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THE CASE OF EXPANSIONARY MONETARY POLICY AND CAPITAL INFLOW: EVIDENCE FROM AN EMERGING AFRICAN COUNTRY

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In this paper, the case of expansionary monetary policy and capital inflow is investigated in the context of the Nigerian economy. The investigation reveals that increase in money supply contributed to the decline in total capital inflow to the economy, and in particular, the contribution was quite significant for foreign direct investment, as well as other financial inflows (excluding portfolio investment). The contribution in respect of other financial inflows superseded that of foreign direct investment. These findings, derived from a rigorous analysis based on vector auto-regression model, demonstrate that expansionary monetary policy was pursued over the years to the detriment of capital inflow and its potentials for economic growth, suggesting that efforts need to be intensified to attract more foreign capital, instead of undue emphasis on monetary expansion. This could be a better option to facilitate rapid economic growth of the country, and indeed all developing countries.

Keywords: Monetary Policy, Capital Inflow, Emerging Economy
JEL Classification: E51, F21, O55

1. INTRODUCTION

The case of expansionary monetary policy and capital inflow, which was first exposited by Kreinin and Officer (1978), simply posits that a mutual conflict exists between expansionary monetary policy and capital inflow. The case has continued to attract the attention of researchers especially in the developing countries, due perhaps to the fact that these countries have continued to rely heavily on both expansionary monetary policy and capital inflow to facilitate economic growth and development. Investigation of the case has so far yielded mixed results. Bini Smaghi (1982) carried out a study in Malaysia for the period 1978-1981 and found that expansionary monetary policy led to significant reduction in capital inflow, thus stifling potentials for growth in

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the country.

A further investigation in Venezuela (Kamas (1986)) produced similar result indicating a significant decline in capital flow to the country due to expansionary monetary policy. The study in Mexico (Cumby and Obstfeld (1983)), on the other hand, yielded insignificant decline in capital inflow arising from expansion in money supply. Insignificant declines in capital inflow were also reported in the investigations carried out in Colombia by Rennhack and Mondino (1988) for the period 1975-1985. More of the mixed results are reported in Boschen and Newman (1989), Dowla and Chowdhurry (1991), as well as Montiel (1994). The countries where such investigations were conducted include Mexico, Bolivia, Chile, Indonesia, Pakistan, India, Israel, Greece, Singapore, Korea, etc, which are predominantly in Asia and Latin America. Generally, the results from the various investigations fall into two broad categories. The first category reports that expansionary monetary policy caused significant decline in capital inflow, while the second category reports insignificant decline in capital inflow.

One striking observation from the foregoing survey of results is that African countries have not been adequately investigated to determine what impact expansionary monetary policy has exerted on capital inflow. This study therefore attempts to investigate the case and produce new evidence based on an emerging African country, Nigeria, to fill what appears to be some vacuum, and therefore make the investigation results in empirical literature more representative of developing countries. Before this is done, it is important to discuss the capital inflow controversy that would bring to light the relevance of capital inflow to developing countries and some factors that affect the inflow.

2. THE CAPITAL INFLOW CONTROVERSY

The issue of capital inflow has been a controversial one in development economics, as clearly indicated by two opposing hypotheses. The Modernization Hypothesis states that it promotes growth by providing external funds to fill the gap between planned domestic savings and investments. The hypothesis goes further to explain that capital inflow facilitates growth by introducing advanced technology, as well as better management and organization (Voivadas (1973), Rana and Dowling (1988), Tsai (1994)).

Several studies in developing countries have indeed found a positive impact of capital inflow on domestic investment and economic growth, with the impact being very strong for foreign direct investment and international bank loans, but weak for foreign portfolio investment (Bosworth and Collins (1999)). In a recent study (Mishra *et al.* (2001)), one percent increase in capital flow to Africa was found to boost domestic economic activities by more than one percent, which is considered reasonable in a continent that is relatively poor, with the level of savings too low to facilitate domestic investment and economic growth. Further evidence from studies conducted by Borensztein *et al.* (1998) indicates that foreign direct investment accelerated economic

growth especially in countries with skilled labour force. Similarly, in other developing countries, foreign portfolio investment has been associated with the development of capital markets, which in turn buoyed growth of the economy (Eichengreen (2001)). This was made possible by the fact that the domestic financial market in those countries exhibited resilience, otherwise the capital inflow would have increased the vulnerability of the economy to financial and exchange rate crises that could dissipate the benefits accruing from it. Such episodes have occurred in countries that liberalized their domestic financial sector at the same time that they were opening up their economies to foreign capital (Hausman and Fernandez-Arias (2000)).

