange rate determination, this carries with it the assumption that income elasticity and interest rate elasticity of the demand for real money, respectively, are the same in both countries. This assumption is normally imposed to minimise possible multicollinearity problems among explanatory variables.

A common variant of equation (8b) in the literature arises when the specified demand for money function is of the form (Edwards, 1983 and Lyons, 1992):

$$(8c) \quad L(y, r, k) = Ky^a \exp^{-br};$$

where exp is exponential.

(8c) with a similar demand for money function for the foreign country and the usual equilibrium conditions give us:

$$(9) \quad \ln e = \ln [K^*/K] + a_1 \ln [M/M^*] + a_2 \ln [y/y^*] + a_3 [r - r^*]$$

In equation (9), however, a_3 is the interest quasi-elasticity (or semi-elasticity) of money demand rather than the full interest elasticity of money demand that it stands for in equation (8b). As with equation (8b), for the monetary approach to exchange rate determination to be true,

$$a_1 = 1; \text{ while } -a_2, a_3 > 0$$

To the contrary, the predictions of traditional approaches are:

$$a_1 > 0; a_2 > 0; \text{ and } a_3 < 0.$$

A short-run variant of either equation (8b) or (9) incorporates a sticky-price version of PPPT which allows for the non-fulfillment of PPPT in the short run. In such a situation:

$$(10) \quad d_t = \ln[e_t P_t^*/P_t] = \ln e_t - \ln P_t + \ln P_t^* = a_6 d_{t-1}$$

Where d_t is the logarithm of deviation from purchasing power parity (PPP) at time t and a_6 is the coefficient of adjustment that removes any deviation from the PPP. The incorporation of equation (10) in equations (8b) and (9) respectively, gives:

$$(11) \quad \ln e_t = \ln [K^*/K] + a_1 \ln [M/M^*]_t + a_2 \ln [y/y^*]_t + a_3 \ln [r/r^*]_t + a_4 \ln [y/y^*]_{t-1} + a_5 \ln [r/r^*]_{t-1} + a_6 d_{t-1}$$

and

$$(12) \quad \ln e_t = \ln [K^*/K] + a_1 \ln [M/M^*]_t + a_2 \ln [y/y^*]_t + a_3 [r-r^*]_t + a_4 \ln [y/y^*]_{t-1} + a_5 [r-r^*]_{t-1} + a_6 d_{t-1}$$

Therefore, either equation (8b) or (9) and their respective short-run variants, equation (11) or (12), are commonly estimated in the literature to test the relevance of monetary approach to flexible rates (see Edwards, 1983 and Lyons, 1992).

For the outcome of this study to be said to provide evidence in favour of the monetary approach, the following conditions must be satisfied:

- (i) estimates of a_1 , a_2 and a_3 must be significantly different from zero and have a priori signs; and
- (ii) a_1 as a point estimate of the parameter must not as a number be too different from one.

3.2. Data Requirement, Sources and Measurement

From the above discussions, we need data on the following variables: P , P^* , y , M , e , y^* , M^* , r , and r^* . While these variables are easily mentioned,

they cannot be so easily measured. In particular, how does one measure e , r^* , M^* and y^* ? However, an examination of the structure and nature of the Nigerian external economic relations during the period under study reveals that over 91 per cent of total Nigerian imports is supplied by the OECD countries and over 95 per cent of total Nigerian exports is bought by the OECD countries (IMFd and Odedokun, 1997, p.471).

Hence, in this study, y^* is measured by the import-weighted index of national outputs of the OECD countries. Finally, the exchange rate (e) used in this study is the “effective” exchange rate defined as:

$$e = \{r_j/r_{j0} - [B_i(r_i - r_{i0})/r_{j0}]\} r_{j0}$$

where r_i = the domestic currency price of the US dollar in the i^{th} country (I for every OECD country);

B_i = Nigerian imports from the i^{th} country as a percentage of total imports from OECD countries;

r_{i0} = the 1985 domestic currency price of the U.S dollar in the i^{th} country;

r_j = the domestic currency price of the U.S. dollar in Nigeria; and

r_{j0} = the 1985 domestic currency price of the U.S dollar in Nigeria.

B_i , r_i , r_{i0} , r_{j0} , M_i , and y_i (index of national output of the OECD countries) are found in International Financial Statistics (IMFa), Supplement on Economic Indicators (IMFb), Supplement on Output (IMFc) and the Direction of International Trade (IMFd), published by the International Monetary Fund (IMF).

P , Y , and money supply ($M2$) for Nigeria are found in the Central Bank of Nigeria (CBN2), and the International Financial Statistics. Two sets of data were used, namely monthly and annual. Monthly data for output variables were interpolated from annual data by spreading the annual growth equally among the months of the respective years. The data used covers 1987-2001 (15 observations for the annual and 180 observations for the monthly data set).

