CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

The demand for money has been an integral part of economics from the origin of the subject. However very little attention was paid to it before the 1920s. This apparent lack of attention appears to have specifically changed since the Great Depression of early 1930's and the publication by John Maynard Keynes, in 1936, of The General Theory[1]. These events have attracted special attention in monetary theory and consequently an equally special attention has been focused on the demand for money.

Today, over sixty years after these events, interest on the causes of the depression and failure of governments and the monetary authorities to prevent it continue. This interest rises to a peak whenever the international economy crashes or a domestic economy enters a recession/depression. It raises issues such as "what are the roles of monetary policy in causing an economic boom or recession?". "What is the role of money in society?". "How is a monetary policy transmitted to the real sector?", "What is the possibility that different policies could have rendered a severe situation less severe?", "Can money be used as a tool to stimulate development and growth, especially in the

developing world?" “Who holds money? Why is it held?”, etc. The debate usually centres on whether easy or tight monetary policies are preferable. In other words, should money and credit be plentiful and inexpensive or scarce and expensive?

These issues call for an appropriate analysis of the use of money and the functioning of monetary policy instruments. This is more so for developing countries where the problems of growth and development appear to be of a particular nature and are compounded by structural bottlenecks and rigidities, movement towards flexible exchange rate regime, globalization of the capital markets, financial market liberalization and innovation. The problem in the developing countries is how more or less quantity of money can be used to stimulate economic growth and development.

During the Great Depression, referred to earlier, officials of the United States of America's Federal Reserve System argued that money was abundant and cheap because market rates of interest were low and only a few banks borrowed. This view implies that neither was the scarcity of money responsible for the depression nor could an increase in the supply of money have alleviated and even prevented the depression. Researchers, on the other hand, contended that monetary policies were tight and that the supply of money fell and consequently the general price levels fell significantly. In the view of this group, a more aggressive response by the monetary authorities in increasing the supply of money and thus the price level would have limited the depression (Seriatis, 1988; Wheelock, 1992).

Using the United States as an example, the economic indices of development and well being (variables that governments all over the world strive to enhance), fluttered during the depression as real national income fell by 33%. Price level declined by 25% whilst unemployment went from 4% in 1929 to 25 % in 1933. Much of the debate of the great depression centered on bank failures. According to David and Wheelock, 1992 about 9000 banks with $6.8 million deposits failed between 1930 and 1933. There was a similar picture in the United Kingdom and a number of other European countries at about the same period.

Interesting questions are being asked, such as "did the banks fail merely as a result of fall in national income and the demand for money?" "Were the banks an important cause of the depression?" and; "are such events possible in the developing world or was the general bank failure in Nigeria in the period 1950s and the 1990s a replay of the American version?"

Irving Fisher (1932) applied the quantity theory of money. He argued that changes in the supply of money caused the price level to change and thus, affect the level of economic activity in short periods. He further argued that the monetary authorities should have prevented deflation by increasing the supply of money.

But modern monetarists[2] like Friedman and Schwatz (1963) contended that banking panics caused money supply to fall, which in turn caused the decline of economic activity. Keynesian explanations did not see the banks as causes. Keynesians dismiss monetary forces as causes of depressions and therefore cannot be a useful remedy. They argued instead that it is decline in business

investment and household consumption that forced a reduction in aggregate demand and consequently caused the decline in economic activities. Which of these explanations or of their smaller variants and extensions is correct remains an issue of dispute and controversy amongst economists.

This study examines the role of the demand for money in influencing the level of economic activities and after detailed analysis of the existing models on the subject, proffer an appropriate framework for the formulation and implementation of monetary policy in Nigeria.

1.6Background of the Study

Governments are generally under intense pressure to enhance the economic well being of their society. In the developing countries this need is direr in view of the agrarian nature of the economies and the low rate of economic growth and development in these countries, which have failed to keep pace with their developed counterparts. Development records show that the world has recorded an astronomically impressive rate of economic growth since the 1930s. This high rate of growth had continued until the late 1970s when there was a recession. This was followed by a rebound, which lasted from 1980 to 1990s (McNamara, 1980).

The developing countries were part of these impressive growths. In spite of the alleged achievement of impressive growth, over 800 million people are still caught up in absolute poverty in the developing world. There was a wide disparity in income distribution between the developed and the developing world during the period of this growth and this has remained stagnant or further widened since the 1970s. “Today, with over 60 percent of world

population, developing countries enjoy less than 25 per cent of world output" (McNamara, 1980).

Thus, the consumption of world output is negatively skewed against the developing world, which produces and exports only primary products which are price inelastic while the developed world produce and export manufactured goods which are highly price elastic. Even within the developing society, a grim picture is evident. The elite that constitute less than 5 per cent of the population consume and enjoy over 75% of the available resources. The rest 95% of the population are trapped in the conditions that characterise poverty. Notable amongst this economic injustice conditions are: malnutrition, disease, illiteracy, lowlife expectancy, high infant mortality, high inflation rate, etc. The emerging picture is that self-perpetuating and self-reinforcing plights of absolute poverty have tended to cut the poor from the progress that is taking place throughout the globe, even in their own societies.

Governments can only change these apparent deplorable conditions through the use of appropriate economic policies. Development efforts the world over acknowledge that unless specific efforts are made to bring the people and nations of the world into the developmental process, no feasible degree of traditional welfare or simple redistribution of already inadequate national income can fundamentally alter the circumstances that impoverish a larger proportion of world population. "The only practical hope, then, of reducing absolute poverty is to assist the poor to be more productive" (McNamara, 1980).

A critical component of this assistance is for governments of developing countries to provide better access for the absolute poor in the society to essential services, particularly education, primary health care and clean water. These services, combined with better shelter and nutrition, (these are variables that only improved income can afford) are the key to the poor's being able to meet their most basic needs. None of these can be achieved, of course, except in a climate of economic growth. But experience has shown that growth alone, essential as it is, cannot assist the poor unless it reaches the poor. Unfortunately it does not seem to reach the poor well enough today in most of the developing world where only a handful of the elite enjoys over 75% of the resources. It too often passes them by.

The emerging scenario seems to indicate that the right kind of public services are those, which not only reach the poor but help them to alter their personal circumstances so that their own inherent potential can be fully realised. Faced with these problems the governments of developing countries have often adopted a wide array of policies, both fiscal, income, foreign exchange and monetary. The financial system plays an important role in either of the policies. Where a fiscal policy is used, the financial system has, more often than not, provided loans to the government for deficit financing of budgets. The financial system is also the object and medium of most monetary policies by intermediating between savers and investors.

According to Gurley and Shaw (1956) the financial system plays a catalytic role in the process of economic growth and development. They believe that as the economy grows the financial system becomes increasingly deep and broad and its structure also becomes increasingly sophisticated. In this way, the

financial system offers a wide range of portfolio options for savers and issuable instruments for investors.

In performing this role, financial intermediaries engage principally in matching lenders and borrowers. They bring borrowers and savers together by 'selling' debt instruments (securities and deposits) to savers and lending the money to borrowers. Thus, financial intermediaries provide a variety of other forms in which households can hold money other than the conventional cash form.

> *"This they do by using their own liabilities to create additional assets, help to mobilise funds ... sums together to reap economies of scale and minimise the risk of the investor"* (Falegan, 1987:36).

Generally, the financial system consists of a wide array of banking and non-banking financial institutions. The banking system comprises of banks, discount houses and development banks. The non-bank financial institutions include a wide range of organisations, operating as regulators, facilitators and investors. The list includes Securities and Exchange Commission, stock exchange, stockbrokers, insurance houses, finance houses, saving and building societies, provident funds, etc.

1.3 Statement of the General Problem

Quite possibly, therefore, one of the most widely disputed areas in macroeconomics is the demand for money. The literature on the subject is quite rich and robust. This is on account of the need for a steady growth of the economy and the variable inflation, which has plagued the world, (both

developed and developing alike), in recent years. The recent growth of literature on the subject also has significant bearing on the underlying problems of unemployment, unequal distribution of income and balance of payment disequilibrium. The demand for money is involved in these issues in two ways:-

i. It is the object of monetary policy to influence the demand for money, and

ii. It is a key function in all models of the economy, be they large or small.

Consequently, if a simple and stable demand for money exists in an economy, then an activist's monetary policy can gain a simple and direct leverage on both monetary and real variables in the economy.

The theoretical analysis of the demand for money function has advanced significantly in recent years because it is one of the most heavily researched areas in monetary economics. However, there remain areas of disagreement and gap in knowledge on the subject.

The major problems remain in empirically establishing the definitions and magnitude of variables. Boorman (1976) noted that the broad problem is one of measurement and stability. On a more detailed level, the issues involved in the theory are:- choice of scale variables, definition of money, choice of the interest variable, price variation and the rate of inflation. Others are the stability of the function, the existence of the liquidity trap, long and short-run interest relationship, partial adjustment, exchange rate and the complementary models that have been developed for developing economies. In addition to

these issues is the contention in recent times that the disagreements on past empirical studies are possible results of wrongly specified models. This new school of thought believes that money, being a commodity should be studied as is done about other commodities. Its demand function should have a microeconomic foundation rather than macroeconomics. This study attempts to develop a microeconomic money demand function for Nigeria and examine its ability to explain developments in the monetary sector of the economy.

The empirical evidence for developing countries is not sparse. However, most are neither detailed nor systematic with respect to the underlying characteristics. Unfortunately most of the available literature on developing economies focused attention on the traditional theories of the classical school, Keynesians and Friedmanian restatement of the quantity theory. Most of the studies (Mckinnon, 1973; Shaw, 1973) tend to treat households' money holding habits as a rather mechanical act which, must be performed with some form of automation[3]. This form of treatment is not likely to be useful for policy purposes in developing countries where the basic characteristics differ significantly from those of the industrialised countries. There is, therefore, the need for the development of models that adequately consider the underlying characteristics of developing economies.

1.4 The Purpose and Rationale for the Study

It has become the habit of modern governments, the world over, to strive for the attainment and maintenance of full employment, increases in real national income, stable price level and equilibrium balance of payment. Generally, the quantity of money demanded (i.e. held by economic agents) at any point in time is an important variable that affects and determines the level of economic activity in an economy. In this way, the demand for money habit of the members of a society determines the economic cycles of boom and recession in an economy. This is why an estimation of the demand for money function must be considered whenever the issues of the appropriate economic policy and the effectiveness of monetary policy are under consideration.

In other words, the purpose of the demand for money function is to provide the monetary authorities with a stable function (i.e. a set of tools), which can be manipulated for the attainment of macroeconomic objectives. This is informed by the fact that the essence of economic policy is to influence the level of macroeconomic aggregates - employment level, national income, price level and the balance of payments through appropriate monetary policy.

Monetary policy may be defined as all monetary decisions and measures irrespective of whether their aims are monetary or non-monetary, and all non-monetary decisions and measures that aim at affecting the monetary system. It is any policy that involves employing the central bank's control of the supply of money and/or the cost of money as an instrument for achieving the objectives of economic policy.

Monetary policy is traditionally designed and directed at addressing anomalies and stimulating general economic growth, moderating inflation rate, stimulating full employment and stability of the external sector.

Monetary policy involves the use of monetary variables - the quantity of money or the cost of money - to influence macroeconomic aggregates. The effectiveness of such a policy depends on the demand for money habit of the members of the public. This is because money held can neither generate an output nor employment or consumption creating expenditure.

A clearer picture of the role of the stock of money in an economy can be presented in a simple macroeconomic framework using the IS-LM model as follows:

$$Y = c(Y-T)\ I(R) + G \quad \text{.....(1.1)}$$
$$M = L(Y, R) \quad \text{.....(1.2)}$$

where Y = Income
M = Money Supply
R = Rate of Interest
G = Government Expenditure
I = Investment
T = Tax
C = Consumption

Equations (1.1) and (1.2) can be solved through appropriate mathematical manipulations (Familoni, 1989) to show that changes in income are a function of monetary and monetary policies as:

$$dY = \frac{LRdG + I'dM}{(1-C')LR + LYI'} \text{ or}$$

$$dY = \frac{LR(I'/LRdM) + dG}{(1-C')LR + I'LY} \quad \text{.....(1.3)}$$

Equation (1.2) shows the changes in equilibrium income (dY) as a function of changes in money supply (dM) and government expenditure (dG). It is also a function of the interest rate elasticity (I') and the speculative demand for money (LR). In other words, changes in income is related directed to changes in money supply and government expenditure but the extent of the dependence is a function of the interest elasticity of investment (I'), transaction demand for money (LY), speculative demand for money (LR) and the marginal propensity to consume (C').

From equation (1.3), we can relate the changes in income through G and M to impact multipliers. For example, fiscal multiplier (FM) can be written as:

$$\frac{dY}{dG} = \frac{LR}{(1-C')LR + I'LY} \quad \text{.....(1.4)}$$

and monetary multiplier (MM) as

$$\frac{dY}{dM} = \frac{I'}{(1-C')LR + I'LY} \quad \text{.....(1.5)}$$

The resulting values of equations (1.4) and (1.5) are very important to the effectiveness of any stabilisation policy of government and the values depends on the constant multipliers of the system. Our focus, in this study, is the effectiveness of monetary policy (equation 1.5). The equation indicates that the effectiveness of monetary policy depends on the quantitative impact of a change in the stock of money, i.e. the value of the MM depends critically on the interest rate elasticity (I').

Also, we can compare the relative effectiveness of monetary policy to fiscal policy.

$$\text{Thus } \frac{MM}{FM} = \frac{I'}{LR} \qquad \text{and}$$

$$MM = \frac{I'}{LR} FM \qquad \text{.....(1.6)}$$

This analysis shows clearly that interest elasticity of the demand for money is potentially an important link in the causation even though it is only one of the many routes through which a change in money supply could influence income. The other is the stability of the function.

Thus, the importance of the demand for money function arises from the fact that given the stock of money, any market disequilibrium can be removed by adjustments in the variables in the money demand function. If the money demand function depends only on the level of income as in the classical or monetarist theory, then only adjustments in the level of income can restore equilibrium. In the Keynesian theory "such adjustment can also occur through interest rate movement" (Saunders and Taylor, 1976:178). It is scarcely necessary to mention that money held can not be used to purchase products. Meanwhile, it is money demanded for this purpose in conjunction with the supply of money that determines the general level of interest rates in an economy. Consequently they influence the amount of consumption, investment and other purchases.

Conclusively, the demand for money function is a critical variable that determines the level of aggregate economic activity in an economy. The purpose of the study is to identify the most appropriate money demand function for Nigeria and hence identify the variables that critically determine the level of

economic activity. Crucial aspects of the study is a critique of the macroeconomic approach to the demand for money and examine the view that a microeconomic approach to the subject produces a better result and explains historical events than the macroeconomic approach. It is our belief that subject to mathematical and statistical computations that precedes the determination of the model, measurements and elasticities, the microeconomic demand for money model will offer the monetary authorities a set of simpler and more effective tools for controlling and regulating the level of economic activity.

The relevance of this study lies in the light it shed on the issues specified above. The study addresses the issues of definitions of scale variables, definition of money, short and long run interest rate relationship, partial adjustment and complementary models. The study projects and advances the microeconomic approach as a better alternative model for the subject.

1.5 Conclusion

In the face of the low level of economic development characterised by low per capita income, income inequality, agrarian and primary produce as well as import dependence nature of the economy (see Appendix 1.1), this study attempts to answer the following questions:

1. Can monetary policy be used to stimulate economic growth in a developing country?

2. Is the demand for money function relevant to monetary policies?

3. Which is the best demand for money model for developing countries such as Nigeria?

4. How does a micro-economic demand for money model provide the necessary framework for analysing the demand for money in Nigeria?

1.6 The Plan of the Study

The study is divided into six chapters as follows:-

Chapter One: This is an introductory chapter. Apart from introducing the study generally, this chapter takes a look at the problem of demand for money and the relevance of the study for macroeconomic policy.

Chapter Two: Some relevant existing literature on the subject is reviewed in this chapter. The theoretical background to the study is also developed.

Chapter Three: The methodology for the research is developed in this chapter. This includes instruments used, research population and sample size as well as procedures.

Chapter Four: We present as well as analyse the data obtained in chapter three. Data will be presented in the form tables, charts, graphs, etc.

Chapter Five: The results presented in chapter four are further discussed and analysed. The tests of structural stability of the models are developed and tested in this chapter.

Chapter Six: This chapter summarises and concludes the study. It ended with policy implications and recommendations.

APPENDIX 1.1

A1. CHARACTERISTIC FEATURES OF THE NIGERIAN ECONOMY

Since the study is based on the Nigerian economy, it is important that some background information of the structure and characteristics of the economy be given. This would enable us draw relevant conclusions for the results of the analysis. Consequently, in this appendix, we present the characteristics of the Nigerian economy sector by sector. The monetary policy experience from independence to date is also discussed.

A1.1 Agriculture

A wide range of climatic and soil conditions allow for the production of many different crops by both traditional and modern methods. The dry savannah of the north is suitable for sorghum, millet, maize, groundnuts and cotton. The main food crops of the middle belt and the south of the country, which have up to five months of rainy season are cassava, yam, plantain and maize. The swampy river basin areas produce rice. Cocoa is cultivated in the south-west, and oil palms in the south-east. The Northern parts of the country support substantial livestock production.