A contrary view on the issue of capital inflow is held by the Dependency Hypothesis, which states that it has short-term positive effects, and a more significant negative long-term impact on economic growth. There is no doubt that increase in capital inflow stimulates investment and consumption, which in turn accelerate economic growth in the short-term, but as the flow increases, the host country would tend to depend on foreign investments and their poor linkages within the economy, to the detriment of indigenous investment. This situation has the potential for creating adverse effects on economic growth, especially when the tendency exists for capital flight to occur (Stoneman (1975), Bornschier (1980), O' Hearn (1990)). In line with this argument, Lopez-Mejia (1999) posits that capital inflow leads to expansion of aggregate demand and macroeconomic heating that are likely to be reflected in inflationary pressure, real exchange rate appreciation, widening current account deficit, and stagnation of the economy. This argument is underscored by the large capital flows to Asian countries in the 1990s that led to unprecedented financial crisis and decline in investment returns, causing considerable economic problem for those countries in that decade.

However, the literature on the role of capital inflow contains overwhelming evidence in support of the Modernization Hypothesis, especially in developing countries, which suggests that effort needs to be stepped up to increase the inflow in order to facilitate development. There is no doubt that developing countries have been largely dependent on capital inflow from advanced countries in the past decades to facilitate economic growth and development, although the inflow has been somewhat erratic. This is in consonance with the theoretical proposition that capital moves from surplus regions to deficit regions, and such flow is expected to boost socio-economic activities in the recipient countries (Summers (2000)), especially when the countries already have a skilled workforce and well-developed physical infrastructure (Lucas (1990)). It follows, therefore, that benefits from capital inflow would be maximized if the environment is conducive and favourable for investment (Mody and Srinivasan (1998)). This environmental factor has contributed immensely to the pattern of capital flow to developing countries especially in the last two decades.

The composition of capital flow to developing countries includes foreign direct investment (FDI), foreign portfolio investment (FPI), and other financial inflows (OFI) that are mostly international bank loans. In these countries, foreign direct investment takes a significantly large proportion, and it is again taken to have the most significant

impact on economic growth, because it is relatively illiquid and cannot flow out easily at the first sign of trouble. The other components constitute a lesser proportion, and possess high liquidity that enables them to flow out easily when environment becomes unfavourable. The impact of international bank loans on economic growth is also considered significant, but that of foreign portfolio investment is somewhat insignificant (Loungaui and Razin (2001)).

The level of capital flow to developing countries could generally be attributed to both external and domestic factors, but the overwhelming evidence is that domestic factors are more predominant. The strong argument here is that domestic policies in these countries are deficient in their content, and also suffer from frequent shifts that make the investment environment unpredictable (Mishra *et al.* (2001)). The International Monetary Fund (1993) and the World Bank (1997) argue further that these policies are mostly in form of restrictions on capital transactions that tend to dampen capital inflow and reduce the rate of economic growth. On the external side, it is argued that the capital flow to developing countries is greatly influenced by the phenomenon known as contagion, which is described as the herding behaviour of international investors who flee because other investors were fleeing from developing countries (Mussa *et al.* (1999)). This behaviour is considered a major cause of the reversals in capital flow to these countries. The herding behaviour, according to Obwona (2001), does not arise out of the ordinary, but depends on the degree of linkage among foreign investors in the host country. If they interact closely and are mutually dependent, the decision of a few to relocate for some extraneous reasons could spur others to follow, leading to capital flight.

More importantly, on the domestic scene, monetary policy is posited to be potentially influential in determining the level of capital flow to developing countries (Agenor and Montiel (1996)). However, economic analysts are divided in their views with respect to the degree of impact that monetary policy exerts on capital inflow. While some argue that the degree is quite significant, others maintain that it is not significant, and a consensus is not about to emerge any time soon on this issue. In the ensuing sections of this study, a further attempt is made to investigate the matter as it relates to African countries, using Nigeria as a case study. This is aimed at producing a more concrete and recent evidence on this controversial issue that appears so far not to have adequately taken the African position into consideration. Before this is done, it is necessary to first discuss capital inflows and money supply trend in Nigeria.

