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EXCHANGE RATE VARIABILITY, CURRENCY SUBSTITUTION AND MONETARY POLICY IN NIGERIA (1986 - 2001)

2006

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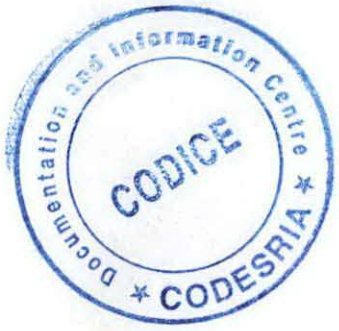

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Being

A RESEARCH THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS, FACULTY OF SOCIAL SCIENCES, OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA IN PARTIAL FULFILLMENT OF THE CONDITIONS FOR THE AWARD OF THE DEGREE **OF DOCTOR OF PHILOSOPHY (Ph.D) IN ECONOMICS**.

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DEDICATION

This thesis is dedicated to GOD ALMIGHTY Who made it possible for me to attain this educational status in Life and also to my wife, Morenike and my loving children, Damilare, Damilola and Damola for their unflinching and unalloyed support throughout the preparation of this thesis.

CERTIFICATION

This is to certify that this research project was conducted under my supervision by D.O Yinusa and is being approved for the Department of Economics, Obafemi Awolowo University, Ile-Ife, Nigeria.

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Date

Prof. A. E. Akinlo
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Date

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ABSTRACT

This study examined the linkage between exchange rate variability and currency Substitution in Nigeria. Specifically, the study tested for the existence of currency substitution and attempted to gauge its magnitude in Nigeria. Also, causality between currency substitution and exchange rate volatility in Nigeria was investigated. Subsequently, the study analyzed the implications of currency substitution and exchange rate volatility for monetary policy in Nigeria.

The study covered a period of 17 years –1986(1)-2001(4). Quarterly time series data collected from the International Financial Statistics published by the International Monetary Fund (IMF) and Central Bank's Statistical Bulletin were used for the analysis. The time series properties of the variables were determined using the Augumented Dickey Fuller (ADF) test and the Phillip-Perron Z-test. The study adopted the unrestricted portfolio balance model of currency substitution, incorporating exchange rate volatility within the framework of the Vector Autoregression (VAR) technique. This was complemented with Autoregressive Conditional Heteroscedasticity (ARCH) model to determine the volatility or otherwise of exchange rate in Nigeria.

The ARCH and Component ARCH model indicated that the sum of the ARCH and GARCH Coefficients was 0.938711 for nominal parallel exchange rate, and 1.0049774 for real parallel exchange rates. These suggested that volatility shocks were quite persistent in both the nominal and real parallel market exchange rates in Nigeria against the U.S. Dollar. The estimate of the persistence of nominal parallel market exchange rate in the long run component was 0.83, indicating that the long run exchange rate volatility component converged very slowly to the steady state. The short-run exchange rate volatility was 0.641034. Also, official exchange rate was volatile in the short run especially in the early stage of liberalization but relatively stable as from 1992.

Also, our econometric exercises revealed the presence of currency substitution in Nigeria. Major factors driving this process were domestic inflation, expected change in the Nigerian Naira/US Dollar exchange rate and real parallel market exchange rate volatility. The coefficient of current level of GDP in the models showed that currency substitution was for store-of- value purposes in Nigeria. Measured in terms of stock, the average currency substitution index for Nigeria was 5.5 percent, indicating that Nigeria could be classified as moderately dollarized economy. The empirical results of Granger causality test support a bi-directional relationship. However, causality from currency substitution to exchange rate volatility appears stronger and dominates Results from both impulse response and the forecast error variance decomposition functions suggest that exchange rate volatility and currency substitution responds to monetary policy with some lags. Hence, a one-time standard deviation shock to monetary policy variable would tend to dampen exchange rate volatility and currency substitution in the medium horizon but might not be effective in the short horizon.

The study concludes that currency substitution was not an instant reaction to the slightest policy mistake rather; it was fallout from prolonged period of macroeconomic instability. The major sources of this instability in Nigeria were untamed fiscal deficits leading to high domestic inflation, real parallel market exchange rate volatility, speculative business activities of market agents in the foreign exchange rate market and poor/inconsistent or uncertainty in public policies. In terms of policy choice, our result favours exchange rate based monetary policy as against interest based monetary policy for stabilization in dollarized economies.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

One of the most significant and notable development of recent years has been the move towards liberalization of exchange rate policy and exchange rate arrangements in many African countries especially Nigeria. This has led to the removal of many foreign exchange restrictions as part of the comprehensive structural adjustment programme implemented in most of these economies. Indeed, the need for structural adjustment and subsequent liberalization exercise implemented in Nigeria was motivated by so many bottlenecks that characterized the economy since independence. For example, before the 1960s, the Nigerian economy was basically agrarian. It depends largely on agricultural products for its foreign exchange earnings. To promote domestic price stability, steady foreign exchange earnings for the government, and also to insulate domestic producers of these products from the risks inherent in world market price instability, a regulated marketing arrangement was adopted. With the discovery of crude petroleum in commercial quantities in the 1970s, Nigeria witnessed an unprecedented improvement in the Balance of payments (BOP). This led to the neglect of the agricultural sector and an increase in demand for imported goods by individual and government, firms also relied heavily on imported inputs for their production. There was rural urban migration of people especially during this period, thereby resulting in over crowding in cities and loss of labour in the rural areas. This over-dependence on crude petroleum export earnings made the economy more vulnerable to the uncertainties and vagaries in the world economy. Therefore, it could be said that the structure of Nigerian economy in the 1970s were dictated largely by the growing importance of crude petroleum, the expanding role

of the public sector in the economy and an unsustainable dependence on the external sector (Yinusa, Akinlo and Ikhide, 1999).

Following the large increase in foreign exchange earnings from oil, which was largely monetised, the public sector involvement in direct economic activities escalated. Fiscal deficits especially after 1978 soared, and because of the increasing over–dependence on external sector, external equilibrium which was quite visible early in the period had virtually disappeared by the end of the decade. Inflationary pressures mounted while monetary management began to experience serious difficulties. Although, the industrial performance appeared to be relatively satisfactory, the dominance of the oil sector in this performance was rather disturbing, while the over-dependence of manufacturing production on imported raw materials made its achieved performance rather unsustainable. Also, the dominance of the public sector in economic activities was promoted by the strategy to utilize the large public resources to expand infrastructural facilities and build up the country's industrial base. The increasing role of public expenditure in determining the course of economic development was boosted by the rapid growth rate of government owned institutions, especially financial. Under government pressure, banks did lend to state enterprises and priority sectors at below–market interest rates. Also, to ensure the success of the import substitution strategy of the government, the financial system was repressed and regulated, trade and payments regimes were restrictive and characterized by such elements as import licensing requirements, quotas, high tariffs and other charges, on the trade side.

In the case of the payments regime, there was 100 per cent surrender of foreign exchange earnings by exporters to the government at the official rates that are far lower than what prevails in the parallel markets, which has existed in the economy as a response to all restrictions imposed to foreign exchange transactions in Nigeria.

Moreover, the balance of payments position in the 1970's presented a picture of large surpluses in the early part of the period followed by reduced surpluses and the emergence of deficits from the middle part of the period. These trends were determined by developments in the oil sector as well as changes in government policies. This was reflected in the increased share of the oil sector in the export trade from under 60 percent in 1970 to over 90 percent starting from 1973, while non-oil exports declined proportionately from 30 percent of aggregate exports in 1970 to less than 10 percent at the end of the decade. However, it should be observed that an important factor in this development was the ban imposed by government during the second half of the period (1970-1980) on the exports of non-oil commodities in order to satisfy the excess demand for these commodities in the domestic market [import substitution strategy]. Another factor responsible for the deteriorating external payments position was the mounting public expenditure by reason of its high import content and also due to the stimulus it gave to private sector imports. It could be argued in particular, that the structure of world demand combined with oligopolistic pricing policies in the industrial economies resulted into a long-term tendency for the commodity term of trade of Less Developed Countries (LDCs) (or of primary product exporters) to deteriorate [Killick and Sharpley, 1984]. Additionally, deficits induced by adverse movements in the commodity terms of trade, towards the tail end of 1970's, necessarily imposed negative distribution of the gains from trade. The real income effect of this adverse trend in relative prices was equivalent to the transfer of resources from poor nations to rich (Killick and Sharpley, 1984). Such an adverse trend tends to accelerate what some (e.g. Balassa, 1964) have argued to be a secular trend in the terms of trade, and the greater instability of LDCs export prices is the destabilizing factor.

Also, with huge increases in government expenditure, occasioned by the increased role and direct involvement of the government in production and distribution and the urge of the government to provide social amenities and job opportunities for the teaming population, the financial sector experienced rapid monetary expansion in the 1970s because these expenditures stemmed from the monetisation of huge oil revenues. There was also significant expansion of bank credit as another stimulus to monetary growth during the period. Under these circumstances, especially in a situation of increased aggregate demand when output response to domestic requirements was not sufficiently elastic, inflationary pressures intensified in the 1970s. A vivid illustration of the general attitude of the government was its decision to award large salary increases with retrospective effects to its workers in 1975. Private sector enterprises took similar action. Consequently, inflationary pressures worsened while further erosion of external stability was encouraged. However, with the collapse by the international oil market in the 1980s specifically in 1981, foreign exchange earnings of the country fell markedly and the uncontrolled taste for imported goods and services exacerbated the balance of payments problems. Indeed, government resulted to excessive borrowing and money creation in order to finance its deficits; hence, the financial system was overheated thereby leading to high inflation.

Hence, the need for adjustment in Nigeria was brought about by economic decline and stagnation occasioned by external shocks and internal factors which characterized the economy in the late 1970s and early 1980s. The external shocks include huge decline in commodity prices, deteriorating terms of trade, high real interest rates, global recession, from 1979-82, increasing protectionism, and declining capital inflows (Obadan, 1996). On the other hand, the internal factors of economic decline and stagnation include: poor domestic polices, inadequate trade and pricing policies, over valued exchange rates,

mounting fiscal deficits (signaling fiscal mismanagement and/or instability), dominant role of the state in production and economic regulation, political instability and policy inconsistencies. Aside from these, the fixed exchange rate regime of the government encouraged the inordinate taste and preference for imported goods by households and government while most of the manufacturing firms in the country are import-dependent. However, with the collapse of the international oil marker in the early 1980s (specifically in 1981), it became obvious that the policy of financial repression cannot be sustained.

Similarly, another major feature of Nigerian economy has been the presence of informal financial markets. Although this was part of Nigeria's monetary history, the imposition of trade controls and exchange restrictions on foreign exchange transactions have often been responsible for the tremendous growth and buoyancy of informal or parallel markets for foreign currency. These controls, often imposed for balance of payment reasons, generate an unofficial market which are both dependent upon conditions in the official market and responses to other domestic macroeconomic forces. Indeed, parallel market activity is basically a market response of economic agents to their economic environment. As such, this activity is demand driven, generated purely by the need of the market place (Montiel, Agenor and Haque 1993). Such markets have been known to exist alongside similar activity in the formal sector. In fact, recent evidence suggests that parallel markets operates alongside the more visible and better –recorded official economy in virtually all countries of the world (Montiel, Agenor and Haque, 1993). In Nigeria, the two markets have been existing side by side, which has been fallout from long periods of economic regulation, and macro-economic mismanagement, which characterized the economy since independence. The logical and obvious implication is that if parallel markets emerge in response to the imposition of controls, the most effective way to reduce their size is to eliminate these restrictions and let prices reflect the

full scarcity of foreign exchange. Hence, the move by most economies for economic reforms becomes obvious.

The first response of the government in Nigeria was the implementation of stabilization or demand management policies in the late 1970s and early 1980s. The economic realities of the period revealed that the structural bottlenecks, which have characterized the economy for many years, could not be corrected by these short-term measures. Hence, there was the need for a more comprehensive policy to address these structural distortions and imbalances in the economy.

In view of the above, Nigerian government commenced the implementation of the structural Adjustment programme (SAP) supported by the World Bank and the International Monetary Fund (IMF) in 1986. The late 1980s and the early 1990s were characterized by massive depreciation of the Naira as the country sought to reduce and/or eliminate the influence of parallel market for foreign exchange that had existed in the country over the years. More importantly, the policy was designed to move the real exchange rate of Naira closer to equilibrium rate. Also, this policy was adopted in the hope that it would improve the competitiveness of Nigeria's exports and also boosts non-traditional exports especially manufacturing exports.

The devaluation undertaken by Nigeria and many other African countries, and more importantly, a move towards market–determined exchange rate regimes resulted initially in a significant narrowing down of premia rate between "official'' and "parallel'' exchange rates that had existed in many of these countries (UNECA, 1997). Furthermore, the elimination of cumbersome exchange control measures and administrative machinery for allocating foreign exchange resulted in an improvement in the allocation and utilization of the scarce foreign exchange.

However, one of the major side effects of these developments has been the increased instability in the external values of Africa currencies especially Nigerian Naira. More importantly, this level of exchange rate instability and its pass-through effects to domestic inflation has led to the move towards the use of foreign currencies in the domestic economy for transactional, unit of account and store of value purposes. This phenomenon has been referred to in the literature as currency substitution or dollarization (see, for example, Calvo, 2000; Dean, 2000; Chang, 2000). Theoretically, currency substitution can be thought of as symmetrical and asymmetrical. According to McKinnon (1985), the underlying concept of currency substitution in developed countries involved symmetrical currency substitution, where domestic and foreign residents hold both domestic and foreign currencies. However, currency substitution is asymmetrical in the context of developing and transitional economies, where domestic residents hold domestic and foreign currencies and in some transition economics, the US dollar is the preferred foreign currency. In these countries, US dollar plays almost all of the three traditional role of domestic currency. First, the US dollar is used as a store of value and as the process is going on, prices of goods begin to be quoted in US dollar and, its role as a means of payment starts, especially for purchases of durable goods, rent and other high–cost items. This phenomenon is often referred to as "dollarization". In the context of this study, dollarization is viewed as asymmetrical currency substitution.

Dollarization episodes became manifest in the late 1980s, and 1990s when most economies were experiencing rapid inflation and exchange rate instability. As inflation rate grows and exchange rate instability increases, following many years of mal-administration, massive corruption and other macroeconomic mismanagement, leading to loss of public confidence in the domestic economic policy management, domestic residents in Nigeria learned to protect themselves against the loss of purchasing power of

their national currencies by switching to the dollar. Over time, the government of Nigeria validated semi-official dollarization by allowing residents to open bank accounts denominated in dollars (domiciliary account). Contracts, foreign and domestic debts were valued and quoted in dollars while monetary compensation to athletics and footballers were made in dollar denominations. In fact, many big super-markets in big cities, in Nigeria, quote the prices of their products in dollars and some big estate agents and valuers only accept dollars as rents for houses in some reserved areas of Lagos, Abuja, Port Harcourt and other highly industrialized cities in Nigeria. All these developments points to the existence of currency substitution in Nigeria. The issues now are has exchange rate in Nigeria been volatile? What is the extent of currency substitution in Nigeria? What is the causal relationship between exchange rate volatility and currency substitution in Nigeria? What implications do the existence of currency substitution and exchange rate volatility has for the conduct of monetary policy in Nigeria?

1.2 Statement of Problem

Exchange rate instability and the existence of currency substitution in Nigeria have a number of implications for a domestic economy. In the first place, currency instability tends to inject additional costs of doing business, especially for firms operating in the trade sector and trade–related manufacturing. Therefore, moving to market–determined exchange rates has its benefits and economic and social costs. In terms of social and economic costs to the country, it could be argued that the country's industrial sector is heavily dependent on imported machines and raw materials. The implication of this weakness is that every depreciation in the value of Naira implies increased prices of the imported inputs. An increase in price of inputs directly raises cost of production that translates to increase in price of output, thereby exacerbating the problem of inflation, the

effect of which is felt in terms of increased cost of living that erodes standard of living and welfare (Ajakaiye, 1991). Also, instability and depreciation of the Naira exchange rate make planning and projection difficult. It more seriously affects the businessmen and industrialists in the areas of production and pricing of output because of its influences on imported input costs. Development of this nature often leads to collapse of some small and medium scale industries. Simply put, exchange rate instability impairs real-sector investment drive in favour of speculative business activities.

The economic and social costs to Nigeria of these magnitudes of currency instability should not be underestimated regardless of whatever benefits currency depreciation may bring to this country. Indeed, currency instability can be inimical to the development of international trade in Nigeria. Furthermore, its impact on inflationary expectations can be detrimental to the achievement of long–term sustainable development. Although, evaluating the costs and benefits of devaluation for an economy is not an easy task, yet understanding and appreciating these elements is essential for a successful exchange rate policy design and management (Cohen 2001; Mizen and Pentecost, 1996).

In the second place, the existence of currency substitution in African economies especially Nigeria has a number of implications for the stability of the domestic country's currency, overall financial system development and monetary policy outcomes in particular. Reallocation of currency, and other capital by large international transactors such as corporate individuals and multinational corporations, will undermine the independence of the exchange rate policy and complicate monetary policy in a world where capital controls do not exist or are easily circumvented (Mizzen and Pentecost, 1996; Chang, 2000). For concreteness it could be argued that switching between domestic and foreign currency would serve to frustrate the authorities' efforts to measure the

demand for national currency and hence make money supply targets impossible to pursue. At the same time it would undermine the degree of independence of monetary policy offered by floating exchange rates. Rather than allowing a nation to determine its own monetary policy under a floating exchange rate, currency substitution would create interdependence between nation states (D' Arista, 2001, Mizzen and Pentecost, 1996). To what extent are these true in Nigeria? Specifically, this study attempts to answer the following questions: Has the exchange rate in Nigeria been volatile? What is the extent/degree of currency substitution in Nigeria? What has been the impact of exchange rate variability on currency substitution in Nigeria? Finally, what implications do the existence of currency substitution and exchange rate volatility has for the conduct of monetary policy in Nigeria? The need to understand these issues has motivated this study.

1.3 Justification for the Study

The global financial system is in a dire strait. The current moves towards currency substitution implicitly acknowledge that the international monetary system is flawed. Indeed, during the last few decades, a number of emerging market economics including Nigeria have moved from fixed to flexible exchange rates. This has in most cases led to instability in the exchange rates thereby creating an atmosphere of uncertainty exacerbated by speculative bubbles, which help to aggravate the problem of inflation in the economy. Under conditions of high inflation, the ability of national currencies to function adequately as a store of value, a unit of account, and a means of exchange are greatly hindered. In these circumstances, the domestic currency tends first to be displaced as a store of value by a stable and convertible currency (usually in the form of interest-bearing foreign currency deposits). Long period of high inflation induce the public also to conduct transactions in foreign currency (currency substitution). Hence, there is the need to determine whether exchange rate in Nigeria has been volatile and also

ascertain the existence of currency substitution in Nigeria. In addition, what is the extent of currency substitution in Nigeria?

Indeed, research attempts into the issue of currency substitution have been diverse and highly controversial especially in the developed, emerging market and transitional economies of the Latin America and Asia (see for example, Dean, 2000, Medhora, 2000, Cohen, 2001 Kneebone, 2000, Studart, 2000;Ritter and Rowe; 2000; Sawada and Yotopoulos, 2000; Rogers, 1996; Sahay and Vegh, 1996;Savastano, 1996, etc.). The volume of work in this area of macroeconomics of international currencies reflects the fact that currency substitution is a subject with global effects, which merits the attention of academics and policy makers alike (Mizen and Pentecost, 1996). However in the African context, prominent attention has not been given to the study of currency substitution. This could be partly because policy makers and researchers feel that instability and financial crises that Latin America, the emerging markets of Asia and the transition economies of the former USSR are passing through can not affect African countries. But the possibility of contagion effect of the current trend towards currency substitution and its aftermaths, point to the fact that African leaders should begin to think of the possible implications it could have on their economies in the face of current information technology breakthrough and the move towards globalization where geographical boundaries no longer matter.

Hence, this study was motivated; in the first place, by the need to understand the relationship that exists between exchange rate variability and currency substitution on the one hand and the need to evaluate the implications of currency substitution for the conduct of monetary policy on the other. Two, the dearth of empirical research on currency substitution in Nigeria provides yet another basis for this study that investigates the issue of currency substitution in Nigeria. Aside from the dearth of empirical research

in this area, most of the studies conducted on the demand for money in Nigeria generally, and currency substitution in particular, relied on single equation modeling approach that arbitrarily assumes one variable to be dependent on others and the approach in most cases can not account for the effects of innovations in one variable on the other variables in the system. It was observed that this methodology would be inappropriate especially with possible simultaneity among variables. This approach was queried and therefore a more recent and robust dynamic modeling methodology, which rely on Vector Autoregression (VAR) popularized by Sims (1980) was used in this study. Indeed, VAR is a dynamic model involving a number of time series. Sims (1980) argues that with simultaneity among variables, the process of classifying variables as endogenous or exogenous is arbitrary. He suggested that all variables should be given equal consideration and so we treat all variables in this study as endogenous. Three principal features of VAR that makes it appropriate for our study is: (1) Causality test among variables can be carried out, which will assist in determining the variables that should enter the VAR model. (2) It facilitates the computation of impulse-response functions, which will assist in assessing the potency or role of monetary policy in the presence of currency substitution in Nigeria. That is, how monetary policy reacts to innovations or changes in all the variables in the system especially, exchange rate variability and the measure of currency substitution. (3) It is used for forecasting purposes.

This study will improve our understanding of the behaviour of money demand functions in an economy where more than one currency co-circulates. Aside from this, the study will shed more light on the role of monetary policy in achieving macroeconomic stability especially exchange rate stability in Nigeria given the untamed fiscal deficits, inflation and the current move towards monetary integration in West Africa. Indeed, a common market for West African countries would be unable to strengthen and thrive in

an environment of exchange rate instability. A clear understanding of the linkages between exchange rate variability, currency substitution and monetary policy will afford policy makers in Nigeria, the opportunity of developing a new financial architecture for the economy that will be capable of accommodating shocks from the global financial system. Aside from this, recent emerging market financial crisis and the general increase in international capital mobility have led to the need for a re-evaluation of the role of exchange rate arrangements in reducing vulnerability of less developed countries like Nigeria to financial crisis. Finally, this study will shed more light on the ongoing debate concerning the choice of appropriate monetary–exchange rate arrangements for developing countries especially Nigeria (Medhora, 2000). It is hoped that this study will fill a gap and provide the basis for a better understanding of the relationship between exchange rate variability, currency substitution and monetary policy in Nigeria.

1.4 Objectives of the Study

The broad objective of this study is to examine the relationship between exchange rate variability and currency substitution and the implication it has for monetary policy in Nigeria. The specific objectives are to:

(i) provide an appraisal of monetary and exchange rate policies in Nigeria between 1986 and 2001.

(ii) establish the volatility or otherwise of the exchange rate in Nigeria.

(iii) gauge the extent of currency substitution in Nigeria.

(iv) determine the causal relationship between exchange rate volatility and currency substitution in Nigeria.

(v) examine the impact of exchange rate volatility on currency substitution in Nigeria.

(vi) analyse the implications of currency substitution and exchange rate volatility for monetary policy in Nigeria;

1.5 Research Hypotheses

The following hypotheses were tested:

(i) There is a high degree of currency substitution in Nigeria.

(ii) Exchange rate volatility causes currency substitution in Nigeria.

(iii) Currency substitution limits the ability of a country on flexible exchange rates to pursue an independent monetary policy.

1.6 Scope of Study

This study examined the linkage between exchange rate variability and currency substitution in Nigeria with a view to analyzing the implications of currency substitution and exchange rate volatility for monetary policy. The study covered a period of 17 years – 1986(1)-2001(4). Indeed, prior to 1986, exchange rates of Naira with major currencies of the world were fixed by administrative fiat. However, with the introduction of structural adjustment in 1986 and subsequent deregulation of the financial sector, exchange rate of Naira with the major currencies of the world (especially the US Dollar and pound sterling) were allowed to float (i.e. the exchange rates were determined by the forces of demand and supply). Consequently, the Naira exchange rate especially with US dollar and pound Sterling became unstable which culminated into the current move towards dollarization and currency substitution; hence, the choice of 1986 as the base year for this study. The upper limit of the data is 2001 because of data availability. It is hoped that this period will be adequate enough for a thorough analysis and provide enough basis for definite and far-reaching conclusions concerning the relationship between exchange rate variability and currency substitution in Nigeria.

1.7 Plan of Study

This study is divided into eight chapters. Background to the study was provided in chapter one while chapter two contains the literature review. In chapter three, the research method adopted in this study was discussed. Chapter four contains a comprehensive appraisal of exchange rate and monetary policies in Nigeria. In chapter five, analysis of result on the tests for exchange rate volatility in Nigeria was presented while chapter six contains discussion of the results on issues of causality between exchange rate volatility and currency substitution, the extent of currency substitution in Nigeria and indeed, an analysis of the impact of exchange rate volatility on currency substitution. Chapter seven contains a discussion of the results on monetary policy responses to exchange rate volatility and currency substitution in Nigeria. Chapter eight contains summary, recommendation and conclusion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction:

In this chapter, various theoretical models of currency substitution as well as empirical literature on currency substitution were examined. The main issues here involve discussing the main theories that have been applied in the literature. These various models are reviewed with a view to gaining insight into the various theoretical constructs that have influenced the current state of knowledge in this area. In addition, previous empirical studies are examined to determine their adequacy and to serve as guide/input into this study. In this respect, the chapter is divided into five sections. Section 2.2 that follows examines the literature on those that sought to provide a precise definition of currency substitution (Calvo and Vegh, 1996; Mizen and Pentecost, 1996; McKinnon, 1996; Wellett and Banaian, 1996; Sahay, and Vegh, 1996; Ramirez-Rojas, 1985; Giovannini and Turtelboom, 1994; Ortiz, 1983; Guidotti and Rodriguez, 1992; Dean, 2000; Studart, 2000; Calvo, 1999, 2000; Chang, 2000; Lau, 2001; Cohen, 2001). This was followed by section 2.3, which provides a review of the various measures of currency substitution. Section 2.4 contains a review of theoretical literature on currency substitution (Chang, 2000, Miles, 1978, Calvo 1999; Studart, 2000; Dean 2000) while section 2.5 examines literature on those that tries to understand empirically the effects that currency substitution will have on macroeconomic policies in both the developed and less developed countries of the world (Miles, 1978; Guidotti and Rodriguez, 1992; Chang, 2000; Cohen, 2001; D'Arista, 2001; Calvo, 2000; Sawada and Yotopoulos, 2000; Uribe, 1997; Choudri, 1982; Rojas, 1992; Lane and Poloz, 1992; Baero and Tullio 1996; Tavlas, 1996; etc).

2.2 Definitions of Currency Substitution

Perhaps the most controversial aspect of this topic is arriving at an agreeable definition for currency substitution. However, if we are to understand and measure currency substitution then, we must have its definition. According to Mizen and Pentecost (1996; p.11) currency substitution refers strictly to the substitution between two monies. This is consistent with the usage of the term in Cuddington (1983, 1989) and Calvo and Vegh (1992), who use the concept to refer primarily to the switching between foreign and domestic currency. They use the term "capital mobility" to refer to transfers between domestic and foreign interest-bearing assets. However, McKinnon (1982, 1985, 1996) prefers to make a distinction between direct currency substitution and indirect currency substitution. In his view, direct currency substitution means that two (or more) currencies compete as a means of payment within the same commodity domain. People hold transaction balances in both, say Naira and dollars, and switch freely between them. In its pure form, McKinnon (1996) asserted that this situation is unusual because it is highly unstable. This is because there is a strong tendency for one fiat money to displace the other. On the other hand, indirect currency substitution refers to investors switching between non-monetary financial assets; say "bonds" denominated in different currencies in a way that indirectly influences the domestic demand for transaction balances. Among industrial countries, McKinnon (1996) posited that the margin of the international risk between bonds denominated in say, "sterling and dollars" varies continually for unpredictable political and economic reasons. If such commonplace shifts in international risk assessment between non-monetary assets effectively destabilize the demand for domestic money, each central bank's monetary policy should be oriented towards stabilizing its exchange rate. In his view, this assertion remains valid even for those industrial countries where direct currency substitution is not significant.

Although, we can distinguish between indirect and direct currency substitution in theory, there is no reason why the two processes cannot occur simultaneously. Indeed, the decision between "pure" currency substitution and asset substitution may be governed by questions of liquidity preference (Mizen and Pentecost, 1996. p.12). A company with trading operations abroad may hold balances, and may switch its wealth between both currency and bonds depending on its expectations of interest rate and exchange rate movements. This, according to Mizen and Pentecost (1996) may make it difficult at a practical or empirical level to distinguish between the concepts of capital mobility and direct and indirect currency substitution. Indeed, it is this practical ambiguity that underlies McKinnon's definition of indirect currency substitution.

Giovannini and Turtelboom (1994) add further to the definitions of currency substitution by making a distinction between "currency substitution" and " currency substitutability". According to them, currency substitution is the complete replacement of one currency by another, in the way that was observable in Panama, Cuba and Mexico. In their view, currency substitutability is the process by which one currency becomes a substitute for another, but does not completely replace it. This can be illustrated by the use of the US dollar in most of the rest of Latin America and indeed many African countries, in which Nigeria is a case study.

Thus far, the confusion apparent in the literature seems to be caused by the many definitions, some of which are broader or narrower than others and some of which are mutually exclusive. Some of the disagreement, according to Giovannini and Turtelboom (1994), is a result of confusion between stocks and flows of domestic-currency holdings by foreign residents, and between equilibria and disequilibria. Consequently, Giovannini and Turtelboom (1994) prefer to distinguish between currency substitution as an equilibrium state, where the foreign currency is substituted (either partially or completely)

for the domestic currency by domestic residents, and currency substitution as a dynamic process, which represents the adjustment of portfolios between equilibria. They therefore concluded that currency substitution could exist either as stock of wealth held in the portfolio in foreign currency (as a substitute for domestic currency) or as a flow of wealth into foreign currency, as portfolios are adjusted.

Calvo and Vegh (1992) introduce yet other concepts similar to the ones introduced by Giovanni and Turtelboom (1994). To them, the idea that some countries completely give up issuing their own money and adopt a foreign currency is referred to as 'full dollarization' while a situation whereby the two currencies co-circulate is referred to as partial dollarization (Krueger and Ha, 1996 Studart, 2000; Medhora, 2000; Torre, 2001; Ortiz, 1983). In a similar vein, Chang (2000) and Calvo (2001) prefer to use the words, "official and unofficial dollarization". To these authors, official dollarization could be described as a conscious effort on the part of the national government of a country to totally replace the domestic currency with dollar and dollar now perform all the functions of money in the domestic economy (currency substitution). They argue further that unofficial dollarization exists in a country where the US dollar is adopted unilaterally (probably, unconsciously) as a means of payment, store of value and unit of account in addition to the co-circulation of her domestic currency.

In an attempt to be different from others, Dean (2000) coined the word *de facto* dollarization and *dejure* dollarization. According to this author, *de facto* dollarization exists if individuals and firms in one country choose to use another country's currency, without any requirement or even authorization to do so by law. This definition is similar to what Calvo, (2001) Chang (2000) meant by unofficial dollarization. " *De facto*" refers to the fact that adoption of the foreign currency is by private rather than public choice as in the case of Bolivia, Nicaragua, Argentina, Peru, Mexico and Costa Rica. " *De jure*" or

official dollarization exists where the use of the foreign currency is legislated as in the case of Cuba. When foreign currency is used as a medium of exchange (and unit of account), dollarization takes the form of currency substitution. In short, de facto currency substitution in practice means using foreign cash but not checkable foreign currency deposits.

From the literature sampled on the definition of currency substitution, it is obvious that although authors have coined different words to reflect their perception of the concept of currency substitution, one thing that is clear is that currency substitution can be direct or indirect. However, direct currency substitution can be classified into three categories: Official (full) currency substitution, semi-official currency substitution and unofficial currency substitution (see Meyer, 2000). Official currency substitution means local currency is completely replaced by foreign currency as the only legal tender (mainly US dollar), which is the case, for example, in Panama and Ecuador. Semi-official currency substitution refers to a situation where both domestic and foreign currencies are freely used in a domestic economy with the public's perception that the government accepts the use of the dollar, although the dollar is not officially accepted as legal tender. This, for instance, has been the case in Nigeria, Cambodia, Laos, and Haiti. Finally, unofficial currency substitution means that local currency is the legal tender with the dollar used in black market transactions and it is generally expected by the public that the government may place restrictions on the used of the dollar. This is the case in Vietnam, (see for example, studies by Viseth, 2001; McKinnon, 1996; Rodriguez, 1993; Calvo and Vegh, 1992; Ramirez-Rojas, 1985; Ortiz, 1983; e.t.c).

2.3 Measurement of Currency Substitution

It is useful to look at how we can quantify or measure the degree of currency substitution. Sargers (2000) concludes that, ideally, the measure of currency substitution

is the value of foreign currency notes circulating in the economy (as a means of payment and a store of value) and all checking accounts and short-term deposits in foreign currency held by residents in domestic banks and abroad. Available data is lacking not only for transition and emerging market economies, but also for industrialized countries. Therefore, most studies generally calculate currency substitution either as (i) the ratio of foreign currency deposits to M2 (broad domestic monetary aggregates) or as (ii) the ratio of foreign currency deposits to broad monetary aggregates including foreign currency (Komarek and Melecky, 2001; Dean 2000: p.3).

In theory, there are two main concepts in understanding the degree of currency substitution in a domestic economy: the *stock* concept and the *behavioral* phenomenon (or process). The stock concept refers to the amount of foreign currencies in a country, which conventionally can be viewed in terms of the volume of foreign currencies circulating in a country and the foreign currency bank deposits of its residents expressed as a ratio of domestic money. On the other hand, the "behavioral" phenomenon measures the *propensity* for domestic residents to switch into foreign currency holdings in response to changes in economic determinants such as exchange rate depreciation, changes in the inflation rate and interest rate. The measurement of the process of currency substitution requires an econometric model of currency substitution. Of course, the stock and the process are related. In measuring the process of currency substitution, changes in the stock are needed as a dependent variable.

The measurement of the stock of foreign currency is a very difficult task because it is closely associated with the perception of domestic residents towards the government's regulatory policy in holding foreign currency. Foreign currency held by domestic residents is divided into three main forms: foreign currency deposits (*FCD*) in the domestic banking system, foreign currency in circulation (*FCC*) within the domestic

economy and cross-border deposits (*CBD*) held at foreign banks. *FCC* consists of the amount of foreign currency circulating in the country and held in the hands of the public and the government. But, in the context of developing countries and transitional economies, measuring *FCC* is empirically impossible and there may be fear of forced conversion into domestic currency (Viseth, 2001). Instead of bank deposits, households in many developing and transitional economies usually hold currency (domestic or foreign) in the form of cash, kept under the mattress or in the safe. Thus, *FCC* is normally not included in the measurement of currency substitution[1].

Since data on *FCC* and *CBD* are not usually available, the only option for measuring the extent of foreign currency holdings in a domestic economy is *FCD*. In some cases, however, holdings of foreign currency are illegal. For example, forced conversion of foreign currency deposits into domestic currency occurred in Mexico (August 1982), Bolivia (November 1992) and Peru (July 1985). The measurement of foreign currency holdings, in this case, is very difficult to deal with, because the restriction simply drives foreign currency out of the domestic banking system as people either seek to save them at home or transfer the fund to foreign banks. Thus, in this case, *FCD* cannot be used as a proxy for the stock of foreign currency in these situations.

Even when the holding of foreign currency is legal, the use of *FCD* as a proxy for the actual stock of foreign currency in a domestic economy still has some limitations and, hence, estimation results should be interpreted carefully. Firstly, *FCD* does not distinguish between domestic and foreign holders, whereas currency substitution

[1] Attempts to identify a better measure of currency substitution have interested many scholars in the literature. However, examples of measurement of foreign currency holdings (*FCC)* can be found in some studies on currency substitution in Latin America (see for example, Krueger and Ha, 1996; Dean 2000; Feige, 2003 etc). For instance, Melvin and Ladman (1991) attempted to measure the supply of foreign currency in Bolivia by relating it to statistics on the illegal drug trade. Alternatively, Kamin and Ericsson (1993) used data on shipments of US dollar notes to Argentina to estimate the stock of foreign currency in that country. In another study, Melvin and Fenske (1992) used the loans market in Bolivia to provide a measure of the dollar holdings in the country.

conceptually refers to demand for foreign currency by domestic residents only. Secondly, data on *FCD* does not show the maturity structure of these deposits. The usual assumption is that these deposits are relatively short-term.