The significance of agriculture to the Nigerian economy is shown in Tables A1.1. The Table shows that the Nigerian economy was largely agrarian at independence in 1960 with agriculture providing employment for about 70 per cent of the country's labour force. Agriculture also contributed about 70 per cent of Gross Domestic Product (GDP). Much of the domestic savings of the

early 1960s were equally generated by the sector. According to Ajayi, (1970), the principal products were cocoa, palm kernel, palm oil and groundnuts. Nigeria was the world's second largest exporter of cocoa in 1960 controlling almost 20 per cent of world cocoa trade. A striking observation from the tables is the gradual decline of the contribution of agriculture to GDP, employment and foreign revenue. Table A1.2 shows the value of exports for the period 1970 to 1998.

TABLE A1.1

SECTORIAL SHARE IN GROSS DOMESTIC PRODUCT

YEAR	AGRIC & FOREST. & FISHING	MINING, QUARR. & PETROL	MANUFAC TURING & CRAFTS	ELEC & WATER SUPPLY	BUILD. & CONSTR UCTION	TRANS. & COMM.	GEN. GOVT.	DISTRI- BUTION	EDU.	HEALTH	OTHER SERV.	TOTAL
1970	43.3%	12.9%	8.2%	0.7%	5.8%	3.7%	7.0%	12.6%	2.9%	0.8%	2.6%	100.0%
1971	39.3%	17.1%	8.2%	7.0%	6.4%	3.7%	6.7%	11.8%	2.8%	0.7%	2.8%	100.0%
1972	36.8%	18.3%	8.4%	0.7%	7.2%	3.5%	6.6%	12.3%	2.7%	0.7%	2.8%	100.0%
1973	24.7%	45.1%	4.8%	0.4%	5.4%	2.1%	5.8%	6.9%	2.4%	0.8%	1.5%	100.0%
1974	23.4%	45.5%	4.8%	0.4%	5.7%	2.3%	6.3%	6.7%	2.6%	0.9%	1.5%	100.0%
1975	23.8%	41.1%	4.9%	0.5%	5.6%	3.0%	8.1%	8.0%	2.7%	0.8%	1.5%	100.0%
1977	27.5%	34.9%	6.5%	0.5%	5.8%	3.8%	6.7%	9.1%	3.0%	0.9%	1.3%	100.0%
1978	30.2%	27.4%	7.6%	0.6%	5.3%	4.9%	6.8%	11.7%	3.2%	1.0%	1.3%	100.0%
1979	32.2%	20.3%	9.1%	0.7%	7.1%	4.3%	7.9%	12.7%	3.4%	1.1%	1.2%	100.0%
1980	33.8%	17.0%	9.7%	0.7%	7.3%	5.6%	6.7%	13.5%	3.5%	1.2%	1.0%	100.0%
1981	34.7%	15.3%	9.9%	0.7%	7.6%	6.4%	6.8%	13.0%	3.4%	1.2%	1.0%	100.0%
1982	35.8%	13.7%	11.2%	0.7%	6.7%	5.1%	6.8%	13.6%	4.3%	1.2%	1.0%	100.0%
1983	37.7%	13.8%	8.4%	0.8%	6.6%	4.7%	7.5%	14.0%	4.5%	1.2%	0.9%	100.0%
1984	37.8%	16.1%	7.8%	0.8%	6.3%	4.6%	7.3%	13.6%	3.8%	1.0%	0.8%	100.0%
1985	40.3%	15.6%	8.6%	0.7%	5.0%	4.9%	7.0%	13.0%	3.4%	0.9%	0.7%	100.0%
1986	42.7%	14.1%	8.0%	0.5%	4.9%	4.2%	7.1%	13.0%	3.9%	0.9%	0.6%	100.0%
1987	41.5%	12.8%	8.4%	0.5%	5.1%	4.4%	7.5%	13.9%	4.3%	0.9%	0.7%	100.0%
1988	41.5%	12.6%	8.7%	0.5%	4.9%	3.9%	7.9%	13.8%	4.8%	0.8%	0.6%	100.0%
1989	40.5%	13.5%	8.2%	0.5%	4.7%	3.7%	8.0%	13.4%	6.2%	0.8%	0.6%	100.0%
1990	39.1%	13.2%	8.1%	0.6%	4.5%	3.4%	8.4%	12.7%	8.7%	0.7%	0.5%	100.0%
1991	38.6%	13.7%	8.5%	0.5%	4.5%	3.4%	8.4%	12.5%	8.7%	0.7%	0.5%	100.0%
1992	38.3%	13.7%	7.9%	0.6%	4.5%	3.4%	9.1%	12.5%	8.7%	0.7%	0.5%	100.0%
1993	37.9%	13.1%	7.4%	0.6%	4.6%	3.5%	10.2%	12.6%	8.9%	0.8%	0.5%	100.0%
1994	38.3%	12.1%	6.9%	0.6%	4.7%	3.5%	11.0%	12.5%	9.0%	0.9%	0.5%	100.0%
1995	38.1	13.4	6.6	0.5	4.8	3.5	11.2	12.6	8.8	0.8	0.6	100.0%
1996	35.9	14.1	7.3	0.6	4.7	3.4	11.5	12.6	8.7	0.7	0.6	100.0%
1997	36.2	12.8	7.5	0.6	4.6	3.4	11.3	12.5	8.5	0.7	0.6	100.0%
1998	36.8	13.6	7.8	0.5	4.5	3.5	11.1	12.5	8.6	0.7	0.5	100.0%

Sources: F.O.S. Annual Abstract of Statistics. Several Issues
Central Bank of Nigeria, Annual Report. Several Issues

TABLE A1.2				
	NIGERIA'S EXPORT SHOWING THE			
	IMPORTANCE OF CRUDE OIL (N'm) (FOB)			
	Oil	Non-oil	Total	Oil% of Total
1970	510.0	375.4	885.4	58%
1971	953.0	340.4	1,293.4	74%
1972	1,176.2	258.0	1434.2	82%
1973	1,893.5	384.9	2278.4	83%
1974	5,365.7	429.1	5794.8	93%
1975	4,563.1	362.4	4925.5	93%
1976	6,321.6	429.5	6751.1	94%
1977	7,072.8	557.9	7630.7	93%
1978	5,401.6	662.8	6064.4	89%
1979	10,166.8	670.0	10836.8	94%
1980	13,632.3	554.4	14186.7	96%
1981	10,680.5	342.8	11023.3	97%
1982	8,003.0	203.2	8206.4	98%
1983	7,201.2	301.3	7502.5	96%
1984	8,840.6	247.4	9088	97%
1985	11,233.7	497.1	11720.8	96%
1986	8,368.5	552.1	8920.6	94%
1987	28,208.6	2,152.0	30360.6	93%
1988	28,435.4	2,757.4	31192.8	91%
1989	55,016.8	2,954.4	57971.2	95%
1990	106,626.5	3,259.6	109886.1	97%
1991	116,858.1	4,677.3	121535.4	96%
1992	203,292.7	3,973.3	207266	98%
1993	213,778.8	4,991.3	218770.1	98%
1994	200,710.2	5,349.0	206059.2	97%
1995	927,565.3	23,096.1	950661.4	98%
1996	1,286,215.9	23,327.5	1309543.4	98%
1997	1,212,499.4	29,163.3	1,241,662.7	98%
1998	717,786.5	34,070.2	751,856.7	95%
Source: CBN Statistical Bulletin 1998				

Again, the striking decline of agricultural contribution to foreign exchange earnings is revealed. The evident implication is the decline in relative importance of agriculture in terms of contribution to GDP as well as export earning. From about 70 percent in 1960, the contribution of the sector to GDP declined to 55 per cent in 1966. The contribution stood at 53 per cent and 23.4

per cent in 1968 and 1975 respectively. According to the Central Bank of Nigeria the figure was 31.6 per cent in 1990. The fall in agricultural production recorded in the 1970s coincided with the rapid growth in urban population, the production of crude petroleum and expansion of the construction sector, which drew young and able bodied men from the farms to the cities to pick up white collar and better paying jobs.

Successive attempts have been made to promote food production over the years, with little or no success. For example, in the 1970s there was "Operation Feed the Nation". "Green Revolution" and River Basin Developments in the 1980s followed this. In spite of these highly publicized efforts, the reality is that there has been little practical support provided to farmers. The result is that Nigeria has moved, since independence, from being a large exporter of major agricultural products to a net importer. The sector seemed to have strengthened in the late 1980s. This trend was more encouraging in the last few years as a result of some of the measures implemented under the Structural Adjustment Programme (SAP), especially the abolition of the produce marketing boards in 1986. But this was short-lived owing to frequent changes in official policies, which failed to raise farmers' confidence enough to stimulate cultivation of major commodities.

Cocoa is the country's main agricultural export crop. Production averaged well over 200,000 tons in the 1970s but suffered subsequently from low prices, drift of labour and insufficient replanting as well as shortages of inputs due to foreign exchange constraints. The liberalisation of cocoa marketing in 1986 along with the devaluation of the Naira increased cocoa farmers' earnings and thus reversed the decline in cultivation. About 256,000 tons was produced in

1989 but this slowed down to 167,000 and 140,000 tons in 1992 and 1995 respectively (CBN Annual Report and Statement of Accounts, 1995).

Nigeria also exported large amounts of groundnuts and groundnut oil, palm kernels and palm oil, rubber, cotton and timber in the 1960s. However, by 1980 the country has become a large importer of foodstuffs such as rice, maize, wheat and sugar. Today, only cocoa and rubber and some small quantities of other commodities are exported. Some former cash crop exports such as cotton and groundnuts are currently being imported to supplement the requirements of local processing industries. In 1992, food and live animal imports amounted to N12.6 billion, 8.8% of total imports compared to N802 million or 13.4% of total imports in 1986. Agricultural exports earned N3.1 billion or 1.5% of total exports in 1992, down from 8.2% in 1988.

A1.2 Petroleum

While agriculture declined sharply in the 1970s, the mining sector and especially the crude petroleum sub-sector increased steeply. Petroleum first entered the export list in 1958. It was, however, relatively insignificant in terms of volume and value. It was not until 1965 that crude petroleum became an important foreign exchange earner. Table 2.3 shows Nigeria crude oil production and export from 1970 to 1996. The table shows that production increased to 1.5 million and 2.4 million barrels per day in 1970 and 1973 respectively.

Crude petroleum accounted for about 83 per cent of the nation's export and about 71 per cent of total foreign exchange earning in 1973. By 1975, Nigeria had become a member of the ten greatest oil-producing nations in the world.

TABLE A1.3			
CRUDE OIL PRODUCTION AND EXPORT (M' Barrels) IN NIGERIA (1970 – 1996)			
	PRODUCTION	EXPORT	% OF TOTAL EXPORT
1970	395.6	383.5	57.6
1971	558.7	542.6	73.4
1972	665.3	650.6	82
1973	719.4	695.6	83.1
1974	823.3	795.7	92.4
1975	660.1	627.6	92.6
1976	758.1	736.8	93.6
1977	766.1	715.2	92.7
1978	696.3	674.1	89.1
1979	845.6	807.7	93.8
1980	760.1	656.3	96.1
1981	525.9	469.1	96.8
1982	470.6	401.7	97.5
1983	450.9	392	95.8
1984	507.5	450.6	97.3
1985	547.1	486.6	95.7
1986	535.9	486.6	93.8
1987	483.3	390.5	92.9
1988	529.6	435.8	91.1
1989	625.9	522.5	94.9
1990	660.6	548.2	97
1991	689.9	585.8	96.2
1992	711.3	604.3	98.1
1993	691.4	563.6	97.7
1994	696.2	578	97.4
1995	715.4	616.9	97.6
1996	740.1	648.7	98.2
Source: Central Bank of Nigeria, Statistical Bulletin (1998)			

The international oil market was a sellers market. Thus, in collaboration with the other Oil Producing and Exporting Countries (OPEC), Nigeria could almost set the price of the commodity. Revenue from this product provided money to government, which immediately commenced constructions of roads, bridges, and buildings, leading to a significant growth of that sector.

As we noted above, this singular development drew able bodied men from the farms leaving the agricultural sector with old and fable men leading to a drop in production and a fall in contribution to GDP. Dependence on this commodity translates into the fact that the economy is today not resilient to shocks in the international crude oil market.

Meanwhile, in 1995, proven oil reserves amounted to 25 billion barrels. This is sufficient to give Nigeria another 25 years of continuous production. Gas reserve is estimated at about 40 trillion scf, enough to last over 20 years.

A1.3 Manufacturing

Like the oil industry, the industrial sector of the Nigerian economy is still relatively young. There were a few manufacturing activities before independence in 1960. The in-flow of foreign exchange occasioned by agricultural exports and later, by oil exports provided sufficient savings, and hence, funds for investment in this sector. The investment climate in the 1960s and 1970s was favourable. Consequently, investment in the industrial sector during the period was high. The sector recorded an annual average growth rate of over 10 per cent between 1960 and 1975. It produced only consumer goods with high import content averaging over 60% in 1985 and 50% in 1990 (Manufacturers Association of Nigeria's (MAN) Half-Yearly Economic Surveys). The absence of the production of light machinery is a challenge to both the government and industrial policy formulators.

Generally, industrial development in Nigeria has been based on import substitution strategy. This was informed by the philosophy of the time and that economic development involves structural transformation from a predominantly agricultural economy to an industrial one. The brand of import substitution adopted merely involved a relocation of the production centre with little or no change to the other aspects of the production function. The industrial plants were designed to run on imported raw materials, thereby handicapping efforts aimed at exploring, developing and utilising local raw materials. Inevitably this meant a serious drain on foreign exchange because productivity was dependent on the ability of the other sectors to provide the foreign exchange needed for the importation of raw materials and spare parts.

Judged by international standards, the size of the Nigerian industrial sector is small. Contribution of the sector to GDP was 4.82, 6.13, 8.90, and 8.80 percents in 1960, 1965,1975, and 1990 respectively (MAN Half yearly Economic Surveys).

Manufacturing accounted for 8.6% of GDP in 1992. There was not much improvement on 7.2% achieved in 1972. Textiles, beverages, cigarettes, soaps and detergents accounted for about 60% of local manufacturing output. The other sectoral outputs are foodstuffs, vegetable oil processing, shoes, cement, flour milling, tyres, paper and packaging, glass making, fertiliser, steel rolling and manufacturing as well as pharmaceuticals. All the larger firms have the maximum level of foreign equity of 40% or 60% that was permitted before the revision of the Nigerian Enterprises Promotion Decree in 1989. The largest foreign investments are from the U.K. But as balance of payment problems worsened during the 1980s, coupled with weakening currency, the willingness

of foreign shareholders to provide operational support (or new investment) in Nigeria declined. Disinvestment and capital flight became the order of the day.

The problems facing this sector have been severe since 1982. Prior to the 1980s, growth had been greatest in soft drinks, brewing, cotton textiles, synthetic fibres, paints and vehicle assembly but in 1988, only five sub-sectors were able to exceed 1982 production levels. Growth in the manufacturing index in 1990 was driven by growth in the production of synthetic fabrics. Overall capacity utilisation in manufacturing rose from 25% in 1985 to 38.7% in 1991 and to 41.8% in 1992, before declining again in 1994 to 31%. Manufacturers using locally sourced inputs have been the most successful in achieving higher rates of capacity utilisation. Conversely, those industries relying heavily on imported inputs fared much worse. Generally, however, the installed machinery are old and require replacements.

The shrinking of the country's foreign exchange earnings was the primary cause of the collapse of manufacturing activities in the mid 1980s, in view of the high dependence on imported raw materials and equipment. Inevitably, manufacturing was hard-hit by import rationing that resulted from the contraction of government import licenses and foreign credit lines in 1982-86.

With the introduction of Second Tier Foreign Exchange Market (SFEM) in September 1986, import licensing was abolished but companies had to face a new set of problems. The devaluation of the Naira greatly increased their import expenses, driving up average cost, which was already high due to low capacity utilisation and poor infrastructure. The escalation of cost was passed on to consumers in the form of higher prices. Moreover, the liberalisation of

trade that came in the wake of SAP exposed hitherto well protected industries to stiff competition from foreign goods. This was compounded by inflation, weak real income and low purchasing power, which culminated in consumer resistance. The impact of these was a rise in inventory levels, a problem that has persisted till now.

Consequently, manufacturers were compelled to rationalise product lines, modes of production and to undertake radical shift of emphasis towards local sourcing, based, in many cases, on agriculture.

However, most of the companies lack the economies of scale, technical know-how and the financial resources to make such ventures successful. Thus, heavy production costs tend to make using locally sourced raw materials more expensive than their imported counterparts. Contractions in the industrial sector mean increases in the rate of unemployment, inflation and external trade imbalances.

A1.4 Monetary Management and Economic Development

Monetary management is commonly defined as the mechanism, for regulating the supply and cost of money at optimum levels so as to ensure the attainment of desired national economic objectives, including price stability, sustainable output and employment growth, and external viability. The question as to whether monetary policy can or cannot, indeed, achieve these objectives is at the centre of the controversy between the Monetarist and Keynesian Schools of thought. However, it is generally agreed that the monetary policy strategy for the achievement of these goals in any economy is often influenced by the stage of development of the economy and its financial infrastructure.

Meanwhile, the effectiveness of monetary policy in an under-development financial environment is often questioned because of the perceived structural and institutional rigidities in the economy and the poorly developed money and credit markets. Besides, there is usually, the pervasive and highly unorganised, often externally dependent and spatially fragmented informal or curb financial market (Tan, 1993).

In addition, most financial intermediaries are often apathetic towards channeling resources to productive investment even in the face of lower interest rates. All these factors combine to limit the performance of monetary policy in developing countries (Balogun and Out, 1991). Thus, severe 'structural' supply constraints are deemed to inhibit expansion of output even when the demand for it increases. An expansionary monetary policy, consequently, often results inflation rather than output growth. Therefore, in practice, monetary policy formulators continuously search for that elusive optimal quantity of money supply that would support non-inflationary economic growth and development.