3. CAPITAL INFLOWS AND MONEY SUPPLY TREND IN NIGERIA

The trend in capital inflows to Nigeria in the period 1970-2003 is characterized by large oscillations that may be attributed to several factors such as unstable political system and inconsistent government policies. The various components of capital inflow exhibit similar trends as shown by their percentage contributions in Table 1. Thus in

1970, foreign direct investment (FDI) contributed as much as 82.4 percent, which fluctuated to an all time high of 89.6 percent in 1975, and thereafter recorded an all time low of 8.9 percent in 1988. However, in subsequent years, the contribution improved, particularly in 1997-2003, when it remained above 75 percent and fluctuations considerably narrowed. The foreign portfolio investment (FPI) component of capital inflow made insignificant contribution of 4.7 percent in 1970, due perhaps to lack of confidence in the Nigerian financial markets. The contribution remained below 10 percent for the entire period except for 1986 that recorded 21.7 percent, as well as 1984 and 1987 having 13.3 percent and 15.6 percent, respectively. The lowest contribution of 0.9 percent occurred in 1993. The other financial inflows (OFI) component, which includes loans, aids, grants, etc, together accounted for 12.9 percent of the total inflow in 1970, and jumped to 66.4 percent in 1978, and subsequently reached a peak of 89.5 percent in 1988. Thereafter, it oscillated and dropped to 15.5 percent in 2003.

The annual changes in total capital inflow over the entire period are quite instructive. Between 1970 and 1980, it fluctuated and had a minimum value of 1.4 percent in 1973, as well as maximum of 38.5 percent in 1978. The period 1981-1990 witnessed negative changes, with the worst rate of change of -49.4 percent occurring in 1990. It declined further in the period 1991-2000 reaching an all time low of -93.7 percent in 1997. Although the rate of change remained positive after 2000, the trend is generally indicative of a substantial fall in the level of capital inflow to Nigeria in the period 1970-2003. The annual changes in money supply on the other hand were generally positive, with a minimum of 3.1 percent in 1970 and a maximum of 67.7 percent in 1975. Except for the first two years, the annual rate of change over the entire period was generally above 10 percent, indicating a substantial expansion in money supply during the period.

Table 1. Capital Inflows and Money Supply Trend in Nigeria, 1970-2003

Year	FDI (% of total capital inflow)	FPI (% of total capital inflow)	OFI (% of total capital inflow)	Change in total capital inflow (%)	Change in broad money supply (%)
1970	82.4	4.7	12.9	14.3	3.1
1971	83.3	5.4	11.3	12.8	3.4
1972	85.0	2.8	12.2	9.2	11.3
1973	85.4	3.1	11.5	1.4	18.1
1974	84.8	2.1	13.1	1.9	42.5
1975	89.6	1.2	9.2	7.6	67.7
1976	87.5	2.2	10.3	4.3	20.2
1977	84.8	5.1	10.1	8.1	33.6
1978	29.3	4.3	66.4	38.5	15.6
1979	22.9	3.1	74.0	28.1	28.9

1980	49.8	2.6	47.6	9.5	46.1
1981	36.7	3.8	59.5	-5.4	28.9
1982	24.6	4.5	70.9	18.8	17.6
1983	19.5	5.5	75.0	6.6	19.5
1984	15.6	13.3	71.1	-3.5	21.2
1985	21.9	9.2	68.9	32.2	15.7
1986	13.7	21.7	64.6	-37.6	11.3
1987	17.3	15.6	67.1	25.4	32.5
1988	8.9	1.6	89.5	20.3	42.6
1989	38.6	4.5	56.9	14.9	23.4
1990	23.8	8.0	68.2	-49.4	40.4
1991	45.4	3.8	50.8	-36.5	32.7
1992	15.3	3.4	81.3	28.9	49.2
1993	56.2	0.9	42.9	-57.2	46.8
1994	85.1	1.1	13.8	-3.6	39.1
1995	31.6	2.5	65.9	28.1	25.0
1996	52.7	5.7	41.6	11.4	16.3
1997	80.9	4.0	15.1	-93.7	18.2
1998	75.3	4.4	20.3	14.3	27.2
1999	77.6	4.3	18.1	16.8	31.4
2000	78.2	4.1	17.7	20.7	48.1
2001	79.1	3.9	17.0	9.6	28.1
2002	76.3	7.4	16.3	10.8	15.9
2003	77.8	6.7	15.5	11.7	21.3
Period average	54.0	5.2	40.8	3.6	27.7

Source: Central Bank of Nigeria Economic and Financial Indicators (2002), and Author's calculations from International Financial Statistics Yearbook (IMF (2004))

A close observation of the table also reveals that FDI recorded a period average of 54 percent, followed by OFI with 40.8 percent, and FPI with 5.2 percent. It shows that the contribution of FDI alone is overwhelming and supersedes that of FPI and OFI put together, which implies that the Nigerian economy mostly used FDI to augment domestic investment. However, the changes in total capital inflow for the period, which stands at an average of 3.6 percent as against the average of 27.7 percent for money supply, clearly reflects a scenario of dwindling capital inflow and rapidly increasing money supply. What is not yet clear is whether this expansion in money supply contributed to the poor performance of capital inflow during the period. This issue would be given further consideration in subsequent parts of this paper.