Despite these limitations, the use of the ratio of *FCD* over broad money is still the most common approach to gauge the extent of currency substitution in a domestic economy. Sometimes this ratio is known as "dollarization" or "currency substitution" *ratio*, [see, for example, Agénor and Khan (1992), Sahay and Végh (1996), Savastano (1996) and Clements and Schwartz (1992)]. The use of this ratio—with *FCD* as a proxy for the stock of foreign currency—is reasonable for the estimation of currency substitution in Nigeria, because during the period under study there has not been any legal restriction on *FCD* holdings in the domestic banking system. In other words, without government regulation on foreign currency holdings being in place, it is argued that *FCD* forms a stable relationship with *FCC* and *CBD* so that changes in *FCD* adequately reflect changes in total foreign currency holdings. Komarek and Melecky, (2001) used this ratio to measure currency substitution in the Czech republic; Dean, (2000) for Canada; and Viseth, (2001) for Cambodia. For our purpose, foreign currency deposits in the domestic economy would be considered as the lower bound of the level of currency substitution in Nigeria.

2.4 Survey of Theoretical Literature on Currency Substitution

Currency substitution has been modeled in two ways, which we describe using the categorization suggested by Krueger (1983). The monetary models interpret current balance surpluses as excess demand for foreign currency by domestic residents. These models are similar to models of the monetary approach to the balance of payments in that the capital account and capital markets are largely ignored. The second type of currency substitution model is the global model, which views the relevant money supply as the

world money supply, within the context of a highly developed, and interdependent world capital market. This class of currency substitution models can be further subdivided by the way they represent domestic residents' portfolios of assets. The first uses a portfolio balance a combination of assets that maximizes the return of the portfolio subject to a minimal level of risk. Mizen and Pentecost (1996) refer to this as the unrestricted portfolio balance model. In the second, agents are assumed to have only a restricted portfolio choice. In this case financial wealth is allocated between the available assets in two stages. In the first stage the portfolio is divided between money and bonds. When these proportions have been determined agents then divide up the independent portfolio between domestic bonds and foreign bonds and between domestic money and foreign money in the second stage. Since these portfolios are independent, by construction, we need only consider the allocation of the money portfolio between domestic and foreign cash balances. This is the money services approach to the process of currency substitution, which is a restricted portfolio balance model.

2.4.1 Monetary Models

The monetary substitution models emphasize that the accumulation of foreign currency balances can only come about through the current account surplus or deficit: foreign-currency accumulation is linked with the real sector of the economy. The models in this category are those of Kouri (1976), Calvo and Rodriguez (1977) and Niehans (1977).

The key idea is that domestic residents hold their real financial wealth, W, in domestic money, M, and foreign money, M*, that is:

$$W = M/E + M^* \quad \text{.....(1)}$$

Where E is the nominal exchange rate defined as the domestic price of foreign currency, so that M/E is the value of the domestic money supply measured in units of foreign

currency, and W is therefore also measured in foreign currency. The asset demands depend upon the level of wealth and the rate of inflation, , and asterisk denote foreign variables, so that:

$$L = L(w, \pi) \quad L_1 > 0, L_2 < 0 \qquad (2)$$
$$L^* = L^*(w, \pi) \quad L_1^* > 0, L_2^* > 0$$

With the money markets in equilibrium the ratio of home money to foreign money is given as:

$$\left[\frac{M}{EM^*}\right] = \frac{L}{L^*} = l(w, e) \quad l_1 > 0, l_2 < 0 \qquad (3)$$

Where e* = π, since perfect foresight is assumed in the domestic country and stable prices are assumed in the foreign country.

In the goods market the home country produces a traded good and a non-traded good. The domestic economy is a price-taker in traded goods, and so, assuming foreign prices are equal to unity, we get $P_T = E$ and dividing both sides by the price of non-traded goods, P_N,

$$\frac{P_T}{P_N} = q\frac{E}{P_N} \qquad (4)$$

where q is defined as the real exchange rate. The production of traded and non-traded goods depends upon their relative prices. Therefore a rise in the relative price of traded goods stimulates the production of the traded good and curtails that of the non-traded good. The consumption of traded and non-traded goods depends positively upon the stock of real financial wealth and inversely on their relative prices. Since the market for non-traded goods must always clear we have:

$$Y_N(q) = C_N(w, q) \qquad Y_{N1} < 0, C_{N1} > 0, C_{N2} > 0 \qquad (5)$$

and a clear, unique relationship is established between q and w:

$$\left(\frac{\partial Y_N}{\partial q}\right)dq = \left(\frac{\partial C_N}{\partial q}\right)dq + \left(\frac{\partial C_N}{\partial w}\right)dw$$

$$\frac{dq}{dw} = \left(\frac{\dfrac{\partial C_N}{\partial w}}{\dfrac{\partial Y_N}{\partial q} - \dfrac{\partial C_N}{\partial q}}\right) < 0 \quad \text{.....(6)}$$

Thus a rise in wealth results in a fall in the real exchange rate. The traded goods market does not have to clear within the country because any excess demand can be met from imports. Thus an excess demand for traded goods over domestic production gives rise to a trade balance deficit and a loss of foreign currency:

$$\dot{M}^* = T = Y_T(q) - C_T(q,w) \quad \text{.....(7)}$$

To offset the effect of a rise in wealth on the current balance a rising real exchange rate is needed. Since q = q(w) and $q^1 < 0$, Equation (7) can be rewritten as:

$$\dot{M}^* = m(w), \qquad m^* > 0 \quad \text{.....(8)}$$

to give the first dynamic equation, which says that higher levels of wealth (and hence consumption) lead to trade balance deficits and the accumulation of foreign currency.

The second dynamic equation is obtained by differentiating the wealth constraint, Equation (1), and replacing the term in foreign-money growth with its equivalent from Equation (8) to give:

$$\dot{w} = \frac{\dot{M}}{E} - \frac{M}{E^2}\dot{E} + m(w) \quad \text{.....(9)}$$

Rearranging and substitution for e = E/E) from Equation (3) above gives:

$$\dot{w} = (w - M^*)\left[\mu - \left\{1/l_1\right\}\left\{\left(w/M^*\right) - 1\right\}\right] + m(w) \quad \text{.....(10)}$$

This model of monetary currency substitution is illustrated in Figure 2.1. The left-hand quadrant shows the equilibrium in the goods markets, with NN denoting the equilibrium in the non-traded goods market, which must always clear, and the TT locus denoting the traded goods market equilibrium. To the right of TT the trade balance is in deficit and to the left of TT in surplus. In the right-hand quadrant the downward-sloping line WW denotes levels of constant real wealth, such that as foreign-money balances rise domestic-money balances held must fall to keep domestic wealth from rising. FF denotes the foreign asset accumulation locus, which is independent of the level of M*.

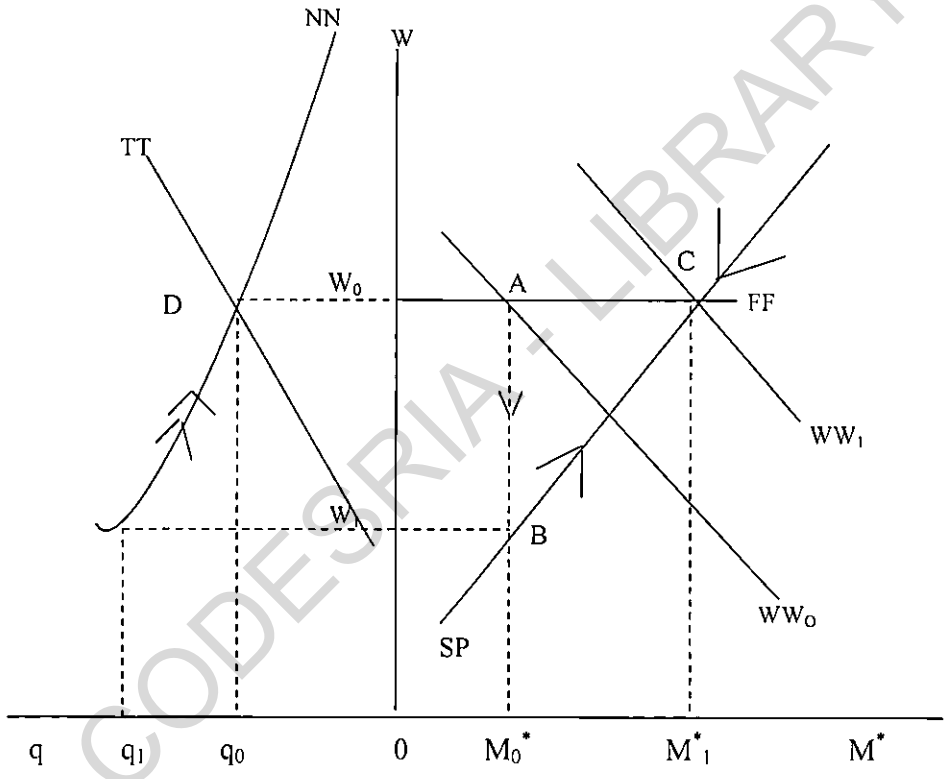


Figure 2.1 A monetary currency substitution model

An unanticipated rise in the rate of growth of money supply (a rise in μ) will lead to a rise in wealth for each level of the exchange rate and foreign balances, thereby shifting WW_0 to WW_1. From the initial equilibrium at A, however, the expansion of the money supply is more than offset by a depreciation of the exchange rate, which reduces

the level of wealth to W_1 at B. This depreciation generates a trade balance surplus and a rise in foreign currency balances. As the exchange rate appreciates from q_1 to q_0 to eliminate the trade balance surplus, domestic residents increase their holdings of foreign balances to M_1* giving the final equilibrium at C. Thus the attempt to expand the rate of monetary growth results in a process of currency substitution, since the proportion of domestic real financial wealth held in foreign currency is higher at the end of the experiment than at the beginning.

A weakness of these models is that they assume that the capital inflow is in money alone. No bonds are permitted in the analysis. They therefore combine foreign-money accumulation and foreign-asset accumulation and hence currency substitution and asset substitution. They are therefore most applicable in economies where there are no well–developed financial and capital markets. This feature does not make them very useful for identifying currency substitution in countries where bond markets are well developed. A second problem is that these models are not amenable to empirical testing because the process of currency substitution is a combination of two separate processes. The first is that of exchange rate depreciation which lowers the value of domestic money in the portfolio, so leading to a higher share of foreign currency in the portfolio. The second process is that the exchange rate depreciation creates a trade balance surplus, which leads domestic residents to accumulate foreign cash, thereby further raising the value of foreign currency in the domestic portfolio. The exchange rate is clearly the crucial variable driving the process of currency substitution, but it has both relative price and quantity effects.

2.4.2 The global models

We now turn to the models, which assume a highly integrated world capital market rather than a small, open economy without a well-developed financial sector.

There are three classes of model in this category. The distinguishing feature of these models is the number of assets available and the extent of substitution allowed between them. We begin with the most restrictive model and end with the most general.

2.4.2.1 Restricted 'money services' model.

The money services model offers a restrictive set of portfolio choices. This class of model is based on a two-stage decision framework, whereby in the first stage agents divide their wealth between liquid and non-liquid assets, and then in the second stage divide each of these two independent portfolios is spread across different currencies, while the non-liquid portfolio is divided between different kinds of risk-bearing assets. The process of currency substitution takes place as individuals switch between different currencies in the liquid asset portfolio. In this class of model it is important to note that such switching is independent of the non-liquid asset position.

The seminal paper on this approach was due to Miles (1978), drawing on earlier work by Chetty (1969), who postulated that agents would maximize their production of money services, SS, subject to the budget constraint. The money services production function is assumed to be of the constant elasticity of substitution (CES) type such that:

$$S = \left[\theta_1 \left(\frac{M}{P} \right)^{-\rho} + \theta_2 \left(\frac{M^*}{P^*} \right)^{-\rho} \right]^{-(1/\rho)} \qquad (11)$$

Where ρ is the elasticity of substitution. This function is maximized subject to the money constraint, M_0, fixed at the first stage of the portfolio allocation process, which is given by:

$$M_0 = (1+r)\frac{M}{P} + (1+r^*)\frac{M^*}{P^*} \qquad (12)$$

Thus maximizing S, subject to the constraint, gives the first-order conditions:

$$\frac{\partial S}{\partial M} = \theta_1\left(\frac{M}{SP}\right)^{-(1+\rho)} - \lambda(1+r)$$

$$\frac{\partial S}{\partial M^*} = \theta_2\left(\frac{M^*}{SP^*}\right)^{-(1+\rho)} - \lambda(1+r^*) \quad \text{.....(13)}$$

$$\frac{\partial S}{\partial M_0} = \lambda\left[\frac{M}{P}(1+r) + \frac{M^*}{P^*}(1+r^*)\right]$$

Taking the ratio of the marginal products and assuming purchasing power parity (PPP) so that P = P*E, gives:

$$\frac{\theta_1}{\theta_2}\left(\frac{M}{EM^*}\right)^{-(1+\rho)} = \left(\frac{1+r}{1+r^*}\right) \quad \text{.....(14)}$$

Taking logarithms gives:

$$\log\left(\frac{M}{EM^*}\right) = \sigma\log\left(\frac{\theta_1}{\theta_2}\right) + \sigma\log\left(\frac{1+r^*}{1+r}\right), where\, \sigma = \frac{1}{1+p} \quad (15)$$

The degree of currency substitution is given by σ which, according to this approach, should be positive.

This model, however, is subject to a number of limitations. First, like the monetary currency substitution model above, it is not able to distinguish empirically between capital mobility and currency substitution. A rise in the foreign rate of interest, for example, may lead to an increased demand for domestic money, but also for foreign money as bond prices are expected to fall. Hence all that is required for σ to be positive is the foreign demand for money to be more interest-elastic than the domestic-money demand. A second limitation is that the demands for money do not depend upon income as would be expected. Third, it is assumed that PPP holds at all points in time. This is not only empirically invalid, but also theoretically undesirable if currencies are substituted for transactions motives. Indeed, this seems to be an important confusion underlying this static optimization approach: it is a transactions-based model but the determinants of

currency substitution, relative interest rates, are inextricably linked to money's role as a substitute for bonds in liquidity preference.

A more general two-stage model due to Joines (1985) and Bergstrand and Bundt (1990), looks not only at domestic residents' demand for domestic and foreign currencies, but simultaneously at foreign residents demand for both currencies. In this model the supply of domestic currency, M, is held by both domestic, M^D and the foreign residents, M^F, and the foreign supply of money, M*, is also held by both domestic, M^{*D} and foreign residents, M^{*F}. Therefore we have the following identities:

$$M = M^D + M^F \text{ and } M^* = M^{*D} + M^{*F} \qquad (16)$$

The demands for money each depend on the price level, relevant to the currency, the level of real income relevant to the 'home' resident and both domestic and foreign rates of interest, r and r*. Thus money market equilibrium conditions are given as:

$$M^D + M^F = PK^D(r, r^*)\,Y + PK^F(r, r^*)\,Y^* \qquad (17)$$

$$M^{*D} + M^{*F} = P^*K^{*D}(r, r^*)\,Y + P^*K^{*F}(r, r^*)\,Y^* \qquad (18)$$

Where $K^D_1 < 0$, $K^D_2 > 0$, $K^F_1 < 0$, $K^F_2 > 0$, $K^*_1{}^D > 0$, $K^{*D}_2 < 0$, $K^*_1{}^F > 0$, $K^*_2{}^F < 0$.

Equations (17) and (18) represent the most general form of the money services model. To permit estimation, these equations need to be restricted because data are generally not available on all the four elements required to estimate the full model. Thus Miles (1978) implicitly assumes that MF = M*F = 0, so we have:

$$\frac{M^D}{M^{*D}} = \frac{PK^D(r,r^*)Y}{P^*K^{*D}(r,r^*)Y} \qquad (19)$$

Assuming PPP and noting that the real income terms cancel, we have:

$$\frac{M^D}{EM^{*D}} = \frac{K^D(r,r^*)}{K^{*D}(r,r^*)} \qquad (20)$$

which in logarithms is identical to Equation (15) above, where the ratio of domestic to foreign-currency balances held by domestic residents depends directly on the foreign rate of interest and inversely on the domestic rate.

An alternative assumption to $M^F = M^{*F} = 0$ is $M^{*D} = 0$, which also implies that $K^D_2 = 0$, since if domestic residents do not hold foreign currency they are unable to switch between home and foreign currency. This implies therefore that any currency substitution, which occurs, must be done by foreign residents since these are the only agents which hold both currencies and hence are able to switch between them, given a fixed total supply of each currency. Therefore to test for currency substitution requires only that the foreign residents' demand for home currency is estimated, which in logarithms is:

$$\log\left(\frac{M_F}{P}\right)_t = k_0 + k_1 r_t + k_2 r_t^* + k_3 \log Y_t^* + \mu_t \quad \text{.....(21)}$$

where μ is a random error term and the expected signs on K_i are $K_1 < 0$, $K_2 > 0$, $k_3 > 0$, where the sign on K_2 denotes currency substitution. Interestingly in this version of the model it is more appropriate to use interest rates to capture currency substitution because the dependent variable is not a ratio of the domestic to foreign currency, but rather just the level of real money balances held by foreign residents. Hence a rise in r* will raise the opportunity cost of holding foreign money and so foreign residents will switch from holding domestic currency, thus giving a positive relationship between r* and M^F. This version of the money services model has the additional advantage of explicitly including real income as a determinant of the demand for money and not imposing PPP.

2.4.2.2 Dynamic optimization model

The dynamic optimization models emphasize rather more clearly the demand for money as a medium of exchange and differ from the restricted money services models by explicitly recognizing bonds. In this framework the fraction of real resources necessary

for transactions is given by the function, V, which is inversely related to the level of money services, S, such that:

$$V = V(S) \qquad V_1 < 0 \text{.....(22)}$$

where subscripts denote the partial derivatives. As before, the level of money services is provided by both domestic and foreign currency, M and M* respectively, so that:

$$S = S\left(\frac{M}{P}, \frac{M^*}{P^*}\right) \qquad S_1 > 0, S_2 > 0 \text{.....(23)}$$

Total real assets, a, are defined as:

$$a = \frac{M}{P} + \frac{EM^*}{P} + \frac{B}{P} + \frac{EB^*}{P} \qquad (24)$$

where, as before, B and B* denote domestic and foreign bonds and PPP is used to convert all assets into domestic prices.

Asset accumulation is defined as income, y, less consumption, c, plus net income from asset holding, which consists of income from bond holding less the decline in income from holding both domestic- and foreign-money balances when inflation rates are non-zero, that is:

$$\dot{a} = y - c\left[1 + v\left(S\left(\frac{M}{P}, \frac{M^*}{P^*}\right)\right)\right] + (r - \pi)\frac{B}{P} +$$

$$(\varepsilon(1+r^*) + r^* - \pi)\frac{EB^*}{P} - \pi\frac{M}{P} - (\varepsilon - \pi)\frac{EM^*}{P} \text{.....(25)}$$

where a dot denotes the time derivative, ε is the expected rate of change of the exchange rate and π is the expected rate of inflation in the domestic country. The optimization problem faced by the consumer is to maximize the utility function

$$U = \int_o^\infty u(c_t)e^{-\partial t}\partial t \qquad u_1 > 0,\ u_2 < 0 \text{.....(26)}$$

where δ is the time discount rate subject to the portfolio constraint and the asset accumulation equation. The present-value Hamiltonian is given by:

$$H=U(c)+q[y-c\left(1+V\left(S\left(\frac{M}{P},\frac{M^*}{P^*}\right)\right)\right)-\pi a+\varepsilon\left(\frac{EM^*}{P}\right)+r\left(\frac{B}{P}\right)+\left(\varepsilon(1+r^*)+r^*\right)\left(\frac{EB^*}{P}\right)+ \quad 27$$

$$\lambda\left[a-\frac{M}{P}-\frac{EM^*}{P}-\frac{B}{P}-\frac{EB^*}{P}\right]$$

The variable q is the co state variable associated with the flow constraint and 8 is the Lagrangian associated with the stock constraint. The consumer chooses c, M, M*, B and B*.

The necessary first-order conditions for each of these variables are as follows:

$$\begin{aligned}
&\frac{\partial H}{\partial c}=u_1(c)-q\left[1+v\left(S\left(\frac{M}{P},\frac{M^*}{P^*}\right)\right)\right]=0\\
&\frac{\partial H}{\partial M}=-qcv_1S_1\left(\frac{M}{P},\frac{M^*}{P^*}\right)\left(\frac{1}{P}\right)-\frac{\lambda}{P}=0\\
&\frac{\partial H}{\partial M^*}=-qcv_1S_2\left(\frac{M}{P},\frac{M^*}{P^*}\right)\left(\frac{1}{P^*}\right)-\frac{E}{P}(\lambda-q\varepsilon)=0 \qquad (28)\\
&\frac{\partial H}{\partial B}=\frac{qr-\lambda}{P}=0\\
&\frac{\partial H}{\partial B^*}=\left[q\left(\varepsilon(1+r^*)+r^*\right)-\lambda\right]\left(\frac{E}{P}\right)=0
\end{aligned}$$

The final two equations imply uncovered interest rate parity. The second and third equations then give the following ratio:

$$\frac{S_1\left(\frac{M}{P},\frac{M^*}{P^*}\right)}{S_2\left(\frac{M}{P},\frac{M^*}{P^*}\right)}=\left(\frac{P}{EP^*}\right)\left(\frac{r}{r^*(1+\varepsilon)}\right)\qquad(29)$$

Thus the ratio of the marginal utilities of domestic and foreign cash balances depends directly upon the real exchange rate and the uncovered interest rate parity (UIP)

condition. If it is now assumed that the money services function, S, is CES, then, using the result above, this expression can be rewritten as:

$$\frac{\theta_1}{\theta_2}\left(\frac{M}{EM^*}\right)^{-(1+p)} = \left(\frac{P}{EP^*}\right)\left(\frac{r}{r^*(1+\varepsilon)}\right) \quad \text{.....(30)}$$

Thus the elasticity of substitution between the two currencies is measured by the parameters on the real exchange rate and the uncovered interest rate differential. Taking logs, this can be written as:

$$\log\left(\frac{M}{EM^*}\right) = \sigma\log\left(\frac{\theta_1}{\theta_2}\right) - \sigma\log\left(\frac{P}{EP*}\right) - \sigma\log\left(\frac{r}{r^*(1+\varepsilon)}\right) \quad \text{.....(31)}$$

Where σ = 1/(1+p) is again the elasticity of currency substitution. Note that, as with the Miles (1978) model, the coefficient on each of the explanatory variables is expected to be the same.

This seems to imply that we can measure the degree of currency substitution by either the real exchange rate or the uncovered interest rate differential. Since we know the latter is linked closely to capital mobility, it is not clear that currency substitution in this model is distinct from capital mobility. In Equation (29), the PPP and uncovered interest rate parity (UIP) conditions enter as a multiplicative term. Taking logs enables us to split up these two effects, but then the model implies that the coefficients on the real exchange rate and the UIP condition should be the same. If however, it is assumed that UIP holds, then the second term on the right-hand side will be equal to unity and the relative money balances will depend only on relative prices. Similarly, if the real exchange rate is assumed to be constant then the degree of currency substitution is given solely by the interest rate differential term. If, however, in long-run equilibrium both PPP and UIP are assumed to hold, there is no scope for currency substitution: indeed it would be unnecessary, since both domestic and foreign goods and bonds are perfect substitutes.

Another weakness with this theoretical structure is that income does not appear in the final equation, although we would expect, a priori, that income would be an important determinant of the demand for money. In empirical estimation therefore some form of volume measure is required in the equation. The most common candidate is the trade balance (de Vries, 1988; Ratti and Jeong, 1994; Milner, Mizen and Pentecost, 1996) as measured by the log of the exports to imports ratio, which is expected to result in an increase in domestic residents' holding of foreign currency.

2.4.2.3 Unrestricted 'portfolio balance' model:

The portfolio balance approach was initially developed for an open economy by McKinnon and Oates (1966) as an extension of the seminal paper of Tobin (1958) for asset demands in a closed economy. More recently, Girton and Roper (1981), Cuddington (1983), Branson and Henderson (1985) and Zervoyianni (1988, 1992) have extended the model to include the possibility of currency substitution. As in Tobin (1958) these models all assume that agents maximize the returns to their wealth subject to a given level of risk. This is the most general model since agents can hold four different assets and switch between them simultaneously. Domestic money is viewed as a riskless asset, since there is assumed to be no domestic inflation, while domestic bonds are risky, in that their prices may vary. In the context of a closed economy, these would be the only two assets, and agents would choose between money and bonds on the basis of the rate of interest. As interest rates rose bonds would become more attractive relative to money and, for given levels of risk, the agents would hold relatively more bonds in the portfolio. Since the model is an open-economy model, there are two further assets: foreign money and foreign bonds. The rate of return on foreign bonds is simply the rate of interest plus the expected depreciation of the domestic currency, since for domestic residents it is the home-currency value of bond returns, which is important. The rate of return on foreign money,

in the absence of inflation, is again zero. In this context it is not clear why domestic residents should wish to hold foreign currency as part of their portfolio unless they wish to purchase foreign goods and services, since it is dominated as a store of value by bonds and as a medium of exchange by domestic money.

In practice, however, inflation is rarely zero. In the case of non-zero inflation, in both the home and the foreign country the return on cash holding is the inverse of the inflation rate. Therefore the relative return on the cash part of the portfolio is given by the expected depreciation of the exchange rate. Thus if domestic inflation is expected to be higher than foreign inflation, the domestic currency is expected to depreciate and the demand for domestic currency will fall relative to foreign currency. In practice the viability of switching between domestic and foreign currency will, in part, depend on the transactions costs incurred, which in turn depend on the volume of currency to be switched.

Thus for each of the four assets in the model we can write down an aggregate demand function which depends upon the level of real income, y, and the rate of return on each of the assets, that is:

$$\begin{aligned}
&\frac{M}{P} = m\left(y, r, r^* + x, x\right) \quad m_1 > 0, m_2 < 0, m_3 < 0, m_4 < 0 \\
&\frac{B}{P} = b\left(y, r, r^* + x, x\right) \quad b_1 < 0, b_2 > 0, b_3 < 0, b_4 > 0 \\
&\frac{EM^*}{P^*} = n\left(y, r, r^* + x, x\right) \quad n_1 > 0, n_2 < 0, n_3 < 0, n_4 > 0 \qquad (32) \\
&\frac{EB^*}{P^*} = f\left(y, r, r^* + x, x\right) \qquad f_1 < 0, f_2 < 0, f_3 > 0, f_4 > 0
\end{aligned}$$

where x is the rate of depreciation of the home currency, r is the rate of return on domestic bonds, and r + x is the rate of return on foreign bonds. In this kind of model the partial derivatives are assumed to satisfy particular adding-up constraints, so for example, $m_1 + b_1 + n_1 + f_1 = 1$. From the point of view of currency substitution, these constraints

are only important if the set of demand functions is estimated as a system. Of more importance is the sign on m_4: this is the coefficient, which represents currency substitution. Thus an expected depreciation of the domestic currency leads to a fall in the demand for domestic money by domestic residents, as they switch into foreign currencies in order to maintain the purchasing power of their liquid balances.

In an empirical context it is most common to estimate just the demand function of the above asset-demand system. Cuddington (1983), for example, suggests the following model with partial adjustment:

$$\log\left(\frac{M}{P}\right)_t = n_0 + n_1 r_t + n_2 (r + x)_t + n_3 \log Y_t + n_4 x_t + n_5 \log\left(\frac{M}{P}\right)_{t-1} + \omega t \quad \text{.....(33)}$$

where the all the coefficients are expected to be negative with the exception of n_3, and the degree of currency substitution is given by n_4.

Another interesting feature of this type of portfolio balance model is that it can be estimated for individual domestic-money demands, as in Cuddington (1983) or Mizen and Pentecost (1994), or as an aggregate demand for money over a specific region. This literature is discussed in some detail in the following section.

2.5 Empirical Studies on the Effects of Currency Substitution:

2.5.1 Industrialised Countries:

The issue under scrutiny in the industrialized countries is the degree of monetary policy independence in an economy where currency substitution is in existence. It is often argued that the greater the holdings of foreign currency relative to the domestic currency the less independent monetary policy can be (Mizen and Pentecost, 1996). The main studies have been conducted on the bilateral relationship between the US and Canada and

more recently on the multilateral relationships in Europe, Latin American and African Countries.

The first study of the effect of international influences of currency substitution on monetary policy independence was by Miles (1978). While the main contribution of the paper was a theoretical analysis of the degree of independence of monetary policy under different assumption about the extent of currency substitution, Miles also opened the debate on the empirical evidence for currency substitution. He regressed the relative demand for domestic and foreign currency by economic agents in Canada on the ratio of US to Canadian interest rates. Allowing for the different types of exchange rate regime over the sample period he found that the two variables were positively and significantly correlated, which he interpreted as evidence of currency substitution on the grounds that, as the opportunity cost of holding US dollars rises, the demand for Canadian dollars rises. Hence, he concluded that there was statistically significant currency substitution, which would undermine monetary autonomy, even with floating exchange rates.

Subsequent works using the same two-country study have been more skeptical, and have questioned the functional specification of Mile's model. Bordo and Choudri (1982) re-examined Mile's results and showed that they omitted important and relevant variables. The inclusion of income and a separate term for domestic interest rates eliminated the positive correlation between Canadian dollars and the US rates of interest, showing that by ignoring the effects of portfolio size Mile's approach draws the wrong conclusions. A rise in the foreign rate of interest would cause residents to switch out of domestic money and foreign money in favour of foreign bonds. It will therefore only take a greater elasticity in the demand for foreign currency with respect to the foreign rate of interest to guarantee a positive coefficient in the interest rate ratio. Likewise, de Vries (1988) argued that Mile's specification of the opportunity losses was inappropriate since

he miscalculated the relevant return due to interest rates and capital gain. de Vries showed that the opportunity loss in allocating a unit of income to the domestic currency rather than the bond is $r + g$, which represents the interest foregone plus the expected capital gain from holding the bond for one period. For low interest rate countries the interest rate term dominates the capital gains and on this basis de Vries shows that Mile's measure of currency substitution is biased and instead the appropriate measure should be: $(1 + r^*)\ r/(1 + r)\ r^*$. de Vries then shows that with this measure of currency substitution, using Mile's data set, the sign is negative, rather than positive, and only significant at the 10 per cent level. de Vries also includes a measure of the net trade balance between the US and Canada in the equation, which he shows, is both significant and correctly signed.

The US-Canadian relationship has also been examined by Cuddington (1983), using the portfolio balance model to examine whether the demand for domestic and foreign money balance is determined simultaneously with the demand for domestic and foreign bonds. Taking the returns to each as the expected change in the exchange rate (proxied by the forward premium) and the domestic and foreign interest rates, the results are generally supportive of currency substitution. Although, while the term on the expected change in the exchange rate is correctly signed, it is rarely significant. The advantage of the portfolio balance approach is that it distinguishes between currency substitution, as measured by the coefficient on the expected change in the exchange rate, and capital mobility, as measured by the coefficient on the foreign rate of interest. The disadvantage as measured by the lagged dependent variable swamps all other effects and so even if currency substitution is found, its significances is lost in the partial adjustment process governing the adjustment of real money balances. Furthermore, if domestic and foreign bonds are close substitutes, the domestic interest rate and the foreign rate (adjusted for the expected depreciation of the home currency) will be highly collinear,

which may result in large standard errors and non-rejection of the null hypothesis of no currency substitution. Ghosh (1989) used a rational expectations model to derive the expected depreciation of the exchange rate based on Mussa (1976), and found that the coefficient was both negative and highly significant when the model was estimated over the same period as Cuddington (1983). Moreover the coefficient was much larger, reflecting the sensitivity of the model to the measurement of exchange rate expectations.

More recently, Roger (1992) has re-examined the question of currency substitution between the US, Canada and Mexico using the general-to-specific methodology. His findings have confirmed Mile's result for Canada-US by finding statistically significant evidence of currency substitution between them, but failed to find a positive relationship between the dollarization ratio (holdings of dollars relative to domestic currency) and expected depreciation of the peso. His explanation for the Mexico-US finding was that currency substitution is accounted for by the holding of Mexdollars (the US dollar-denominated deposits held in Mexican banks) relative to pesos. The holding of Mexdollars were subject to convertibility risk, which made the conversion of Mexdollars into US dollars less than certain when the central bank faced times of difficulty. Since the difficulties for the central bank emerged as the peso was expected to depreciate, there was a simultaneous run on the Mexdollar, to avoid the increasing convertibility risk. Hence the measure of currency substitution (which normally depends on the rate of return on the currency, the rate of depreciation) is distorted by the risk characteristics of the Mexdollars.

Using the dynamic 'money services' model, Ratti and Jeong (1994) considered the dynamic evidence for currency substitution between the US and Canadian dollar, by looking at the coefficient on the real exchange rate, although like de Vries (1988) they also included a scale variable, the net trade balance between the US and Canada, and the

uncovered interest rate differential. In the long run, over the period 1970-73 to 1990-94 the (log) real exchange rate indicated that the ratio of domestic-to foreign-money balances responds elastically to changes in the real exchange rate. In the short run, the impact effect is of the same order of magnitude and highly significant. Although both the net trade balance and uncovered interest rate differentials are significant the coefficient are not as large as those for currency substitution.

The conclusion in the empirical literature on North America appears to be that currency substitution, which is probably best seen as a counterpart to trade, can be detected, although its statistical significance is sensitive to the functional specification and the definition of central variables such as the rate of return on foreign money. There is therefore a question mark over the robustness and its effect on monetary policy independence. Our research agenda is to establish the robustness of the results so that firm conclusions can be drawn on the quantitative effects on monetary policy independence.

2.5.2 Less Developed Countries And Transition Economies:

The Less Developed Countries (LDCs), which have received the greatest attention, are the Latin American countries where the most outstanding characteristic, namely the high and sometimes hyperinflationary environment, makes the issue of currency substitution primarily one of hedging against inflation. The process of currency substitution in LDCs is asymmetric, in contrast to that in industrialized countries: there is a demand for dollars by domestic residents but no corresponding demand for domestic currency by US citizens. This is also true in Eastern Europe where Deutsche mark and the dollar are used as a replacement for the domestic currency. Since the fall of the Iron Curtain there has been more evidence from Eastern Europe as more reliable data have

become available, and the experience there appears to be quite similar to the Latin American experience.

Two outstanding surveys to the phenomenon of currency substitution under such conditions can be found in Calvo and Vegh (1992) and Savastano (1992) in a special issue of the Revista de Analisis Economico. These surveys make a distinction between currency substitution, which is constituted as a replacement of the store-of-value and unit of account functions, and that, which is a replacement of the medium-of-exchange function. The former process tends to occur first as domestic residents protect the real value of their wealth by transferring it into foreign currency deposit accounts in domestic banks. The latter process occurs as the inflation becomes acute, when domestic residents refuse to accept domestic currency and foreign currency substitution for the transactions medium, which in Latin American, is almost always, fulfilled by the US dollar, hence the term 'dollarization'. It is important to note that the effects of currency substitution abroad (i.e. capital flight) undermine the external position of the Central bank while dollarization and foreign-currency deposit held at home can improve the external position. As we note later on, despite the advantages of being able to separate these two effects, the data collected do not permit such a distinction in empirical work.

When examining Nigerian public finance, especially during the military regimes, the authorities often resort to the use of the inflation tax. The response of the general public is to avoid the tax by ridding themselves of the currency on which it is levied. The counter-response of the government, faced with the diminution of the base on which the tax is raised, has been either to out law the use of foreign currency or to try to repatriate fleeing capital by allowing foreign currency substitution to be held in domestic banks. In the first case the process of currency substitution is driven underground and conducted through the black market for foreign exchange. In the second case, the general public

holds more foreign currency in domestic banks-since the cost of administering a domestic account are lower than administering one in a foreign bank-but the risk of government confiscation makes the balance extremely sensitive to the external balance position of the central bank. Examples of foreign-currency deposits within the domestic banking system are found in Bolivia (October 1973), Mexico (March 1977), Peru (January 1978) and Uruguay (October 1973). Forced conversion of foreign-currency deposit into domestic currency occurred in Mexico (August 1982), Bolivia (November 1922) and Peru (July1985), but in certain cases it has been shown that the process was counterproductive since dollarization actually increased (see Melvin and Frenkel, 1992). Thus the issue of the credibility of the stabilization programme is central to the stability of these balances. Indeed Rogers (1992) explicitly models Mexican holdings of Mexdollars with respect to the convertibility risk associated with them. The problem for empirical work is that even if the holding of dollars is legal, there is no separation of balances held for store-of-value purposes and those held for transaction purposes. If foreign-currency holding are illegal then the measurement of the true level of dollars holding is very difficult to deal with, never mind the proportion used for difference function. As a consequence, most studies of dollarization or currency substitution are based on the ratio of foreign-currency deposits to the domestic-money stock.