In the quest for economic development, it is observed that the pursuit of multiple and sometimes, conflicting objectives requires a delicate balance between macroeconomic and sector-specific policies (Balogun, 2000). In particular, it often involves difficult trade-offs among conflicting objectives in order to maximise the overall benefits to the society

A1.51 A Review of Nigeria's Monetary Management Experience

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. It is pertinent, therefore, to review the monetary employed by the monetary authority in Nigeria and assess the outcomes during the period under study. For purposes of convenience, the period 1960 to 1998 has been divided into four phases: the formative years 1960 to 1969; the oil boom era, 1970 to 1979; the collapse of the oil boom, 1980 to 1985; and the Structural Adjustment Programme (SAP) era, 1986 to 1998. It is instructive to note that the first three periods represent the era of controls and regulation.

A1.52 The Formative Years, 1960 to 1969

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 the 'Nigerianization of the credit base'. The vehicles used for the attainment of this objective was the creation of local currency, money and capital market instruments, development finance institutions (DFIs), and through keeping interest rates low for targeted 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 (1967 – 1970) and the collapse of the consortium arrangement for financing the Nigerian export produce in 1968. Consequently, the monetary authority 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 included Federal Government Development Stocks in 1959, Nigeria Treasury Bills (NTBS) in 1960, Produce Bill and the CBN operated Call Money Scheme in 1962.

Interest rates on those debt instruments were administratively determined while the CBN, as the underwriter, absorbed the unsubscribed portions and provided refinancing facilities. As a result of these limitations of interest rate policy could not be used as an active instrument of monetary policy. Rather, interest rate 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 percent 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 (M_1) and narrow money supply (M_2) - rose by 29.7 and 44.0 percent, 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-fold from N33 million to N306 million. The implication of this growth for inflation and exchange rate became a source of concern for the Government.

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 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 NTBs was between 1968 and 1970, progressively increased from 85 to 150 percent of estimated revenue of the Federal Government. The result was an accelerated growth in the money stock with broad money (M_2) rising by up to 47.2 percent in 1970, while bank credit to government rose by 84.9 percent. There was thus, the crowding out of the private sector whose credit contracted

by 24.3 percent from 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.

A1.53 The Oil Boom Era, 1970 to 1979

This period continued to be characterised 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. The absence of a mechanism for sterilizing the proceeds of excessive earnings from crude oil exports resulted in inflationary pressure, with rate reaching 33.9 percent year. Following the report of the Anti Inflation Task Force in 1975, importation was lideralised, resulting in massive importation of food, raw materials and other consumer goods. This was exacerbated by the commitment of government to promote development through cheap money policy with emphasis on subsidy on agriculture, protection of domestic industry and widespread intervention in production, infrastructure and service enterprises by government.

The rapid build-up of external reserves and the pegging of exchange rate during the period helped to stabilise the external value of the Naira. The fiscal authorities, significantly expanded public sector expenditures in response to gains from higher petroleum prices but failed to respond to the need to contract such expenditures when the oil fortunes started to decline. From 1976, fiscal operations began to record deficits but these had to be financed mainly by the CBN, thereby compounding the problem of monetary management. Whereas

the accelerated growth in money supply in 1970-1974 was attributable to monetisation of crude oil export earnings through government spending, the main expansionary factor in 1975-1979 was the explosion in bank credit, especially to the government sector.

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. Consequently, credit was allocated to the preferred sectors of the economy at concessional interest rates. At the same time efforts were made to contain the growth in aggregate demand through the imposition of special deposits, especially on imports.

A1.54 The Collapse of the Oil Boom Era, 1980 to 1985

The Naira continued to be over-valued, even after the collapse of the oil boom. This engendered significant economic distortions in production and consumption, which created a bias towards import dependency and put pressures on the balance of payments. Nigerian importers, buoyed by local purchasing power and government intrinsic guarantee, were able to enter into irrevocable commitments, and importations were done on open accounts as well as by letters of credit. After the collapse of oil prices in the early 80s and subsequent fall in foreign exchange earnings, these obligations accumulated and crystallized into what is today known as the Paris Club debts, promissory note and par bonds.

The Paris Club debt component, which was a mere $5.39 billion in 1983, graduated to $21.6 billion in 1999. Thus, during the period, the Central Bank was unable to adjust the exchange and monetary policies. The result was the

relative inability of the domestic economy to curtail imports, which marked the beginning of Nigeria's external debt trap/burden.

In the face of these developments, monetary management continued to rely on credit ceilings and selective credit controls. The maintenance of low yields on NTB bolstered by the CBN's under-writing of the unsubscribe debt issues (approximately 90 percent of total issues), resulted in the injection of high-powered money into the banking system. The outcome was that narrow and broad money, grew by 50.1 and 46.1 percent, respectively in 1980. There was a subsequent decline to 7.6 and 10.6 percent in the annual growth rates of M_1 and M_2, respectively, in the 1981-85 period. This was at the expense of a rapid depletion of the foreign assets (net) of the banking system. Controls over interest rates and the direction of credit during this period have been described as excessive (Sanusi, 2001). While the repression of the financial system and deposit money banks intensified, the non-bank financial sector seems neglected.

A1.55 The Structural Adjustment Programme (SAP) Era, 1986 to 1998

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 toward the institutionalisation of market-based instruments of control as against erstwhile 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 and moves 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 was tight in 1986, with growth in M_2 decelerating to 3.4 percent. 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 percent of GDP in 1988 to 11.0 percent in 1991, but moderated to 7.2 percent in 1992 before peaking at 15.5 percent in 1993. 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 N10.8 billion banking systems' credit to the economy in 1980 was 67 percent while 33 percent 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 percent, 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 percent in 1987-88, to 18.5 and 17.5 percent in 1989-90, and subsequently peaked at 26.0 and 26.90 percent, 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 1989, when the saving rate was about 16.4 percent, the prime-lending rate reached 26.8 percent, representing a spread of 10.4 percentage points, 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 high lending rates are, theoretically, a disincentive to borrowing for productive investments. Efforts to deal with the situation elicited the re-introduction of measured controls on interest rate in 1994, and the maximum lending rate was pegged at 21.0 percent. 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, rather than ease credit for productive investment, it exerted pressures on the foreign exchange market, and enhanced banks' investment in NTBs. Moreover, while it influenced the collapse of saving deposits rate to between 3-5 percent during the period,

lending rates remained high, reflecting a delicate trade-offs associated with monetary management.

A1.6 Macro-Economic Stability and Economic Development

The intermediate goal of monetary management is to foster desirable balance among the cost (price), sources and uses of both internal and external financial resources of a nation. The objective is to strike a balance such that the demand for funds, especially foreign resources, does not reach unsustainable levels capable of upsetting macro-economic stability (Thornton, 1989). Monetary management, therefore, is a major strategy for macroeconomic stabilization designed to curtail aggregated demand, including unsustainable government consumption expenditures.

The immediate impact of the easy money policies was very manifested in the fiscal operations over the period. Deficit as percentage of GDP rose from about 5.0 percent in 1961-65 to 8.7 percent in 1970. While effort was made to maintain a surplus, which amounted to 2.6, 1.5 and 9.8 percent of GDP in 1971, 1973 and 1974, respectively, this was reversed, thereafter, with deficits of 7.8, 8.5, 11.0 and 15.5 percent of GDP in 1978, 1990, 1991 and 1993, respectively. It subsequently declined to 7.7 and 4.7 percent of GDP in 1994 and 1998, respectively.

Fiscal authorities resorted to both internal and external borrowing to support its high expenditure profile. Nigeria's external debt stock rose from N1.8 billion in 1980 to N544.3 billion in 1992, while the external debt service rose from N0.5 billion to N27.6 billion. Total external debt stock as a proportion of GDP

that stood at 3.7 percent in 1980 but rose to a peak of 114.6 percent in 1990 and fluctuated to 87.2 percent in 1998.

The theoretical relationship between basic macro-economic aggregates such as the GDP, inflation, unemployment rate, balance of payment and debt profile clearly pointed to the relatively high degree of macro-economic instability experienced in Nigeria during the period covered by this study. Indeed, Nigeria's real GDP (at 1984 constant factor cost), estimated at about N70.4 billion in 1981 declined by 0.3, 3.8 and 3.4 percent in 1982, 1983 and 1984, respectively.

There was apparent recovery beginning from 1988 to 1992. It, however, relapsed again into a decline since 1993, reflecting mainly policy reversals, inconsistency and lack of economic infrastructure. Trends in inflation also suggested relative macroeconomic instability during the period. Inflation rates exhibited high cyclical trends as it initially rose from 9.9 percent in 1980 to 20.9 percent in 1981. Thereafter, it fell to 7.7 percent in 1982 but accelerated to 39.6 percent in 1984. It moderated to a single digit with the adoption of SAP but rose subsequently to a high of 72.8 percent in 1995, reflecting largely, the lagged impact of fiscal indiscipline. Available data indicated that there was disguised and rising unemployment among school leavers.

The trend in Nigeria's balance of payments reflected the degree of the country's international financial distress. The balance of payment, which was in surplus of N2,402.2 million on overall accounts in 1980, declined substantially to a deficit of N3,020.8 million in 1981, and deteriorated further up to 1983. With the adoption of SAP, while there was an improvement in the

current account position from 1989 to 1992, the overall account remained in deficit owing to the huge outstanding deficit in the capital account, reflecting the severity of external debt service burden.

The external reserve position also reflected this trend. In 1980, external reserves stood N5,446.6 million ($9,957.2 million) and could support one and half months of imports, a situation that improved marginally to 2.8 months of import in 1985. This improvement was achieved on the back of reneging on payments of internal debt service obligations.

END NOTES

[1] For further information see: Keynes, J. M. (1936), *The General Theory of Employment, Interest and Money;* Harcourt, Bruce and Co., N.Y.

[2] For further information see: Friedman, M. (1956), *Quantity Theory of Money – A Restatement: in Readings in Macroeconomics*; M. G. Mueller (ed), Holt, Rhine Hart and Winston Inc; N.Y.

[3] For details, see Mckinnon, R.I (1973), *Money and Capital in Development*, The Brookings Institutions, Washington D.C.

CHAPTER TWO

REVIEW OF RELEVANT LITERATURE

2.1 INTRODUCTION

A stable money demand function forms the core in the conduct of monetary policy because it enables a policy-driven change in monetary aggregates to exert predictable impact on interest rate, exchange rate, price level and ultimately output. The subject, on account of its importance has generated a stream of theoretical and empirical research all over the world over the past several decades. Initially, however, majority of the studies were confined to the industrial countries, especially the United States of America and the United Kingdom. Relatively fewer works have been conducted on developing countries, and this has been increasing in recent years. This trend is primarily triggered by the concerns of monetary authorities and researchers in developing countries on the impact of flexible exchange rates, liberalization of financial markets, globalization of capital markets, privatisation of state own monopolies and country specific events on the demand for money.

The theory suggests that the demand for money (demand for real balances) is a function of scale variable (as a measure of economic activity) and a set of opportunity cost variables (to indicate the foregone earnings by not holding assets, which are alternatives to money). This finding seem to have been confirmed, in general, by various theoretical framework such as the inventory models, asset theories and consumer demand theory approach. However, they

differ in terms of specification and representation of these variables. As a result of this, empirical research takes this conclusion as the starting point and series of attempts have been made to model the demand for money function by blending the concepts from the theories. In this regard, researchers employ a variety of formulations, functional relationships, and data series to analyse the determinants and the stability of the demand for money. Consequently, the findings also vary from study to study.

Therefore, in order to develop theory-consistent empirical models and provide the economic background behind the functional relationships, this chapter will first provide a brief background of the theoretical developments beginning from the classical school in section two. In the third section, the various issues involved in the demand for money function and the merits and demerit of various commonly used empirical framework are presented in detail. The salient features of a number of studies on the subject in industrial and developing countries are discussed in the last section.

2.2 THEORY

The demand for money function is undoubtedly one of the most researched areas in macroeconomics. This is due to the fact that the effectiveness of monetary policy depends largely on the public's favourable response and willingness to hold on to or to release their cash and near cash balances on transaction.

Researchers interests on the demand for money[3] function have raised a number of questions especially given that the theory of demand in microeconomics should be applicable to all commodities, including money. Money, stocks and

bonds, which though yield their owners cash income in terms of interests and psychological satisfaction are not held for their own sake, but were argued not to fit into the traditional theory of demand for commodities. Whereas it is possible to assume that all factors affecting demand for other goods and services are constant with the exception of price, it is not possible with money. All the variables affecting its demand change simultaneously. However, what has mainly happened, over the years, is a contraption of microeconomic perceptions in macroeconomic context.

A cursory look at the literature shows that most writers have sought to provide answers to the problems posed by the Keynesian and Friemanian restatement of the quantity theory of money. Recent trends are the complementary and microeconomic approaches to the subject. These theories are more often then not projected as opposite poles of ideas. A closer look, however, show that the distinction is not a really a rigid one because there are a plethora of similarities between the various schools of thought. What is empirically observable is a range of variation of explanatory power, this makes it difficult to determine whether a theory is good or bad. This situation has led to the emergence of many alternative theories and what is now known about the subject is learned from tests that sought to compare various theories as well as their empirical evidences.

The traditional theoretical framework on the demand for money models can be grouped into two[3]. These are the theoretical asset and transaction demand for money[3]. The theoretical asset demand for money is presented in the works of Keynes (1936), Meltzer (1963) and Friedman (1956). The transaction theory of

demand for money, on the other hand, is presented in the works of Fisher (1911), Baumol (1952), Miller and Orr (1966), Darby (1972) and Niehans (1978).

1.6.1 2.2.1 The Classical Theory

What is now known as demand for money started with the ideas of Fisher (1911). Fisher did nor set out to produce a demand for money function. This probably explains why the equation contained in his book "The Purchasing Power of Money" is an identity. He stated that in every transaction there must be a buyer and a seller. Therefore, the value of sales must equal the value of receipts in the aggregate economy. Also, the value of sales must equal the product of the number of transaction (T) that took place over a period of time and the average price (P) of the transactions. On the other hand, the value of purchases must equal the product of the amount of money (M) in circulation and the number of time (V) it change hands. Thus, the equation is:

$$MV = PT \quad \ldots\ldots\ldots\ldots\ldots \qquad 2.1$$

The Fisher's equation has been interpreted to mean that the demand for nominal money balances is a function of the present value of transactions. Since the supply of money is exogenously determined, at least at equilibrium, demand must be equal to the supply of money.

$$\text{Hence: } Md = Ms\ldots\ldots\ldots\ldots\ldots \qquad 2.2$$

Depending on the number of stages goods go through between raw materials and the final stage and the number of firms involved, the volume of transaction

may be closely related to the national income. One of the attractions of this theory is the postulation that the demand for money arises from people's desire to trade with one another.

1.6.2 2.2.2 The Cambridge Equation

The Cambridge school includes A.C. Pigou, Alfred Mashall, Robertson and J. M Keynes amongst others. Their interest was to determine the amount of money an individual economic agent would wish to hold to make transactions. They believed that the value of money is primarily determined by exactly the same factors that determine the value of any other commodity, namely: the demand for and supply of it.

Furthermore, the hold the view that since money is universally acceptable in exchange for goods and services, it must be a convenient asset to hold primarily to satisfy transaction needs. The more the transactions that need to be carried out, the more the cash balances that economic agents will want to hold. A second important factor that influences the desire to hold cash balances is the opportunity cost of holding money. Money is the only asset that wealth holders would like to hold and it yield no return. Thus, the desire to hold money in the Cambridge sense includes: wealth, volume of transaction, the convenience derived from holding money for transaction purposes and the rate of return on alternative assets. The Cambridge economists omitted the rate of return (or interest rate) on alternative assets from their equation. They assumed that the supply of money is determined by the monetary authority as:

Ms = Mo. ……2.3

It is worth noting that the Cambridge equations imply a proportionate relationship between the quantity of money demanded and the level of national income. This relationship may (rightly or wrongly) be interpreted to imply unitary elasticity of demand for money.

Both the Cambridge and Fisher's model appears similar but differ in a number of ways, requiring different interpretation. This includes the fact that:

- Fisher requires an institutional framework for determining the technical nature of the transaction making process, and therefore, the theory implies a constant and equilibrium velocity of circulation in the short-run.
- The Cambridge approach emphasises the rate of interest and expectations an individual holds about the future as very significant in the short-run.
- Although the formal version of the Cambridge function does not include interest rate, it has been generally accepted that their main contribution is the introduction of the rate of interest as an important determinant of the demand for money.

1.6.1 2.2.4 The Keynesian Theory

A major difference between Keynes and the Cambridge school is his analysis of the speculative demand. To facilitate his analysis, he identified a two asset world in which there are cash and bonds. A bond is an asset that carries with it a promise to pay its holder a fixed income stream on a

periodic basis till maturity. Therefore, a decision to buy a bond is a decision to buy a claim to a fixed future stream of income.

A significant contribution of Keynes, which flowed from the analysis of the speculative demand for money, is the doctrine of liquidity trap. Keynes argued that there is an expected range of values for the rate of interest. Any rate above or below this normal range means that everyone in the economy will expect interest rates to either rise or fall. For example, at certain high rate of interest everyone expects the variable to fall. Thus, they expect that prices of bonds will soon rise from their current low levels. Therefore, all speculative balances is invested on bonds and hence, speculative balances will be zero. On the contrary, at any rate below the normal range, the rate of interest is very low and everyone expects that it will soon rise. At this level of interest rates prices of bonds are very high and everyone expect it to fall. Therefore, all speculative balances are held in the form of cash.