4. EMPIRICAL METHODOLOGY AND MODEL SPECIFICATION

4.1. Methodology

One problem with earlier investigations of the case of expansionary monetary policy and capital inflow is that most of them did not assess the data used in estimation. When dealing with time series data, it is important to investigate whether the series are stationary or not, because the regression of non-stationary series on another may yield spurious results. According to Engle and Granger (1987), the parameter estimates from such regression may be biased and inconsistent. The standard approach for testing stationarity of time series data is the unit root test. The most commonly used is the Augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1981), which is also employed in this study. A concurrent test to determine the long-run relationship between the variables in the model is conducted by employing the Johansen cointegration test (Johansen (1991)). This is important because variables that do not converge in the long-run may be hazardous to policy making.

Another problem with most of the previous investigations is that they did not completely account for the feedback effect among variables. In order to address this problem, vector auto-regression (VAR) is used in this study. In a VAR, each variable is regressed on its own lag and the lags of other variables in the model. In this way, the procedure allows each variable to be affected by its own history and the history of each other variable, thus minimizing the problem of simultaneity (Kretzmer (1992)).

The VAR contains several procedures for evaluating relationships. Two of the procedures are adopted in this study, namely; causality test and forecast error variance decomposition (FEVD). The causality test is used to determine whether the impact of monetary policy on capital inflow is statistically significant. While the causality test indicates this, it may not show the relative size of the impact. The FEVD is, therefore, used to determine the relative magnitude of such impact. More specifically, it would indicate the percentage decline in capital inflow that may be attributed to increase in money supply. Such estimates are mostly useful for analyzing impacts in a multivariate system, as clearly demonstrated by Sims (1989) and Todd (1990). The study covers the period 1970-2003 (34 years), which has sufficient degree of freedom to capture the actual relationship between monetary policy and capital inflow over time.

Attempt is made in this study to investigate the relationship between each of the three components of capital inflow and monetary policy, by specifying and estimating three models.

4.2. Model Specification

According to Sims and Todd, if there is true simultaneity among a set of variables, they should all be treated on equal footing, and there should not be a priori distinction between endogenous and exogenous variables. It is in this spirit that they developed the

VAR model, based on Granger causality test. The VAR model for this study posits that monetary policy, capital inflow, and other macroeconomic variables are simultaneously inter-related. In order to make the model more compact and tidy, other macroeconomic variables, aside from money supply (monetary policy) and capital inflow, are represented by gross domestic product (GDP). The reason for using GDP to represent the variables is that it mirrors their collective behaviour and transmits it through the accelerator effect (Mlambo and Oshikoya (1999)).

Model 1

The VAR model depicting the relationship between foreign direct investment (FDI) and other variables, including monetary policy, may be specified as follows:

$$FDI_t = \alpha_{1t} + \sum_{j=1}^{k} \beta_{1j} FDI_{t-j} + \sum_{j=1}^{k} \lambda_{1j} MS_{t-j} + \sum_{j=1}^{k} \theta_{1j} NI_{t-j} + u_{1t}, \quad (1)$$

$$MS_t = \alpha_{2t} + \sum_{j=1}^{k} \beta_{2j} FDI_{t-j} + \sum_{j=1}^{k} \lambda_{2j} MS_{t-j} + \sum_{j=1}^{k} \theta_{2j} NI_{t-j} + u_{2t}, \quad (2)$$

$$NI_t = \alpha_{3t} + \sum_{j=1}^{k} \beta_{3j} FDI_{t-j} + \sum_{j=1}^{k} \lambda_{3j} MS_{t-j} + \sum_{j=1}^{k} \theta_{3j} NI_{t-j} + u_{3t}, \quad (3)$$

where FDI_t = log-changes in foreign direct investment over time, MS_t = log-changes in money supply over time (Monetary policy), NI_t = log-changes in real income over time (GDP at constant factor cost), FDI_{t-j} = lagged values of log-changes in foreign direct investment (j = 1, 2, 3), MS_{t-j} = lagged values of log-changes in money supply (j= 1, 2, 3), NI_{t-j} = lagged values of log-changes in real income (j = 1, 2, 3), k= total number of lags, α_{it} = autonomous term (intercept), β_{it} = coefficient of foreign direct investment, λ_{it} = coefficient of money supply, θ_{it} = coefficient of real income, u_{it} = stochastic error term (Gaussian white noise).