A number of papers use the transactions services model of currency substitution in investigating the relationship between the inverse of the ratio of foreign-currency to domestic-money stock to the rate of depreciation of the exchange rate. Ramirez-Rojas (1985) considered a transactions services model amended for partial adjustment by adding the lagged dependent variables to the model for Argentina, Mexico and Uruguay, and substitution is found to be important over the period 1980-84 for Argentina, and 1970-82 for Mexico and Uruguay. Although the findings are positive they need to be

qualified to allow for structural breaks in Mexico and Uruguay, and because of the small sample period for Argentina. Marquez (1987) used the same model where he found significant substitution between foreign-and domestic-currency holdings of domestic residents in Venezuela, using annual data over the period 1961-80. Rojas-Suarez (1992) also found that currency substitution was significant for Peru, being low during high, though stable, inflationary periods but increasing as inflation accelerated and the exchange rate became volatile during the period August 1985-June 1990. These results are for a larger number of observations, but an equivalent length of calendar time to those of Ramirez-Rojas (1985).

Work based on portfolio balance models, on the other hand, also confirms the belief that currency substitutions are significant by demonstrating its influence on domestic-money holdings. The argument was made by Fasano-Filho (1986) that the Cuddington model required modification in many cases to account for the fact that much of the currency holdings in domestic and foreign denominations was held in non-interest-bearing form. Further work has emerged based on the new portfolio balance where real balances are a function of real income, inflation and the depreciation of the domestic currency.

The evidence for Argentina has pointed to significant negative influence of the rate of depreciation on the real balances held in narrow measures of domestic currency, confirming currency substitution, but rejecting the influence on broader measures. The same model was used in the work on Argentina by Phylaktis and Taylor (1993) who rejected the hypothesis of currency substitution, but acknowledged that this result was likely to be due to the co linearity of the return on foreign assets (the actual depreciation of the currency plus foreign inflation) with the domestic rate.

Savastano (1992) indicates that the consequences of using the ratio of foreign-currency deposits to the domestic money stock are that foreign-currency-denominated bills and foreign currency not deposited in the banking system are essentially unrecorded, so the measure is an understatement of the true extent of currency substitution. He used a measure based on total foreign-currency holdings (foreign currency deposits in domestic banks and those held abroad, i.e. in US banks) as a ratio of total domestic and foreign currency. Graphical analysis of these ratios for Bolivia, Peru, Mexico and Uruguay suggested that foreign-currency holdings were never zero even when inflation was moderate; when foreign-currency deposits were allowed the ratio increased; and after foreign-currency deposits banned the level of the ratio was higher than that which existed before their legalization. He concludes that the crucial criteria determining the pattern of currency substitution are the past inflationary history and the stage of development of financial institutional arrangements. Real money balances are explained by industrial production and expected inflation using lagged changes in domestic prices. By inserting dummy variables to detect discrete and gradual changes in the intercept and slopes, following Hafer and Hein (1982) and Miller (1986) they were able to rule out the gradual influence of foreign-currency deposits on domestic money-demand functions, but could not rule out the role of discrete shifts.

Several attempts to overcome the data problems in the previous studies are pursued by Melvin and Lanman (1991) and Kamin and Ericsson (1993), who use supply-side measures of the extent of currency substitution. In the former, the measure is the informal loan market and in the latter recorded flows, from the US Treasury, of US currency between the US and Argentina cumulated over time as a measure of the extent of dollarization. Melvin and Ladman use a probity model to determine the probability that an informal loan is denominated in dollar; they use the term of the loan, the size, the

inflation differential vis-à-vis the US, and seasonal dummies as independent variables. They show that the supply of dollar loans is highly seasonal and coincidental with the requirements of coca producers. The conclusion is that the dollarization process is intimately connected to the process of coca paste production.

Kamin and Ericsson assume that supplies are endogenous and equate them to the demand for dollars. Then they model the demand for money as a function of the interest rate, inflation, the rate of depreciation and the previous maximum value of inflation. The Johansen procedure suggests that the variable co integrate, and since this implies that an error-correction mechanism exists, they devote the remainder of their paper to investigating it. The most important point here is that they show that the behaviour of dollar currency and dollar deposits is different under the same macroeconomic shocks, the conclusion being that looking at dollar deposits alone gives a misleading view of currency substitution, especially when considering short-run trends.

The evidence for Eastern Europe, in contrast to that of Latin American, is interesting for a different reason since there has been a distinct break in regime between a centrally planned episode and a period of liberalization. In the formal situation, the evidence for currency substitution into hard currency of Western Europe is documented for Hungary and Poland by Charemza and Ghatak (1990). The demand for the second is very much dependent on the access to, and information on, western currencies and the severity of the regime in terms of shortages and rationing. In Hungary, where the regime was less austere, the markets for western currency were less developed, but in Poland, where the regime was more restrictive, the market and participation in the uses of a second currency was greater.

In some respects in the later period, after the fall of the iron Curtain the events in Eastern Europe resemble the Latin American experience. As documented in Lahiri (1991)

and Frenkel and Taylor (1993), following moderate inflationary episodes in the 1970s and early 1980s, high and then hyperinflation set in from late 1988. Lahiri (1991) suggested that the influence of foreign-currency deposits had a dominant effect on the liquid assets of Yugoslavia, being extremely close substitutes for money. When Frenkel and Taylor (1993) augmented a Cagan model with the change in the return to foreign assets (indicating currency substitution), the influence of the returns was rejected for the whole sample- but the influence of this variable in the last few observations of the sample was very strong. In both cases the influence of currency substitution and foreign currency holdings on the liquid assets of the country are likely to be strongly dominated by the last few observations. In this case and in other high-inflation Eastern European countries there appears to be evidence of currency substitution as a hedge against inflation, although there are generally too few observations during high-inflation episodes to be able to test the hypothesis more formally using an econometric model.

The conclusion in high-inflation, transition and less developed economies is that, data limitation notwithstanding, currency substitution appears to be strong, and is stimulated by the expectation of inflation. However, empirical analyses of the implications of this development for the conduct of monetary policy have been rear.

In Nigeria, empirical investigation into the nature of the general demand for money functions remain perhaps the most extensively studied area of economic research. However, direct studies on currency substitution have been rare. Oresotu and Mordi (1992) tested the existence of currency substitution by including exchange rate as one of the explanatory variables in the aggregate money demand functions. Their result points to the existence of currency substitution in Nigeria. A specific study addressed to the issue of currency substitution was by Olomola (1999) and more recently by Akinlo (2003). Olomola (1999) investigated the effect of currency substitution on the demand for money

functions in Nigeria for the period 1986 to 1997 using quarterly data. Using single equation OLS estimation technique, he regressed alternative definitions of money stock on domestic rate of interest, inflation rate, domestic output and foreign rate of interest. The findings from the study suggest the significant presence of currency substitution in Nigeria. He observed that the increased holding of foreign currencies could lead to instability in the demand for money specifications thereby causing biases in monetary policy formulation and targeting. He therefore suggested that the value of the Nigerian currency, Naira be enhanced. This, according to him could be achieved through the encouragement of domestic production and the stimulation of exports especially non-oil exports.

Interesting as these studies looks, they suffer from a lot of structural weaknesses. In the first place the studies fail to tell us the extent or degree of currency substitution in Nigeria, which, in our view, is more relevant for policy purposes. Indeed, it is the magnitude of currency substitution that has relevance for policy purposes and not its mere existence. Aside from the above, the method of analysis employed is questionable. The time series properties of the data used for the analysis were never evaluated and this could lead to spurious regression thereby making most of the conclusions flowing from the study unreliable. In addition, the approach fail to answer the question as to how monetary policy reacts to the presence of currency substitution in Nigeria.

More recently, Akinlo (2003) investigated whether exchange rate depreciation in Nigeria has resulted in currency substitution. Using the conventional single equation money demand specification, with some exercise in testing the time series properties of the variables used, came to the conclusion that Naira depreciation has not led to currency substitution in Nigeria. This study also suffers from most of the pitfall of the earlier studies on currency substitution in Nigeria. Specifically, important variable that are theoretically relevant for currency substitution (e.g. foreign rate of interest, a measure of domestic inflation and indeed, exchange rate volatility) were never included.

In order to correct these problems and to further provide empirical study in this area of macroeconomic policy management in the face of currency substitution, this study adopts a vector autoregressive (VAR) model of currency substitution to evaluate the relationship between exchange rate variability, currency substitution and monetary policy in Nigeria.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methods employed in the process of carrying out this study. First, we present the theoretical framework, model specification and identification of restrictions. Sources of data and measurement of variables followed thereafter. Tests for volatility of exchange rate and the measure of the extent of currency substitution in Nigeria respectively were presented in the latter part of this chapter. The chapter is concluded with a discussion of the analytical techniques employed in this study, under which tests for stationarity and cointegration were considered. Specifically, objective one on the appraisal of monetary and exchange rate policies in Nigeria was addressed in chapter four while objective two was handled in chapter five. Objectives three, four and five were taking care of in chapter six while objective six on the implications of currency substitution and exchange rate volatility for monetary policy was examined in chapter seven.

3.2 Theoretical Framework

Currency substitution and monetary policy are the principal issues at hand in this study. The motivation for them derives from the fact that the demand for money plays an important role in the transmission mechanism of monetary policy. Indeed, the temporal stability of the demand for money function is crucial if monetary policy is to have effects on output and price level. There are basically two ideological doctrines that have informed the development of demand for money theories. They are the Keynesian tradition and the Neo-Classical (Monetarist) theories and their extensions. Two characteristics of money that provide the starting point for a number of theories are its use

as universally acceptable means of exchange and its role as a store of value. The former leads to the transactions model of money demand while the latter leads to portfolio model.

Therefore, empirical estimation of money demand functions can be categorized into two: the transactions or money services theories and portfolio theories. The transaction theories view money as a medium of exchange and are demanded as an inventory for transaction purposes. Portfolio theories consider the demand for money in much broader terms as part of the problem of allocating wealth among a portfolio of assets, which includes money. The portfolio theories emphasize store of value function of money. In this case, the demand for money function becomes a portfolio optimization problem, where economic agents choose the composition of their portfolios to maximize the returns on them. This study follows the portfolio balance theories. As such money is viewed as a financial asset.

The demand for money as a financial asset is determined by the rate of return on the money itself, rate of returns on alternative assets, and by the total wealth (often proxied by income). In Friedman's formulation of the demand for money, he expressed the demand for money in real term as.

$$M^d/_P = f(r_i, Y, h, \pi^e) \quad \text{.....(1)}$$

where h is the ratio of human to non-human wealth; r_i is the vector of returns on alternative assets to money holding; Y is a measure of total wealth usually referred to as permanent income; while π^e is the expected rate of inflation. We expect that:

$$f'Y, f'h > 0 \text{ and } f'\pi^e, f'r_i < 0 \quad \text{.....(2)}$$

More recently, Girton and Roper (1981), Cuddington (1983), Branson and Henderson (1985) Zervoyianni (1988,1992), Mizen and Pentecost (1996) and Ropers (1996) have extended the model to include the possibility of currency substitution. As in Tobin (1958), these models all assume that agent maximize the returns to their wealth

subject to a given level of risk. This is the most general model since agent can hold four different assets and switch between them simultaneously. It is often referred to as the unrestricted portfolio balance model of currency substitution. Within this framework, domestic money is viewed as risk-less asset, since it is assumed that there is no domestic inflation, while domestic bonds are risky, in that their prices may vary. In the context of a closed economy these would be the only two assets, and agent would choose between money and bonds on the basis of the rate of interest. As interest rates rose bonds would become more attractive relative to money and, for given levels of risk, the agent would hold relatively more bonds in the portfolio. Since the model is an open-economy model, there are two further assets: foreign money and foreign bonds. The rate of return on foreign bonds is simply the rate of interest plus the expected depreciation of the domestic currency, since for domestic residents it is the home-currency value of bond returns that is important. The rate of return on foreign money, in the absence of inflation, is again zero. In this context it is not clear why domestic residents should wish to hold foreign currencies as part of their portfolio unless they wish to purchase foreign goods and services, since it is dominated as a store of value by bonds and as a medium of exchange by domestic money.

In practice, however, inflation is rarely zero. In the case of non-zero inflation, in both the home and the foreign country the return on cash holding is the inverse of the inflation rate. Therefore, the relative return on the cash part of the portfolio is given by the expected depreciation of the exchange rate. Thus if domestic inflation is expected to be higher than foreign inflation, the domestic currency is expected to depreciate and the demand for domestic currency will fall relative to foreign currency. In practice, the viability of switching between domestic and foreign currency will, in part, depend on the

transactions costs incurred, which in turn depend on the volume of currency to be switched.

Branson and Henderson (1985), assume that the domestic demand (i.e. that of domestic residents) for assets depends on their relative returns, satisfying the usual wealth constraints:

$$M = M\ (i,\ (i^* + e^e),\ e^e,\ PY,\ P^c,\ W) \qquad (3)$$
$$(-)\ (-)\ (-)\ (+)\ (+)\ (+)$$

$$eM^* = M^*\ (i,\ (i^* + e^e),\ e^e,\ PY,\ P^c,\ W) \qquad (4)$$
$$(-)\ (-)\ (+)\ (+)\ (+)\ (+)$$

$$B = B\ (i,\ (i^* + e^e),\ e^e,\ PY,\ P^c,\ W) \qquad (5)$$
$$(+)\ (-)\ (-)\ (-)\ (-)\ (+)$$

$$eB^* = B^*(i,\ (i^* + e^e),\ e^e,\ PY,\ P^c,\ W) \qquad (6)$$
$$(-)\ (+)\ (-)\ (-)\ (-)\ (+)$$

The first argument in equations (3) to (6), i, is the return on holding bonds denominated in domestic currency relative to the return on domestic money (minus the rate of domestic inflation). It is assumed that all four assets are substitutes in the portfolio. Hence, an increase in i raises the demand for domestic bonds but lowers the demand for their substitutes in the portfolio. The nominal return on bonds denominated in foreign currency is i*. This return expressed in terms of domestic currency becomes ($i^* + e^e$). where e^e is the expected change in the exchange rate. It affects the demand for foreign securities positively and that for other assets negatively. Once again, this second argument is in fact a real return differential, where the return on domestic money is minus the rate of inflation. Similarly, the third argument, e^e, is the return on foreign money, converted into the domestic currency.

The fourth argument, PY, is the home currency value of domestic output and affects demand for all assets positively. P^c is the price of the domestic consumer's consumption bundle expressed in the home currency. An increase in P^c increases the

demand for both moneys and lowers the demand for bonds denominated in domestic and foreign currency. The positive effect on domestic wealth W, the last argument, reflects the assumption that all assets are "normal assets".

The advantage of the portfolio balance approach is that it distinguishes between currency substitution, as measured by the coefficient on the expected change in the exchange rate, and capital mobility, as measured by the coefficient on the foreign rate of interest. Another interesting feature of these types of portfolio balance model is that it can be estimated for individual domestic-money demands, as in Cuddington (1983) or Mizen and Pentecost (1994), or as an aggregate demand for money over a specific region. For our purpose, we estimate this equation for the Nigerian economy using quarterly data for 1986 to 2001.

3.3 Model Specification and Identification of Restrictions

For the purpose of model formulation, we adopted the unrestricted portfolio balance model as articulated above. We find this very useful for our purpose because market agents are free to hold all assets that are available- be it foreign or local. Aside from this, both domestic money and foreign money are also allowed to enter the portfolio of assets an individual can hold at a particular point in time. However, in an empirical context, it is most common to estimate just the demand for money function of the form specified in equation (3) (Cuddington, 1983; Viseth, 2001). From equation (3), we assume rational expectations when expectations are formed about exchange rates. An economic agent is said to hold a rational expectation with respect to exchange rate if his subjective expectation is the same as the exchange rate's expected value, conditional on information set containing all publicly available information. More formally, the rational expectations hypothesis states that the market's subjective expectations are in fact the

same as the expected value, conditional on the set of all available information (Copeland, 2000).

A measure of exchange rate volatility, ERV_t, is included to capture both the absolute domestic-money-demand depressing effects of volatility and any substitution away from domestic assets demand to foreign assets demands due to a rise in volatility. We expect exchange rate volatility to increase the desire of domestic residents to want to switch to demanding for foreign currencies and deposits. Hence, the higher the volatility in exchange rate, the higher the substitution between the domestic currency and foreign currencies in an economy and this will unequivocally lower the demand for domestic money. The volatility of exchange rate is conditional on information in period t. This is consistent with the fact that a stochastic process usually models the variable with a changing variance. In the general case, we assume that the variables have a unit root in this sample period and are thus log-difference stationary. Even then, such a series may not be independent because of the serial dependence in the variance. Following Ndung'u (2001), the conditional volatility of exchange rate was extracted and modeled via a state space representation of the form: -

$$Z_t = \sigma\varepsilon_t e^{\frac{1}{2}h_t};\varepsilon_t \_\_\_\_\_ iid(0,1) \quad \ldots\ldots(7)$$

where

$$h_{t+1} = \pi h_t + \mu_t \_\_\_\_\_ NID(0,\sigma_\mu^2)|\pi| \le 1 \quad \ldots\ldots(8)$$

Z_t is the exchange rate. The term σ^2 is a scale factor and subsumes the effect of a constant in the regression of h_t, π, is a parameter, μ_t is a disturbance term that is uncorrelated with ε_t, ε_t is an iid (0,1) are random disturbances symmetrically distributed about zero. The h_t equation is a transition equation in autoregressive form where the absolute value of π is less than unity to ensure that the process in equation (8) is stationary (Ndung'u, 2001; P.12). These equations generate the conditional volatility of

exchange rate used in the VAR. However, we attempt to determine whether the most important aspect of volatility for currency substitution is for the nominal or real exchange rates. To do this, alternative measures of exchange rate volatility (i.e. real and nominal exchange rate volatilities) are estimated and included in the VAR for that purpose.

M_t is included in the model to capture the effect of changes or innovations in both domestic and foreign rates of returns including exchange rate volatility on the demand for domestic money. This represents deposits in the domestic banking system denominated in Naira. This variable is calculated as the difference between the M2 monetary aggregate and deposits in the domestic banking system denominated in foreign currencies. We further subtract Nigerian currency in circulation, since we cannot include foreign currencies in circulation in our analysis owing to a lack of data series.

The foreign rate of interest, i_t^*, proxied by the Federal Funds rate, is included to control for the response of domestic monetary policy to US financial variables and how foreign rates of returns affect the portfolio of assets of domestic residents especially the demand for domestic money. Therefore, i_t^* is included to account for how it encourages or discourages currency substitution in Nigeria as people switch from the demand from domestic money to foreign money. Kim and Roubini (1999) cite evidence in Grilli and Roubini (1995) that this is important for G6 countries. For our purpose, Nigeria has had relatively open capital markets, especially as from 1986 when financial liberalization started, and it is also reasonable to assume that domestic interest rates are related to US interest rates. One important point to note is the focus on US interest rates and the US dollar exchange rate. This means that the US is serving as a proxy for the international economy. Indeed, there is sufficient evidence to suggest that the US has an important influence on Nigerian financial variables and is likely to act as a reasonable proxy (see de Roos and Russell, 1996; and Dungey and Pagan, 1998, for a similar explanation).

The empirical exercise is to model and estimate the dynamic interactions among the variables in a VAR. To be able to capture the response of domestic monetary policy to various shocks in exchange rate, currency substitution and other variables in the system, we specify the following model within the Vector Autoregressive framework (VAR) to best capture the joint behaviour of exchange rate variability, currency substitution and monetary policy in Nigeria.

To sketch the analysis, let X_t denote a vector of endogenous variables. Specifically, the model specification is of the form:

$$X_t = (i_t^*, Y_t, P_t^c, e_t^e, ERV_t, i_t, M_t)' \quad \text{.........(9)}$$

where all variables except interest rates are expressed in logarithms. e_t^e, the expected change in the exchange rate is the return on foreign money converted into the domestic currency, i_t the domestic policy interest rate, M_t is domestic demand for domestic money, y_t is the home-currency value of domestic output, measured by GDP, p_t^c is the price of the domestic consumer's consumption bundle expressed in the home currency, i_t^* denotes foreign rate of interest, proxied by Federal Funds rate, and ERV_t is a measure of exchange rate volatility extracted via a state-space representation (a form of signal to noise extraction) of the form in equations (7) and (8) as used by Ndung'u (2001). It is the best method to use since it enables one to model the noise.

For the time being we proceed with the endogenous variables n=7, and we assume that the structure of the model is consistent with the class of dynamic linear stochastic models, which can be represented as:

$$D(L)\Delta X_t = \mu_t \qquad (10)$$

where L is the shift operator, μ_t is a vector of white noise errors and D_i are (7x7) matrixes of finite coefficients that summarize the dynamics of the model. ΔX_t is a vector of the variables in the system. We make the assumption that the variables have a unit root and thus are first-difference stationary. Each of the μ_{jt} is to be interpreted as an exogenous structural shock to the j^{th} equation. For example, j=4 represents the exchange rate volatility equation and thus μ_{4t} is a random variable depicting the innovation to the exchange rate volatility process.

The sample second moments of the joint probability distribution generating the data are fully summarized by the following Wold moving average representation:

$$\Delta X_t = \left(I + D_1(L) + D_2\left(L^2\right) + \ldots\right)\mu_t = D(L)\mu_t \qquad (11)$$

where $E(\mu t \mu_1) = \Sigma$

If the data generating process for ΔX_t is covariance stationary, then $\lim_{s\to\infty} D_s = 0$. Furthermore, if **D(L)** is invertible, then the coefficient in **D(L)** and Σ are directly obtainable from the following VAR representation of ΔX_t:

$$A(L)\Delta X_t = C(L)^{-1}\Delta X_t = v_t \qquad (12)$$

where A(L) is a k^{th} matrix of polynomials in the lag operator L with all roots inside the unit circle and v_t is a vector of zero-mean, independently and identically distributed innovations with a covariance matrix Σ.

But one problem that arises is that Equation (10) is consistent with any linear theoretical model and thus had little empirical content. We thus require further restrictions so that **D(L)** can be uniquely identified. In the VAR literature, the choice of identifying restrictions is based on a priori economic reasoning regarding the structure of the system. The most commonly used restriction is the recursive system (triangularization) where the innovations of the first variable in the system affect all

variables and the innovations of the last variable contemporaneously affect only that variable.

This method has basic weaknesses by imposing a recursive structure in the dynamic analysis and may not be adequate for evaluating the effects of structural economic disturbances as this study intends to do. The method has been convenient and easy to apply but is inconsistent with any plausible model. To resolve these empirical weaknesses and identify the desired dynamic multipliers we use restrictions from the economic model itself. The most important aspect of this analysis is to analyse the causal structure of the variables in the system. The causal structure will show which variables affect all the other variables and thus determine their position in the matrix (Ndung'u, 2001). The restrictions imposed lead us to the following model:

$$y_t = b_{23}P_t^c + b_{24}ERV_t + b_{26}i_t + b_{27}M_t + u_{2t} \quad \text{.....(13)}$$

$$P_t^c = b_{32}y_t + b_{34}ERV_t + b_{35}e_t^e + u_{3t} \quad \text{.....(14)}$$

$$ERV_t = b_{45}e_t^e + b_{46}i_t + u_{4t} \quad \text{.....(15)}$$

$$e_t^e = b_{51}i_t^* + b_{52}y_t + b_{53}P_t^c + b_{54}ERV_t + b_{56}i_t + b_{57}M_t + u_{5t} \quad \text{.....(16)}$$

$$i_t = b_{61}i_t^* + b_{62}y_t + b_{63}P_t^c + b_{64}ERV_t + b_{65}e_t^e + b_{67}M_t + u_{6t} \quad \text{.....(17)}$$

$$M_t = b_{72}y_t + b_{73}P_t^c + b_{74}ERV_t + b_{75}e_t^e + u_{7t} \quad \text{.....(18)}$$

Hence, b_0 matrix can be written as follows:

$$B_0 x_t = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & b_{23} & b_{24} & 0 & b_{26} & b_{27} \\ 0 & b_{32} & 1 & b_{34} & b_{35} & 0 & 0 \\ 0 & 0 & 0 & 1 & b_{45} & b_{46} & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 & b_{56} & b_{57} \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & 1 & b_{67} \\ 0 & b_{72} & b_{73} & b_{74} & b_{75} & 0 & 1 \end{bmatrix} \begin{bmatrix} i_t^* \\ y_t \\ P_t^c \\ ERV_t \\ e_t^e \\ i_t \\ M_t \end{bmatrix} \quad \text{.....(19)}$$

Where b_{ij} represents coefficients of the seven-vector variables mentioned earlier. As pointed out in equation (19), innovations in foreign rate of interest i_t^*, are due to "own" shocks. By implication, this restriction shows that innovations in foreign rate of interest do not depend on innovations from other variables in the model.

The interest rate equation is interpreted as the policy reaction function of the central bank. The interest rate used is the treasury bills rate. This interest rate has been the principal policy instrument of the Central Bank of Nigeria. For our purpose, the policy reaction function of the central bank depends contemporaneously on all the variables in the model. This is a departure from Brischetto and Voss (1999) specification for Australia, which included only three variables (The oil price variable, which was used as a proxy for anticipated inflation; the domestic monetary aggregate and the nominal exchange rate) in the interest rate equation. According to them, the justification for excluding output and the price level was based upon the timing of information. They argued further, that, measures of these variables are not available at the time policy is set. For the price level, it was argued that, the exclusion was premised on the fact that oil price index had been used in the same model meaning that including price level would amount to a duplication of variables measuring essentially the same thing. For output, however, it was acknowledged that excluding output from the interest equation amounts to restricting the monetary authorities from responding to any indicators of future output apart from those specified in the model. For our purpose, we consider this inappropriate given the nature of our study and the structure of Nigerian economy. Indeed, by including output, price level and all other variables in the interest rate policy equation, we are able to account for how monetary policy reacts to changes or innovation from any of the variables in the system. Also, we follow Cushman and Zha (1997) model for Canada, which includes the US Federal Funds rate in the domestic policy reaction function. They

argued that inclusion of this variable is important in their model. Hence, we include the contemporaneous US Federal Funds rate in the domestic interest rate equation in order to obtain sensible dynamic responses. Also, currency substitution index was included in the model to account for the effect of using foreign currency (either as means of payment or store of value), in the domestic economy, on the conduct of monetary policy in Nigeria.

The monetary aggregate equation is specified as a standard money demand equation, dependent upon domestic output, domestic inflation, expected change in exchange rate and exchange rate volatility which is a measure of uncertainty in the domestic economy. We use a measure of M_2, which is consistent with its use in a cross-country study by Kim and Roubini (1999), Viseth (2001) for Cambodia, Komarek and Melecky (2001) for the Czech Republic and Cuevas (2002) for Venezuela.

Finally, the exchange rate is treated as dependent upon all innovations of the model. This reflects the fact that the exchange rate is a financial variable and reacts quickly to all information. Aside from this, the exchange rate is an indirect tool of monetary policy especially in a free market economy where exchange rates are allowed to float. A similar argument was employed by Cushman and Zha (1997) and also, by Brischetto and Voss (1999).

To capture the impact of exchange rate volatility and currency substitution on the demand for foreign money, M_t^*, measured by the ratio of US-dollar denominated deposits to domestic-currency–denominated deposits, both in domestic currency units, we replace M_t with M_t^* in equation (9). This is similar to those proposed by Feige, Faulent, Sonje and Sosic (2000) in case of Croatia; and by Mongardini and Mueller (1999) in the case of the Kyrgyz Republic for analogous purposes. This may be a measure of the extent of currency substitution/dollarization of the Nigerian economy from the store of value perspective and the new equation becomes:

$$X_t = (i_t^*, Y_t, P_t^e, e_t^e, ERV_t, i_t, M_t^*)' \quad \text{.....(20)}$$

A measure of exchange rate volatility, ERV_t, included here is expected to have a different sign from that of equation (9). Specifically, we expect exchange rate volatility to induce domestic residents to want to hold more foreign money especially for store of value purposes. Hence, rather than depressing domestic demand for foreign money, a rise in volatility will indeed induce it. All other variables are as defined above.

3.4 Tests for Volatility of Exchange Rate in Nigeria

In this section, an empirical measure of exchange rate volatility to determine whether exchange rate in Nigeria has been volatile during the period under review was developed. In this study, the Autoregressive Conditional Heteroskedasticity (ARCH) model introduced by Engle (1982) and generalized as GARCH (Generalised ARCH) by Bollerslev (1986) was used to capture the extent of exchange rate volatility in Nigeria. These models are widely used in various branches of econometrics, especially in financial time series analysis (see for example, Bollerslev, Chou and Kroner, 1992; and Bollerslev, Engle and Nelson, 1994). They are particularly useful in measuring volatility, which is indeed the focus of this section.

In developing an ARCH model, we considered two district specifications – one for the conditional mean and one for the conditional variance.

In the standard GARCH (1, 1) specification,

$$y_t = \lambda x_t + \varepsilon_t \quad \text{.....(21)}$$

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 \quad \text{.....(22)}$$

The mean equation given in equation (21) is written as a function of exogenous variances with an error term. Since σ_t^2 is the one-period ahead forecast variance based on past

information, it is called the conditional variance. The conditional variance equation specified in (22) is a function of three terms.

- The mean: ω
- News about volatility from the previous period, measured as the lag of the squared residual from the mean equation; ε_{t-1}^2 (the ARCH term)
- Last period's forecast variance; σ_{t-1}^2 (the GARCH term)

The (1, 1) in GARCH (1, 1) refers to the presence of a first – order GARCH term (the first term in parentheses) and a first-order ARCH term (the second term in parentheses). An ordinary ARCH model is a special case of a GARCH specification in which there are no lagged forecast variances in the conditional variance equation.

This specification is often interpreted in a financial context, where an agent or asset holder predicts this period's variance by forming a weighted average of a long term average (the constant), the forecasted variance from the last period (the GARCH term), and information about volatility observed in the previous period (the ARCH term). If the exchange rate changes were unexpectedly large in either the upward or the downward direction, then the agent will increase the estimate of the variance for the next period. This model is also consistent with the volatility clustering often seen in financial returns data, where large changes in returns are likely to be followed by further large changes.

For the purpose of this study, a standard GARCH (1, 1) model with no regressors in the mean and variance equations was estimated. i.e.

$$ER_t = c + \varepsilon_t \quad \text{.....(23)}$$

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \quad \text{.....(24)}$$

The autoregressive root, which governs the persistence of volatility shocks, is the sum of α and β. If $\alpha + \beta$ is close to unity (1), it indicates that volatility is present and persistent.

From this result, it will be difficult for us to determine whether the volatility observed will be a short-run or a long-run one. To be able to do this we will employ component ARCH model, which breaks the volatility episodes into its short-run and long run components.

From equation (22):

$$\sigma_t^2 = \varpi + \alpha\left(\varepsilon_{t-1}^2 - \varpi\right) + \beta\left(\sigma_{t-1}^2 - \varpi\right) \quad \text{.....(25)}$$

shows mean reversion to ϖ, which is a constant for all times. By contrast, the component model allows mean reversion to a varying level q_t modelled as:

$$\sigma_t^2 - q_t = \alpha\left(\varepsilon_{t-1}^2 - q_{t-1}\right) + \beta\left(\sigma_{t-1}^2 - q_{t-1}\right) \quad \text{.....(26)}$$

$$q_t = \omega + \rho\left(q_{t-1} - \omega\right) + \phi\left(\varepsilon_{t-1}^2 - \sigma_{t-1}^2\right) \quad \text{.....(27)}$$

Here, σ_t is still the volatility, while q_t takes the place of ω and is the time varying long-run volatility. The first equation describes the transitory component, $\sigma_t^2 - q_t$, which converges to zero with powers of $\alpha + \beta$. The second equation describes the long run component q_t, which converges to ω with powers of ρ. Typically, ρ is between 0.99 and 1 so that q_t approaches ω very slowly. We can combine the transitory and permanent equations and write:

$$\sigma_t^2 = (1-\alpha-\beta)(1-\rho)\omega + (\alpha+\phi)\varepsilon_{t-1}^2 - (\alpha\rho + (\alpha+\beta)\phi)\varepsilon_{t-2}^2 + (\beta-\phi)\sigma_{t-1}^2 - (\beta\rho - (\alpha+\beta)\phi)\sigma_{t-2}^2 \quad \text{.(28)}$$

which shows that the component ARCH model is a (non-linear) restricted GARCH (2, 2) model. The value of ρ is the estimate of the persistence of volatility in the long-run component while short run volatility is governed by powers of $\alpha + \beta$. If ρ and $\alpha + \beta$

is close to unity, it indicates that volatility shocks are quite persistent in both the short run and long run.

In addition, we tested for higher order GARCH effects. This allows us to determine the level of volatility beyond one period (quarter).

3.5 The Extent of Currency Substitution in Nigeria

Measured in terms of stock, the extent of dollarization/currency substitution in Nigeria was captured with the most cited IMF measure of dollarization, denoted DI_{IMF} i.e.

$$DI_{IMF} = FCD / BM \quad \text{..........(29)}$$

where **BM = LCC + LCD + LTD + FCD**. LCC, LCD, and LTD are local currency in circulation, local currency checkable deposits, and local currency time and savings deposits, respectively while FCD refer to foreign currency bank deposits in the domestic economy.

3.6 Sources of Data and Measurement of Variables

This study utilized secondary data. The data were sourced essentially from the publications of the International Monetary Fund's (IMF) various publications on Nigeria and Central Bank of Nigeria Statistical Bulletin. Specifically, data on all the variables were sourced from International Financial Statistics (IFS). We used quarterly data spanning the period from the first quarter of 1986 to the fourth quarter of 2001. Where a particular variable is of discrete form we use a quarterly average calculated as the simple arithmetic average of the monthly end-of-period values for the three months in the current quarter and the last month of the previous quarter

We first attempt to define and operationalise the M_t variable, representing deposits in the domestic banking system denominated in Naira. This variable is calculated as the difference between the M_2 monetary aggregate and deposits in the domestic banking system denominated in foreign currencies. We further subtract Nigerian currency in

circulation, since we cannot include foreign currencies in circulation in our analysis owing to a lack of data series.

The next variable is M_t^* which is measured as the ratio of foreign to domestic currency deposits; we name this variable the FD/DD ratio in percent. We use the consumer price index as the approximation of variable P_t^e in equation (9) and (20). This index should precisely describe consumption basket price development in Nigeria and so correctly deflate the nominal variables from the perspective of the domestic agent.

Furthermore, the variable Y_t in equations (9) and (20) was approximated using domestic absorption, which measures the amount of transactions in the Nigerian economy and/or accumulation of wealth. This variable was employed, as according to Somer (1997) and Melecky (2001). It is more significant for such purpose.

Instead of the return on domestic bonds, the interest rate on credits was used, since this seems to be the most significant opportunity cost of holding money and an alternative wealth allocation to money holdings. For the purpose of measuring return on foreign money, Naira/US dollar exchange rates – N/USD was employed. We use current and one-period-lagged values of the exchange rate to approximate exchange rate expectations, since we assume that agents form their expectations mostly adaptively and the rest use the random walk process as the predictor. We do not use an inflation differential for such purposes, as PPP is likely to hold only in the longer run (Komarek and Melecky, 2001).

Next, an operational measure of exchange rate volatility in Nigeria was developed. The index of exchange rate volatility used is the state-space representation of the form in equation (7) and (8). It is a form of signal-to-noise extraction as used by Ndung'u, (2001). This enables us to model the noise.

As in the above case, the return on US Dollar-denominated assets was employed to explicitly consider their relative importance in equations (9) and (20). This return was

calculated as the sum of the interest rate and the particular exchange rate after logarithmic transformation, i.e. i+e represented by i_t^* in equations (9) and (20).

3.7 Technique for Data Analysis

To explore the long-term relationship between exchange variability and currency substitution in Nigeria, quarterly data from 1986:1-2001:4 were used. Before the Johansen cointegration test can be applied, it must be determined whether the series are non-stationary or have unit roots. Indeed, it is common for time-series data to demonstrate signs of non-stationary; typically both the mean and variance of macroeconomic variables trend upwards over time. It is useful to test explicitly for manifestations of non-stationarity because the presence of non-stationary often has important econometric implications. In particular, it can lead to spurious or unacceptable results. It has been shown in a number of theoretical literatures that the statistical properties of regression analysis using non-stationary time series data are dubious (Phillips.1986).

The next task is to check whether the variables are co-integrated. Testing for the existence of cointegration among economic variables has been widely used in the empirical literature to study economic interrelationships. Such relationships would imply that the series would never drift too far apart. Put differently, the fact that variables are cointegrated implies that there are some adjustment processes, which prevent the errors in the log-run relationship becoming larger and larger. Engel and Granger (1987) have shown that any cointegrated series have an error correction representation. It follows therefore, that cointegration is a necessary condition for error correction model to hold. The Johansen (1988) method was used to examine the existence of a long-term relationship between the currency substitution index and the explanatory variables at the 5

per cent level and 1 per cent level of significance respectively. The cointegration test was applied using alternative lag-lengths in the vector autoregression (VAR).