3.3. Estimation Techniques

First, we examined the dependent variable and all the explanatory variables in the models for stationarity using Augmented Dickey-Fuller (ADF) test—the unit-root test—to determine their respective order of integration (see Engle and Granger, 1987 and Charemza, W. W. and D. F. Deadman, 1992 for details of this test procedure). Specifically, we subjected $\ln e_t$, $\ln [M/M^*]_t$, $\ln [y/y^*]_t$, $\ln [r/r^*]_t$, $[r-r^*]_t$ and d_{t-1} to unit-root test and found that only $\ln [y/y^*]_t$ was integrated of order zero –stationary; all others were integrated of order one. Therefore, we proceeded to test for co-integration between $\ln e_t$ and a linear combination of $\ln [M/M^*]_t$, $\ln [y/y^*]_t$, $\ln [r/r^*]_t$ (or $[r-r^*]_t$) and d_{t-1} using the same Engle and Granger's (1987) test framework. This test indicated that $\ln e_t$ and a linear combination of $\ln [M/M^*]_t$, $\ln [y/y^*]_t$, $\ln [r/r^*]_t$ (or $[r-r^*]_t$) and d_{t-1} were co-integrated. Consequently, the chances that our regression equations were spurious relationships were low.

The equations (8b), (9), (11) and (12) were either estimated with the Ordinary Least squares (OLS) techniques or Autoregressive order one Generalised Least Squares {AR(1) GLS} depending on which was found to be more appropriate. Specifically, the two alternative flexible-price models fitted on monthly data were estimated by {AR(1) GLS} while all other models fitted on either monthly or annual data were estimated by the OLS.

4. EMPIRICAL RESULTS AND IMPLICATIONS

The empirical results of the study are provided in the technical annex attached to the paper. Based on all the statistical properties of the estimates in Tables (1a)-(4b) and the correctness of their signs, our estimated models are an adequate representation of the Nigeria data, and valid inferences could be made from them.

Results in Table (1a) indicate that if domestic money supply exceeds foreign money supply by about one per cent, the exchange rate will depreciate by about 0.89 per cent. Similarly, if domestic income grows faster than foreign income by about one per cent, the exchange rate will appreciate by 4.5 per cent. In the same manner, a one per cent domestic-foreign interest rate differential will cause the exchange rate to depreciate by about 0.71 per cent. It is worth noting that all the estimates in Table (1a)

are statistically significant at the conventional five per cent confidence level. Estimates in Table (1b) have an analogous interpretation to those in Table (1a) and convey the same message that the monetary approach provides a fairly adequate explanation for the Nigerian exchange rate behaviours since 1987.

Tables (2a) and (2b) have similar interpretations to those of earlier tables. They suggest that the sticky price model, irrespective of the functional form, is not a better representation of the Nigerian annual data than the flexible price model. This is probable because one year is long enough to allow for the full adjustment of all relevant prices. But even then, the results in these tables suggest that a one-per cent increase in domestic over foreign money supply would result in about 0.96 per cent exchange rate depreciation.

Estimates from monthly data reported in Tables (3a), (3b), (4a) and (4b) confirm the implications derived from our earlier tables. The only difference here is that the sticky price model is a slightly better representation of the Nigerian monthly data than the flexible price model as the lagged values of income, interest rate and real exchange rate variables are significant explanatory variables at about 5 or 10 percent level of significance, the R^2 are slightly better and DW statistics are within the acceptable ranges so that employing the GLS technique was needless.

Overall, the results from this study suggest that the monetary approach to exchange rate analysis provides a fairly good explanation of the behaviour of the Nigerian floating rates between 1987 and 2001. With Nigerian money supply growth being continuously on the high side and its income growth records very poor, and with its high level of interest rate—ranging between about 25- 40 percent during the period under review against interest sometimes as low as 3 percent in the economies of its major trading partners—the monetary approach provides a good explanation of why its exchange rate continuously depreciated during the period under review.

5. CONCLUSION

This study examines both the Nigerian monthly and annual data between 1987 and 2001 to determine whether it provides any support for the monetary approach to explaining floating exchange rate behaviours. Fitting

some of the most commonly used models for testing the relevance of monetary approach to floating rates analysis on the Nigerian data, it found that those monetary approach models provided an adequate representation of the Nigerian data. This being the case, the study recommends that the monetary authorities in Nigeria pay adequate attention to domestic credit creation in any of their attempts to achieve an acceptable level for its exchange rate. They must also realise that significant economic growth as well low interest rates may cause exchange rate appreciation rather than depreciation.

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TECHNICAL ANNEX

This annex presents the results of the regression analysis.

Whenever {AR (1) GLS} is employed, the coefficient of autoregression (RHO) is supplied together with its t-value. The DW statistics reported is that associated with the finally estimated model after the data had been appropriately transformed. R^2 and F respectively are the conventional measures of goodness of fit and the F-statistics that tests for the joint significance of all estimates in the concerned equation.