Model 2

The VAR model depicting the relationship between foreign portfolio investment (FPI) and other variables, including monetary policy, may be specified as follows:

$$FPI_t = \alpha_{4t} + \sum_{j=1}^{k} \beta_{4j} FPI_{t-j} + \sum_{j=1}^{k} \lambda_{4j} MS_{t-j} + \sum_{j=1}^{k} \theta_{4j} NI_{t-j} + u_{4t} , \quad (4)$$

$$MS_t = \alpha_{5t} + \sum_{j=1}^{k} \beta_{5j} FPI_{t-j} + \sum_{j=1}^{k} \lambda_{5j} MS_{t-j} + \sum_{j=1}^{k} \theta_{5j} NI_{t-j} + u_{5t} , \quad (5)$$

$$NI_t = \alpha_{6t} + \sum_{j=1}^{k} \beta_{6j} FPI_{t-j} + \sum_{j=1}^{k} \lambda_{6j} MS_{t-j} + \sum_{j=1}^{k} \theta_{6j} NI_{t-j} + u_{6t} , \quad (6)$$

where FPI_t = foreign portfolio investment over time, FPI_{t-i} = lagged foreign portfolio investment, and β_{ij} = coefficient of foreign portfolio investment, while other parameters are as stated in Model 1.

Model 3

The VAR model depicting the relationship between other financial inflows (OFI) and other variables, including monetary policy, may be specified as follows:

$$OFI_t = \alpha_{7t} + \sum_{j=1}^{k} \beta_{7j} OFI_{t-j} + \sum_{j=1}^{k} \lambda_{7j} MS_{t-j} + \sum_{j=1}^{k} \theta_{7j} NI_{t-j} + u_{7t} , \quad (7)$$

$$MS_t = \alpha_{8t} + \sum_{j=1}^{k} \beta_{8j} OFI_{t-j} + \sum_{j=1}^{k} \lambda_{8j} MS_{t-j} + \sum_{j=1}^{k} \theta_{8j} NI_{t-j} + u_{8t} , \quad (8)$$

$$NI_t = \alpha_{9t} + \sum_{j=1}^{k} \beta_{9j} OFI_{t-j} + \sum_{j=1}^{k} \lambda_{9j} MS_{t-j} + \sum_{j=1}^{k} \theta_{9j} NI_{t-j} + u_{9t} , \quad (9)$$

where OFI_t = other financial inflows over time, OFI_{t-j} = lagged value of other financial inflows, and β_{ij} = coefficient of other financial inflows, while other parameters are as stated in Models 1 and 2.

Each of the three models has a three-lag structure (k=3) and would be estimated for two periods. The first estimation covers the sub-period 1970-1994 (sample 1), while the second estimation covers the entire period 1970-2003 (sample 2). This is to verify consistency of estimation results. The money supply used in estimation is broad money (M2), because it is a more comprehensive measure of money supply than narrow money (M1). The results of the tests and estimations carried out on the models constitute the

subject of discussion in the section that follows.

5. PRESENTATION AND ANALYSIS OF EMPIRICAL RESULTS

5.1. Unit Root and Cointegration Tests

In order to avoid producing spurious regression results that would make estimates bias and inconsistent, the time series data for all variables in the model were tested for the period 1970-2003, to ensure that they are all stationary, yielding the results reported in Table 2.

Table 2. ADF Unit Root Test Results

Variable	Unit root coefficient	t-statistic	Normalized bias statistic	Serial correlation statistic	
				G(1)	G(2)
FDI	0.33	2.01	3.66	0.03	0.02
FPI	0.48	1.99	4.91	0.02	0.04
OFI	0.37	2.23	5.65	0.01	0.03
MS	0.46	1.78	4.86	0.02	0.05
NI	0.59	2.06	6.72	0.03	0.03
ΔFDI	0.51	4.01*	16.33*	0.02	0.04
ΔFPI	0.66	3.96*	17.08*	0.01	0.05
ΔOFI	0.47	5.14*	19.21*	0.03	0.03
ΔMS	0.62	4.31*	17.84*	0.02	0.02
ΔNI	0.71	5.09*	19.62*	0.04	0.06

*Significant at the 5 percent level.