CHAPTER FOUR

MONETARY AND EXCHANGE RATE POLICY MANAGEMENT IN NIGERIA

4.0 Introduction

In this chapter, an attempt was made to provide a comprehensive but not exhaustive review and appraisal of monetary and exchange rate policy management in Nigeria. The review attempts to bring out the best indicator of the stance of monetary policy in Nigeria. Also, an attempt was made to show how monetary policy and exchange rate management has affected key macroeconomic variables in Nigeria especially those that come into our model equations. In the first place, we take a look at monetary policy in Nigeria while the issue of exchange rate policy was considered in the latter part of this chapter. Indeed, an overview of the evolution of monetary management in Nigeria shows that it has metamorphosed from an era of administrative controls and regulation to a market-based mechanism. An attempt was made to summarise the actions of the monetary authorities and assess the outcomes during the period. For this purpose, the period 1959 to date has been divided into four phases: the formative years 1959 to 1969: the oil boom era. 1970 to 1979: the collapse of the oil boom, 1980 to 1985: and the Structural Adjustment Programmed (SAP) era, 1986 to date. It is instructive to note that the first three periods represent the era of controls and regulation. In a similar vein, exchange rate policy management in Nigeria also evolved through a similar historical development.

4.1 Monetary Policy in Nigeria (1960-2001)

Prior to the commencement of the economic liberalisation programme in Nigeria, the Central Bank of Nigeria adopted direct control of monetary management. Like in many other Less Developed Countries (LDCs), the motives for this are not far-fetched.

Most of them are rooted in the market failure paradigm. There was the need to channel cheap credit towards the sectors in the economy that are believed to be at the forefront of development. At independence, it was felt that the existing financial institutions could not adequately support the process of industrialisation and agricultural modernisation that was needed to move the country into the forefront of development. Existing financial institutions were foreign owned and local farmers and entrepreneurs had difficulties borrowing from them. The informal financial sector provided the little loans they were capable of at high interest rates. There were few sources of equity and long-term finance for long-term borrowers. On their part, creditors actually demonstrated a reluctance to provide long-term funds for a number of reasons. Investment was considered risky - production was in new sectors and used technologies unfamiliar to the work force. Both entrepreneurs and managers were relatively inexperienced. Agricultural lending was particularly suspect as natural calamities and fluctuating commodity prices could affect the incomes of farmers and hence their ability to repay loans. In addition, the uncertainty in government policies, volatile inflation, government borrowing which crowded firms out of the financial markets; uncertainty about borrowers prospects, are the obvious reasons why creditors are reluctant to provide long-term funds under such circumstances.

However, the socio-economic milieu was characterised by an impatient and often impoverished population yearning expectantly for government to perform. Thus the government wanted faster results. There was thus the tendency to want to use the financial system for such purposes as allocating resources to projects with high social returns and redistributing incomes. At independence, economic development became a cardinal objective of government. There was the compelling desire to use the banking system to mobilize and channel resources to finance investment projects highlighted by the development plans of the government. Commercial banks were either nationalised or

indigenised. Following the promulgation of the indigenisation decree in 1972, the Federal government took controlling shares in all of the foreign owned banks and went ahead in the 1977 follow up decree to limit foreign participation in banks to a maximum of 40 percent equity. By 1980, the federal or state government had majority shareholding in all but a few of the 20 commercial and 6 merchant banks in operation. Thus prior to the commencement of structural adjustment programme in 1986, government intervention in credit allocation targeting industry, small and medium-scale enterprises, agriculture, state-owned enterprises, exports and even regional balances was perverse and remained the main form of monetary management

Two main inter-related factors have shaped monetary management in Nigeria. First is the event in international oil market and the other is the perverse nature of the public sector with regards to its borrowing requirements. As the former has to a great extent influenced the latter, we can tentatively delineate four regimes of monetary policy in Nigeria. The first is the period 1960-1969, prior to the larger scale exploitation of oil. The second is the period 1970-79, which coincided with the first oil boom as well as the onset of the second oil boom in 1979. The third period is made up of two sub-periods, 1980-1986 and 1987-1992. The first sub-period coincided with the first major downturn in the oil market and the ensuing economic austerity and the second sub-period coincided with the commencement of the structural adjustment programme, a major component of which is financial liberalisation. It is also worthy of note that this sub-period (1987-92) coincided with a period of gradual recovery in the oil market.

4.1.1 The formative Years, 1959 to 1969

The major objective of monetary policy after the establishment of the Central Bank of Nigeria (CBN) in 1959 was the creation of the necessary monetary and financial infrastructures given that at independence, the nation had inherited a nascent monetary

system with a narrow financial sector. Financial instruments such as treasury bills, treasury certificates and development stocks, which were largely the borrowing instruments of government, were all introduced during this period. These provided necessary channels for mobilising liquid money balances from the banking institutions.

Following the establishment of the Central Bank of Nigeria (CBN) in 1959, monetary management at the initial stage was propelled by the doctrine of 'cheap money-policy' and the use of credit control. This was attained through an expansionary monetary policy via the creation of –local currency, money and capital market instruments, development finance institutions (DFLs), and through keeping interest rates low for priority sectors of the economy. This approach was particularly favoured during the period following the adoption of the First National Development Plan, the prosecution of the civil war and the collapse of the consortium arrangement for financing the Nigerian export produce in 1968. Indeed, the exigencies of monetary management in a war-ridden economy (the Nigerian civil war 1966-70) dictated the enactment of a spate of decrees between 1967 and 1969 to give a bite to the power of the CBN to control the economy.

The Central Bank (amendment) Decrees, 1967-69 and the Banking (Amendment) Decrees 1969 gave legal backing to the monetary control mechanism of the Central Bank. This decree led to an increase in the instruments available in the arsenal of the CBN to include currency changes, compositional variations of liquid asset ratios of banks through discriminatory cash ratios and variations in the Central Bank Minimum Rediscount Rate (MRR). This rate has remained the 'core' interest in Nigeria's organised interest rate structure (Ndekwu, 1995). The overriding objective of monetary policy during the war years, centred on the mobilisation of resources for government to meet up with its war requirements. The annual growth rate of government sector credit was 57.0 per cent between 1967 and 1990 compared with an annual average growth rate of 6.9 per cent for

the whole period 1960-1969. This desire to satisfy a burgeoning government-borrowing requirement constituted a fiscal resource constraint and informed the policy measure to introduce reserve eligible asset requirement in that period. For the first time, all financial institutions that do banking business were brought under the control of the CBN through the instrumentality of reserve asset requirement. The goal of internalising the operational procedures of the banking and financial institution though emphasised was only of secondary importance. Consequently, the supply and allocation of credit to the private sector declined and an annual rate of increase of the consumer price index from 3.7 per cent in 1966 to 13.1 percent in 1969 was recorded (Ndekwu, 1995).

Consequently, the Central Bank embarked on the development of domestic money and capital markets, which were the main financial infrastructure on which monetary management would rely. The main financial assets introduced include Federal Government Development Stocks in 1959, Nigeria Treasure Bills (NTBs) in 1960. Produce Bills and the CBN operated Call Money Scheme in 1962.

Interest rates on the debt instruments introduced were administratively determined while the CBN, as the underwriter, absorbed the unsubscribe portions and provided refinancing facilities. Interest rate policy was not used as an active instrument of monetary policy because it was fixed by administrative fiat. Rather, it provided a channel for the supply of cheap credit to government and the private sector for domestic investments. For example, NTB's rate was progressively reduced from 6.625 per cent in 1962 to 3.5 percent in 1964.

Cheap money policy resulted in rapid monetary expansion. Between 1960 and 1964 the narrow and broad measures of the money stock -- broad money supply (M2) and narrow money supply (M1) – rose by 29.7 and 44.0 per cent, respectively. The major source of monetary expansion in that period was the accelerated growth in bank credit to

the domestic economy, which grew almost ten folds from N33 million to N306 million. In order to restrain monetary expansion between 1965 and 1966, the CBN imposed a ceiling on aggregate bank credit expansion and raised interest rates. However, those measures were prematurely reversed in 1967 because of the need to prosecute the civil war. Thus, the minimum rediscount rate (MRR) was revised downward to signal a general decline in the structure of interest rates. Concomitantly, the statutory limit on government borrowing through TBs was between 1968 and 1970, progressively increased from 85 to 150 per cent of estimated revenue of the Federal government. The result was an accelerated growth in the money stock with the broad measure (M2) rising by up to 47.2 per cent by 1970, while bank credit to government rose by 84.9 per cent. There was thus, the crowding out of the private sector whose credit contracted by 24.3 per cent from the end of December, 1968 level. The inevitable results were the emergence of high inflationary pressures, deterioration of the balance of payments position and depletion of foreign exchange reserves.

4.1.2 The Oil Boom Era, 1970 to 1979

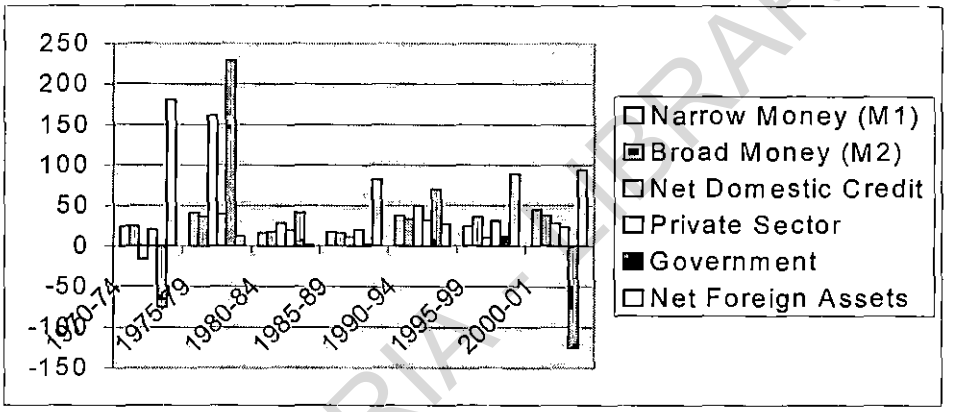
This period continued to be characterized by fiscal dominance and severe macroeconomic imbalances. However, the main expansionary factor was the monetisation of foreign exchange receipts from crude oil exports as against the rapid growth in bank credit to government of the preceding years. Therefore, it could be argued that the second period in our analysis (1970-1979) confronted the monetary authorities in Nigeria with the need for an active monetary management policy with the large expansion in government expenditure and an increasing dependence on the external sector occasioned by burgeoning petroleum revenue. The financial sector experienced rapid monetary expansion in the 1970's as these expenditures had to be met through a monetisation of oil revenue. Bank credit also constituted another major stimulus to

monetary growth during the period. Aggregate demand expanded by more than the increase in output, and inflationary pressures intensified. With large-scale internal and external imbalances, (external stability was eroded), monetary management came under severe pressure. Thus the twin objectives of monetary policy in the 1970's were the maintenance of relative price stability and a healthy balance of payments position. Direct monetary instruments such as selective credit controls and credit ceilings, interest rate controls, prescription of cash reserve requirements, exchange rate control and imposition of special deposits featured. Credit rationing guidelines featured more prominently than the other control techniques. Up to March 1972 and form April 1976-1979, the credit control guidelines took the form of individual and aggregate loan ceilings. Between April 1972 and March 1976, the use of aggregate credit ceiling was dropped while the specification of a sectoral distribution of credit was in vogue. The aim of sectoral distribution of credit was to channel credit into identified productive sectors. At the same time, interest rates were kept low with the intention of promoting investment. The end result of both goals was to increase the level of output and thus stem the tide of inflationary pressure. In addition, supplementary reserve requirements were imposed on the banks to reduce their free reserves and ability to create credit. Discriminatory cash ratios of banks in the range of 2-5 per cent and discriminatory credit allocation were aimed at controlling sectoral allocation of credit between the public and the private sectors and secondly within the private sub-sectoral economic activities Given that interest rates were fixed at low levels by fiat, it is to be expected that administrative allocation of credit became the next best alternative. With a larger share of credit going to government, the excess liquidity in the banking system remained, even in the face of a minimum liquidity ratio of 25 percent. The cash ratios turned out to be ineffective as they were lower than those voluntarily maintained by the banks. Stabilisation securities were

first issued during this period. To tackle the problem of external imbalance, a multiple exchange rate system was maintained first against the US dollar and the UK pound sterling and later against a basket of seven international currencies. In addition, a freezing order on importers' advance deposits in the banks against letters of credit was put in place.

Breaking the period into the 1970-74 and 1975-79 sub-periods enables us to gauge the effectiveness of policy measures during this period. We have summarised these results in Figure 4.1.

Figure 4.1: Growth in Major Monetary Aggregates (1970-2001) Percentages.



Source: Computed from Central Bank of Nigeria Statistical Bulletin, 2001.

Obviously, it became more difficult to attain policy objectives in the second period. The perverse movement in monetary aggregates, fiscal deficit, inflation rate and balance of payments are all reflective of the deviation of targeted variables from actual observations. Narrow and broad money grew by an average of 41.4 and 36.9 per cent respectively, in the second sub-period as against 24.5 and 24.3 per cent in the first sub-period. Growth in the net domestic credit, especially to the government sector became the major cause of rapid monetary expansion taking over from the growth in net foreign assets of previous period. The fiscal operations of the government moved from a surplus in the previous period to a deficit of about 6 percent of GDP during the second period. Inflation rate

increased from 10.4 percent to about to about 20.3 percent. The overall balance of payments position moved from a buoyant surplus to deficit within the period under review (Ojo, 1992). Three policy issues, which we believe rendered ineffective the policy measures embarked upon during the 1970's are, the failure of the monetary control framework which relied heavily on selective credit controls and credit ceilings, a low interest rate policy which rendered government debt instruments unattractive to the private sector and Federal government fiscal operations which resulted in the injection of large amounts of high powered money into the economy.

The concern of the monetary authorities during this era focused mainly on how to optimally channel credit to stimulate investment and output growth in Nigeria. Hence, credit was allocated to the preferred sectors of the economy at concessional interest rates. At the same time, concerted efforts were made to contain the growth in aggregate demand through the imposition of special deposits, especially on import demand.

4.1.3 The Collapse of the Oil Boom Era, 1980 to 1985

The period 1980-86 further put more pressure on the ability of the Central Bank to effectively harness its arsenal of instruments for the purpose of managing the economy in a depression. If the performance of the Central Bank in the 1970's is a test of the use of monetary policy in 'good times' the 1980's definitely tested the use to which monetary policy can be put in 'bad times' (Harvey, 1985). Although one must quickly mention here that due to the absence of concomitant factors, the age old aphorism about the effectiveness of using monetary policy to slow down an economy did not quite work out in the Nigerian context and the reason is not far-fetched both fiscal and incomes policy worked in the opposite direction and the overall result was a failed attempt at restoring balance in the economy.

As pointed out earlier, the collapse of international oil market in the early 1980's led to a significant decline in foreign exchange earnings. The objectives of monetary policy remained as in the earlier period-price stability and balance of payments equilibrium. The direct instruments of monetary policy control were retained. To restrain the growth of liquidity demand pressures on the economy, credit expansion ceiling on banks was reduced from 30 per cent in 1980-82 to 7 per cent in 1985. Selective credit controls were used on a massive scale. Sectoral allocation of credit to preferred sectors saw to it that these sectors took close to 75-79 per cent of banks' loans and advances. The guidelines also altered the distribution of merchant banks assets portfolio with a view to inducing them to lend long term. In 1980, the merchant banks were to ensure that a minimum of 40 per cent of their loans and advances was of medium and long-term nature with a maturity of not less than three years, while a maximum of 20 percent of such loans and advances could be for short term projects maturing within one year. This ratio of medium to long-term loans and advances was raised to 50 percent in 1985. The stipulated minimum proportion of loans and advances that commercial banks were required to grant to indigenous entrepreneurs increased from 70 percent in 1980 to 90 percent in 1984. Out of these proportions, the small-scale indigenous enterprises were to be allocated an average of 16 percent during the review period. In 1982, it became mandatory for banks to lend not less than 30 percent of the total deposits collected by their rural branches to customers in the rural areas though this was raised to 40 per cent in 1985 (Ojo, 1992).

During the same period, reserve requirements remained unchanged from their 1970-79 levels. The ceiling on interest rates remained with only some marginal adjustments in the later part of the period. Within the limits set on lending rates for banks, various sectors and activities enjoyed preferential treatment. Development finance

institutions were supposed to do so at controlled rates. Interest rates on government debt instruments and bank deposits were also rigidly controlled.

One important observation from our discussions on monetary policy during the review period, 1960-85 is the fact that although the monetary authorities tended to have relied extensively on the use of direct methods of monetary control, these measures seem not to have been very effective in attaining the objectives of monetary policy during this period.

It is on record that the compliance with credit guidelines was generally unsatisfactory during the period under review. Banks only acquiesced to ceilings on aggregated credit extension when for instance; there is inadequate demand for loans by the private sector as experienced during the slump between 1982 and 1985. Even though the ceiling was only 7 percent during these years, banks, kept within these limit. When the economic situation was still buoyant, it was not unusual for banks to burst credit ceilings. In 1980 and 1981, banks exceeded the permissible growth rate of 30 percent by 3.3 and 5.2 percentage points respectively. The sectoral credit controls were also not effective as it was difficult to keep banks within the stipulated targets. Although 75 percent of credit was supposed to go to the preferred sectors, the commercial banks achieved a target of 69.1 per cent while the merchant banks only achieved 62.8 percent out of the 79 percent limit for them. Thus both commercial and non-merchant banks would seem to have extended more credit to the non-preferred sectors during the period, with the merchant banks being the worse culprits.

One major shortcoming of direct controls is the preponderance of concessions and exemptions that come with most directives and the tendency for this to breed corruption and other sharp practices. For instance, in Nigeria the small banks were usually given some concessions to extend more credit either in the form of a slightly higher credit

ceiling or as a proportion of their total deposit liabilities, This became destabilising with the increase in the number of small banks in 1986. In 1980, for instance, a small bank was defined as one whose loans and advances fell below 100 million Naira as at March 31 of that year. Such banks were allowed to maintain a credit ceiling of 40 per cent. Alternatively, such a bank could expand credit up to the level of 70 percent of its total deposit liabilities, excluding government deposits of not more than six months maturity. Also, over the years, certain categories of loans and deposits are excluded from credit ceilings. These included money at call with other banks, loans granted for the purchase of shares by Nigerians under the indigenisation performance, loans for buying motor cars by eligible workers and loans for agricultural and residential building construction above the prescribed minimum (Ojo, 1992). The jostle to benefit from some of these concessions often led banks to devise short cut methods for circumventing monetary policy guidelines and bred frauds and malfeasance with attendant effects on the effectiveness of policy measures. More importantly, some of these exceptions could be sources of excessive credit expansion by banks (Ikhide, 1998).

The problems facing the Nigerian economy worsened during the period 1980-85. The maintenance of monetary stability was a dilemma for the CBN. Controls over interest rates and the direction of credit were excessive. The repression of the financial system and deposit money banks intensified, while non-bank financial sector had been neglected. Hence, the need for structural adjustment programme in 1986 became evident. Policy strategies under SAP were meant to be different from what had existed hitherto. However, the country did not move immediately from direct into indirect controls, as will be the norm under liberalisation. But given the need for monetary policy to become a more active tool for the realization of the goals of SAP, the pursuance of the goal of establishing a market-oriented financial system for effective mobilization of financial

savings and effective resource allocation was given a greater attention. Towards this end, the CBN adopted a phased approach to transiting from a direct to an indirect method of monetary control. This transition called for a prior reform and liberalization of the financial sector in order to create a conducive atmosphere for the introduction of indirect monetary control.

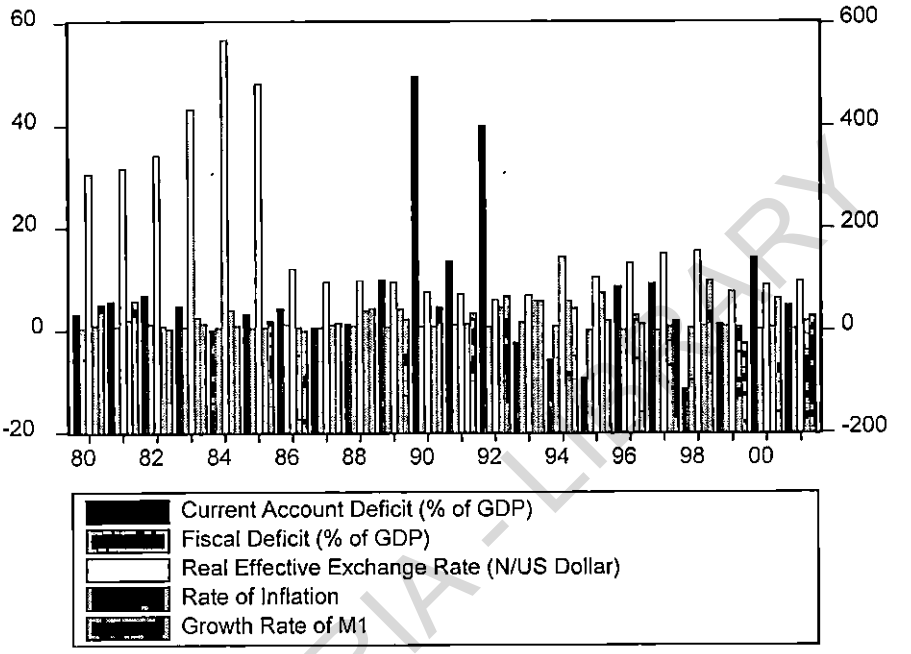
4.1.4 The Structural Adjustment Programme (SAP) Era, 1986 to Date

The focus of monetary management during this period was to realign prices through policy and institutional reforms after many years of distortions introduced by control regimes. There was urgent need to move towards the institutionalization of market-based instruments of control as against former direct control and economic regulation. The main cornerstone of the new policy thrust was exchange rate policy reform, aimed at finding the appropriate external value of the domestic currency. Foreign exchange controls and allocations were abolished outright and concerted efforts were made towards the implementation of a Dutch auction market-based exchange rate mechanism. This was accompanied by deregulation of interest rates and de-emphasising of the use of credit allocation and control policies followed by the introduction of indirect tools of monetary management, anchored on Open Market Operations (OMO). The reform of the entire financial sector was also undertaken, while the size and involvement of government in the economy were rolled back, paving the way for increased role for the private sector.

The stance of monetary policy remained tight in 1986, with growth in M2 decelerating to 3.4 per cent. However, by 1987, there was widespread concern over the adverse consequences of the liquidity squeeze, especially the restrictive budgetary stance on output and employment growth. Thus, a deflationary policy stance was adopted, which resulted in rapid monetary expansion, averaging about 42.0 percent per annum during

1990 and 1994. The main source of the monetary growth was expansionary fiscal operations, financed mainly by the banking system. Fiscal deficits rose from about 8.4 per cent of GDP in 1988 to 11.0 per cent in 1991, but moderated somewhat to 7.2 per cent in 1992 before peaking at 15.5 per cent in 1993 (see Figure 4.2).

Figure 4.2: Some Macroeconomic Indicators (1980-2001)



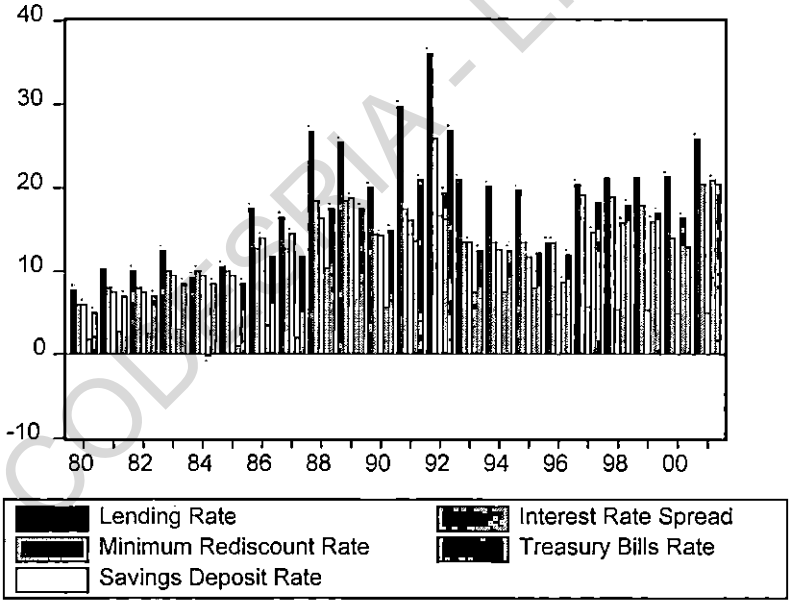
Source: Computed from Central Bank of Nigeria Statistical Bulletin, 2001.

The crowding out effect was demonstrated by changes in the direction of bank credit flows. For instance, the share of the private sector out of a total of approximately NI0.8 billion banking systems' credit to the economy in 1980 was 67 per cent while 33 per cent went to government. The allocation was reversed in 1992 when the shares of the government and private sectors were in the order of 60 and 40 per cent, respectively.

The need to reverse this unsustainable trend and ensure efficient allocation of financial resources informed the upward review of the interest rate structure. The minimum rediscount rate (MRR) and NTB issue rate rose from 12.75 and 11.75 per cent in 1987-88, to 18.5 and 17.5 per cent in 1989-90, and subsequently peaked at 26.0 and

26.90 per cent, respectively, in 1993. During these periods, however, the spread between deposits and lending rates began to widen-and became an issue of concern to the monetary authorities. For instance, beginning from 1988, when the savings rate was about 16.4 per cent, the prime-lending rate reached 26.8 per cent, representing a spread of 10.4 percentage points, as against the stipulated limit of 7.5 percentage points. The further widening of the spread in 1993, arising mainly from high lending rates, reflected the oligopolistic character of the banking system. These unacceptably high lending rates were adjudged to be a disincentive to borrowing for productive investments. Efforts so deal with the situation elicited the re-introduction of measured controls on interest rates in 1993, with the maximum lending rate pegged at 21.0 per cent (See Figure 4.3).

Figure 4.3: Major Monetary Indicators (1980-2001) Percentages



Source: Central Bank of Nigeria Statistical Bulletin, 2001. Data for Real Effective Exchange Rates obtained from IMF International Financial Statistics, 2003.

The MRR was lowered during 1999 and 2000. The further lowering of the MRR, beginning from the last quarter of 1999, was aimed at inducing a downward movement of

bank lending rates with the hope of stimulating private sector investment and economic growth.

Moreover, the transfer of deposits of the Federal Government and its agencies from the CBN to the commercial and merchant banks had the effect of injecting additional liquidity into the banking system, with the expectation that it would douse the escalating lending rates. However, experience so far has shown that the action, rather than ease credit for productive investment, exerted pressures on the foreign exchange market, and enhanced banks' investments in NTBs. Moreover, while it influenced the collapse of savings deposits rates remained high, reflecting the delicate trade-offs associated with monetary management.

4.1.5 Conclusion

A review of the Nigerian experience in monetary management shows that the interventionist policy stance dominated monetary management in the first two and half decades after which an era of liberalization and deregulation of the financial sector followed. Among the instruments employed during the period included direct credit control and allocations (aggregate and selective), and direct interest rates regulations, open market operations, variable rediscount rate, moral suasion, reserves and supplementary reserves). The shortcomings of direct instruments of monetary policy have been identified. However, despite the considerable progress made in building the financial infrastructure and use of market-based instruments for the conduct of monetary policy, a more robust policy outcome was largely constrained by a number of factors. These include – the absence of fiscal discipline for a greater part of the period; lack of true Central Bank independence; frequent policy changes and widespread distress in the financial sector. Moreover, there is need to enhance the efficiency of the payment and settlement system as well as establish a credible data base on which effective conduct of monetary policy depends. The recent initiative of the CBN in creating the Monetary

Policy Forum (MPF) is right step in the right direction. The CBN through the MPF assembles knowledgeable individuals from all spheres of the economy at periodic intervals to brainstorm on monetary policy issues. This provides opportunity for the CBN to explain the rationale behind policy decisions and for the other stakeholders to have input into the policies being implemented or those to be implemented by the CBN thereby promoting policy credibility.

4.2 Exchange Rate Policy Management in Nigeria

4.2.0 Introduction:

This section reviews the various exchange rate policy management strategies in Nigeria before and after financial liberalization in Nigeria. This is to guide us into determining the policy focus of the government during the period under review. Indeed, recent experience of African countries especially Nigeria with regards to exchange rate management and evolution of foreign exchange markets, provide some important lessons on the challenges facing these countries in the management of their foreign exchange markets and exchange rates. The primary challenge facing most of these countries is the shift from controlled foreign exchange markets and administratively determined exchange rates to liberalized markets and market-determined exchange rates. Therefore, in what follows, a review of exchange rate policy management in Nigeria spanning major policy regimes is provided.

4.2.1 Exchange Rate System before 1986

The exchange rate of a currency is the price of that currency in terms of other currencies. It generally represents the number of units of domestic currency that exchange for a unit of foreign currency (Olisadebe, 1995). Just as the price of any commodity is determined by the interplay of supply and demand, the exchange rate is primarily determined by the supply and demand for foreign currency. The higher the demand for foreign currency, the more will its price rise and vice versa.

Foreign exchange problems in Nigeria were not seen as policy issues of concern until the late 1980s because the country was classified as a pegger just like many other developing countries. The Naira exchange rate was pegged initially to the British pound sterling and subsequently to the United States dollar as part of a global exchange rate management under the Breton Woods System (Komolafe 1996). This policy can be traced

back to 1960 when the country became independent. According to Ogiogio (1996), developments in Nigeria's exchange rate policy can be divided into periods or stages. The first period of exchange rate policy in Nigeria, which spanned over 1960-67, was the period of a one-to-one relationship between the Nigerian Pound (N$) and the British pound Sterling (B$). This fixed parity lasted until the British pound was devalued in 1967. As a result of the war that was going on at the time, the monetary authority did not consider it expedient to devalue the Nigerian pound in sympathy with the British pound (Ogiogio 1996).

Nigeria joined the International Monetary Fund (IMF) in 1961, and the Nigerian pound had its parity defined in June 1962 in terms of gold, at one Nigerian pound to 2.48828 grams of fine gold. The Naira replaced the pound as Nigeria's currency in January 1973 and it spar value was set at half of that of the pound. Hence, the exchange rate against the dollar became $1.52 to the Naira. The US dollar and British sterling serve as the anchor currencies. During most of 1973, the anchor currencies, dollar and sterling, weakened considerably and it was evident that the fixed exchange rate of the Naira against any currency could not be sustained if Nigeria wanted to be able to respond independently to economic changes. In April 1974, therefore, a policy of progressive appreciation of the Naira against the dollar and sterling was adopted. This period coincided with the first oil boom. The idea was to let Naira exchange rate reflect the balance of payments position, which had improved considerably as a result of the oil boom (Komolafe 1996).

The policy continued until late 1976 when a policy reversal was effected to reflect changed fortunes in the country's economic scene, i.e., falling reserves as a result of the misfortune in the oil sector. The authorities believed that, at this point, a relatively stable exchange rate might be best achieved through the use of the currency basket. Therefore,

starting from 1978 to 1985, a policy to base the exchange rate on a basket of the currencies of Nigeria's major trading partners was adopted. The basket of currency in exchange rate determination was expected to reflect very accurately, developments in the international foreign exchange market. The system also had the advantage of reducing import price fluctuation resulting from exchange rate movements that reflect developments in the economies of the country's major trading partners (CBN 1999). This system, however, failed because of the fall in crude oil prices in the international market and the commodity market crisis of the 1980s. The economic downturn has been attributed to dwindling prices of oil, the country's major export good, and rises in real international interest rates, which compounded the external debt burden (Faruque 1994).

Government revenue from petroleum, which accounted for over 70 per cent of total revenue, declined from its peak of 93.4 per cent in 1973 to 70.3, 69.0 and 72.6 per cent in 1981, 1993 and 1985, respectively. Meanwhile, government expenditure could not be immediately curtailed. As a result, government budget deficit continued to rise. Imports also continued to increase, especially in the face of an overvalued Naira exchange rate that made imports relatively cheaper than domestic products. The result was growing balance of payments deficits.

Government's initial attempt to solve the problem of the decline in economic fortunes was the introduction of the economic stabilization measure in April 1982. This measure, aimed at structural adjustment and diversification of the country's source of foreign exchange earning, involved restricting and prohibiting a wide range of imports of both industrial and consumer goods. The measure continued throughout 1983. In 1984, more stringent exchange control measures were introduced, including sectoral allocation of foreign exchange and tough import licensing, which really slowed down importation of machinery and transport equipment. In 1985, a policy of gradually depreciating the Naira

exchange rate was adopted in addition to the other policies. These policies continued till 1986, but the situation did not significantly improve despite increasing trade and payment controls. The structural adjustment programmed (SAP) was, therefore, introduced towards the middle of 1986, as a result of the seemingly unabating internal and external imbalance problems.

4.2.2 Flexible Exchange Rate System and Exchange Rate Stability (1986-Date)

With SAP, there was a major reversal of exchange rate policy in September 1986, when the hitherto fixed exchange rate mechanism for determining the Naira exchange rate was replaced with a flexible exchange rate mechanism. Market forces directed the system and the Naira was allowed to find its level according to the strengths of demand and supply of foreign exchange. The monetary authorities retained the discretion to intervene in the market to influence the course of exchange rate movement in order to maintain stability and achieve policy objectives. But, the long search for stability, as dictated by various interventions and change of operating policy guidelines, by the monetary authorities seems not to have yielded much result as the exchange rate has fluctuated widely over the years. Within the framework of market rate determination, several methods have been applied in the search for a realistic exchange rate for the Naira and its stability.

Specifically in September 1986, the second-tier foreign exchange market (SFEM) decree, which introduced a flexible or floating exchange rate regime, was promulgated. The focus of the policy was to achieve a desirable and realistic exchange rate for the Naira that would remove existing distortions and disequilibrium in the external sector of the economy as well as ease the country's persistent balance of payments problems. As such, the auction system was introduced and IMF reclassified the country as an independent floater.

The system, however, witnessed several problems. These range in part from the destabilizing speculative activities of dealers and bidders in the market; accumulated demand pressures given inadequate supply of foreign exchange; and the inherent problem of limited convertibility of the Naira against other major currencies in the international market (Komolafe 1996). From 1986 to date, the foreign exchange market has passed through several modifications in an attempt to reduce exchange rate volatility and bring stability into the market. The various regimes passed through since 1986 are discussed below.

4.2.3 The Dual Exchange Rate System (1986-87)

On 26 September 1986, the Naira was allowed to float in what was referred to as the second-tier foreign exchange market (SFEM). The dual exchange rate system was introduced in 1986 at the inception of SFEM and there were two different rates in the first and second exchange rate markets. All government official transactions were carried out through the official first-tier rate. As such, the first-tier rate was applicable to debt service payments, embassy expenses, subscription to international organizations and settlement of transitional or pre-SFEM transactions, while SFEM rates covered all other private transactions. The operational framework used for the market was the closed auction system whereby CBN called for bids from all authorized foreign exchange leaders. At the beginning of SFEM, the authorized dealers were the banks, which were classified into big and small banks. During the first and second bidding sessions, the average pricing method was used to determine the exchange rate. At the third bidding session, however, the marginal rates system was used so as to reduce multiplicity of rates shown in earlier bidding systems and also to increase the number of successful bidders.

The system was such that rather than buy at the average rate of successful bids, all successful bidders bought at the bid quoted by the last successful bank (Ahmed and

Zarma 1998). The Dutch auction system (DAS) was introduced as the pricing methodology on 2 April 1987, owing to the continued depreciation of the currency. Under the system, the marginal rate was used to determine the successful banks but the latter were debited at their various bid rates plus 1 per cent exchange equalization levy. There was, however, the problem of multiplicity of rates with the system. In fact, the Central Bank of Nigeria had to intervene on two occasions in order to moderate the amplitude of fluctuation in the exchange rate. The first intervention was during the sixth session when the initial foreign exchange supply was increased from $75 million to $86 million, in order to arrest the downturn in the rate. The second intervention at the tenth bidding session was meant to prevent an appreciation of the Naira. The rate that emerged at each of the first two sessions under the SFEM system was N4.6174 and N5.0839 to $ 1 dollar. This fell to N3.0156 at the third bidding session, but rose again in N4.20303 in March 1987.

4.2.4 The Unified Exchange Rate System (1987-1988)

Owing to the subsidy in the dual exchange rate system, it was subjected to a lot of abuses. Subsequently, the two rates were merged on 2 July 1987, under a unified exchange rate market called foreign exchange market (FEM), and all transactions were subjected to market-determined exchange rates. FEM retained all the operational procedures of SFEM and bidding sessions continued as the mode of exchange rate determination. The market featured a total of 30 bidding sessions during the period at which $2,353 million was offered for sale. Record, however, indicates that dealers, on the other hand, sought to purchase a total of $2,787. This unsatisfied demand continually exerted pressure on the Naira and a number of measures were made to help stabilize the currency. One of such measures was to change the frequency of dealings from every week to every fortnight. The other was to introduce the Dutch auction system, which

stemmed the persistent downward slide in the Naira exchange rate for a while. The currency strengthened for a short period, but continued its downward slide thereafter. At the end of December 1987, the Naira traded for N4.1413 = $1.00, representing a depreciation of 19.9 per cent.