Table 1a: Estimates of Flexible-Price Model with Full-Interest Elasticity from Annual Data

Variables	Coefficients	T – Values
Constant	-2.103	-2.924*
Ln $[M/ M^*]_t$	0.892	8.488*
Ln $[y /y^*]_t$	-4.501	-2.771*
Ln $[r/r^*]_t$	0.713	2.506*
Other Statistics: Adjusted $R^2 = 0.940$; DW = 1.830; F = 25.306.		
Notes: (1) * significant at 5%		

Table 1b: Estimates of Flexible-Price Model with Quasi-Interest Elasticity from Annual Data

Variables	Coefficients	T – Values
Constant	-1.969	-3.091*
Ln $[M/ M^*]_t$	0.902	8.765*
Ln $[y /y^*]_t$	-3.585	-2.678*
$[r-r^*]_t$	0.062	2.197*
Other Statistics: Adjusted $R^2 = 0.943$; DW = 1.666; F = 26.896		
Notes: (1) * significant at 5%		

Table 2a: Estimates of Sticky-Price Model with Full-Interest Elasticity from Annual Data

Variables	Coefficients	T – Values
Constant	-2.217	-3.078*
$\ln [M/ M^*]_t$	0.956	7.989*
$\ln [y/y^*]_t$	-4.656	-1.842**
$\ln [r/r^*]_t$	0.639	1.842**
$\ln [y/y^*]_{t-1}$	–	–
$\ln [r/r^*]_{t-1}$	–	–
D_{t-1}	0.237	1.088
Other Statistics: Adjusted $R^2 = 0.947$; DW = 1.977 ; F = 19.622		
Notes: (1) * significant at 5% (2) ** significant at 10% (3) – extremely insignificant and dropped for efficiency gain		

Table 2b: Estimates of Sticky-Price Model with Quasi-Interest Elasticity from Annual Data

Variables	Coefficients	T – Values
Constant	-2.217	-2.080*
$\ln [M/ M^*]_t$	0.960	8.181*
$\ln [y/y^*]_t$	-3.794	1.787**
$\ln [y/y^*]_{t-1}$	–	–
$[r-r^*]_t$	0.055	1.919**
$[r-r^*]_{t-1}$	–	–
d_{t-1}	0.224	1.024
Other Statistics: Adjusted $R^2 = 0.949$; DW = 2.069 ; F = 20.533		
Notes: (1) * significant at 5% (2) ** significant at 10% (3) – extremely insignificant and dropped for efficiency gain		

Table 3a: Estimates of Flexible-Price Model with Full-Interest Elasticity from Monthly Data

Variables	Coefficients	T – Values
Constant	-1.253	-8.021*
Ln [M/ M*] _t	0.899	10.563*
Ln [y /y*] _t	-4.105	-3.911*
Ln[r/r*] _t	0.698	2.057*
Other Statistics: Adjusted R ² = 0.974; DW = 1.756; F = 28.812; RHO = 0.654* (7.261)		
Notes: (1) * significant at 5%		

Table 3b: Estimates of Flexible-Price Model with Quasi-Interest Elasticity from Monthly Data

Variables	Coefficients	T – Values
Constant	-1.693	-7.320*
Ln [M/ M*] _t	0.922	11.645*
Ln [y /y*] _t	-3.895	3.896*
[r- r*] _t	0.084	2.644*
Other Statistics: Adjusted R ² = 0.985; DW = 1.689; F = 30.310; RHO = 0.745* (8.392)		
Notes: (1) * significant at 5%		

Table 4a: Estimates of Sticky-Price Model with Full-Interest Elasticity from Monthly Data

Variables	Coefficients	T – Values
Constant	-2.201	-6.433*
$\ln [M/ M^*]_t$	0.905	11.362*
$\ln [y/y^*]_t$	-4.001	3.756*
$\ln [r/r^*]_t$	0.576	2.941*
$\ln [y/y^*]_{t-1}$	-1.271	1.907**
$\ln [r/r^*]_{t-1}$	0.1002	1.879**
d_{t-1}	0.283	2.79*
Other Statistics: Adjusted $R^2 = 0.981$; DW = 2.031; F = 33.212		
Notes: (1) * significant at 5% (2) ** significant at 10%		

Table 4b: Estimates of Sticky-Price Model with Quasi-Interest Elasticity from Monthly Data

Variables	Coefficients	T – Values
Constant	-1.672	6.841*
$\ln [M/ M^*]_t$	0.915	12.104*
$\ln [y/y^*]_t$	-3.682	4.001*
$\ln [y/y^*]_{t-1}$	-1.183	1.895**
$[r-r^*]_t$	0.071	2.457*
$[r-r^*]_{t-1}$	0.018	1.989*
d_{t-1}	0.276	2.695*
Other Statistics: Adjusted $R^2 = 0.986$; DW = 1.958; F = 35.017		
Notes: (1) * significant at 5% (2) ** significant at 10%		