Notes: [1] Variables are indicated in levels and first differences. [2] Results are reported in absolute values. [3] G(1) and G(2) are Godfrey statistics that test for first and second order serial correlation in residuals.

The results of unit root test in the table show that all the variables are non-stationary in levels, because their corresponding t-statistics and normalized bias statistics indicate that the unit root coefficients are insignificant at the critical 5 percent level. However, they are shown to be stationary in their first differences, as the coefficients are indicated to be significant at the 5 percent level. The Godfrey statistics report that serial correlation in residuals is insignificant, which makes the estimates highly dependable. Since the variables have been found to be stationary in their first differences, the results from estimation of the model are unlikely to be bias and inconsistent.

The relationship between macroeconomic variables in the long-run is very important for the purpose of policy-making. If variables have a causal relationship that allows them to move in perfect harmony in the long-run, policy making and implementation

become less worrisome. In the light of this, a cointegration test was conducted to determine if this type of relationship exists among the variables under consideration in this study, and the results produced are shown in Table 3.

Table 3. Johansen Cointegration Test Results

Model	No. of co-integrating relations (r)	Trace-value	Eigen-value (λ-max)
1	$r \leq 0$	23.4*	18.6*
	$r \leq 1$	20.7*	19.4*
	$r \leq 2$	17.5*	21.3*
	$r \leq 3$	4.9	5.1
2	$r \leq 0$	18.9*	31.3*
	$r \leq 1$	21.6*	24.1*
	$r \leq 2$	6.1	4.3
	$r \leq 3$	26.7*	18.2*
3	$r \leq 0$	22.4*	29.2*
	$r \leq 1$	33.1*	17.3*
	$r \leq 2$	18.6*	14.8*
	$r \leq 3$	4.5	5.8

* Rejected at the 10 percent level.

The table reports the test statistics for determining the co-integrating relations in each of the three models. For Model 1, the results indicate that the null hypothesis of no cointegration among the variables ($r \leq 0$) is rejected at the 10 percent level. Similarly, the hypotheses of one co-integrating relation ($r \leq 1$) and two co-integrating relations ($r \leq 2$) are rejected at the 10 percent level. However, the hypothesis of three co-integrating relations ($r \leq 3$) could not be rejected at the 10 percent level. Similarly, the hypothesis of three co-integrating relations ($r \leq 3$) could not be rejected in Model 3. In the case of Model 2, the hypothesis of two co-integrating relations ($r \leq 2$) could not be rejected. It follows that the variables in each model possess high probability of converging in the long-run, which augurs well for policy making.

The two tests conducted so far have produced results to show that the variables under study possess desirable empirical characteristics that qualify them to be included in a vector auto-regression (VAR) causality test of the models.

5.2. Causality Test (Vector Auto-Regression)

Causality tests are generally sensitive to lag structure. In order to minimize this sensitivity problem, multiple lag lengths are usually adopted in such tests involving vector auto-regression (VAR). For the purpose of this study, multiple lag lengths of 1-3

periods are employed, and the results of the test are presented in Table 4.

For Model 1, the table reports the F-statistics of causality in the two samples. In the first sample, causality MS→FDI is significant in all the lag specifications, indicating that money supply (MS) caused appreciable decline in foreign direct investment (FDI). This impact is significant at the 1 percent level for the one-period and two-period lags, and also significant at the 5 percent level for the three-period lag. On the other hand, the causality NI→FDI indicates that the impact of income on foreign direct investment is significant at the 5 percent level for the two-period and three-period lags only. It is thus obvious that money supply has a relatively stronger impact on foreign direct investment. Although causality FDI→NI and causality MS→NI are also significant at the 5 percent level for the two-period and three-period lags, they are not as strong as causality MS→FDI. The variations that occurred in the F-statistics across the three lag specifications are indications that the test was somewhat sensitive to lag structure.