In 1988, the interbank market (where banks were allowed to transact official foreign exchange business among themselves) was separated from the FEM and was made an autonomous market, owing to persistent fluctuation of the exchange rates. This interbank market had an independent rate for privately sourced foreign exchange. It also introduced some elements of instability to the Naira exchange rate. Initially, it was linked to the second-tier exchange rate but later the link was broken. The interbank rate, therefore, diverged widely from the FEM rate, which implied that resources were not being rationally allocated (Ogiogio 1996). This caused a lot of concern for the monetary authorities. The operations of the autonomous market became destabilizing because authorized dealers diverted official funds to the autonomous segment of the market and made substantial gains. Bank officials and authorized dealers were accused of corruption and allocation of foreign exchange to favoured customers (Ojo 1990).

Data on interbank rates show that in July 1987, the rate stood at N4.3550, compared to N3.8081 to $1 in the foreign exchange market. Although the differential reduced in 1987, it widened progressively to 38 per cent in April 1988 and in December 1988, it stood at 54.8 per cent with the exchange rate at N5.35 to $ 1. By the end of 1988, therefore, it was clear that the multiplicity of rates under the Dutch auction system as well as the large differential between foreign exchange market and autonomous rates was exerting undue pressure on the exchange rate and intensifying the problem of resource misallocation and exchange rate instability.

In order to redress the situation, the official foreign exchange market (FEM) and the autonomous market were merged on 9th January 1989 to form the interbank foreign exchange market (IFEM) with a single ruling Naira exchange rate through daily sessions in the foreign exchange market. This fusion led to the abolition of the DAS and this minimized the fluctuation of the exchange rate to an extent. For example, the exchange rate, which stood at N6.7176 to $ 1 in 1989, depreciated to N7.5871 in March 1989. The rate also strengthened progressively from N7.5808 to $1 in April to N7.1388 in July and N7.0389 in August. To further eliminate the abuses inherent in the system and reduce exchange rate instability, the Naira exchange rate under this IFEM regime was determined using marginal bid and average rate pricing, highest and lowest bids, weighted average and average of successful bids. Private entrepreneurs were also licensed to operate Bureau de Change in 1989 to enlarge the scope of the official market for foreign exchange transactions and to give small dealers more freedom of action. At the end of December 1989, the Naira exchange rate was N7.62 to the dollar.

In spite of the above developments, the exchange rate still did not attain a stable level. In the continued quest for stability and a realistic exchange rate, the monetary authorities on 14 December 1990 abandoned the bidding system for determining the exchange rate and reintroduced the DAS with daily bidding sessions. The DAS involves the payment for foreign currency by an authorized dealer at the exchange rate of its bid unlike the former system whereby the CBN's selling rate was centrally determined and applicable to all the banks regardless of their bid rates. A total of 51 weekly bidding sessions were held in 1991 compared with 248 daily bidding sessions in 1990. Bureau de change, established in 1989, were made to handle small-scale foreign exchange transactions based on unofficial fund, and this further reduced demand pressure on official foreign exchange. But with this, the exchange rate still depreciated by 0.9 per cent

to an effective rate of N8.46 to $ 1. In March 1991, daily bidding was replaced with two biddings a week. The consequence of this was another sudden fluctuation in the Naira; it further depreciated to N9.40 to $1. It was initially believed that various safeguards present in the Bureau de change, especially in connection with the simple documentation and other records kept by them, would protect customers from counterfeit money and other bad practices prevalent in the parallel market. But unfortunately, the scheme had hardly taken off when some operators started perpetrating frauds and other malpractices (Akinmoladun 1990).

The liberalization and deregulation of the foreign exchange market (FEM) continued in 1990 with additional measures introduced to enhance the operational efficiency of the market. The measures included the requirement that all oil bunkers should surrender 100 per cent of foreign exchange proceeds from oil bunkering to the Central Bank for the Naira equivalent, and all government parastatals earning foreign exchange should surrender 75.0 per cent of such earnings to the Central Bank. The Naira depreciated persistently in the foreign exchange market (FEM) in 1990, mainly as a result of excess demand for foreign exchange. For example, the Naira traded for the US dollar at N9.000 a dollar at the end of 1990, showing a depreciation of 15.0 per cent from the rate at the end of 1989. By February 1991, it had depreciated to N9.40 to $1, reflecting a depreciation of 7.45 per cent.

4.2.5 Fully deregulated Exchange Rate System (1992-93)

The persistent instability in the exchange rate system led to the dissolution of the Dutch auction system on 5 March 1992 and the introduction of a fully deregulated interbank foreign exchange market system (IFEM). The IFEM rate was depreciated to equate the parallel market rate, which was considered the most appropriate indicator of market perception of the value of the Naira in relation to other currencies. Government's

intention was to reduce the parallel market premium and enhance operational and efficient allocation at the IFEM through adequate participation in the market. Under this system, the Central Bank bought and sold foreign exchange actively in the market and was expected to meet all requests of the authorized dealers. In 1992, the CBN acknowledged the persistent downward pressure on the Naira exchange rate leading to its continuous depreciation and wide gaps between the official rate and other rates, particularly in the bureau de change and parallel market. In order to arrest the malpractices and eliminate the exchange rate differential, the monetary authorities moved the official exchange rate from N10.226 to $1.00 in February to N17.657 in March 1992, representing 41.8 per cent devaluation.

A total of 48 bidding/sale sessions were held at the foreign exchange market in 1992 compared with 51 sessions in 1991. Total foreign exchange released to authorized dealers rose by $1,048.2 million to $4,0457 million, while total amount offered for sale increased from $2,910 million at a monthly average of $242.5 million in 1988 to N5, 080.4 million ($423.4 million) in 1992. The Naira/dollar monthly average rate depreciated from N9.9331 to $1.0 in December 1991 to an average of N17.3760 in December 1992, representing a decline of 50.1 per cent.

The domestic currency, the Naira, remained under considerable pressure in the local exchange market owing to excess liquidity and speculative influences coupled with foreign exchange shortage. This led to increased pressure in the parallel market to satisfy additional foreign exchange needs, which the official market could not provide. In addition, the political uncertainties that characterized the second half of 1993 resulted in increased capital flight, which put further pressure on the Naira exchange rate. The average official exchange rate of the Naira depreciated by 10.2 percent from N19.6609 to $1.00 in January to N21.8861 in December 1993. Also, parallel market exchange rate

depreciated persistently and, thus, widened the parallel market premium from 13.1 per cent in December 1992 to 11.04 per cent in December 1993. The widening of the premium was the result of both administrative and economic factors. The implication of the reform is that the IFEM became an interbank market with the CBN as a participant, free to buy and sell foreign exchange at a rate freely determined by all authorized dealers. The banks freely determined the rates in the market and a total of 48 bidding/ sale sessions were held in 1993. The CBN influenced the rate only by open market operations (OMO), that is, by buying and selling foreign exchange at the market rate. CBN also came up with mop-up exercise, essentially to reduce the purchasing power of the target foreign exchange dealers, with a view to lowering the high bid rates, so as to increase the value of the Naira. Another complementary effort put in place was the increase in the foreign exchange supply to the FEM. This was essential so as to increase aggregate supply with the expectation of matching increased demand for foreign exchange. A total of 43 sessions were held in 1993. The amount of foreign exchange released to authorized dealers, however, reduced, resulting in rapid deterioration of the Naira (CBN 1993). Renewed demand pressures and speculative activities, however, widened the premium and the high margin that resulted led to the regulation policy of 1994.

4.2.6 The Fixed Exchange Rate System (1994)

A fixed exchange rate was introduced in 1994 to stabilize the value of the Naira. The Naira was pegged against the US dollar at 22.00 to $1. The intent of government policy was to encourage investment in the productive sectors and increase the capacity utilization of the manufacturing sector. Bureau de change and some designated banks were made "buying agents" of CBN in the remittance of foreign exchange. Transactions on bills of collections and open accounts were suspended while all foreign exchange receipts were centralized in the CBN. Concessions were, however, given for the

continued operation of special accounts for World Bank-Assisted projects and similar projects, as well as external accounts operated by embassies and foreign missions at the banks. Bureau de change were to buy foreign currencies or travelers cheques from customers and sell their purchase to the CBN or some other designated banks. Towards the end of 1994, some modifications affecting foreign trade and exchange policy were made, including the reopening of domiciliary accounts in banks and allowing bureau de change to buy and sell foreign exchange up to a maximum of $2,500.00 to a single customer. A total of $8,131.0 million foreign exchange receipts was budgeted while the actual receipts of exchanges was $6.12 1.2 million.

Also, government constituted a Foreign Exchange Allocation Committee to supervise allocation of foreign exchange to sectors based on approved percentages by government. Authorized dealers also bided for their customers according to CBN guidelines and were mandated to provide Naira cover of their bids from accounts held with the CBN. This system widened the premium between the official and parallel exchange rates considerably. Owing to acute shortage of official foreign exchange, only 15 bidding sessions were held in 1994 and a fixed exchange rate of 1.99 to the dollar was maintained during the year with the hope of providing an anchor for domestic price.

4.2.7 The Dual Exchange Rate System (1995-1999)

The fixed exchange rate system or partial regulation of 1994 recorded low economic performance during the period, especially as it relates to the growth of non-oil exports. This led to the reintroduction of the dual exchange rate policy in 1995, called "guided deregulation". This new policy focused on reducing the instability of exchange rate in the market and achieving efficient allocation and utilization of resources. As such, the Exchange Control Act of 1962 was repealed, while the Foreign Exchange (Monitoring of Miscellaneous) Provision Decree 17 of 1995 was promulgated. The decree established

the autonomous foreign exchange market (AFEM) for trading in privately sourced foreign exchange while the fixed exchange rate in the official market (N21.9960 to $1) remained for constructive government transactions. The ruling exchange rate at AFEM was market determined and the CBN had the discretion to intervene at any time to regularly monitor developments and ensure stability of the exchange rate in the market. The CBN intervention fund was to be sold directly to end-users through selected banks, while unselected banks were to participate in foreign exchange dealings at the autonomous market. A major change, however, was that the procedure for determining foreign exchange rates changed from the bidding sessions to intervention exercises. A dual exchange rate regime was, thus, in operation in 1995 with the official exchange rate fixed at 2 1.9960 to $1.00 and the AFEM rate of between ₦80 and ₦85 per $1.00. The CBN intervened six times in the AFEM in 1995 (CBN 1996) but the intervention changed from monthly to weekly bids from 1996, thereby increasing the number of intervention funds sold to end users directly through the selected banks. Forty-five routine examinations on the foreign exchange federation of commercial and merchant banks were conducted. Also, special investigations were carried out and 80 commercial and merchant banks were penalized for failing to comply with stipulated foreign exchange regulations (CBN 1996). In 1995, the emergent average AFEM rate of $1 = ₦82.3 converged significantly with the parallel market average rate of $1 = ₦ 83.7, reflecting only about 1.7 per cent premium. The exchange rate policy of guided deregulation continued in 1996 with AFEM being conducted through sales to banks, subject to compliance with the relevant guidelines and regulations of the market. Government paràstatals, agencies and companies as well as oil service companies continued to maintain their foreign currency domiciliary accounts with the Central Bank while the Bank purchased such funds at the prevailing AFEM rates for intervention. The CBN intervened 35 times (weekly) in the market in 1996 as against six

times (monthly) in 1995. Under the new arrangement, the CBN stopped offering a specified amount of foreign exchange to banks for sale, while the total demand of the banks with: Naira cover was fully met. The total amount of foreign exchange demanded by banks was $1,861.9 million as against $1,748.0 million in 1995, while actual amount released during the year amounted to $1,846.1 million compared with $1,747.2 million in 1995.

Development in the international foreign exchange market was largely influenced by the domination and appreciation of the dollar as well as by the financial crises in East Asia in 1997, which may have affected the exchange rates, as it remained relatively stable during the greater part of 1997. This development was largely attributed to the continued stability in the macroeconomic environment, occasioned by a more effective coordination of monetary and fiscal policies.

The policy of guided deregulation introduced in 1995, designed to achieve exchange rate stability through the operation of the autonomous foreign exchange market (AFEM), continued during the year. Some new measures were, however, introduced. These included the removal of ceiling on personal travel allowance (PTA) and business travel allowance (BTA), removal of restriction on educational remittance and personal home remittances (PHR) for expatriates, and the lifting of suspension on bills of collection and open accounts transactions. In addition, only hotels licensed as authorized buyers were allowed to accept foreign exchange from their customers in settlement of hotel bills. The dual exchange rate policy was retained in 1997. The official rate was fixed at N2 1.9960 to $1.00 while the AFEM rate ranged between N76. 8095 and N8 5.00 to $1.00. There were 51 weekly interventions in which $2,939.3 million was sold to banks. Of this amount, 52.3 per cent came from the federal government account while the rest was from AFEM purchase account.

Operation in the AFEM was the main anchor for orderly deregulation of the foreign exchange market and achievement of exchange rate stability in 1998. The CBN conducted 51 weekly interventions in the AFEM during which $4,112.1 million was sold to authorized dealers for end users, against $2,939.3 million in 1997. The actual receipts of foreign exchange in 1998 amounted to $12,033.0, million, which was $4.003.3 million or 25.0 per cent lower than the budget estimate for the year. Out of $4,112.1 million sold at AFEM, 32.8 per cent came from the federal government account while the Central Bank of Nigeria supplied the balance.

The dual exchange policy was retained in 1998. The official selling exchange rate remained fixed at ₦21.9960 to $1.00, while the AFEM rate ranged between ₦81.00 and ₦86.00 to $11.00. This policy of guided deregulation continued until the fiscal 1999 when the dual exchange rate was harmonized, leading to one single market for foreign exchange transactions, called the inter bank foreign exchange market. (IFEM).

4.2.8 Fully Deregulated Exchange Rate System (1999-Date)

The AFEM was replaced with IFEM on 25th October 1999. Participation in the market was broadened in order to deepen market activities, thus relieving the CBN as the major supplier of foreign exchange (CBN 2001). The major problem was that the exchange rate was not stable despite several interventions by the Central Bank. The rate, which was as low as ₦4.4 to a dollar in 1987, was ₦86.00 to the dollar in 1998 and N117 in 2000.

The CBN also started to investigate the operations of some banks suspected to be flouting the rules governing the interbank foreign exchange market (IFEM). According to the Business Times of 29 May 2000, erring banks were barred from IFEM. According to CBN rules, banks are to bid for foreign exchange on behalf of customers and return unused foreign exchange within five days. The failure of some banks to comply with this

rule prevented the CBN from properly monitoring the level of foreign exchange in the system. The CBN also moved to prevent banks from trading on the dollar bought from it for customers. This was done to ensure effective use of the scarce dollar.

4.2.9 Assessment of the Foreign Exchange Market in 2000 and 2001

Though there were improved earnings in oil revenue and rising external resources in Nigeria in year 2000, a stable Naira exchange rate vas not achieved. The currency did not only maintain a steady slide against other currencies in all segments of the foreign exchange market, it also defied all managerial techniques, threats and pleas of the Central Bank of Nigeria. In fact, the basic economic laws of supply and demand did not influence price appreciably even with the level of the nation's external reserve at $10 billion. The interbank foreign market exchange (IFEM) reintroduced in October 1999 was adjusted several times just as maritime policies were fine-tuned accordingly.

In January 2000, the Naira exchanged at $1 to ₦96.3 at IFEM, $1 to ₦99 at the bureau de change (BDC) and $1 to ₦100 at the parallel market. By December, the Naira had depreciated to $1 to ₦110 at IFEM, ₦117 at the BDC and ₦120 in the parallel market, giving the picture of a turbulent year. Seven banks were barred from IFEM for six months and subjected to other punishments for violating foreign exchange rules at different periods. Despite these measures, the rates were not stable, and in assessing the performance of IFEM, the CBN Governor noted that its intervention appeared not to have significantly altered the forces of demand and supply in the market.

The demand pressure intensified and since CBN was the major supplier, the intervention in supply was inadequate to meet the demand upsurge. AFEM demand in the first six months of the year averaged $525.28 million monthly, compared with $477.1 3 million in 1999. By mid-December, however, before CBN's intervention that shot up rates, average daily demand was $103million and an estimated monthly average of $665

million were demanded for the second half of the year. The immediate result was a fall in the Naira exchange rate with the implication that the transmission of growth of growth from the finance sector to other sectors was little. This became a matter of concern, especially considering the huge amount of foreign exchange injected into the market by CBN, which was not reflected or transmitted into the real sectors of the economy policies has introduced new reforms into the market to sanitize

The merger of IFEM with the autonomous market through CBN dealings and also stabilize rates as follows. The mistake of not including the Bureau de Change, as part of the reforms to engender competition with banks, was rectified and it had a significant effect on rates Participation in the market was broadened in order to deepen market activities, thus relieving the CBN as the major supplier of foreign exchange (CBN 2001). Therefore, all banks, non-bank financial institutions, parastatals, oil companies, bureau de change and other private companies were considered eligible to participate in the market. The CBN was expected to intervene to influence the prevailing rate towards achieving the desired objectives. Other complimentary measures introduced in recent times include the intensification of surveillance on banks and the imposition of sanctions on those apprehended for unethical practices, the management of excess liquidity through the issuance of additional instruments called the CBN certificate of deposits, and the CBN's persuasion that government should curt fiscal expansion. Others include government directives to its agencies and parastatals to move their capital accounts to the CBN and retain recurrent accounts in other banks, the retention of 100 per cent export proceeds and some exports incentives to encourage exporters to earn more foreign exchange, and the introduction of 100 per cent destination inspection to ascertain the genuiness of imports and duties payable. Also, the introduction of daily bid and offer rates for foreign exchange by prime banks for amounts in excess of on million dollars by a private sector

initiative, Money Market Association of Nigeria (MMAN), was expected to influence rates. In addition, the Nigerian Interbank Foreign Exchange Fixing was expected to revolutionize the market and deepen it, and create derivatives and increase investors' confidence, as well as aid predictability and planning.

The most radical move by the CBN to stabilize rates was the pursuit of a policy of fixing the rates without recourse to the parallel market. The potency of this measure in stabilizing rates, however, depends on the premium or spread between the two markets as a result of this policy and its effects on the volatility of the exchange rate. The effectiveness of CBN's policies in the future would depend on how well they are able to check the major cause of the problems of the currency, which have been identified as: excess liquidity and huge extra budgetary expenditure on unproductive ventures; heavy debt service burden; speculative demand driven by social and political uncertain ties; and unbridled importation.

CHAPTER FIVE

EXCHANGE RATE VOLATILITY IN NIGERIA.

5.0 Introduction:

In this chapter, the issue of exchange rate volatility was investigated. The intention here was to establish the volatility or otherwise of exchange rate in Nigeria. The issue of Exchange Rate (ER) Volatility and its impact on a number of macroeconomic variables have been investigated in a number of theoretical and empirical studies (see, Kenen and Rodrik, 1996; Cushman, 1988, and Chowdhury, 1993, among others, while examples of theoretical contributions are, De granwe, 1988 and Krugman, 1989). But, less attention has been given to the establishment of volatility or otherwise of exchange rates in Nigeria. Yet, it is necessary to establish the volatility or otherwise of exchange rate because of its important roles in linking the small domestic economy with the outside world and more importantly because of its pass-through effects to domestic prices and indeed, domestic inflation and welfare. This issue is particularly important for less developed countries like Nigeria that switched from a fixed to a flexible exchange rate regime following the implementation of the structural Adjustment programme of the World Bank/IMF. This is even more so for Nigeria that has experienced major structural imbalances orchestrated by lopsided policy regimes, inconsistencies and huge debt burdens following many years of military rulership. However, while many Sub-Saharan African Countries (especially Nigeria) have moved to a flexible exchange rate regime at some point in the recent past, it is surprising that studies that explicitly test for the volatility or otherwise of exchange rate following this policy shift has been rare. Therefore, the focus of this chapter was to establish the volatility or otherwise of exchange rate in Nigeria during the period between 1986:1 and 2001:4. To be able to do this, a GARCH (1,1) model was fitted to the first difference of logged quarterly Nigerian

Naira/US dollar exchange rates. Specifically, the nominal and real parallel exchange rates were first considered while the volatility of the nominal and real official exchange rates was also investigated thereafter.

5.1 Estimation Results and Discussion

Quarterly values of nominal and real parallel market exchange rates and real and nominal official exchange rates were used in this chapter. The sample point for the variables is the period 1986.1-2001.4. The parallel market exchange rate data series were obtained from NDIC Quarterly while the nominal official exchange rate data were sourced from CBN Statistical Bulletin published in 2002. Variables are measured at log difference of their actual levels. The time series properties of the data were carefully evaluated before proceeding to estimation stage.

5.1.1 Unit Root Tests for Stationarity:

Before proceeding to the estimation of our equations, the time series properties of our variables were determined to ascertain the stationarity or otherwise of the data set. Indeed, it is common for time series data to demonstrate signs of non-stationarity; typically both the mean and variance of macroeconomic variables trend upwards over time. It is useful to test explicitly for manifestations of non-stationarity because its presence often has important statistical and economic implications. In particular, it can lead to unacceptable results. It has been shown in a number of theoretical literatures that the statistical properties of regression analysis using non-stationary time series data are likely to be spurious (Phillips, 1986). The result is presented in Table 5.1

Table 5.1: Augmented Dickey-Fuller Tens for Unit Root.

Variables	ADF Test Statistics	Order of Interpretation
i. Series in Levels:		
NOER	- 0.300229	
ROER	-1.467821	
NPER	1.355283	
RPER	-2.283774	
ii. Series in first Difference:		
NOER	- 4.590395*	I (1)
ROER	-7.810392*	I (1)
NPER	- 4.098125*	I (1)
RPER	-6.640274*	I (1)

ADF is the Augmented Dickey – fuller test. It shows the t – statistic from a specification that includes a Constant, trend and two (2) lagged changes in the dependent variable. * Indicate rejection if the Null Hypothesis (E = o) of non-stationarity at 1% critical values. Mackinnon's critical value for refection of a unit root for ADF at 1% is – 3.5226.

5.2 Nominal and Real Parallel Exchange Rates Volatility Tests

A GARCH (1,1) model fitted to the first difference of log annual Nigerian Naira/ US. Dollar exchange rates yielded the following output. The output for the nominal parallel exchange rate is presented in Table 5.2 while that of the component ARCH model for nominal parallel exchange rate is presented in Table 5.3.

Table 5.2: ARCH Model of Parallel Market Exchange Rates in Nigeria

Dependent Variable: DLOG(NPER)
Method: ML – ARCH
Date: 04/14/04 Time: 03:04
Sample(adjusted): 1986:2 2001:4
Included observations: 63 after adjusting endpoints
Convergence achieved after 44 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.021457	0.010346	2.073829	0.0381
	Variance Equation			
C	0.000164	5.95E-05	2.761330	0.0058
ARCH(1)	-0.103543	0.032058	-3.229893	0.0012
GARCH(1)	1.042254	0.036881	28.26027	0.0000
R-squared	-0.059125	Mean dependent var		0.055226
Adjusted R-squared	-0.112979	S.D. dependent var		0.139993
S.E. of regression	0.147690	Akaike info criterion		-1.661800
Sum squared resid	1.286922	Schwarz criterion		-1.525728
Log likelihood	56.34671	Durbin-Watson stat		1.971375

The Output from ARCH estimation is divided into two sections – the upper part provides the standard output for the mean equation while the lower part, labeled "Variance Equation" contains the Coefficients, standard errors, T- statistics, P-values for

the Coefficient of the variance equation. The ARCH parameters correspond to $\forall$ and the GARCH parameters to β.

The bottom panel of the output presents the standard set of regression statistics using the residuals from the mean equation. The R^2 here has no meaning since there are no regressions in the mean equation. For example, the R^2 is negative with no economic or statistical meaning.

From Table (5.2), the sum of the ARCH and GARCH Coefficients ($\forall + \beta$) is 0.938711, which is close to one, indicating that volatility shocks are quite persistent in the nominal parallel market exchange rates in Nigeria against the U.S. Dollar. Indeed, this is a case of exchange rate volatility in Nigeria. Also, we tested for volatility in the real parallel exchange rate volatility and our result indicates that the sum of the ARCH and GARCH coefficients is 1.0049774, which is more than unity. This is case of exchange rate overshooting. This also means that real exchange rate in Nigeria has been more volatile than nominal exchange rates during the period under review.

To be able to discuss whether the volatility observed in the parallel market Exchange rates (Real and Nominal), is a short-term one or long run, we estimated the component ARCH model for the same series. The output is presented in Table 5.3 and Table 5.4.

Table 5.3: Component ARCH Model for Nominal Parallel Market Exchange Rates in Nigeria

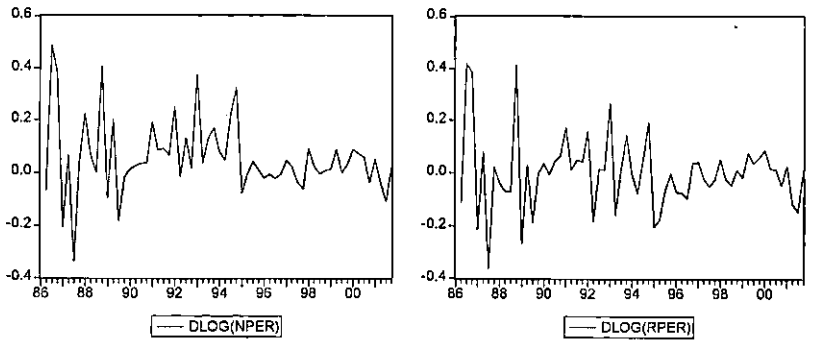
Dependent Variable: DLOG(NPER)
Method: ML – ARCH
Date: 04/14/04 Time: 03:05
Sample(adjusted): 1986:2 2001:4
Included observations: 63 after adjusting endpoints
Convergence achieved after 14 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.030887	0.013332	2.316786	0.0205
Variance Equation				
Perm: C	0.008743	0.002623	3.332986	0.0009
Perm: [Q-C]	0.824967	0.053636	15.38076	0.0000
Perm: [ARCH-GARCH]	0.350484	0.043484	8.060074	0.0000
Tran: [ARCH-Q]	-0.441013	0.091077	-4.842206	0.0000
Tran: [GARCH-Q]	1.082047	0.023686	45.68335	0.0000
R-squared	-0.030713	Mean dependent var		0.055226
Adjusted R-squared	-0.121126	S.D. dependent var		0.139993
S.E. of regression	0.148229	Akaike info criterion		-1.362887
Sum squared resid	1.252399	Schwarz criterion		-1.158779
Log likelihood	48.93095	Durbin-Watson stat		2.025717

Table 5.4: Component ARCH Model Result for Real Parallel Market Exchange Rates in Nigeria

Dependent Variable: D(RPER)
Method: ML – ARCH
Date: 04/14/04 Time: 03:10
Sample(adjusted): 1986:2 2001:4
Included observations: 63 after adjusting endpoints
Convergence achieved after 38 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.167638	0.833722	-0.201072	0.8406
Variance Equation				
Perm: C	90.69553	142.7441	0.635371	0.5252
Perm: [Q-C]	0.963255	0.045872	20.99873	0.0000
Perm: [ARCH-GARCH]	0.110458	0.115801	0.953862	0.3402
Tran: [ARCH-Q]	0.388829	0.098260	3.957121	0.0001
Tran: [GARCH-Q]	-0.802817	0.123619	-6.494296	0.0000
R-squared	-0.000622	Mean dependent var		0.109994
Adjusted R-squared	-0.088395	S.D. dependent var		11.22550
S.E. of regression	11.71114	Akaike info criterion		7.409802
Sum squared resid	7817.594	Schwarz criterion		7.613910
Log likelihood	-227.4088	Durbin-Watson stat		2.340427



The Coefficients with perm: are the Coefficient for the permanent equation and Trans: For the transitory equation. The estimate of the persistence of nominal parallel market exchange rate in the long run component is $\hat{\rho}$=0.83, indicating that the long run exchange rate volatility component converges very slowly to the steady state. The short-run exchange rate volatility is however governed by powers of $\hat{\alpha}+\hat{\beta}$ = 0.641034, which is very significant looking at the Z-statistics and p-values. A similar picture is also presented for the component ARCH model of real exchange rate as presented in Table 5.4. The estimate of persistence in the long run is given by $\hat{\rho}$=0.96 while the short run component is equal to $\alpha+\beta=-0.413988$ indicating that real parallel exchange rates in Nigeria is not volatile in the short run.

The principal conclusion that can be drawn from this result is that parallel market exchange rates (real and nominal) in Nigeria have been volatile during the period under review. The result also indicates that the long-run component of exchange rate volatility converges very slowly to the steady state. The policy implication of this discovery is that any shock to parallel market exchange rates in Nigeria will have lasting effects in the economy. If the shock is negative, the uncertainty it will inject into the economy will take a long time before it can be eliminated. Indeed, this could be very damaging noting that our economy (indeed, all the sectors of the Nigeria economy) is very vulnerable to this important price (exchange rate). It could be deduced that the exchange rate volatility in

Nigeria could have been responsible for the level of macroeconomic instability, which this economy has experienced, in the past few years.

To further reinforce the earlier conclusions reached about the volatility of nominal and real parallel market exchange rates in Nigeria; we conducted the wald-test for coefficient restrictions. The hypothesis of no volatility was tested (i.e. $\alpha + \beta = 0$) against the alternative of the existence of volatility. The result of Wald-test conducted is reported in table 5.5 below. The result shows that the coefficients of ARCH and Component ARCH models are significant meaning that they are significantly different from zero. This means that the hypothesis of no volatility is hereby rejected in the first panel of Table 5.5. This is in support of the earlier result. Yet, the same thing can be said of the result in the second panel of Table 5.5 in which case the hypothesis of no volatility in the short run can also be rejected although at a weaker confidence level looking at the p-values.

Table 5.5: Wald-Tests for Coefficient Restrictions –

ARCH Model For Nominal Parallel Market Exchange Rate:

Null Hypothesis:	C (1) +C (2)=1		
F-statistic	7587.151	Probability	0.000000
Chi-square	7587.151	Probability	0.000000

Component ARCH model for Nominal Parallel Market Exchange Rate.

Null Hypothesis:	C (2)+C (3)=1 C (4)+C (5)=1		
F-statistic	5.247863	Probability	0.007301
Chi-square	10.49573	Probability	0.005259

5.3 Nominal and Real Official Exchange Rate Volatility in Nigeria

As expected, the Official Exchange rate behaved differently from that of the parallel market exchange rate. Indeed, going by the power of $\hat{\alpha} + \hat{\beta} = 0.65$ one can

conclude that the official exchange rate has been relatively stable during the period under review (see Table 5.6 below). The fact that $\hat{\alpha}+\hat{\beta}=0.65$ is significant means that official exchange rate in Nigeria has been relatively stable during the period under review. One observed trend in the behaviour of nominal official exchange rate is that it depreciated markedly immediately after the commencement of the liberalization exercise but became relatively stable thereafter. This was due to official devaluation of the Naira at the wake of the introduction of financial liberalization in an attempt to find a realistic exchange rate for Naira and also to reduce the parallel market premium that have been wide for some time now especially during the regulated regime. However, the component ARCH model gave the picture of permanent or long-run volatility but short run stability as can be seen from Table 5.7.

Table 5.6: ARCH Model of Nominal Official Exchange Rates in Nigeria

Dependent Variable: DLOG(NOER)
Method: ML – ARCH
Date: 04/14/04 Time: 03:14
Sample(adjusted): 1986:2 1998:4
Included observations: 51 after adjusting endpoints
Convergence achieved after 88 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.045987	0.028327	1.623428	0.1045
	Variance Equation			
C	0.004373	0.000805	5.429640	0.0000
ARCH(1)	-0.049435	0.020145	-2.453911	0.0141
GARCH(1)	0.697951	0.063226	11.03891	0.0000
R-squared	-0.004094	Mean dependent var		0.060475
Adjusted R-squared	-0.068185	S.D. dependent var		0.228699
S.E. of regression	0.236367	Akaike info criterion		-1.275758
Sum squared resid	2.625867	Schwarz criterion		-1.124243
Log likelihood	36.53184	Durbin-Watson stat		2.433811

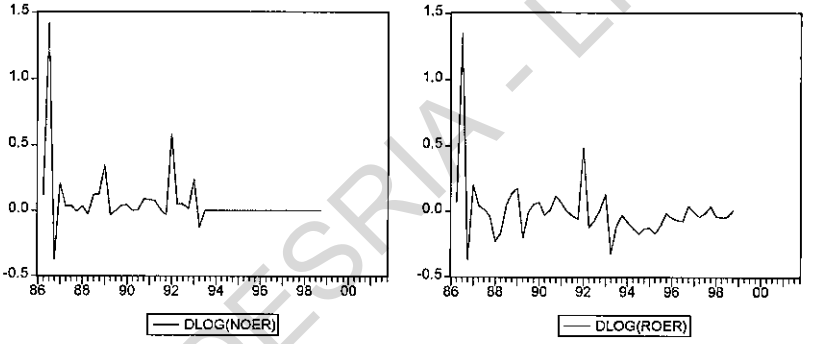
Table 5.7:Component ARCH Model of Nominal Official Exchange Rates in Nigeria

Dependent Variable: DLOG(NOER)
Method: ML – ARCH
Date: 04/14/04 Time: 03:12
Sample(adjusted): 1986:2 1998:4
Included observations: 51 after adjusting endpoints
Convergence achieved after 24 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.040501	0.027462	1.474841	0.1403
Variance Equation				
Perm: C	0.012050	0.001615	7.460455	0.0000
Perm: [Q-C]	0.710019	0.037044	19.16693	0.0000
Perm: [ARCH-GARCH]	-0.060225	0.012995	-4.634511	0.0000
Tran: [ARCH-Q]	0.011479	0.014100	0.814126	0.4156
Tran: [GARCH-Q]	-0.419916	0.028547	-14.70951	0.0000

R-squared	-0.007780	Mean dependent var	0.060475
Adjusted R-squared	-0.119756	S.D. dependent var	0.228699
S.E. of regression	0.242006	Akaike info criterion	-1.180454
Sum squared resid	2.635509	Schwarz criterion	-0.953180
Log likelihood	36.10157	Durbin-Watson stat	2.424907

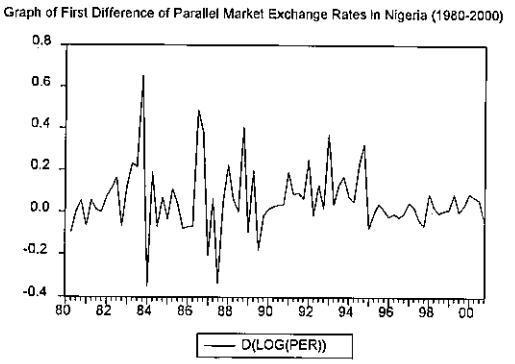
Figure 5.1: Graph of nominal and real official exchange rate in Nigeria.



However, a very interesting discovery although not unexpected is the behaviour of nominal official exchange rate as from 1986 till 1992. It can be observed that the nominal official exchange rate depreciated sharply with the commencement of structural Adjustment programme in 1986 up till 1992. However, the depreciation thereafter was not as noticeable as the earlier periods of Adjustment (see figure 5.1). Specifically, there was a policy reversal in 1994 when the then Military Head of State halted the liberalization process by resulting to a fixed exchange rate system. Even then, the official exchange rate was not only stable during the period, but also constant from 1994 till 1998

when Nigeria disengaged with official exchange rate arrangement (see figure 5.1). A comparative picture for parallel market exchange rate is presented in figure 5.2, which displays a noticeable volatility throughout the period of study.

Figure 5.2: Graph of First Difference of Parallel Market Exchange Rates in Nigeria (₦ /$).



This observation seems to support the result from the component ARCH model of exchange rate, where in the short–run, official exchange rate is stable with the power of $\hat{\alpha}+\hat{\beta}=-0.408437$, but in the long run, exchange rate was perpetually depreciating and never return back to the steady state. In this case, $\hat{\alpha}+\hat{\beta}=0.710019$ which indicates that official exchange rate in Nigeria is moderately volatile in the long run.

Table 5.8: Wald-Tests for Coefficient Restrictions –

ARCH Model For Official Market Exchange Rate:

Null Hypothesis:	C(1)+C(2)=1		
F-statistic	867.2992	Probability	0.000000
Chi-square	867.2992	Probability	0.000000

Component ARCH model for Official Market Exchange Rate.