Generally, the Keynesian theory potent following implication for the demand for money:

- Although there is a normal range of interest, it is not constant overtime and for all economies;
- The conclusions seem to be opposite of those reached by Fisher, who did not include interest and who implies a stable relationship between money and income.
- Keynes implies that the speculative balance dominates the demand for money function.

1.6.2 2.2.5 The Modern Quantity Theory

Friedman (1956) emphasized the flow of services that money bestows on its holder. He noted that these services derive from the fact that money is a temporary abode of purchasing power.

He applied the theory of diminishing marginal rate of substitution between goods. The demand for money, he noted, depends on the prices (expected yield) of all other assets and total wealth, which contains the overall value of the portfolio.

His analysis took the form of applying the theory of demand to a special case. This necessitated detailed analysis of the budget constraint and variables to measure the opportunity cost. It also incorporated human and non-human wealth. Yields on other assets, rate of inflation, level of prices will have a negative effect on money holding while the level of wealth will have a positive effect.

2.2.6 The Asset Demand for Money.

Keynes (1936) viewed the transaction and asset demand for money as distinct. Expectations of interest rate are crucial in determining speculative demand for money. In the liquidity trap region, all assets are held in the form of cash and demand for bonds are at their its minimum. He concluded that the demand for money is a function of income and the rate of interest, but strongly depended on expectations, which fluctuates continually, thereby implying that the demand for money is unstable.

Seriatis (1983), Fisher (1989) and Mankiv (1970) amongst others have employed an approach that is consistent with microeconomic principles. They argued that the consumer's decision problem is expressed as that of maximising composite consumer goods and monetary assets subject to the price of the two items and budgets.

2.2.6 Transaction Demand for Money

Fisher (1978) in his transaction theory proposed that individuals could be assumed to hold a fixed proportion of their transaction balance in the form of money.

Baumol (1952) introduced an explicit transaction cost in the form of (1) penalty or brokerage costs in converting other assets to cash and (2) interest income forgone by holding a non-interest bearing cash. He assumed a direct proportionality between the quantity of money held and transaction (income) and an inverse proportionality between money held and interest rate. Fisher (1978) pointed out that empirical results tend to infer that demand for money was a stable (at least until about 1971) function of a few variables.

Some studies (Darby, 1972; Santomero and Seater, 1981) seem to hold the view that adjustment of money (especially when it comes as a shock) is not an instant or an automatic phenomenon

2.3 ESTABLISHING THE THEORETICAL ISSUES

Much of the empirical works on the demand for money function seeks to establish certain regularities (or irregularities) within the above-mentioned context.

One of the unresolved differences revolves around the stability or instability of the determinants of the function. Keynes believed that the asset holder is volatile and that the money holding schedule shifts in response to changes in interest rates. The monetarists believe otherwise. They emphasize the stability of velocity. Empirical evidence does not appear to have helped matters much. Empirical results tend to infer that demand for money was a stable (at least until about 1971) function of a few variables (see Laidler, 1985 and Fisher 1978).

There seems to be a consensus amongst economist, that money holding is functionally related to income and interest rate(s) or some other cost variables. The disagreement is on the appropriate definition and magnitude of influence of the variables. Friedman emphasises the importance of a rather broad concept of wealth whereas Tobin, in his analysis, restricted wealth to non-human wealth only. Keynes and his followers considered the effect of current income on the assets and transactions demand for money.

There are, also disagreements on the magnitudes of variables. The first of these is the scale variable. Friedman stressed the importance of a rather broad concept of wealth while Tobin (1956, 1958) in his analysis, restricted wealth to non-human wealth only. Keynes on the other hand considered the effect of current income on the demand for money.

The literature tends to indicate that the definition of money is not a good yardstick to distinguish the two approaches. Friedman concentrates his analysis on the utility of money. He saw money as a temporary abode of purchasing power. He suggested a broad definition of money, which includes some interest yielding capital assets as well as savings and demand deposits. Friedman maintained in his studies, that the definition of money is not to be determined apriori because it is an empirical affair. The Keynesians based their theory of transaction demand on the narrow definition of money. Tobin's analysis is concerned mainly with the demand for capital certainty, which when incorporated with the Keynesian theory yields a full Keynesian model. The emerging Keynesian demand for money function suggests a broad definition of money which includes all capital certain assets, with wealth, long-term interest rates and expectation of future rates of interest as exogenous variables (Saunders and Taylor, 1972).

Keynes and his followers argued that there is a high degree substitution between financial assets, with the holding of bonds depending on the prevailing rate of interest. Thus a high interest elasticity is implied in their model. Money, to the monetarists, is the most liquid of all assets. Money's essential attribute is its liquidity and not substitution. And hence, money has low interest elasticity in the monetarist model.

As if this difference is not enough, there is also disagreement as to the representative rate of interest i.e. between long-term or short-term rate of interest. To the two schools of thought, the expected yield is the opportunity cost of holding money. The expected capital gain/loss and the expected rate of

inflation discussed in the theories are not directly observable. This probably accounts for why neither of the theories provides a means for determining their influence on the demand for money. However, with developments in the demand for money, inflation rate has come to be included in the function. It's inclusion is borne out of the argument that a variation in the price level is likely to cause a movement in the opposite direction in the real value of a given nominal return from fixed assets. Consequently money holding is inversely related to the rate of inflation.

Studies (Darby 1972; Santomero and Seater, 1981) seem to hold the view that adjustment of money (especially when it comes as a shock) is not an instant and automatic phenomenon. Rather, time is taken to search out for available assets and their rates of return. The duration of the search, and hence, the period that the disequilibrium balance is held depends critically on the intensity of search, availability of assets and their rate of returns. As a result of the evolution of this view, some economists see the demand for money function as an amalgam of two components - an equilibrium balance and a disequilibrium balance. The equilibrium is the optimal or desired value of cash balance that a household will hold. The disequilibrium balance is the deviation of the short run money demand function from its long run steady state value.

The long run steady state value rarely ever exists in practice because, given that unitary probability of inflation and unexpected expenditure (if we assume negative unexpected expenditure) which are the main cause of transitory shocks, are not zero at any point in time. Thus, the household will be left with a positive transitory balance at all times.

Ideally, the household should convert this excess money balance into some interest yielding assets immediately. Unfortunately, the conversion is not immediately done because transitory shocks are unexpected and the household is not at all times prepared for their disposal. Time must be taken to search for the most competitive asset to buy. The length of time spent (i.e. the time between the inflow of surplus cash and the time it is invested) depends critically on the intensity of search. While the search continues, the household holds a disequilibrium balance.

The issues can be broadly classified as follow:

a. **Scale Variable:** What should be the appropriate scale variable – income or wealth, and what should be its definition? Should income be measured as current or permanent income? Again, if income is the most appropriate scale variable, which of gross national income (GNP), gross domestic product (GDP), or national income (NI) is a more accurate measure? On the other hand, if wealth is the appropriate scale variable, should it include or exclude human wealth? Moreover, Friedman had predicted income elasticity to be greater than one, indicating that money is a luxury good, while Baumol and Tobin predicted that it is less than one. The classicals and Keynes predicted that is unitary. Which is the appropriate measure of elasticity?

b. **Definition of Money:** Some economists favour the narrow definition of money (M_1), while others believe in the broad definition (M_2). Those who favour the narrow definition emphasized money as a medium of exchange while those in support of the broad definition have argued that

time and savings deposits are money because they satisfy the an essential function of money, namely, as a store of value. Furthermore, should money be defined in real or in nominal terms?

c. **Interest Variable:** Keynes claimed that the rate of interest is an important variable in the demand for money function while Friedman believes that it is insignificant. If it is important, which rate of interest – short-term or long-term is more relevant? Friedman predicted interest elasticity to be very small in magnitude while Baumol and Tobin claimed it is –0.5. Others have argued that it is greater than unity. Moreover, is the risk involved in interest variation an important factor affecting the demand for money?

d. **Price Variable:** Is the demand for money measured in nominal terms proportional to the price level? If not proportional, how is the real demand for money affected by expected changes in the price level?

e. **Stability:** Keynes claimed that the demand for money is subject to sudden and erratic changes with respect to changes in interest rates. Friedman and his followers claimed that it is not and that the demand for money function is stable overtime.

f. **Long and short run:** What are the relationships between the long and short-run demand for money? Are their characteristics similar or dissimilar?

g. **Partial adjustment:** What is the lag effect of monetary policy? Friedman believes that monetary policy operates with long and variable

lag and that there is need to adopt monetary rule rather than discretionary monetary policy in planning for stabilization. Culberton (1960) says that there is need to determine the time interval, which will elapse between policy action and its proximate effects on income stabilization. Friedman (1961) found the adjustment parameter to be about 0.2. hence, it would take three quarters for half of the effect of policy change to be felt. Others have suggested that the adjustment coefficient to be within the range of 0.25 and 0.4. This indicates a shorten period for policy impact to be felt.

h. **Complementary formulations:** Mckinnon contends that the conventional variables cannot perform well in developing countries because of the assumptions of the models – that the capital market is competitive, with a single interest and with real money balances being treated by people as substitutes and vice versa. According to Mckinnon, this relationship is complementary in developing countries. Does these models explain the demand for money with superior magnitudes.

i. **Microeconomic Formulations:** Based on the arguments that the entire demand for money functions are based on wrong aggregate level, can a function derived for utility maximisation constraint provide a superior explanation for demand for money in Nigeria?

2.4 REVIEW OF SOME RELEVANT EMPIRICAL RESULTS

So far, we have traced the theoretical developments on money demand beginning from the classical school and ending in the microeconomic approach. It is interesting to note that while all the models analysed the demand for money in different angles, the resulting implications are almost the same. In all instances, the optimal stock of real money balances is inversely related to the rate of return on earning assets (the rate of interest) and positively related to real income. The differences arise in terms of using the proper transaction (scale) variable and opportunity cost of holding money. The empirical analysis of demand for money estimation takes this conclusion as a starting point.

There is a large body of literature on estimating money demand functions. In the past the work was confined primarily to industrial countries. However, lately there has been considerable interest among several industrial and developing countries alike. The central banks in these countries came to realised that the stable money demand function forms the fulcrum of the conduct of monetary policy. Researchers from other institutions are also interested at the stability of these functions in the face of rapidly changing external and internal economic and financial landscape.

One of the significant contributions of the empirical research on the subject is the major advancements made in time series econometrics in the past two

decades, which motivated researchers to revisit the empirical models built previously. This section provides a brief overview of relevant issues concerning the empirical estimation of money demand functions, which are slightly different from those presented in the theoretical literature in the last section. Also, in this section we discussed broad types of models employed in the empirical works along with their relative strengths and weaknesses. Lessons learnt from this section will serve as valuable input in the selection of appropriate modelling framework and estimation technique.

2.4.1 Aggregation Problems

The purpose of constructing aggregates is usually to attain simplicity whilst employing microeconomic perceptions in a macroeconomic context with a view to making both theoretical and empirical work easy. Although, definitions of money vary across countries due to either institutional characteristics or arbitrary decisions (Boughton, 1992), money stocks are generally classified into two major groups – narrow and broad money[3]. The correct definition to be used is, however, an empirical matter (Laidler, 1993). Three main issues are involved under the aggregation problem in the demand for money function; namely commodity aggregation (M_1 versus M_2), temporal aggregation and aggregation of business and personal demands. The commodity aggregation problem attracts the attention of most writers on the issue. However all

constructions on the aggregation can be classified as Keynesian and monetarists.

The Keynesian aggregative structure produces different emphasis, due to differences both in functions and detail, which directly affect the demand for money function. In particular, the representative interest rates in the demand for money adopted by the two Keynesian schools differs thus, implying different aggregate structure.

Keynes chooses a long-term interest rate to represent the yield on non-money assets on the ground that it directly represents the yield on long-term assets. Thus, the long-term interest rates represent the returns on an alternative means of holding money. Keynes seems to prefer a very broad definition of money. The Keynesians would rather aggregate all bonds together as the natural antithesis for money. The conglomerate is represented by the yield on shortest asset in the bundle. This is the yield on treasury bills. The selection of this yield is informed by the fact that it is the closest substitute to money and hence would dominate the longer-term assets in the portfolio with respect to demand for money.

The macroeconomic definition of money of the monetarists is almost an empirical one. The definition however has nothing to do (directly) with substitutability. Friedman and Schwartz (1970) believes that money can be defined in any way convenient, that is, the most suitable definition for the particular purpose. The various works of Friedman clearly states that there is no separate issue as definition of money. What matters is what seems to work well within the relevant context e.g. for forecasting, estimating, etc. In fact, to

the monetarist, the definition of money is an empirical matter. Hulett (1971) recommended that the best definition should correspond to the underlying tasks which money performs and to the stability (Friedman and Schwartz, 1971 and Laidler (1969a) of the demand for money in empirical tests or (Laumas, 1968), to the measure of moneyness which most effectively predicts changes in national income.

Several empirical studies exclusively estimated the demand for narrow money with an argument that the broader aggregates might muddy the interest rate effects. The bulk of the analytical work on narrow money was conducted in the United States and in Western Europe on the assumption that narrow money was more amenable to control by monetary authorities[3]. Studies on a number of developing countries also indicate that the models using narrow money work better than those employing broad money, reflecting the weak banking system and low level of financial sector development (Moosa, 1992 and Hossain, 1994).

The interest in estimating the demand for broad money emanates from the fact as pointed out by Ericsson and Sharma (1996), *"although easier to control narrowly defined aggregates are less useful in policy issues because their relationship with nominal income appears subject to considerable variability. Broader aggregates appear more stable relative to nominal income, but they are less amenable to control"*.

Fisher (1985:13) summarizes the available evidence on commodity aggregation as

a) The aggregation of currency and demand deposits seems a reasonably effective one, except in times of very unusual strain in monetary markets (such as during a currency panic) or when substantial institutional changes are in progress[3].

b) The aggregation of narrow money and time deposits (broad money), while sometimes seeming to provide a stable measure, does not always do so. This seems to do primarily with the fact that time deposits are permanent savings for money and if they are not, they are held for down payments on consumer durables.

c) The evidence on the broader measures of money, which include financial intermediary deposits and large size certificates of deposits, is hopelessly ambiguous with some research finding stability and some instability[3].

The temporal aggregation problem refers to the use of explicit measures of permanent income or the use of Koyck transformation to generate estimates of the independent variables (i.e. income, interest rate and prices) with monotonically declining weights assigned to the past values of these variables. The estimates are used to determine the time lag in the demand for money function. A long lag implies that monetary policy will take much longer period to achieve set objectives. If the lag itself is unstable, policy problems are further complicated. For example, if we are to use expected income as the dependent variable in a function, this will require postulating that economic agents adjust their expectations of income in line with the ratios of actual values of previous income and thus we would have a long run demand for money function:

$$(M-P)_t = a_0 + a_1 Y_t^p + a_2 r_t + e_t \quad \text{.....2.4}$$

where the log of the expected income is given as

$$Y_t^p = Øy_t + (1-Ø)Y_{t-1}^p \quad \text{.....2.5}$$

By applying Koyck transformation on the above by substituting equation (2.5) into equation (2.4) and subtract equation (2.4) from the resulting expression multiplied through by 1-Ø and lagged one period yield:

$$(M-P)_t = Øa_0 + Øa_1 y_t + a_2 r_t - (1-Ø)a_2 r_t + 1-Ø)(M-P)_{t-1} + e_t - (1-Ø)e_{t-1} \quad 2.6$$

Equation (2.3) provides a platform with which to attempt to distinguish between expectations and adjustment cost approaches to introducing a lagged dependent variable into the demand for money function.

Gibbon (1972) found a short lag (the shortest) in the demand for money on US data. Goodhart and Croket (1970) found a long (the longest) lag on British data. As a result the literature shows that empirical findings pose a policy problem. Dickson and Starleaf (1972) used US quarterly data and found the total lag to be shorter for broad money on annual data studies than on the narrow definition for money, while time deposits have longer lag. Their findings therefore tend to cast some doubts as to the usefulness of the broad definition of money. In a detailed and thorough study, Goldfeld (1973) studied the impact of lag on US post-war quarterly data and came up with reports that are similar to Dickson and Starleaf. Goldfeld underscores the point that lag on

interest rates should not be expected to be the same as that on income - the simple Koyck transformation technique normally treat them alike.

Teriba (1974), Ojo (1974), Fakiyesi (1980) and Salami (1989) have studied the lag on Nigerian data. Teriba in his study covering the period 1958-1972 found that the narrow definition of money was slow in adjusting between desired and actual balances, while the demand deposit component was much faster than the demand for currency. Salami (1989) was similar to Teriba and he concluded that "money holders in the Nigerian economy react very slowly to increase" in income. Thus in much of the literature, there seem to exist a fairly wide range in the findings over the length in lag of the demand for money.

The aggregation of business and personal demands has its roots in Keynes (1936) proposal of "finance motive" for holding money. This motive is a function of expected activity. Davidson (1973) expounded the proposition and suggested a disaggregation of the demand for money function to reflect consumers and firms expected money holding. Thus:

$$M^* = a_1C^* + a_2F^* \quad \text{.....2.7}$$

where the asterisk denotes expectation

M = Total money demand

C = Consumers demand for money.

F = Firms demand for money.