Table 4. VAR Causality Test Results (F-Statistics)

Model	Direction of Causality	Sample 1			Sample 2		
		1	2	3	1	2	3
1	MS→FDI	5.13*	4.66*	2.55**	4.15*	2.53**	2.36**
	FDI→MS	0.74	1.21	1.17	0.61	1.03	1.20
	NI→FDI	1.01	2.97**	2.33**	0.87	2.92**	2.66**
	FDI→NI	1.03	2.90**	2.79**	1.51	0.83	2.41**
	MS→NI	0.55	2.48**	2.53**	0.72	2.70**	2.77**
	NI→MS	1.02	1.16	1.04	1.14	1.11	0.81
2	MS→FPI	1.31	1.03	1.73	0.34	1.29	0.99
	FPI→MS	1.22	1.33	0.32	1.38	0.98	0.62
	NI→FPI	1.43	1.52	0.50	1.26	0.17	1.20
	FPI→NI	0.61	0.97	1.60	0.73	1.66	1.38
	MS→ NI	1.25	2.47**	2.25**	1.26	2.44**	2.75**
	NI→MS	1.27	2.98**	2.70**	0.81	2.11**	2.64**
3	MS→OFI	3.10*	5.22*	4.55*	3.60*	6.07*	4.90*
	OFI→MS	1.33	1.20	1.22	0.71	1.34	1.02
	NI→OFI	0.92	2.53**	2.38**	1.26	2.79**	2.61**
	OFI→NI	1.08	2.22**	2.18**	1.37	2.05**	2.40**
	MS→NI	0.89	2.16**	2.97**	1.19	2.74**	2.44**
	NI→MS	0.75	2.36**	2.01**	0.81	2.33**	2.09**

* F-statistic significant at the 1 percent level.

** F-statistic significant at the 5 percent level.

Note: Lag lengths are indicated in each sample as 1, 2, 3.

In sample 2, slight changes occurred in the F-statistics, which did not alter the major findings in sample 1.This clearly indicates that the estimation results are to a large extent consistent. The causality MS→FDI indicates that the impact of money supply on foreign direct investment is significant at the 1 percent level for the one-period lag, and also significant at the 5 percent level for the two-period and three-period lags. This impact predominates that of the NI → FDI, which is only significant at the 5 percent level for the two-period and three-period lags. The performance of causality FDI→NI declined to such extent that it now becomes significant at the 5 percent level just for the three-period lag only, while the performance of MS→NI remains same as in sample 1. It is thus obvious that the causality MS→FDI supersedes all others in the model, which goes to confirm that the impact of expansionary monetary policy on foreign direct investment in Nigeria is somewhat significant.

In the case of Model 2, only causality MS→NI and causality NI→MS are significant at the 5 percent level for the two-period and three-period lags in both samples. It is important to note that causality MS→FPI failed the significance test for all the lags in both samples, which implies that monetary policy did not exert significant impact on foreign portfolio investment. Although the results are somewhat sensitive to lag specification, they appear quite consistent in both samples.

The results for Model 3 indicate that only causality OFI→MS is not significant for all the lags in both samples. In particular, causality MS→OFI is highly significant at the 1 percent level for all the lags, while the others are significant at 5 percent level in two out of the three lags. This clearly indicates that the impact of monetary policy on other financial inflows is tremendous. The analysis that follows determines the degree of this impact alongside the impact on the other components of capital inflow.

5.3. Forecast Error Variance Decomposition (Vector Auto-Regression)

In the preceding analysis, it has been established that expansionary monetary policy made some impact on capital inflow to Nigeria, and in particular, the impact was quite significant for foreign direct investment and other financial inflows. The magnitude of that impact can be ascertained from the forecast error variance decomposition (FEVD) estimates obtained from the vector auto-regression. These estimates, which are reported in table 5, indicate among others, the relative contribution of increase in money supply to the observed decline in capital inflow to the country that was analyzed in Table 1.

In Table 5, estimates in the MS columns for Model 1 indicate the relative contribution of money supply to the decline in foreign direct investment for all the lag specifications. The largest contribution of 63.41 percent is associated with the three-lag specification in sample 2, while the smallest contribution of 56.77 percent occurred in the one-lag specification in sample 1. Thus, money supply can generally be considered to have contributed 56.77-63.41 percent to the decline in foreign direct investment during the period. This contribution is quite significant and overwhelming when compared with the estimates in NI columns showing the contribution of income to the decline in foreign direct investment. The estimates indicate that income contributed a minimum of 34.46 percent occurring in sample 2 and a maximum of 41.21 percent in sample 1, thus contributing 34.46-41.21 percent to the decline in foreign direct investment. The FDI column simply indicates the contribution that can be attributed to foreign direct investment interacting with itself, which is put at 2.02-2.57 percent. The SE columns show that standard errors of the variance are not significant, thus making the estimates reliable.