Null Hypothesis:	C(2)+C(3)=1 C(4)+C(5)=1		
F-statistic	106.6440	Probability	0.000000
Chi-square	213.2881	Probability	0.000000

The Wald-test conducted reveals that the sum of the coefficients of ARCH and GARCH is significant (i.e. it is not different from one (1)) meaning that the hypothesis of

official exchange rate volatility is accepted both in the ARCH model and in long run aspect of the component ARCH model. From this result, it seems that the permanent volatility overshadows the short run stability in the component ARCH model.

The main conclusion from this is that although parallel market exchange rate was volatile both in the short-run and in the long run, the same thing cannot be said of the official exchange rate which depreciated markedly at the onset of policy shift to market determined exchange rates as witnessed from 1986 but relatively stable thereafter. This support the view of Odusola and Akinlo (2001) when they argue that official exchange rates does not reflect the market fundamental in the Nigerian economy because they were fixed by administrative fiat prior to the introduction of the Structural Adjustment Programme.

5.4 Conclusion

The principal focus of this chapter was to establish the volatility or otherwise of exchange rate of Nigerian Naira vis-à-vis the U.S dollar. Evidence from the results reveals the existence of mixed results on the volatility or otherwise of exchange rates in Nigeria. The ARCH and Component ARCH model fitted to both parallel and official exchange rates in Nigeria suggests that Parallel Market Exchange rates has been volatile both in the short-run and in the long-run. This is expected since the exchange rates in this market were determined principally by the forces of demand and supply as against the regulated one in the official market. On the other hand, official exchange rate was volatile in the short run especially at the early stage of liberalization but relatively stable as from 1992. From this standpoint, a pertinent question to ask is " what effects does exchange rate volatility has on currency substitution in Nigeria?" The answer to this question is provided in the next chapter.

CHAPTER SIX

THE EXTENT OF CURRENCY SUBSTITUTION IN NIGERIA

6.0 Introduction

Three principal objectives were pursued in this chapter. In the first place, causality issue between exchange rate volatility and currency substitution in Nigeria were considered. In the second section, the issue concerning the extent of currency substitution in Nigeria was considered, while the last dwelt on the impact of exchange rate volatility on currency substitution in Nigeria. In understanding the extent of currency substitution in Nigeria, we are guided by two main concepts in the literature: the stock and the process or behavioural concepts. The process concept enables us to establish the existence and the determinants of currency substitution in Nigeria while the stock concept enables us to gauge the magnitude of this phenomenon. The behavioural concept, which requires an econometric model, was investigated using the unrestricted portfolio balance model of currency substitution as presented in our theoretical framework. Specifically, we estimated equations (3) and (4) for that purpose. On the other hand, the stock concept was handled through the computation of relevant ratios for the Nigerian Economy. In this case, we computed the popular IMF dollarization index as a measure of currency substitution in Nigeria. First, we take up the behavioural concept. In the latter part of this chapter, we returned to the stock concept. However, before we go into the empirical determination of the extent of currency substitution in Nigeria, we first try to understand the causal relationship between exchange rate volatility and currency substitution in Nigeria. This is the fourth objective of our study.

6.1 Exchange Rate Volatility and Currency Substitution in Nigeria: A Causality Test

The main focus of this section is the determination of the causal relationship between exchange rate volatility and dollarization in Nigeria. Consequently, a pair wise Granger causality test between nominal exchange rate volatility (NERV) and dollarization index (DI) was estimated within a VAR setup. Since correlation does not necessarily imply causation in any meaningful sense of that word, the Granger (1969) approach to the question of whether x causes y is to see how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation. y is said to be Granger-caused by x if x helps in the prediction of y, or equivalently if the coefficients on the lagged x's are statistically significant. Note that two-way causation is frequently the case; x Granger causes y and y Granger causes x.

It is important to note that the statement "x Granger causes y" does not imply that y is the effect or the result of x. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term. From the above definition, it follows that optimal choice of lag length of the variables of interest to be included in the model plays a pivotal role in the appropriate determination of Granger causality. Indeed, wrong lag order selection can cause spurious rejection or acceptance of no causality. Hence, in general, it is better to use more rather than fewer lags, in carrying out Granger Causality test, since the theory is couched in terms of the relevance of all past information. For our purpose we picked optimal lag length suggested by Akaike Information Criteria (AIC) and Schwarz Information Criterion (SIC). However, where these two information criteria produces conflicting lag length choices, a feasible empirical procedure will be to examine the stability of the underlying VAR and settle for the model with a lag length that produce a stable VAR.

This is a reasonable choice as the probability of spuriously accepting or rejecting the null hypothesis of no-causality is greatly reduced (Lutkepohl, 1993; Hamilton, 1994). This corresponds to reasonable beliefs about the longest time over which one of the variables could help predict the other.

In a bivariate VAR describing x and y, y does not Granger-cause x if the coefficient matrices Φ_j are lower triangular for all j:

$$\begin{bmatrix} x_t \\ y_t \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} + \begin{pmatrix} \phi_{11}^1 & 0 \\ \phi_{21}^1 & \phi_{22}^1 \end{pmatrix} \begin{bmatrix} x_{t-1} \\ y_{t-1} \end{bmatrix} + \begin{pmatrix} \phi_{11}^2 & 0 \\ \phi_{21}^2 & \phi_{22}^2 \end{pmatrix} \begin{bmatrix} x_{t-2} \\ y_{t-2} \end{bmatrix} + \ldots + \begin{pmatrix} \phi_{11}^\rho & 0 \\ \phi_{21}^\rho & \phi_{22}^\rho \end{pmatrix} \begin{bmatrix} x_{t-\rho} \\ y_{t-\rho} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \ldots.$$

(30)From the first row of the system, the optimal one-period-ahead forecast of x does not depend on lagged values of y but on its own lagged values:

$$E(x_{t+1} / x_t, x_{t-1}, \ldots, y_t, y_{t-1}, \ldots) = c_1 + \phi_{11}^1 x_t + \phi_{11}^2 x_{t-1} + \ldots + \phi_{11}^\rho x_{t-\rho+1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots($$

31)To implement this test, we used the optimal autoregressive lag length ρ suggested by the various information criteria and equation (3) was estimated:

$$Z_t = (DI_t, NERV_t)'$$

……(32)

within the VAR structure. Z_t is the column vector of our variables. More explicitly,

$$DI_t = c_1 + \alpha_1 DI_{t-1} + \alpha_2 DI_{t-2} + \ldots + \alpha_\rho DI_{t-\rho} + \beta_1 NERV_{t-1} + \beta_2 NERV_{t-2} + \ldots + \beta_\rho NERV_{t-\rho} \ldots\ldots\ldots\ldots(33)$$

$$NERV_t = c_2 + \alpha_1 NERV_{t-1} + \alpha_2 NERV_{t-2} + \ldots + \alpha_\rho NERV_{t-\rho} + \beta_1 DI_{t-1} + \beta_2 DI_{t-2} + \ldots + \beta_l DI_{t-\rho} \ldots\ldots(34)$$

for all possible pairs of DI_t and $NERV_t$ and ρ is the optimal lag length adopted in this study. The reported F-statistics are the Wald statistics for the joint hypothesis

$$\beta_1 = \beta_2 = \ldots = \beta_\rho = 0$$

for each equation. The null hypothesis is therefore that $NERV_t$ does not Granger-cause DI_t in equation (33) and that DI_t does not Granger-cause $NERV_t$ in equation (34). The null hypothesis that $NERV_t$ (DI_t) does not Granger-cause DI_t ($NERV_t$) is rejected if the β_i coefficients are jointly significantly different from zero, using a standard F-test. Bi-directional causality (or feedback) exists if β_i coefficients are jointly different from zero in both equations.

Non-stationarity is a major feature of time series data. The starting point in any empirical study involving time series therefore, will be to investigate this property before estimation proper to avoid spurious results. In applying the VAR technique, there are three basic approaches by which non-stationary data can be handled. However, experts differ in the advice offered for applied research. One option is to ignore the non-stationary altogether and simply estimate the VAR in levels, relying on standard $t-$ and $F-distributions$ for testing any hypothesis. A second option is to routinely difference any apparently non-stationary variables before estimating the VAR. If the true process is a VAR in differences, then differencing should improve the small sample performance of all the estimates and eliminate altogether the non-standard asymptotic distributions associated with certain hypothesis tests (Hamilton, 1994). The third approach is to investigate carefully the nature of the non-stationarity, testing each series individually for unit root and then testing for possible cointegration among the series. Once the nature of the non-stationarity is understood, a stationary representation for the system can be estimated[2]. At the application level, Hamilton (1994) suggests a combination of the three approaches. Therefore, in what follows, the stationary properties of the series were carefully examined; tests for cointegration and structural breaks carried out and unknown break points determined to avoid spurious rejection or acceptance of causality.

[2] See Hamilton (1994) for a discussion of the drawbacks of each of these empirical procedures.

6.1.1 Unit Root Tests

To test for causality, it is important to ensure that the series are stationary to avoid spurious rejection or acceptance of causality. Therefore, the stationary of the variables of interest was investigated using Augmented Dickey-Fuller (ADF), and Philip-Perron (PP) tests. The result is presented in Table 1.

Table 6.1: Unit root tests.

Variables	Unit Root Tests *(With intercept only)*						**Likely degree of integration**
	ADF			**PP**			
	Levels	1st diff.	2nd diff.	Levels	1st diff.	2nd diff.	
DI	-2.4630	-8.9426*	-	-2.2823	-9.7715*	-	I (1)
NPERV	-5.2250*	-8.1140*	-	-8.1856*	-49.7843*	-	I (0)
	With intercept and trend						
	ADF			**PP**			
	Levels	1st diff.	2nd diff.	Levels	1st diff.	2nd diff.	
DI	-2.5798	-8.8768*	-	-2.4846	-9.8553*	-	I (1)
NPERV	-8.4850*	-8.0660*	-	-8.4865*	-53.7913*	-	I (0)

ADF is the Augmented Dickey – Fuller test and PP is the Phillips-Perron test.. It shows the t – statistic from a specification that includes a Constant, without time trend. * Indicate rejection if the Null Hypothesis (E = o) of non-stationarity at 1%, and ** indicates stationarity at 5% critical values.

The tests indicate that DI is not stationary at levels but it is first difference stationary. On the other hand, NERV has no unit root both at levels and at first difference. Since one of the variables is integrated of order one and the second integrated of order zero, cointegration analysis was employed to examine possible long run relationship between the variables. For this purpose, Johansen technique (see Johansen and Juselius, 1990) was employed. Hamilton (1994) and Hayashi (2000) argue that testing and analyzing cointegration in a VAR model is superior to the Engle-Granger single equation method. Moreover, specific restrictions suggested by economic theory can be tested in this framework. The cointegration test indicates one cointegrating relationship suggesting

the existence of long run relationship between dollarization and exchange rate volatility (see Table 2).

Table 6.2: Trace Test Result.

H_0: rank <	Eigen values	Trace test	Prob of Trace Test**
0	0.270927	23.08114	0.0030*
1	0.060492	3.80630	0.0511

*denotes rejection of the hypothesis at 5% significance level
Trace test and L.R. test indicates 1 cointegrating equation(s) at 5% significance level
**MacKinnon-Haug-Michelis (1999) p-valus

Next, lag length selected for VAR estimation play a critical role in causality tests. The optimal lag length of one (1) suggested by the various information criteria reported in Table 6.3. From Table 6.4, the hypothesis of no causality could not be rejected in either direction. This is because the respective F-statistics are not significant judging by the probability (*p*) values.

Table 6.3: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	76.79245	NA	0.000231	-2.696017	-2.548684	-2.639196
1	92.44645	28.98890*	0.000150*	-3.127646*	-2.832982*	-3.014006*
2	93.82992	2.459498	0.000166	-3.030738	-2.588741	-2.860277
3	96.69882	4.887763	0.000173	-2.988845	-2.399517	-2.761564
4	101.1669	7.281334	0.000171	-3.006182	-2.269521	-2.722081
5	102.9351	2.750515	0.000187	-2.923522	-2.039529	-2.582601
6	106.7027	5.581646	0.000190	-2.914915	-1.883590	-2.517174
7	107.0506	0.489675	0.000221	-2.779653	-1.600996	-2.325092
8	112.1609	6.813722	0.000215	-2.820775	-1.494786	-2.309393
9	117.5882	6.834287	0.000209	-2.873636	-1.400314	-2.305433
10	120.9800	4.019928	0.000219	-2.851110	-1.230457	-2.226088

**indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion.*

Table 6.4: VAR Causality test

Variables	*NERV*	*DI*
c	0.2373	0.007754
	(0.99)	(1.88)
NERV(−1)	0.0033	0.003269
	(0.03)	(1.48)
DI(−1)	-4.4570	0.840291
	(-1.12)	(12.23)
Summary Statistics		
F-statistic	*0.6256*	*75.5062*
S.E. equation	*1.0227*	*0.0176*
Chi − sq	*7.5398*	*2.1879*
Prob.	*0.2636*	*0.1391*

Hence, we tested for possible structural break in the data using CUSUM tests for stability and one-step forecast test to determine the break point in the data.

6.1.2 Recursive Residual Tests for Structural Breaks

To test for structural breaks in our variables, the recursive test for stability was conducted using both the CUSUM test and the One-Step Forecast test. The CUSUM test is based on the cumulative sum of the recursive residuals suggested by Brown, Durbin, and Evans, (1975). It plots the cumulative sum together with 5% critical lines. Parameter instability is found if the cumulative sum goes outside the area between the two critical lines. So, movement of the sample CUSUM test outside the critical lines is suggestive of coefficient instability. The CUSUM tests performed on both DI and NERV is presented in the figures 3 and 4 respectively below:

Figure 6.1: Recursive CUSUM test on dollarization index

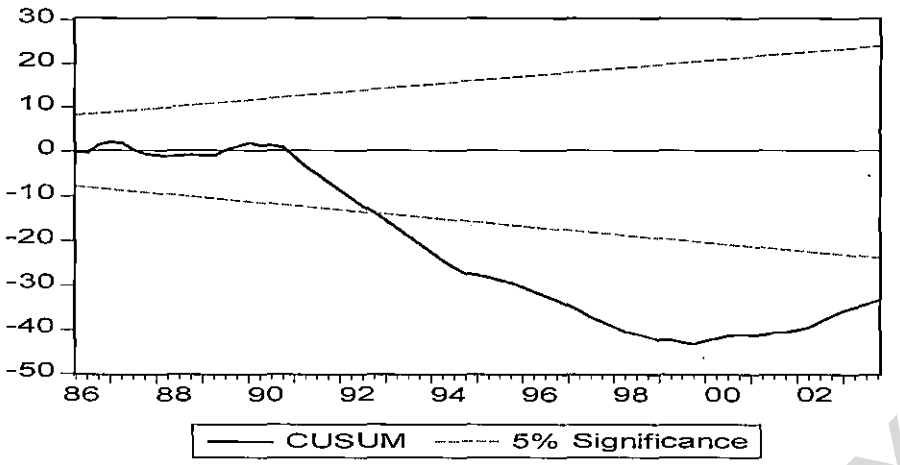
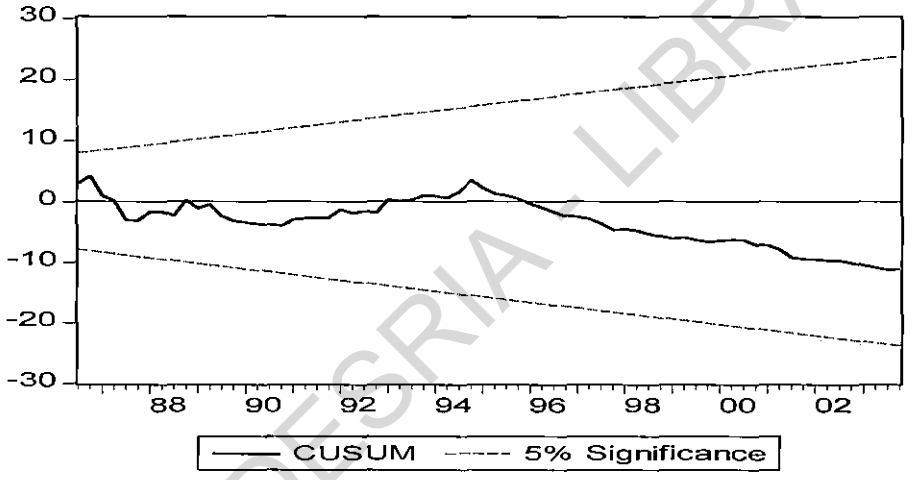


Figure 6.2: Recursive CUSUM test on exchange rate volatility



The CUSUM tests on both variables indicate a case of variance instability or the presence of structural breaks in DI. To be able to identify the specific point of break in the data series, a one-step forecast test was conducted on DI which shows sign of instability. The test result for dollarization is presented in figure 5 The upper portion of the graph (right vertical axis) reports the recursive residuals and standard errors while the lower portion (left vertical axis) shows the probability values for those sample points where the hypothesis of parameter stability would be rejected at the 5, 10 and 15 percent levels. The point with p-value less than 5 percent corresponds to those points where the recursive

residuals go outside the standard error bounds. In this case, the graph will sometime show dramatic jumps as the postulated equation[3] tries to digest a structural break. As shown in figure 5, structural break was detected in the dollarization data in 1991.

Figure 6.3: Recursive One-Step Forecast test on Dollarization

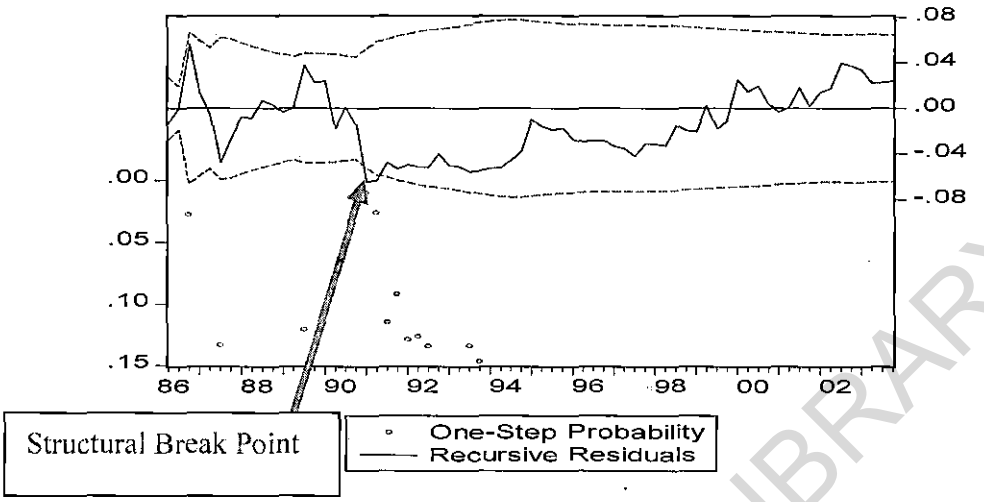
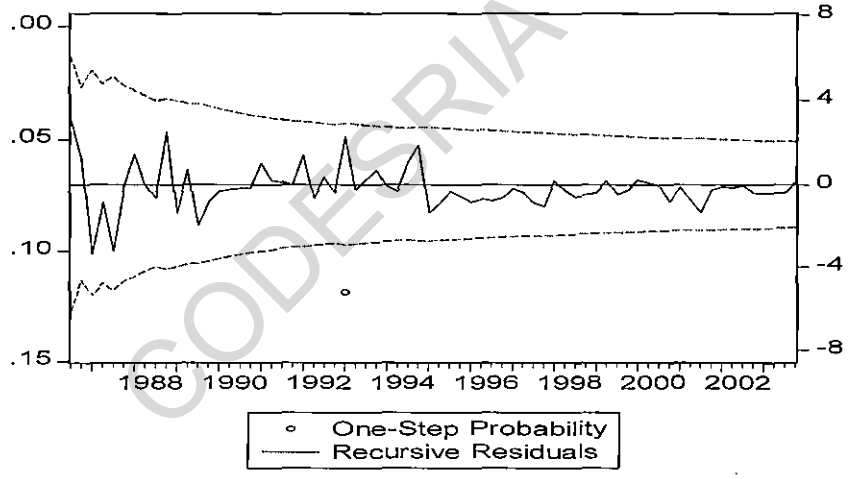


Figure 6.4: Recursive one-step forecast test on exchange rate volatility



Therefore, to account for this structural break in the data, we included a dummy as an exogenous variable in the VAR. The dummy variable is essentially zero-one function which is equal to one after 1991q1 (break point) and zero elsewhere. The inclusion of exogenous variable enables us to capture the effect of structural breaks in the regressions.

[3] See Perron (2005) for a detailed review and alternative derivations.

Equation (32) was estimated using ordinary least square estimation technique within a VAR structure in ***EViews, version 5.1.*** The result of the regressions is presented in Table 6.6. Interestingly, the result changed dramatically.

Table 6.5: VAR Causality test with dummy variable

Variables	*NERV*	*DI*
c	1.4573	0.0177
	(2.71)	(1.94)
$NERV(-1)$	-0.0269	0.0030
	(-0.12)	(1.40)
$DI(-1)$	-14.2536	0.7764
	(-2.66)	(8.56)
Dummy	-1.1797	-0.0078
	(-2.36)	(-1.20)
Summary Statistics		
F-statistic	2.5104	61.4147
S.E. equation	1.0000	0.0170
$Chi-sq$	7.1000	1.9643
$Prob.$	0.0077	0.1611

From this result, we cannot reject the hypothesis that *NERV* does not Granger cause DI_t at 5% level but we do reject the hypothesis that DI_t does not Granger cause *NERV* at a similar percentage level of significance. Therefore it appears that Granger causality runs one-way from dollarization to nominal exchange rate volatility. However, this relationship was initially blurred by the structural break in 1991q1 when the then military head of state (Ibrahim Babangida) was asked to vacate office and the demand for a democratic rule in Nigeria was at its peak. This period was characterized by massive strikes and nation wide stay-at-home protests in the country. This must have been responsible for the break at this time.

6.1.3 Policy Implications

This result raises an interesting policy issue in that a high degree of dollarization tend to increase exchange rate instability under floating exchange rate arrangement, as policy makers in dollarized economies tries to maintain independent currency. This is

consistent with Willett and Banaian (1996) argument that slight changes in dollarization would cause a "huge exchange rate movements". McKinnon (1982, 1993) and Bofinger (1991) maintained that dollarization is the main cause of instability in flexible exchange rates. This view implies that dollarization has been a significant destabilizing force in the world economy (Willett and Banaian, 1996). This become more relevant for a developing economy like Nigeria where exchange rate instability has strangulated most productive sectors of the economy especially manufacturing which is import dependent. The process driving exchange rate volatility in this case is outside the control of domestic policy makers. Therefore, optimal policy responses to exogenous disturbances may be very challenging especially when domestic institutional structures are lacking or weak at best. This view seems to underlie most of the recommendation for a fixed exchange rate arrangement in the face of dollarization found in the dollarization literature (see, McKinnon, 1982; 1993b; Bofinger, 1991). However, while the possibility of exchange rate instability due to dollarization cannot be dismissed from the empirical evidence presented above, it must be bore in mine that there are many other types of shocks that could cause exchange rate instability (e.g term of trade shocks). Hence, it may not be safe to conclude that dollarization disturbances should dominate the formulation of exchange rate policies. Yet, it should be explicitly considered in policy design and implementation.

6.2 Determinants of Currency Substitution in Nigeria

This section is concerned with the identification of key determinants of currency substitution in Nigeria using a multi-perspective unrestricted portfolio balance model. Conventionally, we first explore the stationary properties of analysed time series, as they are expected to be integrated of order I (1). Results of applied ADF- and PP-tests are summarized in Table 6.6 a & b:

Table 6.6a: Unit Root Tests on Time Series Used for the Analysis.

Variables	Unit Root Tests (With intercept only)						Likely Degree of Integration
	ADF			PP			
	Levels	1st Diff.	2nd Diff.	Levels	1st Diff.	2nd Diff.	
i^*	-1.4472	-2.2274	-4.7190*	-1.4524	-3.2195**	-8.2430*	I (1) or I (2)
Y	1.6913	-4.8030*	-	1.7551	-8.3794*	-	I (1)
P^c	1.5846	-2. 2280	-8.6280*	1.9245	-4.3167*	-	I (1)
Ne^e	-3.2920	-7.9006*	-	-6.8401*	-15.334*	-	I (0) or I (1)
Dr	-3.1849	-4.9836*	-	-2.7507	-7.5198*	-	I (1)
i	-2.7880	-4.6922*	-	-2.4422	-6.8348*	-	I (1)
M2	3.3533	-3.2043**	-12.714*	3.7958	-7.6933*	-	I (1) or I (2)
DI	-2.0590	-4.4252*	-	-2.1833	-7.9718*	-	I (1)
Re^e	-6.6403*	-9.1538*	-	-9.3280*	-22.130*	-	I (0) or I (1)
NPERV	-5.2893*	-7.0009*	-	-8.1863*	-18.987*	-	I (0) or I (1)
RPERV	-6.4897*	-8.271*	-	-8.9307*	-21.130*	-	I (0) or I (1)

ADF is the Augmented Dickey – Fuller test and PP is the Phillips-Perron test.. It shows the t – statistic from a specification that includes a Constant, without time trend. * Indicate rejection if the Null Hypothesis (E = o) of non-stationarity at 1%, and ** indicates stationarity at 5% critical values.

Table 6.6b: Unit Root Tests of Time Series Used for the Analysis.

Variables	Unit Root Tests (With intercept and Trend)						Likely Degree of Integration
	ADF			PP			
	Levels	1st Diff.	2nd Diff.	Levels	1st Diff.	2nd Diff.	
i^*	-2.4810	-2.2238	-4.8024*	-1.8602	-3.1919	-8.3733*	I (2)
Y	-1.0884	-5.6455*	-	-1.2856	-9.0743*	-	I (1)
P^c	-1.7897	-2.6913	-8.5472*	-1.6696	-4.7485*	-	I (1)
Ne^e	-3.2251	-7.8934*	-	-6.7902*	-15.213*	-	I (0) or I (1)
Dr	-3.2826	-4.9392*	-	-2.8757	-7.4557*	-	I (1)
i	-2.8222	-4.6471*	-	-2.5131	-6.7740*	-	I (1)
M2	1.0970	-4.5715*	-	0.4149	-9.160*	-	I (1)
DI	-2.4565	-4.3825*	-	-2.5246	-7.9060*	-	I (1)
Re^e	-6.5120*	-9.0615*	-	-9.3607*	-22.017*	-	I (0) or I (1)
NPERV	-5.2559*	-6.9052*	-	-8.5174*	-18.8437*	-	I (0) or I (1)
RPERV	-6.3546*	-8.1840*	-	-9.0009*	-21.0548*	-	I (0) or I (1)

ADF is the Augmented Dickey – Fuller test and PP is the Phillips-Perron test.. It shows the t – statistic from a specification that includes a Constant, without time trend. * Indicate rejection if the Null Hypothesis (E = o) of non-stationarity at 1%, and ** indicates stationarity at 5% critical values.

Since the dependent variables are integrated of order I (1), as are most of the explanatory variables, we need to use cointegration analysis to prevent spurious regression phenomenon. For this purpose we use the Johansen technique (see Johansen and Juselius, 1990).

Table 6.7: Johansen Cointegration Test on Variables.

Series: DI FFR TBR EXPRPER GDP PC RPERV
Lags interval: 1 to 2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.722863	193.9874	124.24	133.57	None **
0.554634	116.9927	94.15	103.18	At most 1 **
0.396582	68.46119	68.52	76.07	At most 2
0.240660	38.15253	47.21	54.46	At most 3
0.183412	21.63418	29.68	35.65	At most 4
0.099174	9.476969	15.41	20.04	At most 5
0.052100	3.210358	3.76	6.65	At most 6

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 3 cointegrating equation(s) at 5% significance level

The cointegrating vector, which are normalized with respect to the dollarization index (DI), together with their respective t-values, are presented in the equation below:

$$\ln DI = 14.23 - \underset{(6.70)}{1.7678 \ln i^*} - \underset{(3.68)}{0.6356 \ln i} + \underset{(3.96)}{2.0048 \ln EXPRPER}$$

$$- \underset{(30.54)}{0.0000113 \ln GDP} + \underset{(2.63)}{0.05824 \ln PC} + \underset{(3.39)}{56.1902 \ln RPERV}$$

The result of this normalization yield estimates of long-run elasticity. Foreign rate of interest and domestic policy rate of interest are negatively related to currency substitution index and the coefficients are statistically significant at the 1% level. Domestic inflation is positively related with currency substitution and the coefficient is statistically significant at the 1% level. This points to the fact that the higher the domestic inflation, the more residents in Nigeria tends to substitute or replace Naira with dollar or relatively more stable currency. Mirroring a priori expectation, the GDP is negatively related with currency substitution in Nigeria and the coefficient is statistically significant at the 1% level. This confirms the wealth depressing effect currency substitution. The higher the currency substitution level, the lower will be the level of national income in Nigeria that will be available for developmental purposes. An appealing aspect of the result, which is in line with our hypothesis is that the real exchange rate volatility is positively related to currency substitution in Nigeria meaning that the higher the real

exchange rate volatility, the more residents in Nigeria tends to switch into holding foreign currency for store of value purposes. The coefficient is also statistically significant at the 1% level. These results provide strong evidence that real exchange rate volatility has a positive and significant long run effect on currency substitution in Nigeria.

Since our variables are cointegrated, it therefore means that there exist long run relationships between the variables. We therefore estimate our models in error correction form.

6.2.1 Determinants of Currency Substitution in Nigeria from the Demand for Money Perspective

The presence of currency substitution in Nigeria was investigated using the demand for money approach. More specifically, equation (3), which describes demand for deposits denominated in Naira, was used. If currency substitution is one of the important techniques of portfolio allocation, then the opportunity costs of holding Naira deposits with respect to deposits in foreign currency and/or foreign assets are to be significant determinants of the demand for Naira deposits.

The empirical analysis of currency substitution in Nigeria is conducted by exploring the existence of currency substitution concerning the effect of exchange rates and the effects of other alternatives to holding money. A measure of exchange rate volatility was also included since we hypothesized that it will affect the behaviour of asset holders concerning the form in which they keep their assets. Analysing the demand for deposits denominated in Naira, we estimated equation of the following form in which all variables entered in the first difference of their logarithms:

$$M_2 = a_0 + a_1 i^* + a_2 y + a_3 P^c + a_4 Ne^e + a_5 \mathrm{Re}^e + a_6 NERV + a_7 RERV + a_8 i \ldots\ldots\ldots 3'$$

where M2 is monetary aggregate adjusted for deposits in foreign currencies (FCD), i.e. (M2-FCD); P^c is the consumer price index, measuring price level development; y is

domestic absorption (GDP), measuring the amount of transactions in the Nigerian economy; i is the treasury bills rate, representing domestic interest rates on alternative assets; and Ne^e *and* Re^e are *the* nominal and real expected exchange rates respectively while *NERVandRERV* are the nominal and real exchange rate volatility respectively. The intent of this model is to determine the impact of exchange rate volatility alongside with returns to alternatives to money on the demand for domestic currency in the Nigerian economy. The result of the parsimonious regression equation with lagged and current period values of explanatory variables after adjusting for error correction is presented in Table 6.8 below. The coefficient of determination (R^2) indicates that the identified explanatory variables explain upwards of 27 percent of the variation in the demand for domestic currency. The low value of R^2 could be justified on the ground that most of the variables entered in the first difference of their lagged values. The Durbin Watson (DW) statistics are generally satisfactory. The error correction terms are marginally significant (significant at 10%) correcting between 6 and 8 percent of the errors in the model. The low value of the error correction term points to the fact that errors in the model takes longer time than expected before they are finally corrected. It also means that distortions in macroeconomic variables take longer time than necessary before they return to the steady state. This is particularly true for Nigeria given our experiences in the past few years especially since the commencement of Structural Adjustment Programme. For example, when most important prices (e.g. commodity prices, exchange rates, etc) in Nigeria go up, they hardly come back to the steady state. The empirical evidence therefore, supports this structure of Nigerian economy.

The presence of currency substitution in Nigeria was investigated by looking at the coefficient on expected change in Naira exchange rate vis-à-vis the US Dollar (Dlog (e^e). It could be observed that this variable has the expected signs in all the regression

equations indicating the presence of currency substitution in Nigeria, even though, they are not significant except regression (1) in Table 6.8. The non-significance of the coefficients in these models may be due to the non-inclusion of important components of this phenomenon of currency substitution in the analysis. Specifically, foreign currency cash and indeed, cross border deposits were no captured in this study. Therefore, summarizing our results, we can conclude that the results indicate the presence of currency substitution in Nigeria. The important variables accounting for this phenomenon is past (two quarter lagged) value of the Nigerian Naira/US Dollar exchange rate.

Another very important variable to note is the coefficient on nominal exchange rate volatility. The result indicates that the more volatile nominal exchange rate becomes, the less will be the demand for domestic currency. This is in line with our *a priori* expectations. Aside from the support from economic theory, the coefficient is also statistically significant. This points to the relevance of nominal exchange rate volatility in explaining currency substitution in Nigeria.

In other to ascertain which of the exchange rate volatility is more important for currency substitution in Nigeria, we included alternative specification of exchange rate volatility in our model. The procedure adopted was that, we first include them separately and later the two measures came into the same model. Our results indicate that real exchange rate volatility is more relevant for currency substitution in Nigeria. This flows from the insignificant coefficients on ***NERV*** in Table 6.8, regression (2), (5) and (6). However, the coefficient on RERV in regressions (1) is marginally significant. When the two variables are brought together in the same model, as indicated in regressions (3), (4), (5) and (6), the superiority of one over the other is hard to determine. This is because the coefficient on the two variables are not significant except for regression (3) where the coefficients on the two variables are marginally significant although with opposite signs.

Nominal volatility has the correct negative sign while that of real volatility is positive. The negative sign on nominal volatility indicates that increased nominal volatility tends to make people to want to reduce their demand for domestic money and in favour of foreign currency deposits. The positive sign on real exchange rate volatility is hard to interpret.

The effect of inflation (domestic Prices) in explaining currency substitution is depicted by coefficients on the variables P^e and $P^e_{(-1)}$. It can be observed that $P^e_{(-1)}$ has negative impact on demand for domestic currency while P^e has positive effect. This indicates that current inflation will stimulate increased demand for domestic currency while past inflation (one quarter lagged) has negative impact on domestic money demand. The positive one supports linear homogeneity of deposits in Naira with respect to the price level while the negative one supports the fact that past period value of inflation can stimulate currency substitution in favour of foreign currency.

Table 6.8. Regression Equation with Lagged Variables
***Dependent Variable:* D log (m2)**

Variables	Regressions					
	1	2	3	4	5	6
D log (M2 (-4))	0.4090 (2.84)	0.3991 (2.79)	0.4026 (2.83)	0.4197 (2.85)	0.4204 (2.86	0.4494 (3.23)
D log (GDP)	0.0561 (0.85)	0.0525 (0.8)	0.0503 (0.78)	0.0709 (1.20)	0.0703 (1.01)	0.0751 (1.09)
D log (P^C)	2(8600 (1.18)	0.0546 (0.28)	3.2832 (1.31)	0.1143 (0.60)	0.0881 (0.43)	0.0726 (0.43)
D log (P^C (-1))	-0.2440 (-1.51)	-0.2613 (1.51)	-0.2449 (-1.42)	-0.2150 (-1.17)	-0.2855 (-1.61)	1.5558 (0.59)
D log (P^C (-4))	- (-0.49)	-0.0851 (-0.62)	-0.1078 (-0.40)	-0.0703 (-0.41)	-0.0716	-
D (i (-1))	-0.0047 (-1.07)	-0.0039 (-0.87)	-0.0047 (-1.04)	-0.0044 (-0.96)	-0.0043 (-0.95)	-0.0047 (-1.04)
D (i^* (-3))	-0.0314 (-1.35)	-0.0240 (-1.05)	-0.0283 (-1.23)	-0.0287 (-1.20)	-0.0288 (-1.20)	-0.0321 (-1.43)
D log (e^e)	-2.7975 (-1.15)	-	-	-	-	-
D log (e^e(-1)	-0.0543 (-0.61)	-	-	-	-	-
D log (e^e (-2)	-	-0.0218 (-0.28)	-0.0396 (-0.50)	-0.0449 (-0.53)	-0.0436 (-0.52)	-0.0440 (-0.53)
NERV	-	0.0393 (0.44)	-3.1970 (-1.27)	-	0.0244 (0.26)	-
NERV (1)	-	-	-	-0.0707 (-0.72)	-	-1.8477 (-0.70)
RERV	2.8220 (1.16)	-	3.2299 (1.29)	0.0280 (0.30)	-	-
RERV (-1)	-	-	-	-	-0.0689 (-0.70)	1.7610 (0.67)
C	0.0350 (1.64)	0.0577 (3.17)	-0.1382 (-0.90)	0.0480 (2.85)	0.0540 (2.83)	-0.0649 (-0.40)
Ecm1 (-1)	-0.0601 (-1.42)	-0.0766 (-1.65)	-0.0737 (-1.60)	-0.0731 (-1.56)	-0.0731 (-1.56)	-0.065 (-1.56)
R2 R-2 DW	0.2837 0.1345 2.13	0.2627 0.1091 2.07	0.2878 0.1212 2.19	0.2714 0.1009 2.08	0.2704 0.0996 2.07	0.2732 0.1218 2.05

This means that the higher the current level of prices in the domestic economy, the higher will be the demand for domestic currency in Nigeria. Further more, the result indicates that a 1percent change in domestic prices will cause a 3.2 percent change in domestic money demand in Nigeria.