Price (1972) using British data, found that individuals' demand for money tends to be relatively slow in response to interest rates. He observed that the aggregation of business and private demand appeared to be involved in the

choice of independent variables - firms responded to the short-term interest rate while individuals responded to the long-term interest. Income elasticity of the private demand was found to be 2.0 while the business demand was less than unity. Hoffman (1979) confirmed this result on US data. In a similar approach, Meltzer (1936) and Brunner and Meltzer (1967) also found mild economies of scale for business demand for money.

Ungar and Zilberfarb (1980) experimented the model on Israeli data. They found the business demand for money to be stable, without economies of scale and has high interest elasticity. Tinsley and Garrett (1978) have also suggested disaggregation by sector. They argued that the problems in the stability of the demand for money (section 2.3.6) may well be related to the development of certain liquid assets which are widely used by firms. These assets, which he referred to as 'immediately available' has implicit impact on transaction demand for money. They, therefore, warned about the dangers of using monetary aggregates as targets or indicators in monetary policy.

To sum up, monetary aggregates employed in the empirical analysis vary from study to study. They are selected based on the study objective of the researcher and variables being considered in the estimation.

2.4.2 Scale Variable

The scale variable is used as a measure of transaction relating to the level of economic activity. The transaction motive for cash balance holding places more emphasis on current income, while the asset portfolio behaviour

emphasizes wealth[3]. Aside from the theoretical emphasis, income is often justified as a proxy for wealth on grounds of greater availability and reliability. Ultimately, the selection of an appropriate scale variable becomes an empirical issue (Gupta and Moazzamu, 1988).

In the empirical estimation, however, the level of income has been widely used to represent the scale variable, mainly because it poses little measurement problem. The most pertinent candidate is GNP. A number of other related variables that move together with GNP, such as net national product (NNP) and GDP have been heavily used. Substituting one for the other does not present any significant difference (Laidler 1993: 98-99).

The choice of the scale variable is between income (nominal or real) and wealth. Should income be measured as current, real or permanent? If income (of whatever definition) is the most suitable scale variable, which of Gross Domestic Product (GDP), Gross National Product (GNP) and National Product (NP) is a more appropriate measure?

On a priori basis, the literature gives the impression that wealth or its proxy - the permanent income - might be expected to perform better on the demand for money. The permanent income hypothesis of Friedman has received strong attention and support in the empirical literature, although the level of comparison was not always uniform and the results were sometimes controversial. The fact that the work on the demand for money is necessarily piecemeal has not helped matters.

Friedman (1959) initially set out to explain the empirical conflict in the velocity of money but his arguments necessarily drew attention to permanent income hypothesis. The irregularity in the velocity of money stems from the belief that income velocity rises during cyclical (short-run) expansions. The reverse was equally believed to be true for contractions. But Friedman argued that the secular picture was correct while the cyclical pattern of velocity was obscured because of the existence of transitory changes in income during the cycle. This prompted him to estimate a demand for money function without interest rate variable in it. He found that permanent income has elasticity of 1.81.

The work of Bronfenbrenner and Mayer (1960) appeared to be the earliest Keynesian test in the literature. They included interest rate variable in their model and found that the short-run demand for cash balances was more responsive to wealth than to income variable. This result using short-run money demand function basically contradicts Friedman's prediction.

Gregory Chow (1966) directly compared the two reports and argued that the short-run demand would be expected to show a relative dominance for current income while a long-run demand would favour permanent income. His empirical study confirmed this (though marginally) on US data and later on British data, Canadian data and then US data again. He employed basically the same methodology throughout and the results were suggestive, although there was a mild preference for permanent income. Chow demonstrated the importance of the asset motive. He concluded that permanent income was more important in equilibrium demand and current income in short-run changes in demand. His results, however, seem difficult to accept, on account of the

interpretation given to the importance of current income as the transaction motive. The traditional transaction motive relates money stock to the flow of income whereas Chow's short-run theory relates changes in money stock to income.

Laidler (1966) also pursued this line of study and confirmed that for a variety of long run functions with interest rate variable, the permanent income always out-performs the current income. Saunders and Taylor (1976) used wealth and income expectations in their function, which included long-term and short-term interest rate variable on US and United Kingdom data. Their result showed evidence favouring the use of wealth rather than current income.

Unlike the preceding studies, Fisher (1970), used money balances as a proxy for wealth on British data while Butkiewicaz (1979) used monetary base and real value of Public debt. Both studies came out with significantly positive real balances. In their own study Meyer and Neri (1975) associated the transaction motive with the level of expected income and the asset motive with the permanent income. Their function was:

$$Y_{te} - Y_t = \theta (Y_{tn} - Y_t) \quad \text{.....2.8}$$

where Y_{te} is expected income

Y_t is income in time t

Y_n is 'nominal' income

If $\theta = 0$, then $Y_{te} = Y_t$ which supports the transaction motive. If $\theta = 1$, then $Y_{te} = Ytn$, which supports the permanent income hypothesis.

In their empirical test θ was found to be less than unity and hence they concluded that the transaction approach was very relevant to the demand for money function. They also found that the permanent income dominates actual income in the demand for money function but when the transaction motive is formulated in terms of expected income rather than actual income the transaction motive theory performs as well as the permanent income theory.

In a recent paper, Lieberman (1980) revived the Chow model and examined it after correcting the original data for institutional changes in 1933. He also corrected the estimation procedure for serial correlation. Like Meyer and Neri, his findings also favour the transaction model over the asset model and current income over permanent income.

The emerging picture from the above review is that no overriding conclusion can be drawn from the literature on the developed countries as to the most appropriate scale variable. The role of wealth has however not received much attention as a result of data availability problems in developing countries. However, the findings for the developing countries are not much at variance with that for the developed world.

For example, Tomori (1972) in his pioneering effort on Nigerian data established that income, irrespective of the definition adopted, was significant in explaining variations in the demand for money. Tomori's work generated a spate of reactions (Ojo 1974 a, Odama, 1974; Teriba, 1974 and Ajayi, 1974). Teriba (1974), in his study, which accompanied his comments on Tomori's work, found that real income is the most important variable determining the demand for money as well as the components of money. Ajayi (1974) also in a

reactionary study found that income alone explains about 81 per cent of the narrow demand for money and 85-86 per cent of the wider definition of money demand. On income elasticity he found that it was less than unity for both narrow and broad real balances. Ojo (1974) was unique in his results, which suggested that the demand for money was inelastic with respect to income.

In his contribution, Iyoha (1976) concluded that income elasticity for current income is slightly greater than unity in both log linear and linear equations and that permanent income equations seem to have provided slightly better overall fit than equations employing current income as the scale variable. The short-run income elasticity for permanent income was significantly less than unity while the long-run one was about unitary.

Akinnifesi and Philips (1978) found the expected income elasticity to be significantly greater than one.

Fakiyesi (1980) and Darat (1986) also confirmed the superiority of permanent income while Adejugbe (1988) and Ajewole (1989) found relevance for measured income and real income respectively.

One of the issues that writers are yet to resolve satisfactorily is the issue of economies of scale of income. The issue of economies of scale arises from the juxtaposition of Friedman's view that money is a luxury good (with income elasticity of 1.81). In the prediction of the Baumol - Tobin model, the transaction elasticity of income should be 0.5. Keynes had earlier suggested that income elasticity should be 1.0. But taking 1.0 as representing the margin of division between economies of scale, a clear empirical distinction, which

should shed some light on the inventory theoretic model and the permanent income hypothesis, is drawn.

The literature[3] reviewed above shows that an enormous amount of evidence has been produced. Every theoretical and empirical study on the demand for money has given a role to transaction or income or wealth (or its proxy). The empirical results, summarized above, cover a range from negative income elasticity to Friedman's economic of scale find. In this area, Laidler (1985) concluded that results favouring economies of scale are dominant in advanced economies. The evidence for developing economics is non-conclusive as shown by the mass of evidence on the Nigerian economy. On this subject, Fisher D. (1985) has cautioned that notice should be taken of sub-periods of data. He concluded, "One can not reject out of hand the proposition that the scale elasticity may well be around unity (or a little less)". The emerging picture from the literature is that this issue, which involves an exact value, rather than a mere sign in the demand for money function, still needs to be tidied up further.

2.4.3 Interest Rates

It has become conventionally acceptable that the rate of interest is the opportunity cost of holding money. The introduction of the variable into the demand for money function has its origin in the work of Keynes (1936). Although the monetarists do not agree with Keynes on the magnitude of influence (or co-efficient) of this variable, the literature indicates that most

writers have consistently made references to it. Four problems are raised in the literature with regard to the rate of interests.

- Which rate of interest is most relevant (if any) to the demand for money? Is it a long one or a short one?
- Do multiple rates of interest affect the demand for money?
- What is the importance of 'own' rate of interest to the demand for money?
- Does the liquidity trap really exist.

The opportunity cost of holding money involves two ingredients (Sriram 1999) – the own rate of money and the rate of return on assets alternative to money[3]. Tobin (1958) and Klein (1974) are in favour of including both of these rates. Ericsson (1998) in a research confirms the importance of including both rates. According to Ericsson, omission of own-rate of money often leads to a breakdown of the estimated demand function especially when financial innovation occurs in the economy. Sriram (1999) shows that both the own-rate and return on alternative assets of money are important in explaining the demand for money in Malaysia.

Regarding the return on assets alternative to money, researchers had several choices. Those adopting a transaction view typically used one or more short-term rates like the yields on government securities, commercial paper or savings deposits with a notion that these instruments are closer substitutes for money and their yields are especially relevant among the alternatives that are foregone for holding cash. Those considering a narrow view of the demand for money have used correspondingly a broader set of alternatives including the return on equities, yields on long-term government securities or corporate

bonds (Hall, Henry and Wilcox, 1989). However, Laidler (1993) pointed out that what is important in the money demand function is to include some sort of variables rather than "which" variable to represent the opportunity cost of money since the research has shown that the demand for money is not sensitive to the precise measure of the variable chosen.

The literature indicates that earlier studies adopted one interest rate variable especially until and including the study of Laidler (1966). Most of them employed short-term rate of interest, as the opportunity cost variable. However, recent empirical evidence seems to support the view that more than one interest rate should be included in the demand for money function. That is, there seems to be growing consensus that several rates of interests (with possibly negative sign) may be a better formulation of the function. Evidence on either way, however, is not sufficient for an overwhelming conclusion.

Hamburger (1969, 1977) was one of the earliest studies on multiple rates of interest. In his first paper (1969), Hamburger used five rates of interest of the United States. All five rates of interest rate did not come out statistically significant in any of his equation. He demonstrated that when accompanied with a short-term rate of interest (which usually enter with a negative sign) the 'own yield' on money has a positive coefficient. In his study on United Kingdom (1977), he employed three rates of interests - short-term rate, common stock rate and Euro-dollar rate. The short-term rate of interest did not enter the function significantly but the common stock rate and the Eurodollar rate did.

Crouch (1967) showed that when two short term rates of interest are used, one comes out with a positive sign. White (1976) also used two rates of interests, a short-term rate to represent the company sector demand for money and a long-term rate to represent the personal sector. His result showed that the short-term rate has a positive sign.

Working on Nigerian data, Teriba (1974) used three-interest rate variable - time deposit rate, treasury bill rate and government stock rate[3]. Teriba showed that treasury bills are the closest substitutes for money or currency while savings deposits are the closest substitutes for demand deposits. Akinnifesi and Philips (1978) employed seven different rates of interest in their study. They ran into problems of multi-collinearity where five or more rates of interest entered an equation. They showed that the demand for money and its components were quite responsive to the average lending rate, minimum rediscount rate and expected rate of interest. They therefore suggested that monetary authorities should focus on them.

The appropriateness of the use of the rate of interest[3] has been criticized on account of the institutional constraints on the payment of interest on deposits (especially demand deposits) (Feige 1964). This has led to the computation of implicit rates of interest on currency and demand deposits. In their contribution to the debate, Klein and Murphy (1971) suggested the following formulation for the computation of implicit rate of interest (im)

$$im = \frac{Co - S}{D} \qquad 2.13$$

where Co is the total operating costs attributed to demand deposits,

S is the service charge revenue and

D is total demand deposits.

On a priori basis, they suggested that the coefficient of im should be positive in the demand for money function. Klein (1974) and Klein and Murphy (1977), investigated the specification and found evidence for it. But Barro and Santomero (1972) proposed a different specification, which included 'remission rate' (i.e. service charges) paid to large customers. The rate worked in their empirical test. However, in a further study by Santomero and Seater (1978) where the same rate was used and where the study was more careful the variable failed to work with the expected sign[3].

The liquidity trap problem is perhaps the least studied area in the demand for money. This state of affairs is not due to lack of interest but rather because the theoretical and empirical validity of the subject are hard to establish (Fisher D, 1985). Be that as it may, three basic empirical questions feature in the literature.

- Could speculative activities in the bonds and stock market influence the demand for money?
- If yes, could such influence have a strong enough impact on interest elasticity in the demand for money function?
- Does the liquidity trap really exist?

As we noted above, empirical works to resolve these problems are rather sparse. There is, however, some evidence in the area of speculative forces. Most of the existing literature attempted to measure the normal rate of interest or its proxy. The normal rate of interest is represented by the identification of

error-learning types of adjustment in the demand for money function. Crouch (1971) tried in vain to find a normal range of interest for the United States of America. Gandofi and Lothian (1976), in their study which covered periods of low rates of interest, agreed that interest elasticity may have decreased in the United States in the 1930s. Thus they imply an evidence of the existence of liquidity trap. Scaddy (1977) in his study also find some evidence for the trap. Pifer (1969) did a basic and detailed study on the subject. He observed that the minimum rate of interest (i_{min}) for the United States is around 2.06 and suggested a movement into the liquidity trap range for any rate of interest below that.

Eiser (1971) also investigated the problem and pronounced Pifers work on the existence of i_{min} a success. He argued that no direct observation of the liquidity trap was necessary to prove its existence. Spifzer(1977) and Boyes (1978) in their separate attempt observed that the estimates of the i_{min} may be lower. Both of them therefore concluded in favour of the existence of an asymptotical liquidity trap.

Courchane and Kelly (1971) found evidence of the existence of a normal rate of interest for Canada while Fisher D. (1973) found evidence in support of an error - learning process on British data. Thus there seems to be some modest evidence that liquidity trap is a possibility at a low rate of interest. This evidence is dependent on the use of long-term interest rate. No evidence of liquidity trap has been found for short-term interest rates. Laidler (1985) interpreted this to mean that "... these works may be dealing with a phenomenon associated with the term structure of interest rates rather than the

demand for money' (p130). The problem has not really been investigated in the developing countries. And in any case, until very recently interest rates in most developing countries have been institutionally controlled and deliberately kept low for reasons of stimulating investment and hence economic growth as well as allowing governments cheap access to deficit funding of social infrastructural facilities.. Detailed studies are required to prove the validity of the liquidity trap range in these economies.

2.4.4 Price Level and The Rate of Inflation

The impact of price level and the rate of inflation on demand for money must be viewed as separate issues. The problems that they pose are quite different. As far as the price level is concerned, economists often raise two problems:

- Should price level be included as a separate variable in the demand for money? The answer to this question should be 'Yes' if we assume that economic agents suffer from money illusion.
- If we assume the absence of money illusion, the question becomes whether nominal variables should be deflated by the price level so as to eliminate the effect of price movement. In other words, which variable perform better in the demand for money function - nominal or real?

On theoretical grounds, Friedman (1956) argued that physical goods should be considered as substitute for money and hence, higher expected inflation should induce a portfolio shift away from money to physical assets. In developing countries, which do not have much alternative financial assets to money, nominal interest rates can be considered as the own-rate of money and the

expected inflation rate is the return on real assets (Arestis and Demetriades, 1991).

Monetarists have extensively argued in support of deflation of nominal values with the price level. They have argued that the nominal stock of money is determined by the conditions of supply and real money by the conditions of demand. Consequently they contend that demand for money functions that are specified in real terms are bound to perform better. It is worthy to note that no uniform specification has been accepted in the literature and hence different writers have adopted what they please.

With regard to the problem of inflation there are two basic arguments (Fisher, D. 1983 and Laidler, 1985). One of these has been that during inflation, the changing value of money may be regarded as the opportunity cost of holding cash. The greatest concern in this regard is that the theoretical case is not easy to prove on a priori basis. For example, if the rate of inflation is the actual opportunity cost of holding money, it should then be a good proxy for the rate of interests. Some writers have argued that a persistent fall in the value of money will cause economic agents to prefer non-monetary balances - some of which their value appreciate overtime and hence they expects a negative relationship. Its coefficient should be negative. But this is not always the case in studies. There is, however another school of thought, which argues that an expected price variation will cause precautionary demand for money to rise and hence cause the holding of assets that are denominated in monetary terms to fall. According to this argument, the inflation variable should come out positive[3].

Klein (1977) using U.S. data found that inflation rate has a positive co-efficient. But Blejer (1979) who worked on data from some American countries with high rate of inflation found that the variable has a negative effect.

The expected rate of inflation has been adopted in countries which are experiencing high inflation as the rate of return on alternative financial assets is dominated by the rate of inflation (Cagan 1977; Khan, 1977; Ahumada, 1992 and Honohan, 1994). A study by Choudhry 1995b, however, indicates that in high inflation countries, it is important to include an appropriate exchange rate variable in addition to the expected inflation in explaining the demand for money. Domowitz and Elbadawi (1987) show that to do so may overstate the influence of inflation on money demand.