In Model 2, the estimates are remarkably different. The contribution of money supply to changes in foreign portfolio investment falls within the range of 15.31-19.43 percent, the minimum occurring in the one-lag specification of sample 1, and the maximum associated with the three-lag specification in sample 2. This contribution is significantly lower than that of income, which falls within the 77.55-82.62 percent range. This shows that the impact of monetary policy on this component of capital inflow is somewhat insignificant. The contribution from the self-interaction of foreign portfolio investment is quite small and falls within the 1.01-3.43 percent range. The standard errors of the variance remain insignificant.

In Model 3, the estimates show the relative contribution of money supply to changes in other financial inflows in the range of 67.02-83.03 percent, the minimum occurring again in the one-lag specification of sample 1, while the maximum corresponds to the three-lag specification in sample 2. This contribution is quite outstanding and supersedes that of income, which falls within the 15.09-34.25 percent range. The contribution from the self-interaction of other financial inflows is 1.87-3.08 percent, which is quite similar to the self-interactions of foreign direct investment and foreign portfolio investment. The standard errors of the variance are also insignificant.

From the foregoing analysis, it is obvious that monetary policy had the greatest impact on other financial inflows (OFI), by contributing 67.02-83.03 percent to the decline. It also made significant impact on foreign direct investment (FDI) by contributing 57.77-63.41 percent to its decline, which is clearly less than the former. Although monetary policy had some impact on foreign portfolio investment (FPI) by contributing 15.31-19.43 percent to its decline, it was however not significant. The remarkable contribution of money supply to the decline in capital inflow therefore suggests that rapid increase in money supply needs to be controlled by de-emphasizing expansionary monetary policy, while more efforts should be geared toward attracting foreign capital with its high potentials to facilitate economic growth and development of the country.

6. CONCLUSION

The case of expansionary monetary policy and capital inflow has been of particular interest to economic researchers in the developing world, and has undergone investigation in some countries yielding mixed results that seem to make a consensus position on the issue most unlikely in the foreseeable future. It is also observed that the investigations were mainly carried out in Asian and Latin American countries, while African countries have not been adequately investigated. Again, one common problem that cuts across those studies is that most of them did not test the time series data used in estimation, and also used estimation methods that ignored the effects of simultaneous relationships among variables in a model. The underlying study of this paper attempted to surmount these problems by investigating an emerging African country, Nigeria. Furthermore, it applied unit root and cointegration tests in the first instance to assess the data series used, and finally conducted causality test and forecast error variance decomposition on VAR models of capital inflow, to take care of the simultaneity problem, all aimed at producing new and reliable evidence on the relationship between monetary policy and various components of capital inflow.

The estimation results showed that monetary policy exerted considerable degree of impact on aggregate capital inflow to Nigeria during the period 1970-2003, because increase in money supply contributed 67.02-83.03 percent to the net decline in other financial inflows (OFI), 56.77-63.41 percent to the decline in foreign direct investment (FDI), and 15.31-19.43 percent to the decline in foreign portfolio investment (FPI). These findings imply that rapid increase in money supply needs to be curtailed by de-emphasizing expansionary monetary policy, while more efforts should be made to enhance capital inflows to the country. Indeed, all developing countries need to control expansion in money supply and attract more foreign capital with its high potentials for rapid economic growth and development.

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Table 5. VAR Forecast Error Variance Decomposition (in percentage)

Model	Dependent Variable	Lag	Sample 1						Sample 2					
			MS	NI	FDI	FPI	OFI	SE	MS	NI	FDI	FPI	OFI	SE
1	FDI	1	56.77	41.21	2.02	-	-	1.13	58.12	39.52	2.36	-	-	1.01
	FDI	2	59.33	38.10	2.57	-	-	2.02	60.46	37.50	2.03	-	-	2.09
	FDI	3	62.57	35.22	2.21	-	-	1.91	63.41	34.46	2.13	-	-	1.86
2	FPI	1	15.31	82.62	-	2.04	-	1.30	17.42	79.61	-	2.95	-	1.96
	FPI	2	16.67	80.93	-	2.40	-	2.05	18.51	78.06	-	3.43	-	2.05
	FPI	3	18.02	81.02	-	1.01	-	1.98	19.43	77.55	-	3.02	-	2.14
3	OFI	1	67.02	31.02	-	-	2.03	1.02	72.84	24.52	-	-	2.72	1.54
	OFI	2	73.66	32.19	-	-	2.34	2.16	76.02	22.01	-	-	1.98	2.13
	OFI	3	82.36	34.25	-	-	3.08	2.36	83.04	15.09	-	-	1.87	2.36

Note: SE = Standard error of variance (in percentage)