Also, an inspection of the results gives a significant support for the effect of foreign rate of interest on the domestic demand for Naira i.e. there exist a significant effect of returns on foreign assets on the demand for Nigerian Naira from the perspective of domestic residents. Specifically, it could be observed that demand for domestic currency is affected by past (three quarters) values of foreign rate of interest proxied by the US federal funds rate. The impact is negative as expected and significant. We can thus conclude that substitution of currency within the domestic banking system is the particularly relevant pattern for Nigeria resident behaviour. Furthermore, in this respect money holdings in Naira were substituted by holdings deposits denominated in U.S. dollars.

Finally, all the domestic determinants are not significant except the lagged value of domestic money demand, which is significant in all the regressions and the coefficient on exchange rate volatility, which is marginally significant, especially regressions (1) and (3). This points to the fact that foreign factors seem to be more important in the determination of currency substitution in Nigeria (see Table 6.8). When real volatility is included, the picture changed. More domestic variables became significant (see regression (3) in Table 6.8).

The coefficient on the GDP variable points to the wealth accumulation effect. In another words, deposits are perceived to be a luxury good, i.e. as agents reach higher income levels they start to save by holding more of their funds as deposits. In terms of the poorest part of population, it implies that after attaining a certain level of income the impecunious agents not only consume but also start to save.

The domestic rate of interest (one period lagged) is correctly signed especially in regressions (1), (3) and (6) while others are not significant. This indicates that the higher the domestic rate of interest, the lower is the demand for domestic currency in idle form.

6.2.2 Determinants of Currency Substitution in Nigeria from the Perspective of Demand for Foreign Deposits

In this section, we inspect the presence of currency substitution by estimating the domestic demand for foreign deposits. We considered the pure stock of foreign deposits in the domestic banking system and at the same time modelled the ratio of such stock to domestic deposits. Using the same set of explanatory variables as in the previous case, we first modelled the impact of the explanatory variables on the demand for the stock of foreign currency and the results of alternative regression models are presented in Table 6.9.

From this Table, it could be observed that the coefficient of determination (R^2) ranges between 0.3700 and 0.4209 meaning that the explanatory variables explained between 37 percent and 42.09 percent of the variations in the demand for the stock of foreign currency in Nigeria. The Durbin Watson statistics are quite satisfactory indicating non-existence of autocorrelation problem in the models.

The main purpose of this exercise in this section is to investigate the presence of currency substitution in Nigeria. In order to do this, expected change in Naira exchange rate was included to capture this phenomenon. The results generally indicate the significant presence of currency substitution in Nigeria. This is because, the coefficients on this variable has expected positive signs and are significant. The positive sign indicate that the higher the expected exchange rate depreciation the higher will be the demand for the stock of foreign currency by residents in Nigeria.

Another principal variable in our model is exchange rate volatility whose impact on currency substitution was investigated. Specifically, impacts of nominal and real exchange rate volatilities were investigated. It could be observed that nominal exchange rate volatility do not perform well in the model. Hence, it could be deduced that nominal exchange rate is not a significant determinant of the stock of foreign currency deposits in

Nigeria (see regressions 1, 4 and 5 in Table 6.6). However, the superiority and relevance of real exchange rate volatility in determining the stock of foreign currency deposits in Nigeria is very conspicuous going by the significance of the coefficients on real exchange rate volatility variables (see regressions 2,3,4 and 5). In addition to their significance, they are correctly signed. Therefore, we can conclude that real exchange rate volatility is a significant determinant of the stock of foreign currency deposits in Nigeria.

The next variable is domestic price level capturing the impact of domestic inflation on the demand for foreign currency by domestic residents in Nigeria. The result indicates that current level of inflation is not as significant as past (four quarter lagged) value of inflation in determining the stock of foreign currency deposits in Nigeria, although wrongly signed contrary to *a priori* expectation. Hence, we can conclude that residents in Nigeria are motivated to hold foreign currency deposits by past period level of inflation and not the current level. This reflects the significance of past period level of inflation as opposed to its current value.

Table 6.9. Regression Equation with Lagged Variables
Dependent Variable D log (FCD)

Variables	Regressions				
	1	2	3	4	5
D log (FCD (-3))	-0.1998 (1.68)	0.1605 (1.39)	0.2086 (1.81)	0.2025 (1.74)	0.2123 (1.81)
D log (GDP)	0.7555 (2.86)	0.9313 (3.24)	0.9332 (3.33)	0.9374 (3.31)	0.0475 (3.31)
Dlog (P^C)	- (1.18)	1.2325 (1.70)	0.5060 (0.64)	0.3720 (0.45)	0.5248 (0.66)
Dlog (P^C (-4))	-1.5522 (-2.46)	- (1.51)	-1.4676 (-2.14)	-1.5546 (-2.18)	-1.4366 (-2.05)
D (i)	0.0310 (1.53)	-	-	-	-
D (i (-2))	-0.0446 (-2.22)	-0.0500 (-2.50)	-0.0417 (-2.09)	-0.0426 (-2.11)	-0.0404 (-1.98)
D (i^*)	0.2829 (2.50)	0.2793 (2.44)	0.3268 (2.85)	0.3289 (2.85)	0.3172 (2.64)
D i^* (-1)	-0.1245 (-1.05)	-0.1967 (-1.65)	-0.2132 (-1.83)	-0.2123 (-1.81)	-0.2065 (-1.74)
Dlog (e^e (-1)	-	1.4630 (1.94)	1.3876 (1.89)	1.3368 (1.70)	1.3567 (1.81)
D log (e^e (-2)	-0.2386 (-0.74)	-0.5669 (-1.83)	-0.6575 (-1.86)	-0.6325 (-1.76)	-0.6420 (-1.78)
NERV	-0.1648 (-0.470)	-	-	-0.1832 (-0.50)	-
NERV (1)	-	-	-	-	0.2225 (0.6356)
RERV (-1)	-	-1.93352 (-2.57)	-1.8851 (-2.48)	-1.8629 (-2.43)	-1.8999 (-2.44)
C	0.1059 (1.72)	0.0120 (0.19)	0.0626 (0.94)	0.0599 (0.89)	0.0627 (0.92)
Ecm2 (-1)	-0.1414 (-1.74)	-0.1008 (-1.33)	-0.1222 (-1.56)	-0.1240 (-1.56)	-.01148 (-1.31)
R^2 R^{-2} DW	0.3729 0.223 2.07	0.3700 0.2415 2.04	0.4178 0.2815 2.05	0.4209 0.2699 2.04	0.04097 0.2523 1.99

When we moved to the estimate of the impact of y (GDP), on domestic demand for foreign currency deposits, it was observed that this variable is generally significant in all the regression models with correct signs. This points to the fact that the higher the income level of residents in Nigeria, the more they seek alternative form of holding their

assets other than in domestic currency. This may probably suggest that foreign currency deposits in Nigeria are held solely for store of value purposes.

The domestic rate of interest has the expected negative sign and significant meaning that as domestic rate of interest increases, the demand for foreign currency deposits in Nigeria falls. However, the relevant interest rate is the past (second lagged quarters) period rate of interest and not current interest rate. For example, the current level of domestic rate of interest in regression (1) is marginally significant and is wrongly signed.

When the impact of foreign rates of interest on the demand for foreign currency deposits was examined, we find that past period (one quarter) value of foreign rate of interest is correctly signed but marginally significant. However, current level of foreign interest rate is wrongly signed although very significant. This points to the fact that foreign rate of interest proxied by the US federal funds rate, has a significant impact on the demand for foreign currency deposits in Nigeria. The wrong sign could be explained on the ground that high foreign rate of interest tend to stimulate increased demand for assets denominated in foreign currency. This is particularly true in Nigeria where asset holders are always interested in getting safe havens for their assets, which in most cases are readily provided by stable currency denominated assets like the dollar.

Finally, past period (three quarter lagged) stock of foreign currency deposits in Nigeria is a significant determinant of current stock of foreign currency deposits in Nigeria (see Table 6.6).

To probe further into the existence of currency substitution in Nigeria, we modelled the ratio of foreign currency deposits to domestic broad money so that we can reinforce or refute the earlier results. Regressing this ratio (dollarization index) on the same set of explanatory variables as above, we observe the following:

1. Past period (one quarter lagged) value of expectation about exchange rate depreciation causes increased dollarization in Nigeria. This is supported by the values of the coefficients on one period lagged value of expected exchange rate depreciation as shown in regression (1), (2), (3) and (4). However, two quarter lagged value of the same variable has the opposite sign and marginally significant.
2. Real exchange rate volatility is more relevant for currency substitution in Nigeria. This flows from the significance of the coefficient on RERV especially regression (4) where both real and nominal volatilities entered into the same model.
3. Current level of inflation may cause dollarization to increase as indicated by regressions (1), (3) and (4). However, four quarter lagged value of inflation has the opposite sign (i.e. negative).
4. The impact of foreign rate of interest on dollarization is also mixed. For example, while changes in two quarter lagged value of foreign rate of interest may dampen dollarization in Nigeria, three quarter lagged values may aggravate it (see coefficients on foreign rate of interest (i^*)).
5. Dollarization may be self-perpetuating. This could be so given the significance and positive signs on past values (one quarter and three quarter lagged) of dollarization index in Nigeria (see Table 6.10).

Table 6.10. Regression Equation with Lagged Variables
Dependent Variable D log (DI)

Variables	Regressions				
	1	2	3	4	5
D log (DI (-1))	0.5532 (1.49)	0.4544 (1.27)	0.4092 (1.29)	0.4928 (1.41)	0.5622 (1.60)
D log (DI (-3))	0.1987 (1.56)	0.2226 (1.78)	0.2440 (2.08)	0.2038 (1.59)	0.1777 (1.40)
D log (DI (-4))	-	-	-	-0.1355 (-1.07)	-0.1679 (-1.35)
D log (GDP)	0.6279 (1.93)	0.6840 (2.14)	0.7078 (2.27)	-	-
D log (GDP (-1))	0.5716 (0.39)	0.5148 (1.33)	0.3364 (1.64)	0.9989 (2.70)	0.6378 (2.00)
D log (GDP (-2))	-	-	0.4794 (1.44)	0.7318 (2.38)	0.5358 (1.56)
D log (PC)	0.8221 (0.69)	0.8743 (0.73)	-	1.3014 (1.14)	-
D log (PC (-1))	-	-	16.5524 (1.27)	-	15.2333 (1.11)
D log (PC (-4))	1.5722 (1.99)	1.5043 (1.91)	0.9792 (1.42)	1.1036 (1.41)	0.7735 (1.09)
D (i (-2)	-0.0365 (-1.59)	-0.0414 (-1.85)	-0.0419 (-2.06)	-0.7211 (-1.86)	-0.0317 (-1.47)
D (i^* (-2))	-0.1660 (-1.25)	-0.0830 (-0.80)	-0.0550 (-0.55)	-0.6386 (-0.88)	-0.0979 (-0.73)
D (i^* (-3))	0.1414 (0.99)	-	-	0.9469 (1.16)	0.1845 (1.31)
D log (e^e (-1))	1.2317 (1.45)	1.2216 (1.44)	18.7794 (1.45)	1.3969 (1.69)	-
D log (e^e (-2))	-	-	-	-	-0.4645 (-1.15)
NERV	0.3805 (0.91)	0.4769 (1.67)	-	0.6859 (1.59)	-
NERV (-1)	-	-	-	-	17.1701 (1.26)
NERV (-2)	-	-	-0.7020 (-1.75)	-	-
RERV (-1)	-1.4694 (-1.90)	-1.4986 (-1.94)	-19.1949 (-1.49)	-1.7560 (2.27)	-17.3667 (-1.27)
ECM3 (-1)	-0.6393 (-1.88)	-0.5308 (-1.65)	-0.5457 (-1.90)	-1.8378 (-1.84)	-0.6675 (-2.10)
C	-0.0352 (-0.48)	-0.0514 (-0.72)	0.0355 (0.34)	0.0247 (0.37)	1.0833 (1.30)
R^2 R^2 DW	0.3663 0.1832 2.0031	0.3525 0.1836 1.99	0.4309 0.2665 1.99	0.4226 0.2389 1.92	0.4057 0.2166 1.98

Given our results, we conclude that agents are concerned with the real value of the Dollarizatin Index (DI). The overall significance of the current level of GDP most probably suggests that foreign deposits are held solely for store-of- value purposes. The estimates of the i effect on dollarization index seem to be robust and significant, with the expected sign. To explain the i effect we recall that i stands for the domestic policy rate of interest. In the case of Nigeria, this could also means the cost of financing for business firms, assuming that financial intermediation goes mostly through the banking system. So if i increases, agents probably look for an alternative source of financing. In the absence of effective and efficient domestic capital markets, this involves borrowing on foreign or international financial markets, resulting in an increase in foreign currency deposits in the domestic country when the funds are raised. The mechanism described here is relevant for Nigerian corporations and indeed the three tiers of government, as these made intensive use of international sources of financing between 1986 when financial liberalization started and 2001.

When we move to the estimates of the returns on foreign currency, there is general support for the existence of a significant effect on dollarization index from the Naira/US Dollar exchange rate. The significance of the Naira/US Dollar exchange rate probably results from the higher volatility of this rate, which has made domestic agents more aware of the opportunity cost of holding domestic currency. Foreign currencies are held in order to hedge against domestic inflation and unfavourable exchange rate movements.

6.3 Magnitudes and Trend of Currency Substitution in Nigeria:

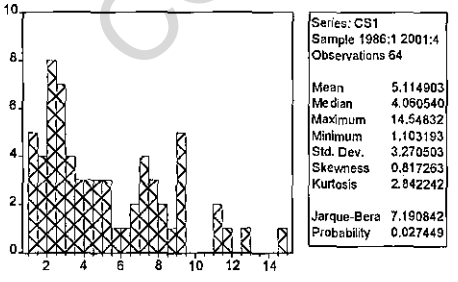
To capture the magnitude of currency substitution in Nigeria, we adopted the IMF dollarization index. This was measured by taking the ratio of foreign deposit to monetary aggregates adjusted for foreign currency in Nigeria. The result of our computation is presented in table 6.11 below, which presents the ratios of foreign currency deposits to

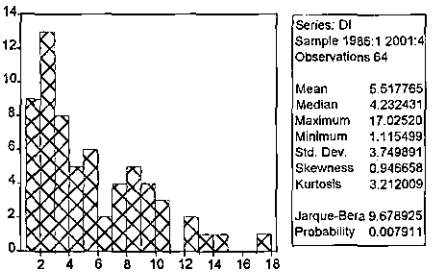
broad money in Nigeria, alongside with the ratio of foreign currency deposits to broad money adjusted for foreign currency in Nigeria. Measured in terms of stock, a country is classified as highly dollarized if the country's dollarization index is 30 percent and above (Feige, 2002). Looking at the figures in Table 6.11, it could be deduced that the level of dollarization in Nigeria is generally very low with its currency substitution ratios of 17.03 percent and 14.55 percent as the highest in 1986 when liberalization started and 1.20 and 1.18 percent minimum during the last quarter of 1993 when Nigeria witnessed a reintroduction of economic regulation by the Abacha administration. Indeed, the commencement of financial liberalization witnessed sporadic changes in the various rates and prices in the domestic economy especially the Naira exchange rate against major currencies of the world especially the U.S dollar. The pass-through effect of this development to domestic inflation made residents to realize the great opportunity cost of holding domestic currency in the face of high inflation. Hence, without any legal restrictions on the holding of foreign currency, foreign currency cash and deposits became ready candidates for hedging against inflation in Nigeria.

Table 6.11: Ratio of Foreign Currency Deposits (FCD) to Broad Money (M2).

Year	CSI=fcd/m2	Percent	Growth Rate %	DI=fcd/m2-fcd	Percent	Growth Rate %
1986	0.1455	14.55	-	0.1703	17.03	-
1987	0.0638	6.38	-128.06	0.0681	6.81	-60.01
1988	0.0903	9.03	41.54	0.0993	9.92	45.67
1989	0.1127	11.27	24.81	0.1271	12.71	28.13
1990	0.0763	7.63	-32.30	0.0826	8.26	-35.01
1991	0.0281	2.81	-63.17	0.0289	2.89	-65.01
1992	0.0334	3.34	18.86	0.0346	3.46	19.72
1993	0.0118	1.18	-64.67	0.0119	1.20	-65.32
1994	0.0226	2.26	91.53	0.0232	2.32	93.33
1995	0.0411	4.11	81.86	0.0429	4.29	84.91
1996	0.0276	2.76	-32.85	0.0284	2.84	-33.80
1997	0.0217	2.17	-21.38	0.0222	2.22	-21.83
1998	0.0312	3.13	44.24	0.0323	3.23	45.50
1999	0.0389	3.89	24.28	0.0405	4.05	25.39
2000	0.0552	5.52	41.90	0.0584	5.84	44.20
2001	0.0527	5.27	-4.53	0.0556	5.56	-4.79

Source: Author's calculation based on CBN and IFS Quarterly data on Nigeria.





This process was later legalized in the early 1990s when individuals and corporate bodies were allowed to hold foreign currency deposits in their domiciliary accounts. This

process was slightly halted in 1994 when General Sanni Abacha reintroduced economic regulation in Nigeria. Hence, the low values of currency substitution index in that year. Subsequently, currency substitution index has been on the increase. For example, in 1994 alone, there was a 91.53 percent growth rate in the currency substitution index while it increased by 81.86 percent in 1995. However, in 1996, there was a drastic fall of about 32.85 percent in the value of currency substitution in Nigeria. From 1998 onwards, the value of currency substitution has been on the increase recording as high as about 44.24 percent in 1998 and 41.90 percent in 2000 with a slight decline of about 4.53 percent in 2001.

Going by the trend of figures presented in table 6.8 above vis-à-vis the bench mark for classifying countries as highly dollarised or otherwise, it could be concluded that in Nigeria, the currency substitution ratio (share of *FCD* in domestic banks over total broad money) has been low, fluctuating and indeed on an increasing trend especially since the reform began in 1986.

However, the results interpreted above must be taken with caution because this index represents the lower bond of currency substitution in Nigeria. Specifically, the low level of currency substitution can be justified on many grounds: one, during the period under review, Nigeria was under military ruler-ship and as such, there was a widespread of insecurity among resident to the extent that asset holders are mindful of where they keep their assets. Even political office holders who are aware that citizens are familiar with their corrupt practices prefer to keep their loots in foreign banks abroad. Aside from this, sizable amounts of foreign currency are held in form of cash, which cannot be captured in this study for lack of data. Hence, the general preference of military looters for cross border deposits due to fear of confiscation of the stolen public money from the treasury, fear of assets holder concerning loosing their money and the general lack of

confidence in the domestic banking system due to widespread distress in this sector and a sizable amount of foreign currency held in form of cash might have been responsible for the generally low level of currency substitution index observed in Nigeria. Therefore, it will be misleading to conclude that Nigeria is lowly dollarized without taking into consideration all the factor identified above. Hence, we can conclude that although, the data indicates that currency substitution index has been low during the period under review, it might be due to all the factors identified above.

6.4 How Does Currency Substitution Affect Monetary Policy in Nigeria?

Do present levels of currency substitution/dollarization in Nigeria create a threat to macroeconomic stability, or at least complicate monetary policy? The theoretical paradigm, suggesting that dollarization complicates monetary policy because of less reliable intermediate targets and less effective monetary policy instruments, rests on the presumption that dollarization renders money demand unstable and less predictable.

To determine the practical implications of currency substitution for the conduct of monetary policy in Nigeria, a Chow forecast test for stability was conducted on the domestic demand for money in Nigeria. To carry out the test, one recommended empirical technique is to split the data series into two (i.e. observations to be used for estimation, and observations to be used for testing and evaluation). In view of this, we note that 1994 will be an appropriate point at which there was a policy reversal in Nigeria and hence, this year was used to partition our sample into two for analytical purpose. The results of the tests indicate that neither of the forecast test statistics rejects the null hypothesis of no structural change in the domestic money demand function for Nigeria before and after 1994:1 (see Table 6.12). This means that money demand function in Nigeria has been unstable with very serious implications for monetary policy in Nigeria. This instability in the domestic demand for money function may be attributed to the

presence of currency substitution in Nigeria. This may tend to support the findings of Balino et al., 1999, for a group of developing and transition economies to the effect that currency substitution may complicate monetary policy. This could be interpreted to mean that monetary policy may not be an effective too for the purpose of stabilization in Nigeria where there is significant presence of currency substitution.

Table 6.12: Chow's Forecast and Breakpoint Tests for Money Demand Stability in Nigeria

EQ1

Chow Forecast Test: Forecast from 1994:4 to 2001:4			
F-statistic	1.159907	Probability	0.378152
Log likelihood ratio	62.17848	Probability	0.000328
Chow Breakpoint Test: 1994:4			
F-statistic	1.780415	Probability	0.091073
Log likelihood ratio	28.11351	Probability	0.005324

EQ2

Chow Forecast Test: Forecast from 1994:4 to 2001:4			
F-statistic	1.344705	Probability	0.253145
Log likelihood ratio	65.84062	Probability	0.000110
Chow Breakpoint Test: 1994:4			
F-statistic	1.850243	Probability	0.080062
Log likelihood ratio	25.85979	Probability	0.006809

EQ3

Chow Forecast Test: Forecast from 1994:4 to 2001:4			
F-statistic	1.252641	Probability	0.313237
Log likelihood ratio	65.17388	Probability	0.000135
Chow Breakpoint Test: 1994:4			
F-statistic	1.526188	Probability	0.161278
Log likelihood ratio	24.83049	Probability	0.015647

EQ4

Chow Forecast Test: Forecast from 1994:4 to 2001:3			
F-statistic	1.509366	Probability	0.182762
Log likelihood ratio	70.08337	Probability	0.000018
Chow Breakpoint Test: 1994:4			
F-statistic	1.574412	Probability	0.146358
Log likelihood ratio	25.63075	Probability	0.012101

EQ5

Chow Forecast Test: Forecast from 1994:4 to 2001:4			
F-statistic	1.292085	Probability	0.288627
Log likelihood ratio	66.40325	Probability	0.000093
Chow Breakpoint Test: 1994:4			
F-statistic	2.042569	Probability	0.049832
Log likelihood ratio	31.31780	Probability	0.001762

Eq6

Chow Forecast Test: Forecast from 1994:4 to 2001:3			
F-statistic	1.509677	Probability	0.177024
Log likelihood ratio	67.91028	Probability	0.000036
Chow Breakpoint Test: 1994:4			
F-statistic	1.289035	Probability	0.269952
Log likelihood ratio	19.26096	Probability	0.056567

6.5 Policy Considerations about the Current Level of Currency Substitution in Nigeria.

In view of the current level of currency substitution in Nigeria, it is important to consider what can be done to reduce the magnitude of the episode in the country so as to reduce its negative consequences. Slowing down financial dollarization can have costs since it reflects optimal portfolio choices of agents. Taking away asset substitution and portfolio diversification possibilities (reducing dollarization) may result in welfare losses due to the loss of risk hedging options. Other types of welfare losses can also occur, and it would be a mistake to ignore them when proposing policies that can reduce currency substitution. We identify three broad policy levers at the disposal of policymakers in Nigeria to reduce currency substitution. This includes exchange rate policy, fiscal policy, and enforcement policy.

Since currency substitution in Nigeria has its roots in macroeconomic imbalances, especially, exchange rate volatility, as evident from the causality test result presented in Table 6.5, and also regression results presented in Tables 6.8 and 6.9, the most powerful tool to reduce it is to restore confidence in the domestic currency and more broadly macroeconomic stability. As such, macroeconomic policies that will ensure long periods of low inflation and exchange rate stability are the single most important preconditions that help stabilize or reduce currency substitution. It would be suggested that currency substitution could be reduced if the Naira is allowed to temporarily but significantly appreciate or if the authorities would more strictly enforce laws that prohibit transactions to be carried out in dollars. However, we are aware of the fact that while the formal policy option is quite plausible for Nigeria, the latter may not be a feasible policy option because Nigeria have attained a level of economic integration with the rest of the world that it may be difficult or at best costly to impose any restriction on the use of dollars in

this economy. This is because the considerable appreciation needed for a meaningful reduction in dollarization may imply a serious cost in terms of loss of competitiveness, which could easily exceed any benefits of reduced currency substitution.

Also, another effective but clearly undesirable measure to curb dollarization would be to reverse the opening of Nigerian economy and engage in direct administrative measures such as the introduction of capital controls or the prohibition of foreign currency deposits. But such measures would reverse the broadly successful liberalization and global market integration and would almost certainly provide only a short-lived solution. Capital controls and the prohibition of foreign currency deposits are unlikely to boost the demand for domestic currency assets in Nigeria.[4] Without capital controls, the prohibition of foreign currency deposits would likely result in a move of foreign currency deposits abroad.

6.6 Conclusion

In this chapter, we tested for the existence of currency substitution and attempted to gauge its magnitude in Nigeria. The first part was dedicated to an analysis of causality between currency substitution and exchange rate volatility in Nigeria while the following section dwelt on an empirical analysis of the existence of currency substitution phenomenon in Nigeria during the period 1986–2001. We have based our analysis on a multi-perspective unrestricted portfolio balance approach. However, we have first modified, or rather reduced, the system, excluding the equation describing the demand for domestic and foreign bonds or alternative assets since these are not the focus of this study. We have thus been left with two equations to describe the demand for domestic and foreign currency. In this respect we have modelled the demand for domestic broad money (M2) adjusted for currency in circulation since foreign cash in Nigeria cannot be

[4] This is because there is still insufficient supply of domestic currency assets that would permit portfolio diversification. Fear of confiscation of assets on the part of political office holders is another reason.

measured at least for now. The stock of foreign currency deposits in Nigeria and the ratio of deposits denominated in foreign currency in the domestic banking system to deposits denominated in the domestic currency were also modelled. We have used a set of explanatory variables which approximate those suggested by theory, namely: the consumer price index, domestic absorption, approximated by GDP, the Nigerian Naira/US Dollar exchange rates, foreign rate of interest proxied by the US federal funds rate and exchange rate volatility. First, we have found that causality is running from exchange rate volatility to currency substitution in Nigeria. Second, we have detected the presence of currency substitution in the domestic banking system in Nigeria. A major factor driving this process has been exchange rate volatility especially real volatility.

Subsequently, we analyzed the implications of currency substitution for monetary policy in Nigeria. In this case, we note that the presence of currency substitution can make domestic money demand function unstable thereby complicating monetary policy in the country. We therefore explored alternative policy framework that could help reduce the magnitude of currency substitution in Nigeria. This includes exchange rate policy, fiscal policy, and enforcement policy for reducing the volume of currency substitution in the country.

In the latter part of the chapter, we demonstrated that currency substitution in Nigeria was low during the period under review. Hence, we can classify Nigeria as moderately dollarized economy. However, this low level was attributed to the non-inclusion of some vital component of currency substitution index notably foreign currency notes in circulation and cross border deposits in foreign banks abroad. Hence, we cautioned that the result must be interpreted with great care since the measure of currency substitution used in this study constitutes the lower bound of the phenomenon. If all other components of currency substitution are included, perhaps, Nigeria will be

classified as highly dollarized economy. This limitation however, does not in any way invalidate the conclusions from the study. We can therefore conclude from our analysis that currency substitution (i.e. substitution of deposits in the domestic currency by deposits in foreign currency) is an element of Nigerians' behaviour concerning wealth allocation. However, exploring the responses of monetary policy to exchange rate volatility and currency substitution constitute the focus of the next chapter.

CHAPTER SEVEN

MONETARY POLICY RESPONSES TO EXCHANGE RATE VOLATILITY AND CURRENCY SUBSTITUTION IN NIGERIA

7.0 INTRODUCTION

This chapter focuses on one particularly interesting aspect of Nigeria's monetary history: the implications of currency substitution and exchange rate volatility for monetary policy in Nigeria. The phenomenon of currency substitution refers to the situation when two or more currencies co-circulate within a single economy or region to facilitate transactions that are unrelated to international trade and finance. One reason why rational economic agents prefer holdings of foreign money to domestic one can be found in the high degree of purchasing power stability which is provided by foreign currency when expectations of high inflation or exchange rate depreciation take place.

The other reason why agents may prefer to hold foreign money is that it may pay higher returns adjusted for risk than domestic one and therefore create an opportunity cost of holding domestic money versus having it invested in foreign currency. From above, it can be inferred that nominal exchange rate depreciation often lead to domestic currency instability and its pass-through effects to domestic prices may aggravate domestic inflation. Long periods of high and volatile inflation encourage currency substitution. This has been the case in Nigeria since the introduction of structural adjustment programme in 1986. On the other hand, currency substitution may reinforce the impotence of monetary policy because at the margin, it weakens the ability of domestic central banks to control the stock of domestic money predictability (Broda and Yeyati, 2002). Indeed, currency substitution is a common issue in the design of monetary policy in developing countries (Soydan, 2003). It can be argued that currency substitution affects

the stability of the velocity of circulation of the domestic money as well as the demand for domestic money. The stability of the last in its turn is the cornerstone in formulating and conducting monetary policy. Also, currency substitution behaviour in developing countries like Nigeria leads to constant pressure on the exchange rate thereby undermining the ability of the central bank to maintain it at a constant level (Volkov, 2000; West, 2004).

The principal question raised in this chapter is: What effects does the existence of currency substitution and exchange rate volatility have on monetary policy in Nigeria? Put differently, how does monetary policy responds to currency substitution and exchange rate volatility in Nigeria?

In other to provide solutions to above questions, we developed a seven-variable VAR model to best capture the dynamic interactions among the variables of interest. Specifically, the following variables were included in the VAR in that order: Foreign rate of interest (i^*), domestic policy rate of interest (i), expected change in exchange rate (e^e), consumer price index expressed in the home currency (P^C), a measure of real exchange rate volatility ($RERV$), a measure of currency substitution and GDP which is the home currency value of domestic output.

All the variables are measured at log levels except for the interest rates, which are in percentages, i.e. all variables appears as rates of change rather than in levels. Because inferences drawn from VAR models and its variants may be sensitive to specification (levels or first differences and inclusion or exclusion of time trend), the time series properties of the data were carefully evaluated (see Tables 6.6 a &b). The Augmented Dickey Fuller (ADF) and Philip-Peron (PP) suggest that our variables do not have two-unit roots. The Johansen (1988) cointegration test suggests that the variables are

cointegrated (see Table 6.7) meaning that long run stable relationship exists among the variables.

The theoretical exposition of VAR methodology is based on the implicit assumption that the lag order is known (Hamilton, 1994). In empirical applications however, the optimal lag order is typically unknown and hence it must be determined. Based on several criteria[5], a lag order of 4 was selected (see Table 7.1).

Table 7.1: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1209.500	NA	1.91e+09	41.23728	41.48377	41.33350
1	-937.0337	471.0432	993297.2	33.66216	35.63406*	34.43191
2	-859.7909	115.2097	408171.1	32.70477	36.40209	34.14806
3	-803.8966	70.10462	388602.7	32.47107	37.89380	34.58788
4	-675.9235	130.1422*	39359.65*	29.79402*	36.94215	32.58436*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

The net task is whether to estimate a VAR in first difference or a VECM in levels. With cointegration between two or more of $I(1)$ variables, VAR models in first difference are misspecified (Hamilton, 1994) and a VECM should be applied to the level of the cointegrated series. Hamilton (1994) asserts, "...if [a set of variable] are cointegrated, then it is not correct to fit a vector autoregression to the differenced data. The correct empirical procedure is to estimate a VECM on the variables at levels." This suggests the existence of a long run relationship among the variables (Johansen, 1988). Thus, we estimated a VECM.

All the variables are measured at log difference of their actual levels. Because inferences drawn from VAR models and its variants may be sensitive to specification (levels or first

[5] See Lutkepohl, (1993) for a review of popular selection criteria

differences and inclusion or exclusion of time trend), the time series properties of the data were carefully evaluated (see Tables 6.6a & 6.6b). The tests conducted include the Augmented Dickey Fuller (ADF) and Philip-Peron (PP). The results of the tests suggest that first differencing is sufficient or that these macro-variables do not have two-unit roots. The cointegration test suggests that the variables are cointegrated. Therefore, measures of all the variables entered the model in the first difference of their log except for the interest rates, which are in percentages, i.e. all variables appears as rates of change rather than in levels. This suggests the existence of a long run relationship among the variables (Johansen, 1988). Thus, we estimated a vector error correction model.

7.1 Reduced-Form Estimation Results

The fact that the variables are cointegrated justifies the use of Vector Error Correction Model (VECM). The VECM allows the long-term behaviour of the endogenous variables to converge to long-term equilibrium relationships while allowing a wide range of short-term dynamics. The cointegration relationships are presented in the first panel of Table 7.2. Evidence from Table 7.2 suggests that domestic income, domestic policy rate of interest, expected change in exchange rate, inflation and currency substitution adjusts to the deviations from their long-term paths within four quarter, unlike foreign rate of interest and real exchange rate volatility.

However, this long-term relationship is significant at 1 percent for domestic income (GDP), and 10 percent for domestic policy rate of interest, expected change in exchange rate, inflation and a measure of currency substitution. Foreign rate of interest and real exchange rate volatility tend to show that there is absence of convergence to equilibrium paths. In all, the result in Table 7.2 indicates that the adjustment process takes longer time for foreign rate of interest, real exchange rate volatility, monetary policy,

domestic inflation, currency substitution measure and indeed expected change in exchange rate.

Table 7.2:Summary of Reduced Form Estimation (1986.1-2001.4)

Test Statistics	Foreign Rate of Interest	Domestic Policy Rate Of Interest	Expected Change in Exchange Rate	Domestic Inflation	Real Exchange Rate Volatility	Currency Substitution Index	Real Income
	(i^*)	(i)	(e^e)	(π^e)	(ERV)	(CSI)	(GDP)
Cointegrating Equation	-0.0080	-0.0928	-0.0055	-0.0028	-0.0026	0.0151	0.0264
	(-0.64)	(-1.13)	(-1.19)	(-1.66)	(-0.59)	(1.24)	(6.11)
Goodness of fit statistics							
Adj.R-squared	0.01	0.17	0.44	0.41	0.56	0.50	0.71
SEE	0.39	2.58	0.15	0.05	0.14	0.38	0.14
Correlation among reduced-form errors:							
i^*	1.00	0.02	-0.04	-0.02	-0.04	0.20	-0.04
i	0.00	1.00	-0.08	0.04	-0.09	0.10	-0.09
e^e	0.00	0.00	1.00	0.33	0.93	0.01	0.01
π^e	0.00	0.00	0.00	1.00	-0.05	0.14	0.43
ERV	0.00	0.00	0.00	0.00	1.00	-0.04	-0.16
CSI	0.00	0.00	0.00	0.00	0.00	1.00	0.36
GDP	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Note: *The model was estimated using a four-quarter lag structure per equation. The cointegrating equation presents the error correction estimate (with t-statistic in parenthesis) since the model was run through the Vector Error Correction Method. SEE stands for the standard error of the equation.*

As presented in the second panel of Table 7.2, the model explains a significant proportion of the variability of the series, principally for domestic income and real exchange rate volatility, followed by the currency substitution, expected change in exchange rate, domestic inflation, and domestic policy rate of interest and least for the foreign rate of interest. The very low value of R^2 for foreign rate of interest model reflects the fact that identified domestic macroeconomic factors in Nigeria explains only about 1 percent of the variations in the foreign rate of interest. Altogether, the standard errors of the equations are plausibly low except for domestic policy rate of interest equation, which is slightly high.

The summary of the correlation matrix is as presented in the last panel of Table 7.2. The result indicates that there is a high and positive correlation between real exchange rate volatility and expectations about exchange rate changes in Nigeria. Also, the correlation between expected exchange rate changes and domestic inflation is very interesting although expected. It shows that market agents' expectation about exchange rate depreciation encourages domestic inflation in Nigeria. This is particularly relevant for Nigeria since the introduction of structural adjustment programme when market forces determine all rates. A significant development in Nigeria following this policy shift has been speculative businesses in the foreign exchange market. This had more often than not encouraged exchange rate volatility with its pass-through effects to domestic inflation. Again, the correlation between expected change in exchange rate and domestic policy rate of interest indicates that market agents expectation about macroeconomic fundamentals especially exchange rate changes in Nigeria is always at conflict with monetary policy stance of the government. This is reflected by the negative value of the correlation between the two variables. Also, note that currency substitution is relatively more correlated with foreign rate of interest, domestic inflation and monetary policy stance or credibility in Nigeria (see Table 7.2). This is in line with the findings of most empirical literature on currency substitution (see, Gruben and McLeod, 2004 and Agenor, 2004).