The expected rate of inflation is measured in many ways in the literature: for example Cagan, 1956; Adekunle, 1968; Darat, 1986; Khan and Knight, 1982; and Gupta and Moazzami, 1988 used adaptive expectation. Rational expectation was used by Arize, 1994 while Brissimis and Leventakis (1995) set it up as the weighted average from the past values. Asilis, Honohan and McNelis (1993) used lagged inflation values while Goldfeld 1973 used data collected from survey opinion. Frankel, 1977, used values derived from forward premium in the foreign exchange market. Crocket and Evans (1980) and Eken and others (1995) simply equated the ex-poste as the ex-ante value. Honohan (1994) in a study on estimating the demand for money in Ghana used the actual inflation in place of expected inflation with an argument that in a

number of earlier studies, the expected inflation was highly correlated with the actual inflation.

The issue of including the price level as a variable has not received much attention in Nigeria. The variable was however included in Fakiyesi (1980) and Shahi and Sheikh (1979). In his study, Ojo (1974b) used the variable on the ground that in an under-developed money market like Nigeria, which lacked financial assets, the choice facing an individual is more between money and financial assets. He found that the expected rate of inflation has a negative effect and was statistically significant. The variable was also tested in Darrat (1986), Adejugbe (1988) and Audu (1988).

2.4.5 Stability

A stable demand for money function implies that there are a few and certain variables the monetary authority can use, from time to time to influence the demand for money in a society and hence influence the level of economic activity. Stability is one of the most heavily researched problems in the demand for money. In spite of this fact, one cannot say convincingly that the demand for money is a stable function of a few or so many variables. The results have been more contradictory than offering solutions to the problem. This issue has been sufficiently discussed in the preceding sections and hence we forbear to discuss it in details here.

We must, however, mention here that the seemingly emerging picture is that the problems of stability or instability revolve around the specification of the

function (at least for the developed countries). The basic problem revolves around the omission of some variables whose addition or omission creates distortion in findings. For example, inflation rates have been found to be one of such variables. The fact that demand for money has been found to be stable and later unstable for the same country by different studies lends support to this view. We shall highlight some of such studies here rather than review each individual study in detail.

Meltzer (1963) used a simple monetarist style and showed that the long-run demand for money function was relatively stable irrespective of the definition of money used. Courchane and Shapiro (1974) subjected the Meltzer specification to Chow test of stability and it failed to perform. Thus the result was doubted. Similarly, Eisner (1963) had some doubts about the stability of demand for money results obtained by Bronfenbrenner and Mayer (1960) using Keynesian-styled study.

In a bid to resolve the above stalemate Lacumas and Mehra (1976) studied the behaviour of parameters of a standard demand for money function. They searched for permanent changes in the coefficients of variables. Their results indicated that partial adjustment is required to stabilize the demand for real balances. Their study also indicated that the demand for money was stable irrespective of the definition of the scale variable and definition of money employed. Contrarily, Mullineaur (1977) observed that disaggregation was what was required to find a stable function. But Hamburger (1977) noted in his study that the basic cause of the contradictory findings was inadequate

specification of the function and that missing relevant variables was a major issue in this respect.

In a further effort to resolve the impasse, Lieberman (1982) in his study observed a break in the stability of the relationship between demand for money in the United States and the rate of interest during the period covered by most of the earlier studies. Although the break could be linked to the period the United States Government[3] commenced prohibition of payment of interest on certain deposits, Lieberman doubted the observed stability of the function on the grounds that the instability test ignored the own rate of return on money, which was favoured by the resulting change. Laidler (1985:131) believes that '.....1970s (and beyond) have generated a good deal of data that cast doubt not just on the stability of the demand for money - interest relationship but on the function as a whole' Subsequent work has shown that institutional changes can account for some, though not all, of the problems.

2.4.6 The Open Economy

The degree of openness of an economy may be defined "in terms of both the percentage of Gross Domestic Product (GDP) which is traded and the volume of the flows of liquid and non-liquid foreign capital". (Fisher, 1983: 196). The higher the percentage of GDP traded the greater the degree of openness and vice versa. Similarly, the higher the volume of flows in and out of liquid and non-liquid capital, the greater is the degree of openness.

In an open economy, choice of assets for portfolio diversification is wider, as foreign-currency dominated assets are now available in addition to the domestic financial and real assets. As more and more countries are moving towards the floating exchange rate regime, the domestic money demand could also be sensitive to the external monetary and financial factors (Bahanani-Oskooee, 1991)[3]. According to McKenzie (1992) if foreign securities were to form an appropriate investment alternative, then their expected rate changes should appear in the money demand function[3].

In the demand for money function, however, it has been contended that an economy deemed to be open should include foreign assets in the potential portfolio of domestic asset holders. This translates into the inclusion of an additional interest rate variable - obviously a foreign rate of interest - livened up with net export data. The net export data translates into the inclusion of balance of payment, which may be defined as:

$$(Xg - Mg) + (Xk - Mk) + (Xm - Mm) = 0 \qquad 2.14$$

where X is exports

M is imports

g is goods

k is capital and

m is money.

The effect of foreign interest rates on domestic demand for money may not be uniform between different exchange rate regimes, although the various transmission mechanisms is not very clear on apriori basis. For example, in a fixed exchange regime, attempts to control the domestic economy by means of

the traditional methods of monetary control can be undermined by capital flows, which will tend to affect the monetary base. For instance, when foreign interest rates rise relative to domestic rates, both domestic and foreign based asset holders will switch from domestic to foreign assets. As a result of this switch, the monetary base of the domestic economy will fall.

The application of the same policy instrument in a flexible exchange rate regime will equally cause both domestic and foreign based asset holders to respond to changes in foreign interest rates. But expectations of fluctuations in the exchange rate in response to movement of assets will put a restraint to the volume of asset movement. It is for these reasons that it is essential to examine the demand for money as a function of foreign interest rates.

Gregory and McAleer (1980) examined the response of demand for money under different exchange rate regimes in the Canadian economy. Their study did not show any significant differences between the different exchange rate regimes. Miles (1978) also examined the problem on Canadian data and showed that foreign currency was a substitute for domestic currency in periods of floating exchange rates. Sargent (1977) uses Canadian, Germany and British data. His observations were roughly the same effect as Gregory and McAleer.

Another issue that has been raised with regard to an open economy is that of higher risks. It has been argued that fluctuating exchange rates are associated with the likelihood of higher risks and hence changes in foreign interest rates will have both direct and indirect effect on domestic demand for money. The direct effect was suggested in the works of Girton and Roper (1981), Miles

(1978) and Aklatar and Putnam (1980). Their separate studies that expounded on the issue of currency substitution argued that domestic asset holders would always increase their demand for foreign currencies in order to spread their currency risks. With regard to the indirect effect, the increased cost of foreign trade which is often associated with less stable exchange rates (such as the Nigerian Naira) could induce less money holding, at least if trade itself declines at a faster rate than the rise in costs. Girton and Roper (1981) therefore argued that the degree of currency substitution bears a negative influence on the stability of the exchange rate. They however noted the possibility of a two-way effect. If currency is exogenously supplied, the higher the degree of currency substitution, the wider will be the potential fluctuation in exchange rate and perfect currency substitution would imply perfectly determined exchange rate. Where currency is endogenously supplied, on the other hand, a higher degree of currency substitution will be associated with smaller fluctuations in exchange rates and vice versa. Thus, Girton and Roper concluded that a fixed monetary growth (as recommended by monetarists) would very likely lead to a depreciating and inferior currency in the domestic economy if there are competitively close substitutes available.

Bomhoff (1980) in his study based on Dutch data, adopted rational expectation approach. His money demand function is

$$\text{In } \Delta M_t = \text{In}\Delta P_t + a_1 \ln \Delta Y_t + a_2 r_{1t} + a_3 \Delta r_{2t} - a_4 \Delta FP_t \qquad 2.16$$

where ΔM_t is change in money stock

ΔP_t is change in price level

ΔY_t is change in income

r_{1t} is own rate

Δr_{2t} is a cross rate of interest and

ΔFpt is the change in forward premium, which Bomhoff used to capture the influence of charges in the ratio of forward spot rate

Bomhoff's reason for use of forward premium is not clear. The literature however presented, amongst others, two reasons (a) as a proxy for expected inflation as advanced by Frankel (1977) and (b) as a measure of the substitution between domestic and foreign money.

The two reasons advanced above work in unison. In the first place, it reflects the substitution between physical goods and money and in the second place the substitution between monies. Third, it shows the substitution of both with goods and external assets. The study came up with the expected signs with the forward premium used to capture the influence of changes in the ratio of forward to the sport rate (negative).

Perhaps the most direct and basic study on open economies is the work of Hamburger (1977). Hamburger based his work on German and U.K. data. He used narrow stock of money as the dependent variable and compared a short-term domestic interest rate, an equity yield (measured by the dividend/price ratio) and the covered yield on short-term foreign assets. He showed that the equity-yield rate was unsuccessful while the foreign rate came out successfully as well as the domestic rate. His demand for money function was notably stable. For the U.K, Hamburger showed that for narrow money, the best

performance is obtained in a formulation in which the equity yield and the uncovered rate on three months Euro-dollar deposits were included in the function but when a domestic interest rate was included in the function, it came out insignificant.

Bomberger and Makinen (1977) paid more attention to the measures of income in an open economy. They pointed out that in an open economy it is possible that the influence of the interest rate may be positive, depending on the income variable used as proxy. The income proxies they presented are the "expenditure" and the "production" proxies with the two differing only to the extent that balance of trade are not zero. The reason for this argument is that foreign traders need to hold money balances, which may be larger or smaller than purely domestic needs. Based on this argument, they carried out their study on twelve countries. They found that the expenditure proxy produced a better fit while in one case (the UK) the interest rate came out with a positive co-efficient for the production proxy.

Towler (1975) also took interest in the issue. He considered the effect of exchange rate the demand for money. He concluded that it depends on the income elasticity of the demand for money. If the income elasticity is greater than one, devaluation will tend to shift the demand downward (and vice versa).

Some attempts have also been made to study the influence of the external world on demand for money in Nigeria. For example, Darrat (1986) considered how international monetary transactions influence the demand for money in Nigeria. The variables employed in the study are the broad and narrow definitions of money, permanent income and inflationary expectation.

He found that foreign interest rate exerts a significant negative impact on the demand for money. The impact (of foreign interest rate) was stronger on real balances in terms of long-run elasticities than the expected inflation rate. Darrat therefore concluded that money demand function in open economies that do not include foreign interest rates among their explanatory variables might be seriously mis-specified to the extent of potentially rendering the whole money demand relationship structurally unstable. Oresotu and Mordi (1992) also examined the influence of the international economy on money demand function in Nigeria. Their study, in which the exchange rate was used as a proxy to capture external influence, showed that the exchange rate exerts a significant effect on domestic demand for money. They concluded that the non-inclusion of this variable could lead to biased results.

2.5 SPECIFICATION ISSUES

2.5.1 Partial Adjustment Models

One of the log-linear specifications that have been extensively used for estimating money demand is the partial adjustment model, originally introduced by Chow (1966). The model augments the conventional formulation of money demand by introducing the following two concepts: (i) distinction between "desired" and "actual" money holdings and (ii) the mechanism by which the actual money holding adjust to the desired levels[3].

The problem of partial adjustment of economic balances (i.e. money and bonds or stocks) from their actual to their desired levels is often inexorably mixed up

with the role of income. This is because the flow of income is usually seen as the cause of the deviation of actual balances from planned balances.

The money market is assumed to be in equilibrium initially. When the original condition is disturbed, either income or interest rate or both are necessary to adjust to restore the market back to the equilibrium so that the desired money balances equal the actual money stock as reported in the statistical series (Boorman, 1976). However, the presence of portfolio adjustment cost prevents a full and immediate adjustment of actual money holdings to desired levels (Goldfeld, 1973) and this, as suggested by Chow (1966) is assumed to take place through a partial scheme.

The traditional partial adjustment models used lagged dependent variable to attempt to capture directly the aspect of adjustment in the demand for money function. In some specifications, lagged independent variables were included, not because the authors so desire, but as a result of the application of Koyck transformation. Koyck transformation is normally used to convert the unobservable permanent income into observable current income. The two approaches produce the same or identical equation.

One of the notable works on partial adjustment of money balances was by Darby (1972). Darby argued that transitory balances may be treated as a shock absorber during periods of disequilibrium. He proposed that;

$$\frac{dMTt}{dt} = a_1 STt + a_2 MTt \qquad 2.9$$

Where STt is transitory savings and MTt is transitory money balances.

He included lagged dependent and independent variables in his model. The lagged dependent variable was used to estimate lags in the adjustment of actual to desired cash balances while the lagged independent variable was on account of transitory cash flows.

Darby's result was consistent with his expectation. The interest rate variable had a positive co-efficient. He showed that there is a relatively slow adjustment of actual to planned transitory balances. He found that it takes eleven quarters for a disequilibrium in transitory balances to completely disappear (or fall below 10 per cent of its original level). This result contrasts the findings of Barro (1978). Barro found the adjustment period to be about two quarters.

Goldfeld (1973) also examined the problem of partial adjustment of actual to planned cash balances. According to him

> *'...the adjustment can be conceived as a slow response of desired stock itself to actual current values of income and interest rates, rather than a gradual shift in money holdings to meet a promptly adopted new level of desired holding*" (1973, p.599).

Thus, his equation has the same general form as short-run models but the adjustment parameter came from an equation with revised expectation. For example:

$$Y_t^e - Y_{t-1}^e = \lambda(Y_t - Y_{t-1}^e) \qquad 2.10$$

$$R_t^e - R_{t-1}^e = þ(R_t - R_{t-1}^e) \qquad 2.11$$

His suggested specification which is just like that used in many empirical tests but has their coefficient interpreted as coming from a different structural and the adjustment coefficients interpreted as rates of revision of expectation rather than as actual adjustments was:

$$\text{Log}(M_t/P_t = a_0 + a_1 \log Y_t + a_2 \log Rs + a_3 \log R_L + a_4 \log M_{t-1}/P_{t-1} \quad 2.12$$

The coefficient of the lagged adjustment variable (M_{t-1}/P_{t-1}) was close to unity. Goldfeld interpreted this to indicate implausibility of long adjustment lags. Although this result differs significantly from earlier studies, many authors adopted the model as the standard formulation[3].

Santomero and Seater (1981) developed a model, which have an equilibrium and a disequilibrium arguments. They found that partial adjustment has a significant but small effect that dies away within two and three quarters. This result seems to support Friedman (1961) and Feige (1972)[3].

With respect to developing countries, studies in the area of partial adjustment are rather skimpy. There have been little or no rigorous attempts at estimating the magnitude of adjustment. We should, however, note the attempts on the problem by Teriba (1974), Shahi and Sheikh (1979), Adejugbe (1988) and Oresotu and Mordi (1992) on the Nigerian economy. Teriba observed that the speed of adjustment between desired and actual demand deposits is very fast. Shahi and Sheikh in their study employed the lagged dependent variable and inflation rate. They found that the speed of adjustment of actual to desired cash balance was reflective of the inflationary situation in the country. Adejugbe, who adopted the Aiken's Generalized Least Squares in his

estimation, observed that the adjustment of actual real M_1 to desired level was fast. While this result was supported by the study of Audu, Oresotu and Mordi who found that the speed of adjustment is quite low contradicted it. Specifically, Oresotu and Mordi found that the speed of adjustment is longer than two years.

According to Leventakis and Brissimis (1991) the partial adjustment models worked well using the postwar data up till 1973, but faired very poorly when data after 1974 were included. Specifically, it was unable to explain the apparent instability in the money demand experienced since the early 1970s to what is called "missing money episode". The empirical estimates have produced inaccurate predictions of real money balance (Boughton, 1991). In general, all estimates showed very low short-run elasticities for income (about 0.1) and interest rates (about –0.05) and a coefficient close to unity for the lagged dependent variable. On account of the limitations of the partial adjustment models, Tseng and Corker (1991) have suggested that it should be replaced by a more general, inter-temporal version called the error-correction specification.

2.5.2 Buffer Stock Models

The Buffer Stock Models (BSM) came into the literature during the 1980s as an alternative paradigm for money demand estimation to overcome the two common problems with the partial adjustment specification namely; interest overshooting and long implausible lags of adjustment. The theoretical

foundation for the model was derived from the precautionary demand for money. Money holdings in these models are considered as shock absorber to smoothen much of the unexpected day to-day variations in receipts and expenditures. Since it is costly to make continual portfolio adjustments, an unexpected inflow might remain as excess money holdings for some time. The economic agents, aided by the buffer the money provides, permit temporary deviations of their money holdings from the desired level (Milbourne, 1988), and adjust their current money holdings to some average target level instead. The literature on this is adequately surveyed in Laidler (1984 and 1988), Culberton and Taylor (1987), Milbourne (1988) and Culberton and Barlow (1991)[3].

The models fall under the broad category of disequilibrium approach of demand for money. Two common basic assumptions of this approach are exogenous money stock, that is, money stock is primarily influenced by the supply factors – open market operations and/or loan expansion of the banking system – and a disequilibrium real balance effect. This approach assumes that the money market is in disequilibrium because there is a possibility that at certain times and places and over certain time intervals aggregation over the agent's excess money holdings may not eliminate the difference between the aggregate demand and supply of money (Laidler, 1984).

The disequilibrium phase can be long enough to have the exogenous changes in the money supply work their way through the economic system resulting in positive real balance effect in all markets. This approach, thus, concerns more on the transmission mechanism of monetary policy in the short run and renders

an alternative explanation of the short-run dynamic relationships between money, income, prices, and interest rates in comparison with the conventional demand for money functions.

There are two major changes in the BSMs over the partial adjustment models. First, money shocks are explicitly modeled as part of the determinant of money demand. Second, the lag structure is much more complex. These two novelties have the following three implications (Boughton and Tavlas, 1991):

First, the short-run interest overshooting problem is avoided[3]. According to the proponents of the buffer stock, the reason the partial adjustment models did poorly in explaining the missing money episode is that they failed to consider the short-run impact of monetary shocks. In the BSMs, the positive monetary innovations result in an accumulation of cash balances in the short-run, and hence, the cash balances rather than the interest rates adjust, which help in overcoming the interest overshooting problem.

Second, the complicated nature of the monetary transmission mechanism is much more realistically dealt with by modeling the effects on short-run demand for money directly.

Third, the insertion of the money shock variable in the money demand function addresses the specification bias of the partial adjustment models assuming that the BSM is the "true" model.

The literature identified three approaches in the applied work of the BSM. These are the single equation disequilibrium, complete disequilibrium and shock absorber models. The single equation models start with the notion that if

the money stock is exogenous, the partial adjustment models should be considered as a semi-reduced form. In other words, it is an equation for one of other variables rather than a structural money market equation.

Therefore, this approach recommends inverting the money demand function prior to estimation, assuming that the chosen dependent variable (price level, interest rate, or output) adjusts slowly to its long-run value. Artis and Lewis (1976) argued that the equation is a semi-reduced form for interest rate, while Laidler (1980) interpreted it as one for price level. Unfortunately, as Cuthbertson and Taylor (1987) pointed out, a major disadvantage of this approach is that only one argument may be chosen as the dependent variable while on a priori grounds one might expect all the arguments of the demand function to adjust simultaneously.

The second approach of complete disequilibrium monetary models, therefore, involves large scale econometric models where the disequilibrium money holdings are allowed to influence a wide range of real and nominal variable.

The money disequilibrium term appears in more than one equation hence, the model yields cross-section restrictions on the parameters of the long-run demand for money function. The major problem with this approach is that the estimates of the coefficient of the long-term money demand equation are conditional upon the correct specification of the entire model (Cuthbertson, 1988 and Milbourne, 1988). These types of models did not perform well in the flexible exchange rate regime of open economies as they did in the context of closed economies such as the United States (Cuthbertson and Taylor, 1987).

Another strand in the buffer stock approach is modeling the "shocks" affecting the demand for money. This hypothesis is rather loose and hence the "shocks" analyzed vary from study to study. However, the shock absorber model as developed by Carr and Darby (1981) is the most widely used BSM. This type of model directly estimates the demand for money function by incorporating money-supply shocks in an otherwise conventional demand for money function. The model emanated from the inadequacy of the Chow's partial money demand in quarters in which money supply shocks occur. Carr and Darby (1981) argue that the anticipated changes in money supply will be reflected in the price level expectations leaving no effect on real money balances. However, the unanticipated changes in the money supply will temporarily be displayed in money holdings. They modified the conventional money demand equation to include unanticipated money as an additional explanatory variable.

The original Carr and Darby's model has gone through several modifications to address the econometric problems of the original version. In general, the shock absorber model formulates the money demand as follows:

$$(m-p)t = \beta o + \beta 1 yt + \beta 2 it + \beta 3(mt-1 - Pt-1) + \delta(mt - mt^*)\, ut$$

where $mt^*t = \gamma Z\, et$

The above equation is the just partial adjustment model of demand for money with an additional term of unanticipated money of (*mt-m*t)*. Where m*t is the anticipated component of the money supply). Z is a set of variables that agents

assume has a systematic influence on the money supply; g is a vector of coefficients to be estimated; and et, is a white-noise error.

The results of the empirical application of this approach are mixed. While Boughton and Tavlas (1991) obtained good results for a number of industrial countries, other researchers as referred in Cuthbertson and Taylor (1987) including the authors themselves, concluded that the BSM of Carr and Darby type was not supported by data. The performance of the model also depends on the underlying partial adjustment scheme used. One major criticism is that *mt*, appear on both sides of equation causing econometric problems, in specific that mt, and ut, are no longer uncorrected.

In general, the BSMs have been proposed as improvement over the Partial adjustment models, but they are still subject to a number of short comings. Further to the words of Laidler (1984) that the lagged demand for money variable is "badly needed," Goodfriend (1985) argues that the BSMs are a way to justify the lagged dependent variable on the right hand side rather than having an economic justification in the first place. The short-run dynamism structure is much more sophisticated in the BSMs in comparison to the PAMs, but still is somewhat restrictive. Another criticism with the BSMs is the assumption of money stock exogeneity. As Laidler (1993), has pointed out the nominal money supply, in real world, does respond to changes in the variables underlying the demand for money. Fischer (1993), indeed, shows in the context of Switzerland that money stock is a dependent rather than an exogenous variable.

In the empirical testing as well these models did not fare well. Milbourne (1987) summarized the reservations of the BSMs both in theoretical and in empirical grounds. In fact, Milbourne (1988) concluded from his extensive survey that:

> "*the buffer stock notion is an interesting idea, the current models do not lend themselves to empirical testing, and those models which do have performed poorly.*"

Subject to these criticisms, the BSMs lost their appeal while the (Error Correction Models (ECMs) have come to the forefront in estimating the money demand function to which we turn in the next subsection.

2.5.3 Error-correction models

The ECMs have proved to be one of the most successful tools in applied money demand research. This type of formulation is a dynamic erro-correction representation in which the long-run equilibrium relationship between money and its determinants is embedded in an equation that captures short-run variation and dynamics (Kole and Meade 1995). The impetus came from the findings that in modeling the demand for money, due consideration be given not only to selecting appropriate theoretical set up and the empirical make up, but also in specifying the proper dynamic structure of the model. Accordingly, the economic theory should be allowed to specify the long-term equilibrium while short-term dynamics be defined from the data. The new research shows that the dynamic adjustment process is far more complex than as represented in

the PAMs and BSMs. According to Sriram (1999), one of the major reasons for the failure of these two types of models is that they severely restricted the lag structure by relying solely on economic theory or naïve dynamic theory without thoroughly examining the actual data (and the underlying data generating process)[3].

Works done by researchers like Hendry (1979 and 1985) constantly questioned whether the observed instability in the U.K. and the U.S. money demand functions could be a spurious phenomenon due to incorrect specification. Transformation of variables from levels into first differences to overcome the nonstationarity problem (and hence spurious regression problem) as carried out by Hafer and Hein (1980), Fackler and McMillin (1983), and Gordon (1984) is not a solution because it loses valuable information on long-term relationship that the levels of economics variable convey. There was also a constant tension in applied money demand work between the long-run equilibrium and short-run dynamics and the difficulty in specifying explicit plausible methods of expectations formations of dynamic adjustment. The cointegration and ECM framework seem to provide answers to these modeling, specification, and estimation issues. The cointegration technique, if carefully applied, allows inferences on the long-run relationship providing a firm basis for the investigation of short-run dynamic.

The literature indicates that the ECM contains information on both the short- and long-run properties of the model with disequilibrium as a process of adjustment to the long-run model. Granger (1983 and 1986) has shown that the concept of stable long-term equilibrium is the statistical equivalence of cointegration. When cointegration holds and if there is any shock that causes disequilibrium, there exists a well defined short-term dynamic adjustment process such as the error-correction mechanism that

will push back the system toward the long-run equilibrium. In fact, cointegration does imply the existence of a dynamic error-correction form relating to variables in question (Engle and Granger (1987).

Since the long-run specification is based on the theory and the short-run behaviour is modeled after carefully examine the underlying data generating process, the model formulation is not standard across the board but may differ from case to case. As they have demonstrated their ability to incorporate the difficult empirical issues in modeling and estimating money demand and showed the richness in their implications, the ECMs have attracted significant research interest among economists from around the world. They also encompass previously discussed models as restrictive cases. Consequently, within the past decade, the estimate of cointegrating relationship together with largely unconstrained dynamic adjustment processes have become a useful generalization of the PAMs and the BSMs that dominated the literature in the 1970s and early-1980s[3].

Arize and Shwiff (1993) summarize the desirable properties of the ECM as follows:

> *"First, it (ECM) avoids the possibility of spurious correlation among strongly trended variables. Second, the long-run relationships that may be lost by expressing the data in differences to achieve stationarity are captured by including the lagged levels of the variables on the right-hand side. Third, the specification attempts to distinguish between short-run (first-differences) and long-run (lagged-levels) effects. Finally, it provides a more general lag*

structure, while it does impose too specific a shape on the model (Hendry (1979).”

There is a growing literature on the application of cointegration with or without ECM to examine the demand for various definitions of money in the past ten years. One major contribution of this procedure is that it allows the researchers handle the question on the appropriate formulation of the dynamic elements of the model independent of the specification of long-run parameters. The major contributions on these techniques and concepts were made by Sargan (1964), Davidson and others (1978), Banerjee and others (1986), Granger (1986), Hendry (1986), Engle and Granger (1987), Johansen (1988), Phillips and Perron (1988), and Johnasen and Juselius (1990)[3].

In the money demand literature, these techniques initially were to examine the demand for money in the United States and United Kingdom as traditionally these countries dominated the research on money demand. A significant degree of additional effort was directed in these countries to explain the instability of money demand observed in the 1970s[3].

The new techniques were also used, to certain extent as in the case of previous models, for studies dealing with other industrial countries as the central banks in these countries have always been interested in analyzing the demand for money because of its implications in conducting the monetary policy.

The ECM approach received only scant attention to analyze the demand for money in developing countries in the 1980s with exceptions such as Domowitz and Elbadawi (1987) on Sudan, Arestis (1988a) for a group of small developing economies, and Gupta and Moazzami (1988, 1989, and 1990) for

Asia. With the encouraging results from these earlier studies researchers have expanded their focus to analyze the demand for money in a wide range of countries.

The earlier ECMs on money demand tended to be based on bivariate cointegrating relationship between money and the chosen scale variable as developed by Engle and Granger (1987). However, further research suggested that multivariate cointegrating vectors encompassing a broader number of variables provide a fuller characterization of the long-run determinants of demand for money. The specification of such multiple cointegrating vectors between nonstationary variables primary employs the procedures developed by Johansen (1988) and Johansen and Juselius (1990), which make the original Engle-Granger framework as a special case.

In terms of the study objectives, majority of the studies in the literature were interested in estimating cointegrating relationships and setting up appropriate short-run dynamic ECMs. Only very few focused on estimating just the long-run cointegrating relationship (see Hafer and Jansen (1991), Eken and others (1995), Haug and Lucas (1996), for example). With regard to estimation techniques, the two widely used approaches are Engle and Granger (1987), and Johansen (1988) and Johansen and Juselius (1990). Within these two procedures, the latter has become more prominent as it provides an opportunity to evaluate the presence of multiple cointegrating vectors and has shown that it is more efficient than the former. The former approach was used only in a few studies especially during the early part of the 1990s. In a way, the studies published in the mid and late 1980s exclusively used the former procedure.

The recent papers most often apply multivariate procedures especially of Johansen (1988) and Johansen and Juselius (1990)[3].

The most common unit root test is the augmented Dickey-Fuller (ADF) test although the number of lags to start with varied across studies. The other unit root tests such as Dickey-Fuller (DF), Kwaiatkowski, Phillips, Schmidt, and Shin (KPSS), Phillips and Perron, and CRDW also received some attention. In terms of results, majority of the papers did find cointegrating relationship between the monetary aggregates and the arguments of the money demand functions. The caveat, however, is that sometimes conflicting results were obtained from different tests being used. One important finding is that generally a stable relationship between money and its arguments is obtained. The Chow test was primarily used for examining the stability.

It is interesting and surprising to find stable money demand relationships considering the big debate on monetary instability of the 1970s in the development world[3]. A point worth noting is that by applying the new ECM framework, some studies have even concluded that the demand for broad money in Japan, the United Kingdom, and the United States remained stable during those years, which the overwhelming past research employing the conventional models identified as the period of monetary instability (Rose (1985), Baba, Hendry, and Starr (1988) Hendry and Ericsson (1991b), and Mehra (1991) for the United States; Corker (1990) and Yoshida (1990) for Japan, and Adam (1991), Hendry and Ericsson (1991b) for the United Kingdom). These observations just confirm that indeed the earlier models did suffer from specification problems and the ECM models provide a better

framework to model the money demand amongst the specifications that have been developed from the conventional models.

2.5.4 Microeconomic Approach

It has been argued that the traditional approach (which is sometimes called the macro-economic approach) to estimating the demand for money has not produced consistent and reliable results for the function as a whole, its disaggregates and even the issues relating to it. Rather the existing body of literature shows that there are a lot of conflicting and inconsistent results. By implication therefore, the traditional money demand function which treats money balances as a function of income, and interest rates (and sometimes the rate of inflation) have not been particularly helpful in predicting fluctuations in the demand for money or in formulating and evaluating monetary policy[3].

In the light of the foregoing, there is an evolving school of thought that holds the belief that the money demand function should be founded on micro-economic foundations. That is, money should be regarded as a commodity and its demand function derived and investigated as such. Attempts in this regard are usually based on the utility maximization objective of wealth holders. Money is seen as a commodity whose utility wealth holders strive to maximize at any point in time.

The new school of thought also contends that the traditional money demand function have been the subject of several unexplainable shifts, which often imply larger liquidity effect than was typically experienced. Friedman (1984)

argued that the yet unexplained break in income velocity of M_1 in the United States of America is the most dramatic example of this phenomenon.

These and perhaps more contradictions and overt deficiencies of the macroeconomic demand for money functions in aiding policy makers in formulating effective oriented policies and the need to find a lasting solution have stimulated the interest of a number of researchers to attempt to estimate the money demand function in a manner that is consistent with micro-economic foundations. Serletis (1988), Fisher (1989) and Moore, Porter and Small (1990) have made various attempts in this regard by formulating money demand models based on utility maximization approach[3].

Even then, the estimated own price elasticities of demand for monetary assets obtained by most of the aforementioned studies are positive, implying, that their demand curves slope upwards. Thus even in these cases the empirical results have been largely discouraging. We believe that these studies and others not reviewed but which adopted the macroeconomic approach suffer from inadequate model specification. We shall therefore adopt an advanced form of the micro-economic foundation approach in this study. Our thesis is based on the belief that it is possible to obtain negative own and cross price elasticities of demand for monetary assets. The study shall also test the stability of the money function with a view to observing that the demand for money in Nigeria is a stable function of a relatively few economic variables - income and user costs[3].

1.62.5CONCLUSION

Significant amount of work has been done in estimating money demand functions both in developed and, increasingly, in developing countries. The empirical work begins with an objective that for a stable money demand function it is imperative to have as fewer arguments as possible linking money with the real sector. The literature review confirms the earlier theoretical assertion that the major determinant of money demand are scale variable and opportunity cost of holding money, which are represented by various alternatives.

Since the availability and definition of monetary aggregates vary among countries, the typically employed aggregates included narrow and broad money. The narrow money usually represented by M_1 and the broad money by M_2, M_3 and sometimes others. A number of other aggregates in between these two broad categories are also used. Some studies also estimated the demand for individual components of these monetary aggregates (disaggregated by type of assets and by type of holders, some others tried the divisia aggregates for the broad categories. The scale variable is represented by two broad choices namely income and wealth. Here again, possible representation for income comprised of GNP, GDP, NNP, national income, industrial output and so on, and for wealth, permanent income, consumption expenditure, for instance.

For the opportunity cost of holding money, the theory called for own rate and the return on alternative assets. However, the empirical work requires inclusion of some representative rate rather than focusing on any specific interest rates. For developing countries characterised by underdeveloped financial sector or

those where governments regulate the interest rates, the expected inflation enters as an additional variable or used as the only variable to represent the opportunity cost of holding money. In hyper-inflation countries, the expected inflation variable is solely used in place of any type of interest rate mainly because the rate of return an alternative financial assets is dominated by the rate of return on real assets.

Open market models recently seem promising. The inclusion of some combination of appropriate exchange rates and foreign interest rates in addition to the variables discussed above have appeared significantly in most recent models. This seems right because in the world of international capital and financial market integration, the recent studies indicate that the influence of international monetary developments on domestic money holdings should be explicitly taken into account in specifying the money demand function. This is true for both developed and developing nations alike.

Partial adjustment models were very popular in the 1970s. However, further studies have shown that it is unable to explain the missing money episode of the 1970s. a number of refinements were made to improve its performance. These changes improved the models' ability to explain the past performance but shown only limited success in predicting the future money demand. Further research indicated that the partial adjustment models suffered from specification problem and highly restrictive dynamics. The solutions suggested were to modify the theoretical base and improve the dynamics structure. The first suggestion led to buffer-stock models, which were built on the theory of

precautionary demand for money, and the second suggestion resulted in error-correction models.

However, attempts to further explore opportunities based on the consumer demand theory initiated by Friedman have stimulated studies called microeconomic models. We believe that by combining what the theory says with the advancement in time series econometrics, the current state of research seems to be better equipped to analyse the demand for money in Nigeria.

The literature revealed a growing number of papers written in a score of countries in the past three to four decades. Two important points come out of the analysis presented. First, both the model specification and the estimation technique are very important. Second, recent studies are finding more and more evidence supporting the foreign influence on the domestic money demand function due to liberalization of world financial and globalization of world capital markets.

END NOTES

CHAPTER THREE

METHODOLOGY OF RESEARCH AND DEVELOPMENT OF MODELS

3.1 Plan of the Study

The study involves a combination of field and desk research.