7.2 Impulse Response Functions

Since the focus of this section is to determine how currency substitution and exchange rate volatility responds to monetary policy in Nigeria, we therefore constructed the impulse response functions from the vector error correction model (VECM) to trace the response of one variable to a one standard deviation shock to monetary policy and this can be thought of as a type of dynamic multiplier (Prock, Soydemir and Abugri, 2003). Table 7.3 depicts the impulse response functions of the variables described above, using a

horizon of ten quarters. Table 7.3 shows the responses of a particular variable to a one-time shock in each of the variables in the system. This allows us to address directly issues concerning the implications of exchange rate volatility and currency substitution for monetary policy in Nigeria.

In this case, we consider the response of currency substitution and exchange rate volatility to monetary policy in Nigeria i.e. the first issue addressed has to do with how does exchange rate volatility and currency substitution responds to monetary policy in Nigeria. This will allow us to determine the potency of monetary policy in containing or managing exchange rate volatility and currency substitution episodes in Nigeria. However, we consider two possibilities: when interest rate is used as a policy instrument and when exchange rate is used as a policy instrument.[6]

7.2.1 Impulse Responses: The Interest rate as a Policy Instrument

Table 2 shows the impulse response functions of the variables included in the VECM to a monetary policy shock that results in a one-standard deviation rise in the domestic rate of interest. Following a contractionary monetary policy shock, it is expected that output, prices and currency substitution will all fall while the exchange rate will rise (appreciate). It can be observed that following a contractionary monetary policy shock; output fell immediately but oscillates between the sixth and ninth quarters before fading away towards the tenth quarter. As expected, a tightening shock leads to a persistent fall in domestic prices both in the short term and in the longer horizon. Although, this behaviour of the data is supported by economic theory, but our knowledge of economic history of Nigeria reveals that more often that not prices in Nigeria do not always fall persistently as a response to any monetary policy initiative of the government. In most

[6] It has been argued that under a flexible exchange rate system, exchange rate is an indirect tool of monetary policy (see for example, Fung, 2002). Therefore, in what follows, we examine each of these issues more closely.

cases, when prices go up, they never come down. Although a rise in domestic interest rate leads to an increase in currency substitution in the first quarter, the effect is not significant and oscillates thereafter. This points to the fact that currency substitution is not an instant reaction to the slightest policy mistake. This is because it takes time before people will switch into holding foreign currency. But once people learn to shift their assets into safer, dollar-denominated deposits, bringing about a reversal may be difficult. This finding is consistent with the observation of Dornbusch and Reynoso (1993) in a study of the Latin American countries. It was argued that when economic and political instability is pervasive, the response of market agents would be a shift into foreign currency assets in the form of currency or real and financial assets located abroad even when domestic rate of interest is high.

Next we look at the effect of monetary policy shocks on exchange rate volatility in Nigeria. The impulse response function presented in Table 7.3 shows that a one-time standard deviation shock to monetary policy variable will dampen (reduce) exchange rate volatility in the first and third quarters while it fuels volatility around the sixth quarter and oscillates thereafter. The conclusion that can be drawn from this is that monetary policy can be used to dampen real exchange rate volatility only in the short and medium horizon but may not be effective in the longer horizon. These results are generally in line with most empirical studies in this area (see, Dungey and Pagan, 1998 and Prock, Soydemir and Abugri, 2003). Similarly, we find that the effect of monetary policy on the level of output is largest in the first and third quarters out which follow an hump shape as reported by Bernanke and Mihov (1998), Walsh, (2003) for the American economy.

7.2.2 Impulse Responses: The Exchange rate as the Policy Instrument

Following, financial liberalization and the subsequent liberalization of capital account in Nigeria, the instability in the exchange rate has made it mandatory for policy

makers to initiate policy aimed at reducing this swing in exchange rate. The approach followed in Nigeria has been periodic intervention (daily or weekly depending on the level of expected instability) in the foreign exchange market largely by selling or buying foreign exchange in the market thereby using exchange rate as a policy instrument. The idea is that since, market agents do not have perfect information about the timing and magnitude of intervention, then, such actions becomes exogenous. Therefore, such action could be perceived as an exogenous policy action. In this section, the results of the impulse response function in the case where the effective exchange rate is used as the monetary policy instrument are reported. Precisely, we look at the responses of all the variables included in the VECM to a monetary policy shock that results in a one-standard deviation change in the exchange rate following policy intervention.

Following a monetary policy shock that results in an appreciation of the effective exchange rate through central bank intervention in the foreign exchange market, output, prices, money, the interest rate and exchange rate volatility are expected to fall. The results presented in Table 7.3 indicate that depreciation in the Naira exchange rate following financial liberalization resulted in a persistent increase in domestic inflation in Nigeria. The impact however fades away towards the 9^{th} quarter. The response of real exchange rate volatility to a one standard deviation shock to exchange rate in Nigeria is mixed. In the first place, depreciation in the Naira/ US dollar exchange rate resulted in increased volatility especially from the third quarter onwards. However, this affects die out towards the ninth quarter. This points to the fact that exchange rate liberalization in Nigeria created increased uncertainties in the system that aggravated the erratic behaviour of exchange rate in Nigeria. The erratic behaviour of the exchange rate made planning difficult and therefore encouraged speculative activities, which more often than not encourages exchange rate volatility in Nigeria.

Next we consider the effects of monetary policy shocks using exchange rate as a policy variable on currency substitution in Nigeria. The impulse response function presented in Table 7.3 shows that a one-standard deviation shock to monetary policy variable will dampen currency substitution in the first and tenth quarter while it encourages currency substitution in the third, sixth and the ninth quarter. This point to the

fact that exchange rate depreciation reduces the value of peoples' assets denominated in domestic currency and as such encourages currency substitution in favour of more stable currency like the U.S. dollar.

Finally, we look at the response of output (GDP) to a one-time standard deviation shocks to monetary policy variable in Nigeria. The result from the impulse response function indicate that exchange rate appreciation leads to a fall in domestic output (as indicated by the figure in the first and tenth quarters), while a depreciation will result in an increase in domestic output (as indicated by values in the third, sixth, and ninth quarters of column nine of Table 7.3).

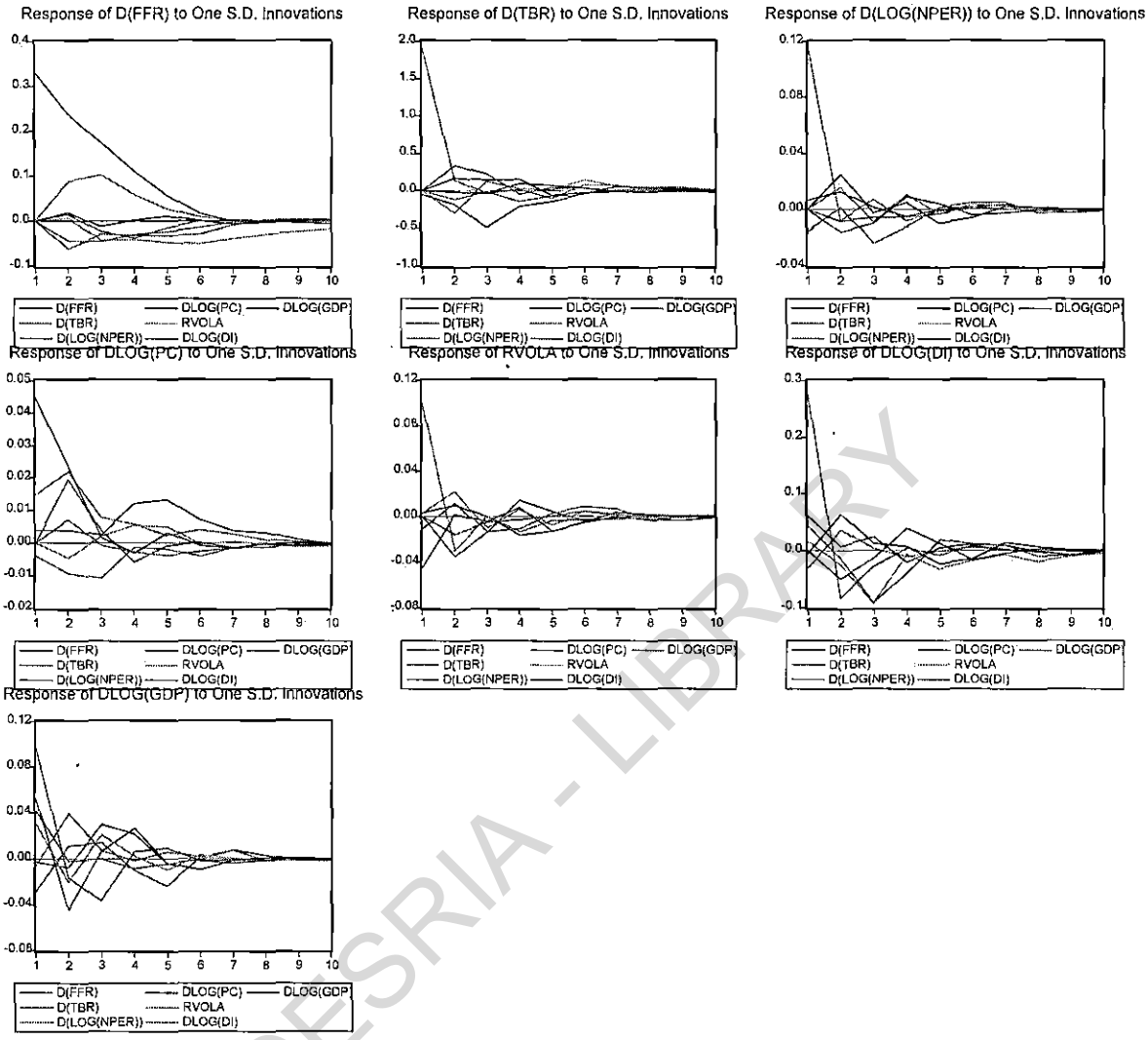
Overall, modeling the effective exchange rate as the monetary policy instrument produces results that are consistent with the conventional thinking about the monetary transmission mechanism. This result is quite interesting because, unlike in the case using the interest rate as the instrument, there are other factors affecting the exchange rate that may not be captured by the variables included in the VECM. For example, capital flows due to foreign direct investment in Nigeria could move the exchange rate but are unlikely to be accounted for by the macroeconomic variables included. However, this exogenous exchange rate movement may be interpreted as a monetary policy shock in the VECM. This is in line with the finding of Fung, (2002) study for the East Asian economies. Nevertheless, the result suggests that the VECM model is capable of identifying the exogenous monetary policy shock that results in an appreciation of the nominal effective exchange rate.

Table 7.3:Impulse Response Functions From the Reduced-Form Model

Type of Innovations	Horizons/ Quarters	Foreign Rate of Interest (i^*)	Domestic Policy Rate of Interest (i)	Expected Change in Exchange Rate (e^e)	Domestic Inflation (π^e)	Real Exchange Rate Volatility (ERV)	Currency Substitution Index (CSI)	Domestic National Income (GDP)
	1	0.3298	-0.0479	0.0066	0.0039	0.0030	0.0605	-0.0026
	3	0.1741	-0.4933	0.0015	0.0024	-0.0002	0.0247	0.0296
ε_{i^*}	6	0.0165	-0.0398	0.0019	0.0072	-0.0052	0.0119	-0.0009
	9	-0.0041	0.0209	-0.0022	0.0011	-0.0033	-0.0076	-0.0008
	10	-0.0060	0.0110	-0.0008	-0.0002	-0.0007	-0.0015	-0.0008
	1	0.0000	1.8976	-0.0152	-0.0040	-0.0108	0.0434	-0.0288
	3	-0.0293	-0.0382	-0.0240	-0.0108	-0.0134	-0.0912	0.0141
ε_{i}	6	-0.0294	0.0739	0.0048	-0.0041	0.0087	0.0126	0.0013
	9	0.0029	-0.0085	-0.0021	-0.0010	-0.0011	-0.0078	-0.0015
	10	0.0009	-0.0198	0.0003	-0.0006	0.0008	0.0027	-0.0006
	1	0.0000	0.0000	0.1147	0.0148	0.0996	-0.0310	-0.0062
	3	0.1027	-0.0145	0.0069	0.0078	-0.0003	0.0037	0.0073
ε_{e^e}	6	0.0095	-0.0254	0.0008	0.0040	-0.0031	0.0064	0.0020
	9	-0.0025	0.0126	3.75E-05	0.0004	-0.0004	0.0006	0.0008
	10	-0.0018	0.0066	-0.0007	5.62E-05	-0.0007	-0.0021	-0.0002
	1	0.0000	0.0000	0.0000	0.0447	-0.0447	-0.0044	0.0529
	3	-0.0126	0.1431	-0.0024	0.0016	-0.0044	0.0134	0.0065
ε_{π^e}	6	0.0003	-0.0304	-0.0058	-0.0008	-0.0051	-0.0141	-0.0093
	9	0.0010	0.0195	9.39E-05	6.66E-06	5.62E-05	-0.0013	0.0010
	10	0.0029	-0.0030	-0.0004	-0.0001	-0.0003	-0.0003	-0.0002
	1	0.0000	0.0000	0.0000	0.0000	0.0026	0.0165	0.0302
	3	-0.0427	0.1173	-0.0091	0.0020	-0.0101	-0.0926	0.0209
ε_{ERV}	6	-0.0500	0.1444	0.0037	- 0.0004	0.0044	-0.0169	0.0034
	9	-0.0241	0.0468	2.35E-06	-0.0012	0.0013	-0.0097	-0.0011
	10	-0.0180	0.0173	0.0002	0.0009	0.0012	-0.0047	-0.0016
	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.2754	0.0416
	3	-0.0454	0.2249	-0.0056	-0.0007	-0.0050	-0.0276	-6.14E-05
ε_{CSI}	6	-0.0140	0.0321	0.0021	-0.0026	0.0046	0.0092	-0.0009
	9	0.0036	-0.0124	3.98E-05	-0.0006	0.0006	0.0017	-0.0002
	10	0.0037	-0.0136	-0.0003	-0.0002	-9.5E-05	0.0001	-0.0004
	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0968
	3	-0.0233	-0.0390	-0.0099	0.0038	-0.0140	-0.0133	-0.0366
ε_{GDP}	6	-1.2E-05	0.0330	-0.0038	0.0002	-0.0041	-0.0163	-0.0018
	9	0.0007	-0.0037	0.0005	-0.0004	0.0009	0.0023	0.0003
	10	0.0018	-0.0002	0.0004	3.42E-05	0.0004	0.0015	0.0002

Note: Entry (i, j) denotes the dynamic response of variable $\backslash$ to a one standard deviation shock in variable i. Here, the column heads show "i" variables while row entries (that is, $\varepsilon_{i^*}, \varepsilon_{i}, \varepsilon_{e^e}, \varepsilon_{\pi^e}, \varepsilon_{ERV}, \varepsilon_{CSI}, \varepsilon_{GDP}$) represent "$\backslash$" variables. All the variables corresponds to percentage increases of the level of each variables from the baseline i^*, i, e^e, π^e, ERV, CSI, GDP.

Figure 7.1: Impulse Response Functions From the Reduced-Form Model



7.3 Forecast Error Variance Decomposition Results

In addition to the impulse response function results presented above, we also obtained the variance decomposition. While impulse response functions trace the effects of a shock to one endogenous variable on to the other variables in the VECM, variance decomposition separates the variation in an endogenous variable into the component shocks to the VECM. Thus the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VECM. In Table 7.4, we report the proportion of the forecast error variance of each variable accounted for by the innovations to each of the structural equations. Results are reported for forecast horizons 1, 3, 6, 9 and 10 quarters ahead. They show the fraction of the forecast error variance for each variable that is attributable to its own shocks and to shocks in the other variables in the system.

Mirroring results from previous studies in the VECM literature, the predominant sources of variation in all the variables in the system are the "own" shocks. Foreign rate of interest is an important source of the forecast errors in the domestic policy rate of interest followed by currency substitution, real exchange rate volatility and domestic inflation in that other. Foreign rate of interest accounts for less than 1 percent in the first two quarters away but account for more than 7 percent forecast error variance in the longer horizons. This can be interpreted to mean that foreign rate of interest and indeed U.S monetary policy has a significant effect on Nigeria's monetary policy especially in the longer horizons. Another very interesting discovery has to do with the contribution of currency substitution to forecast error variance in domestic policy rate of interest in Nigeria. This may be interpreted to mean that formulating domestic monetary policy without taking into consideration this important variable may lead to ineffectiveness of monetary policy in Nigeria. This supports both theoretical and empirical literatures on currency substitution. See for example, Seater (2002) for theoretical discussions and Friedman and Verbetsky (2001) for the Russian economy. Also, real exchange rate volatility account for about 3 percent of the forecast error variance of monetary policy.

This means that exchange rate volatility may frustrate monetary policy intentions due to it destabilizing effects by introducing uncertainty into the system thereby making planning difficult.

Innovations in domestic monetary policy account for about 6 percent, 5 percent, 4 percent,.10 percent and 7 percent of the forecast error variance in expected exchange rate changes, domestic inflation, real exchange rate volatility, currency substitution and domestic national income respectively. Another striking discovery is the role of currency substitution in explaining forecast error variance in domestic income. Currency substitution account for about 11percent of the forecast variance error in the short run although the contribution decline to about 7 percent in the longer horizon. This may mean that the existence of currency substitution indicates income loss to a dollarised economy. This supports the views of D'Arista (2000) about income loss due to currency substitution.

In a similar vein, domestic policy rate of interest and real exchange rate volatility account for a larger proportion of the forecast error variance in currency substitution in Nigeria than other variables included in the model aside from own shocks. Specifically, it could be seen from Table 3 that innovations to monetary policy alone account for about 10 percent of the forecast error variance in currency substitution while real exchange rate volatility account for about 9 percent especially in the longer horizon. This could be interpreted to mean that monetary policy may be a weak weapon in reversing currency substitution in Nigeria going by the level of the variance error explained by monetary policy.

Again, price is an important source of forecast error variance in gross domestic output explaining about 22 percent of the forecast error variance in GDP while currency substitution, domestic policy rate of interest and real exchange rate volatility each account for about 7 percent of the forecast error variance in domestic income (GDP) particularly in the medium and long term horizons. The contributions of innovations to domestic monetary policy are of interest and we find results that are generally in support of the

findings in the literature. Innovations to monetary policy contribute very little to forecast error variance of output, contributing only approximately 5 percent in the medium horizons and about 7 percent in the longer horizons. This is similar in magnitude to results reported in Dungey and Pagan (1998), and Brischetto and Voss (1999) in their empirical model of monetary policy in Australia. Our results are also broadly consistent with the general findings from the structural VAR literature- innovations to domestic monetary policy has very little effect on output.

Contrary to the findings of Brischetto and Voss (1999) reported for the Australian economy and most U.S literature on monetary policy, to the effect that monetary policy innovations contribute very little to the forecast error variance of monetary policy instrument itself i.e. interest rate, we finds that for the Nigerian economy, this proposition do not hold. As presented in Table 7.4, we note that innovations to monetary policy account for over 99 percent of the forecast error variance in self in the medium horizons and over 82 percent in the longer horizons.

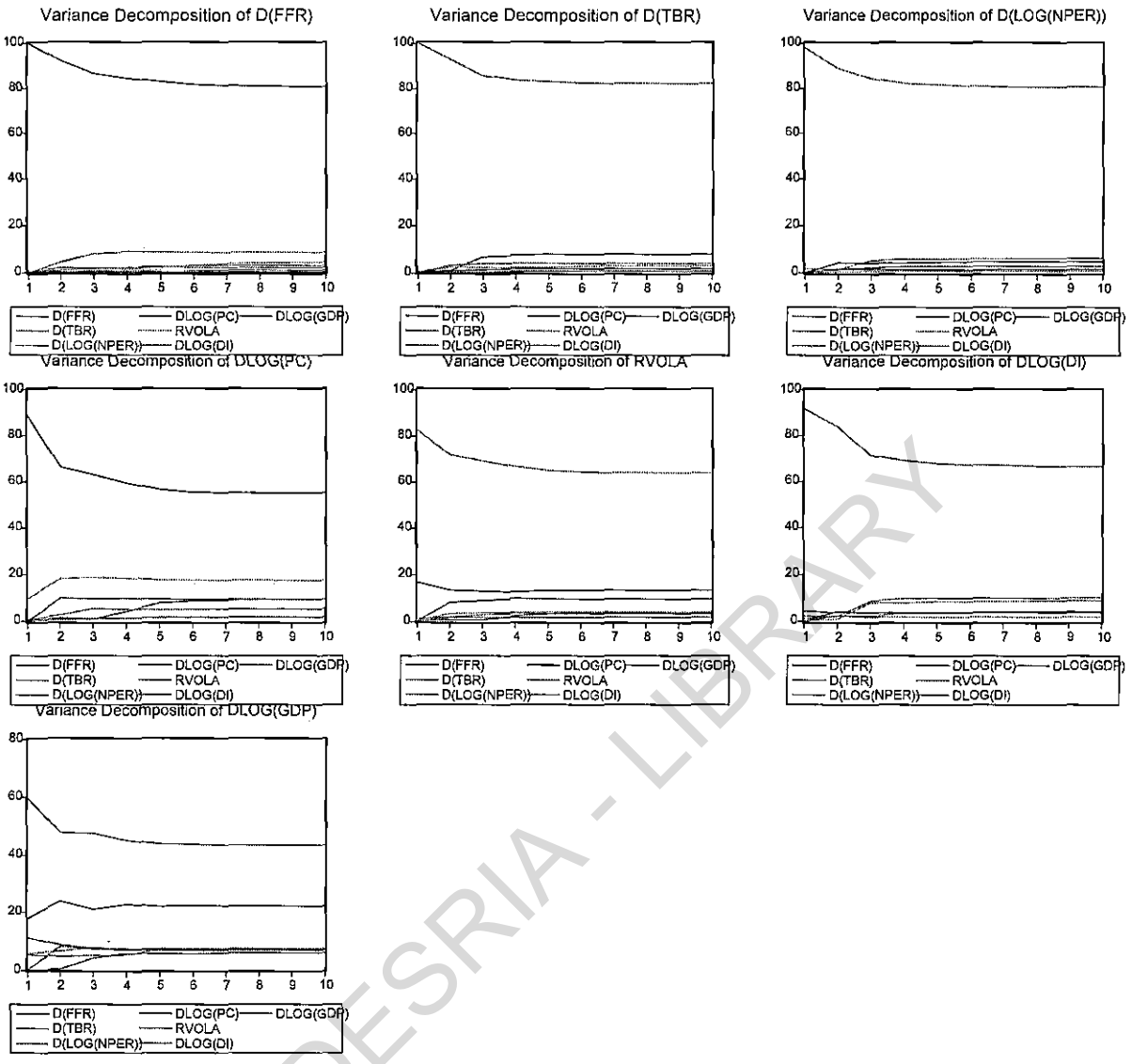
Finally, innovations to market agents' expectation about future changes in exchange rate accounts for about 18 percent of the forecast error variance in domestic inflation in the medium term while it accounts for about 17 percent in the longer horizons. This explains the pass-through effects of expected exchange rate depreciation to domestic prices in Nigeria.

Table 7.4: Variance Decomposition from the Reduced-Form Model

Variables	Horizons /Quarters	ε_{i^*}	ε_i	ε_{e^e}	ε_{π^e}	ε_{ERV}	ε_{CSI}	ε_{GDP}
Foreign Rate of Interest (i^*)	1	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	86.71	2.08	8.05	0.22	0.82	1.77	0.34
	6	81.83	2.93	8.68	0.25	3.19	2.18	0.94
	9	80.84	2.94	8.58	0.26	4.28	2.16	0.93
	10	80.73	2.94	8.57	0.27	4.40	2.17	0.93
Domestic Policy Rate Of Interest (i)	1	0.06	99.94	0.00	0.00	0.00	0.00	0.00
	3	6.58	85.57	0.31	1.19	2.36	3.96	0.04
	6	7.79	82.52	0.87	1.75	2.76	3.92	0.40
	9	7.87	82.23	0.88	1.75	2.96	3.90	0.41
	10	7.87	82.22	0.88	1.75	2.96	3.90	0.41
Expected Change in Exchange Rate (e^e)	1	0.33	1.73	97.94	0.00	0.00	0.00	0.00
	3	1.33	5.18	84.48	4.09	2.09	0.61	2.23
	6	1.43	6.01	81.21	4.83	2.84	0.83	2.84
	9	1.54	6.21	80.82	4.86	2.88	0.82	2.86
	10	1.55	6.21	80.82	4.86	2.88	0.82	2.86
Domestic Inflation (π^e)	1	0.66	0.70	9.72	88.91	0.00	0.00	0.00
	3	0.89	5.48	18.83	63.09	0.63	1.28	9.80
	6	8.85	5.25	17.61	55.53	1.73	1.73	9.28
	9	9.30	5.27	17.60	55.01	1.75	1.81	9.27
	10	9.29	5.27	17.60	54.99	1.77	1.81	9.26
Real Exchange Rate Volatility (ERV)	1	0.07	0.96	82.34	16.57	0.06	0.00	0.00
	3	0.70	2.74	69.13	12.95	3.74	1.67	9.07
	6	3.27	3.68	64.25	13.30	4.08	1.69	9.73
	9	3.36	3.96	63.89	13.32	4.09	1.70	9.69
	10	3.36	3.96	63.88	13.31	4.10	1.70	9.69
Currency Substitution Index (CSI)	1	4.42	2.27	1.16	0.02	0.33	91.79	0.00
	3	3.70	8.88	1.97	3.68	8.10	71.40	2.29
	6	3.96	10.09	1.97	4.08	8.69	67.43	3.78
	9	4.05	10.19	1.96	4.27	8.99	66.78	3.77
	10	4.05	10.20	1.96	4.26	9.01	66.76	3.77
Domestic National Income (GDP)	1	0.04	5.28	0.25	17.83	5.81	11.05	59.75
	3	4.07	5.01	7.25	20.99	7.59	7.52	47.57
	6	5.59	7.14	6.76	22.25	7.33	7.19	43.73
	9	5.84	7.32	6.73	22.13	7.31	7.16	43.51
	10	5.84	7.32	6.73	22.13	7.32	7.16	43.50

Note: Entry (i, j) denotes the percentage of forecast variance of variable i (that is the column heads-$\varepsilon_{i^*}, \varepsilon_i, \varepsilon_{e^e}, \varepsilon_{\pi^e}, \varepsilon_{ERV}, \varepsilon_{CSI}, \varepsilon_{GDP}$) at different horizons attributable to innovations in variable j (i.e., the row entries).

Figure 7.2: Variance Decomposition from the Reduced-Form Model



7.4 Conclusion

In this study, empirical evidence on the response of exchange rate volatility and currency substitution to monetary policy shocks in Nigeria in a multivariate setting was analyzed. Both the impulse response and the forecast error variance decomposition were constructed. Our results from both functions suggest the following conclusions: One, exchange rate volatility respond to monetary policy with some lags. For example, monetary policy will not affect exchange rate volatility until three quarters away. Two, a tightening shock leads to a persistent fall in domestic prices both in the short term and in the longer horizon. Currency substitution is not an instant reaction to the slightest policy mistake rather; it is fallout from prolonged period of mismanagement and macroeconomic instability. Indeed, it takes time before people will switch into holding foreign currency. But once they do, reversal may be difficult.

In terms of policy choice, it could be concluded that exchange rate-based monetary policy would be more potent in reducing currency substitution than interest rate-based policy. Specifically, exchange rate volatility must be brought under control by pursuing deflationary policy. However, the effect on output loss of deflationary policy must also be compared to the gains of reducing currency substitution at the margin.

Our results from the forecast error variance decomposition reveal that the predominant sources of variation in all the variables in the system are the "own" shocks. Foreign rate of interest is an important source of the forecast errors in the domestic policy rate of interest followed by currency substitution, real exchange rate volatility and domestic inflation in that other. Finally, innovations to market agents' expectation about future changes in exchange rate accounts for about 18 percent of the forecast error variance in domestic inflation in the medium term while it accounts for about 17 percent in the longer horizons. This explains the pass-through effects of expected exchange rate depreciation to domestic prices in Nigeria.

CHAPTER EIGHT

SUMMARY, RECOMMENDATION AND CONCLUSION

8.1 Summary of Findings and Recommendations

In this chapter, the summary of findings and policy implications of the study were presented. This is later followed by major conclusions from the study. Since the focus of this study is to investigate the relationship between exchange rate variability, currency substitution and monetary policy in Nigeria, we started by detailing the fundamental macroeconomic background that led to domestic currency instability with its pass-through effects to domestic prices. The theoretical link between this level of macroeconomic instability and the motivation on the part of asset holders to want to hold foreign currencies were also provided. It was found that this phenomenon of currency substitution in Nigeria became manifest in the late 1980s, and 1990s when Nigeria was experiencing rapid inflation and exchange rate instability. As inflation rate grows and exchange rate instability increases, following many years of maladmnistration, massive corruption and other macroeconomic mismanagement, leading to loss of public confidence in the domestic economic policy management, domestic residents learned to protect themselves against the loss of purchasing power of their national currencies by switching to the dollar. However, it was observed that holding foreign currencies for transactionary, unit of account and store of value purposes in the domestic economy may have very serious implications for the stability of the value of domestic currency and monetary policy outcomes in particular. For concreteness it was argued that switching between domestic and foreign currency would serve to frustrate the authorities' efforts to measure the demand for national currency and hence make money supply targets impossible to pursue. At the same time it would undermine the degree of independence of monetary policy

offered by floating exchange rates. Rather than allowing a nation to determine its own monetary policy under a floating exchange rate, currency substitution would create interdependence between nation states

Chapter two contains the literature review. It was found that the remarkable feature of this body of literature is that there is very little agreement between economists regarding its definition, its measurement or its precise consequences for policy. Hence, our review of literature had followed several dimensions in the literature. It ranges from those literature that sought to provide a precise definition of currency substitution, those that sought to provide theoretical models of currency substitution and those that tries to understand empirically the effects that currency substitution will have on macroeconomic policies in both the developed and less developed countries of the world. From the theoretical literature, it was found that the choice of models for empirical application has been influenced majorly by the role assigned to money. It ranges from money services models to portfolio balance models. From the empirical point of view, we distinguished between developed and less developed and transition economies. The conclusion in the empirical literature on North America appears to be that currency substitution can be detected but its statistical significance is sensitive to the functional specification and the definition of central variables such as the rate of return on foreign money. There is therefore a question mark over the robustness and its effect on monetary policy independence. The conclusion in high-inflation, transition and less developed economies is that, data limitation notwithstanding, currency substitution appears to be strong, and is stimulated by the expectation of inflation.

Chapter three contains a detailed model specification and the theoretical framework for the study. In the first section, we presented an explicit model for determining the volatility or otherwise of exchange rate in Nigeria. This is immediately

followed by a measure of the stock concept of currency substitution in Nigeria. The measure adopted here was the IMF dollarization index. Later in the chapter, we constructed a-seven variable VAR to determine the dynamic responses of all the variables in the VAR to a one-time standard innovation to any of the variables in the system. This allowed us to resolve the issue of potency of monetary policy in controlling exchange rate volatility and the existence of currency substitution in Nigeria. Chapters five, six and seven contain the results from the models estimated. The results from our estimated models indicate many interesting discoveries. We can summarise our findings as follows:

(1) Both real and norminal parallel exchange rates in Nigeria had been volatile during the period under review. Going by the result of our component ARCH model, we can conclude that real and nominal exchange rates have been volatile both in the short run and in the long run. However, the official exchange rate was only volatile during the early days of liberalization (i.e. between 1986 and 1990). It was virtually constant thereafter.

(2) The empirical results of Granger causality test support a bi-directional relationship. However, causality from currency substitution to exchange rate volatility appears stronger and dominates.

(3) There is a significant presence of currency substitution in Nigeria. The most important explanatory variable is real exchange rate volatility in Nigeria. This is so given the size of coefficient on this variable which indeed measure the degree of responsiveness of currency substitution to a small change in Exchange rate volatility. Specifically, the model shows that a small change in exchange rate volatility will lead to significant change in currency substitution in Nigeria. Also, real exchange rate volatility is a significant determinant of the stock of foreign currency deposits in Nigeria.

(4) Past period (one quarter lagged) value of expectation about exchange rate depreciation causes increased currency substitution in Nigeria. However, real

exchange rate volatility is more relevant for currency substitution in Nigeria. This tends to suggest that foreign currency deposits in Nigeria are held for store of value purposes. This could also be interpreted to mean that foreign currency deposits are held in order to hedge against domestic inflation and unvafourable exchange rate movements. And finally, we find that currency substitution may be self-perpetuating. This supports the body of literature on hysteresis or irreversibility of currency substitution.

(5) Nigeria can be classified as moderately dollarized economy going by our result presented in the latter part of chapter Six (see Table 6.5 with dollarization ratios less than 30 percent).

(6) Monetary policy responds to exchange rate volatility with some lags. For example, monetary policy will not affect exchange rate volatility until three quarters away. Two, a tightening shock leads to a persistent fall in domestic prices both in the short term and in the longer horizon. Currency substitution is not an instant reaction to the slightest policy mistake rather; it is fallout from prolonged period of mismanagement and macroeconomic instability. Indeed, it takes time before people will switch into holding foreign currency. But once they do, bringing about a reversal may be difficult

(7) Our results from the forecast error variance decomposition reveal that the predominant sources of variation in all the variables in the system are the "own" shocks. Foreign rate of interest is an important source of the forecast errors in the domestic policy rate of interest followed by currency substitution, real exchange rate volatility and domestic inflation in that other. Finally, innovations to market agents' expectation about future changes in exchange rate accounts for about 18 percent of the forecast error variance in domestic inflation in the medium term while it accounts for about 17 percent in the

longer horizons. This explains the pass-through effects of expected exchange rate depreciation to domestic prices in Nigeria.

From the above, the following policy implications stand out clearly. The first has to do with the development of internal financial/institutional structure capable of insulating the domestic financial system from shocks inherent in the global economic integration. This is because; currency substitution/dollarization signifies closer integration with international markets, exposure to competition from these markets and the availability of a more complete range of assets for domestic investors.

While the general considerations regarding the choice of exchange rate system applies to dollarized economies, the prevalence of currency substitution (the use of foreign-currency-denominated assets for transactions) tend to strengthen the case for a fixed exchange rate system. Such an exchange rate would protect the economy from the effects of potentially excessive exchange rate and money market volatility. However, fixed exchange rate system may not be effective in the case of Nigeria, which reflects only asset substitution (the holding of foreign-currency-denominated assets as store of value).

Dollarization requires the adoption of special prudential measures. The banking system must be able to withstand significant exchange rate adjustments, as well as possibly larger-than-normal swings in capital flows. To deal with the latter, commercial banks or central banks need to hold a larger than normal volume of international reserves. This requires commercial banks to be more serious with financing productive activities that are capable of generating foreign exchange into the economy. Aside from the above, limits to banks' foreign exposure positions need to be carefully monitored so as to avoid off-balance-sheet operations that could involve foreign exchange risk. Since devaluation cannot reduce the value of dollar claims, policies must be put in place to ensure that banks do not incur undue risks in lending to dollar borrowers that do not have ability to honour their obligations when devaluation occur.

Policy makers also need to know that currency substitution reflect the absence of macroeconomic stability and the existence of distortions in financial markets. In these circumstances, dollarization may complicate stabilization and cause additional volatility. However, in circumstances where it becomes very difficult to reestablish quickly stability of the national currency, economic well being would most likely surfer as a result of any administrative measure to reduce dollarization. Hence, we want to submit that macroeconomic stability is the first priority in dealing with dollarization, but this may not, in itself, be sufficient to reverse it. Other measures, such as the liberalization of domestic interest rates, establishment of a competitive domestic currency payments system, and the development of domestic financial instruments are also potent means of "dedollarizing" an economy. More direct measures to reverse dollarization can be problematic. Regulatory limits on foreign currency deposits or punitive reserve requirements on dollar deposits may simply drive dollars offshore, while forced confiscations will undermine confidence and may also encourage capital flight.

8.2 CONCLUSION

The study concluded that currency substitution was not an instant reaction to the slightest policy mistake rather; it was fallout from prolonged period of macroeconomic instability. The major sources of this instability were untamable fiscal deficits, high domestic inflation, real parallel market exchange rate volatility, speculative business activities of market agents in the foreign exchange rate market and poor/inconsistent or uncertainty in public policies. As such currency substitution cannot be eliminated by any direct policy measure without throwing the economy into greater crisis.

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