Field Survey: The field survey is aimed at establishing empirically what factors individuals and firms consider in determining how much money they want to hold in Nigeria. This pre-study survey involves the collection of primary data on individuals households and corporate bodies, mainly banks. For this segment of the study a questionnaire was administered on 100 individuals and 10 banks. A copy of the questionnaire is attached as Appendix A. The results are presented in tables. Some measures of central tendency used in summarizing the results are:

Mean;

Median;

Mode; and

Variance and Standard Deviation.

Desk/Econometric Research: The desk research involves analysis of secondary data using econometric tools to determine, on a macro-economic level, the factors that determine the demand for money in developing countries, using Nigeria as our case study.

3.2 Model Framework

There is a diverse spectrum of money demand theories emphasizing the transactions, speculative, precautionary and utility considerations. Money is both a means of payment and an asset (Tobin, 1956, Friedman, 1956, Sriram 199a) depicting the transaction and portfolio motive. These theories implicitly address a broad spectrum of hypothesis. One significant aspect, however, is that they share common important variables among all of them. In general, they bring forth relationship between the quantity of money demanded and a set of few important economic variables linking money to the real sector of the economy (Judd and Scadding, 1982). Although all the theories consider similar variables to explain the demand for money, they frequently differ in the specific role assigned to each. Consequently, one consensus that emerged from the literature is that the empirical work is motivated by a blend of theories.

Our main objective in this study is to develop and test representative models from the above classification with a view to determining the one that best explains the demand for money in Nigeria. Since relatively less volume of studies have taken place on the microeconomic models, especially with

reference to developing economies, we shall be more detailed in the development of its model.

Taking the above and the specific characteristics of developing economies into consideration, we classified the existing theories into three – conventional models, structuralist models and micro-economic models.

1.6 3.21 Conventional Models

As discussed (chapter 2) the conventional theoretical framework embraces two basic money demand models – an asset model and a transaction model. The theoretical asset demand model is represented in the works of Friedman (1956), Keynes (1933) and Meltzer (1963) while the transaction demand model is presented in Baumol (1952), Tobin (1956), Miller and Orr (1966) and Darby (1972). The two approaches produce similar structural relationship, although, there are a number of important differences. The main difference lies on the stability of the determinants of the demand for money. Keynes believe that asset holding is volatile and that money holding shifts with respect to changes in interest rates while the monetarists emphasizes the stability of velocity.

The standard model of demand for money is another issue over which economists are not in agreement. That money holding is functionally related to income or wealth and interest rate(s) or some other cost variable is not in dispute. The disagreement is on the definition and magnitude of the variables. However, our development of the models follows the order of the various schools on the subject.

According to the Classical and Cambridge schools, the demand for money function can be stated as:

(1) $M_{it} = f(Yi)$

Where Mi is money balances defined in narrow or broad terms;

Yi is the income variable, defined as GNP, GDP or permanent income.

Considering the Keynesian theory, which believes that money demand is volatile with respect to interest rate, we obtain a second, third and fourth equations as:

(2) $M_{it} = f(Yi, r_L)$

(3) $M_{it} = f(Yi, r_S)$

(4) $M_{it} = f(Yi, r_L, r_S)$

Where r_L and r_S refer to long-term and short-term interest rates respectively.

From the point of view of the new quantity theorists and other specifications of the conventional theory (also widely referred to as the neo-classical models) could be derived. These models include price level (see Appendix 3.1), inflation rate, exchange rate and lagged money supply as arguments[3]. Thus, we can present the following additional set of equations:

(5) $M_{it} = f\ (Yi, r_L, r_S, P)$

(6) $M_{it} = f\ (Yi, r_L, P)$

(7) $M_{it} = f\ (Yi, R_S, P)$

(8) $M_{it} = f\ (Yi, r_L, M_{it-1})$

(9) $M_{it} = f\ (Yi, R_S, M_{it-1})$

(10) $M_{it} = f\ (Yi, r_L, R_S, M_{it-1})$

(11) $M_{it} = f\ (Yi, x)$

(12) $M_{it} = f\ (Yi, r_L, x)$

(13) $M_{it} = f\ (Yi, R_S, x)$

(14) $M_{it} = f\ (Yi, R_S, M_{it-1}, x$

(15) $M_{it} = f\ (Yi, r_L, M_{it-1}, x)$

(16) $M_{it} = f\ (Yi, r_L, p)$

(17) $M_{it} = f\ (Yi, R_S, ^{p)}$

(18) $M_{it} = f\ (Yi, r_L, rS, ^{p})$

Where M_{it-1} refer to money supply in time t_{-1}

X refers to the exchange rate in time t_0, and

P refers to the annual change in the rate of inflation.

Throughout the study, we adopted two definitions of money - narrow (M_1) and broad (M_2). M_1 is currency in circulation plus demand deposit, while M_2 is M_1 plus time and savings deposit.

Government stock rate is used as long-term interest rate while treasury bills rate is used as short-term interest rate.

Income is defined as Gross Domestic Product (GDP) and Gross National Product (GNP) and they are further defined in nominal and real terms[3].

Expected Results of the Conventional Models:

The first of the above equations represents the classical model, which states that income is the only determinant in the money demand equation. If this version is right, we expect the income elasticity co-efficient to be unitary and with a relatively high $R^{2.}$

With respect to the other equations, we expect the interest rate elasticity to be low and possess negative signs. This will indicate an inverse relationship and unimportant variable as suggested by Friedman.

If, on the other hand, the income elasticity parameter were 1.8, it would validate Friedman's prediction that money is a luxury. Unitary elasticity, however, would support the proportionality principle of Keynes as against the elasticity coefficient of 0.5 predicted by Tobin and Baumol. Moreover, to validate the importance of the models we expect a better fit relative to the classical version.

On the price elasticity coefficient, our objective is to test the linear homogeneity assumption that price elasticity is one less income elasticity coefficient. This assumption will be validated if the price elasticity parameter is equal to zero in equations 3, 5, and 7.

3.22 Complementary Models

The traditional models presented above treat money and physical assets as different form of wealth but ignores the accumulation process. Mckinnon (1973) and Shaw (1973) individually criticized the conventional models and provided similar framework for analyzing the subject in developing countries. Mckinnon contends that the conventional models cannot perform well in developing countries because of the assumptions of the models – that the capital market is competitive with single interest rate and with real balances being treated by people as substitutes and vice versa. According to Mckinnon the relationship is complementary because given the limited possibilities of

finance for investors in developing countries and the lumpiness of physical capital, deposits serve as conduit for capital formation, thereby making money and capital complementary.

In developing countries where the financial sector is underdeveloped this generalization is bound to cause serious problems. Mckinnon (1973), Shaw (1973) and Wijinbergen (1982) argued that such underdevelopment creates circumstances, which change the nature of the relationship between money and physical assets from a competitive into a complimentary relationship. The implication of this for the demand for money function is to include the current and expected rate of return on capital and the real rate of return on money as determinants. This tends to imply that the fragmentation of capital and financial markets in developing countries is the most important factor in the slowing down of growth and development. These are some of the inherent characteristics of developing countries, which the conventional theories failed to take into account.

Shaw's analysis reached the same complementary conclusion although it laid greater emphasis on external rather than internal financing. The difference in emphasis on different methods of financing by Mckinnon and Shaw has led to assertions (Fry 1978:472) that the hypotheses are incompatible. It is therefore, pertinent to examine, briefly, the compatibility of the Shaw-Mckinnon hypothesis.

Mckinnon's complementarity hypothesis emphasis the role of deposits in encouraging self financed investment, with an increase in deposit rate stimulating demand for capital by making savings more rewarding, thereby, increasing the amount of internally financed investment. Shaw's hypothesis focuses on the role of deposit accumulation in expanding the lending potential of financial institutions, and thereby, stimulating externally financed

investment. In spite of these differences, the two hypotheses are complementary rather than competing. In the light of the foregoing we have adopted the Mckinnon's model for our study.

The Mckinnon's demand for money may be specified as:

$$\frac{Mi}{P} = L[Y, \frac{I}{Y}, (D\text{-}RP)]$$

where Mi = Money, 1 = 1, 2.

Y = Income (GDP)

P = Consumer price index

D = Interest rate on deposits

RP = Percentage rate of inflation

This equation is estimated in its the log-linear form. Using the two definitions of money, we obtained the following two equations, which are estimated:

$$(19a) \qquad \ln\frac{M1}{P} = \ln a_0 + a_1 \ln Y + a_2 \ln\frac{I}{Y} + a_3 \ln(D\text{-}RP)$$

$$(19b) \qquad \ln\frac{M2}{P} = \ln a_0 + a_1 \ln Y + a_2 \ln\frac{I}{Y} + a_3 \ln(D\text{-}RP)$$

The recommended solution to fragmentation is liberalisation of the financial system. On the import of liberalisation, Shaw (1973:47) noted, "Nonetheless the signals it gives do invoke changes in market structure and market behaviour

that makes steady optimal growth a more relevant dream for lagging economies". He however, warned that:

> *"the strategy of liberalisation including financial deepening can perform no miracles in cleaning up the markets for money and capital. … what it can do is difficult even to measure and describe precisely…".*

3.23 New Structuralist Model

Buffie, Wijinbergen and Lim proposed a model, which though maintains the basic classical framework where financial assets are regarded as substitutes for one another, includes the curb market interest rate. The curb market interest rate is introduced to measure the degree of substitution between the formal money and curb market loans in the money demand equation.

Curb market rates are not easily obtainable due to paucity of data in developing countries. The extent of unorganized market, even though generally accepted as large, is not easily estimable. To overcome the difficulties posed by unobservable curb market rates, it is assumed that asset holders divide their assets between money (i.e. currency, savings, time and demand deposits), curb market loans and physical assets. The level of curb market loans is assumed to depend on the following assets:

i) money – deposit rate of interest (rd);
ii) curb market loans – curb market rate (rc);
iii) physical assets – the expected rate of inflation (pe); and
iv) real income (y)

In Nigeria where the rate of interest was institutionally determined for most of the period covered by our study, we may assumed that the deposit rate would not necessarily clear the money market and that the curb market interest rate will fluctuate form time to time to clear (i.e. equate demand and supply) the market. The curb market rate will fluctuate in response to the volume of real bank loans to the private sector (Cp), deposit interest rate (rd), expected rate of inflation (Pe), working capital need of firms – represented by the domestic price of imported inputs (Pm), real wages (w) and real income (y). This is presented as:

The money demand function in developing countries could, therefore, be presented as:

$$Md = f(y, Pe, Pm, W, rc, rd) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .. 3.1$$

and

$$rc = r(y, Pe, rd, w, Pm, cp) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .. 3.2$$

where W is wealth;

(Cp), is real bank loans to the private sector,

(rd) is deposit interest rate;

(Pe) is expected rate of inflation;

(Pm) is working capital needs of small and medium firms – represented by the domestic price of imported inputs;

(w) is real wages; and

(y) is real income

In equation 3.1 (see Appendix 3.2), it is also assumed that: f1, f2, f4, f6 > f0, f3,f5 < 0

And on equation 3.2: r1 = 0, r1>0, I = 2,3,4,5,6 < 0.

By taking total differentiation of equation 3.2 and substituting into 3.1 yields:

$$Md = f_1Y + f_2P + f_3W + f_4Pe + f_5rc + f_6(r1Y + r_2Pe + r_3rc + r_4W + r_5Pm + r_6Cp).$$

The above equation can be restated as:

$$Md = (f_1 + f_6r_1)Y + f_2P + f_3W + (f_4 + f_6r_2)Pe + f_5 + f_6r_3)\ (f_6r_4)W + f_5r_5Pm + f_6r_6Cp$$

Or

(20) $$\ln Md = b_0 + b_1\ln Yt + b_2\ln P + b_3\ln ET + b_4Pet + b_5\ln rc + b_6\ln W_{t-1} + b_7\ln Pm\ b_8\ln Cp.$$

Where the variables are as previously defined.

Model (20) was also estimated using the log-linear form.

The new structuralists did not give any a priori results of the variables as the traditional conventional theorist did. However, as in most econometric studies

it is of paramount importance that we discuss the expected signs and coefficients of the parameters of the model.

The magnitude of the income elasticity is not clear but it is expected that income will exert a positive influence on money demand. Unitary income elasticity will imply the absence of a curb market effect, increased income in the presence of a curb market has implications for the curb market rate of interest by altering the demand for and supply of curb market loans. Thus, changes in the curb market rate affect the demand for money. However, the impact on income of induced changes in the curb market rate of interest depends on the magnitude of the income induced changes in the supply or demand for loanable funds.

If an increase in income has the net impact of raising the supply of curb market funds, the excess supply will cause the curb market interest rate to decline, relative to return on money (rc). This will lead to a substitution of asset portfolio of money for curb market loans. If on the other hand, the increase income has the net impact of raising the demand for curb market funds, the excess demand will cause the curb interest rate to rise, relative to return on money and hence, trigger off a substitution of curb market loans for asset portfolio.

Inflationary expectation is expected to have a negative impact on demand for balances. This is because inflationary expectation is synonymous with expectation of loss of value of money balances and economic agents will switch away from holding money (including curb money) to hold physical assets. Inflation expectation is measured as:

$$Pe = \Delta p + et$$

The impact of changing the rate of return on money (rc) depends on the stronger of two effects:

a) the higher rc makes money holding more attractive; and

b) the higher rc may lead to increases in the return offered on curb loans because curb brokers strive to maintain curb supply.

Higher import prices and higher real wages or both will in a regime of credit rationing or pegged official interest rate regime, force users of funds into the curb market. Thus, increasing demand and consequently, curb market rate of interests. This has the impact of leading to a substitution effect and hence, changes in portfolio composition in favour of curb market loanable funds.

It seems that the complimentary model and that new structuralist model of Buffie, Wijinbergen and Lim could be merged to describe the Nigerian situation. The Nigerian financial system is largely undeveloped with few financial products and a significant amount of M_1 is outside the banking system and hence, outside the controls of the monetary authorities. The ratio of M_1 outside the banking system to total narrow money in Nigeria is about 80% (CBN: Annual Report and Statement of Account, 2000). Under this situation there is bound to be some degree of substitution between the organized money and the informal market loans. It is therefore, important that the rate in this market, the curb market (local money) rate, be introduced into the basic classical model to measure the degree of substitution between formal and informal market loans.

Tests of Autocorrelation

It is quite possible that a number of the dependent variables in the models discussed could be auto correlated. Therefore, it is important to test for the presence of autocorrelation among the residuals in the demand function. The most commonly reported test of serial correlation is the Dublin-Watson statistic. However, in the presence of lagged dependent variables among the explanatory variables, the Dublin-Watson statistic (DW) becomes biased towards acceptance of the null hypothesis of auto correlation. Furthermore, the width of the range over which the DW statistic is inconclusive limits its use to being only a "casual" teat for serial correlation. However, since the purpose of our tests is to determine the most stable demand for money model in a developing country, we shall adopt the test all the same.

3.24 Microeconomic Models

Friedman (1956), Laidler (1985) and Yue (1991) see money as an asset, like every commodity. Money bestows on its holder satisfaction, and hence, when it is held provides its holder with certain abstract utility. Yue argued that money has own, cross and income elasticities, and therefore, wondered why economists have always adopted a macroeconomic approach to a microeconomic problem[3].

Given perfect information on prices and cost operating in all markets in the economy and a regular inflow of income, which operates in non-synchrony with expenditure requirements, an individual at the point of each inflow would be faced with two choices – what portion of his income to expend on goods and services and what portion to keep aside. This implies a choice between acquiring physical assets and cash balances or physical assets and liquid assets. We appreciate that each one of these two will have its sub-heads but we shall ignore this for now. Details on the costs of converting non-liquid assets to liquid assets are succinctly presented in Tobin (1956, 1958) and Baumol (1956).

The cash balances of the typical income earner in a transiting underdeveloped economy can be classified into three major groups (Yue, 1991):

1. Cash and demand deposits – (A_1)

2. Savings and informal (curb) money market deposits – (A_2) and

3. Time deposits with the banking system – (A_3)

The non-monetary assets the typical consumer acquires can be aggregated and referred to as A_4.

The cost of holding monetary assets is measured by interest rate (r) payable to the asset holder. This is the user cost of monetary assets or the user cost of holding money[3].

Let us assume that the aggregates of consumer durables, non-durables and services (A_4), have a weighted average price, represented by the consumer price index (P).

The consumer's choice problem is how to optimally allocate his income among the four assets available to him. His utility function can be written as:

$$MaxU = f(A_1, A_2, A_3, A_4)$$

$$\text{Subject to } Y = r_1A_1 + r_2A_2 + r_3A_3 + PA_4 \qquad \ldots\ldots\ldots\ldots 3.4$$

One of the most common approaches to determining the level of utility maximization is through the Lagrange multiplier. However, as shown in the previous chapter, this approach is rather too restrictive and its adoption by researchers has not produced attractive results. Thus, we adopted the Muntz-Szatz expansion approach.

Using the Muntz-Szatz expansion series, the indirect utility function is:

$$F(V,A) = a_1v_1^{\frac{1}{2}} + a_2v^{\frac{1}{2}}_2 + a_3v_3^{\frac{1}{2}} + a_4v_4^{\frac{1}{2}} + a_5v_1^{\frac{1}{2}}v_2^{\frac{1}{2}} + a_6v_1^{\frac{1}{2}}v_3^{\frac{1}{2}} + a_7v_1^{\frac{1}{2}}v_4^{\frac{1}{2}} +$$
$$a_8v_2^{\frac{1}{2}}{}_{v3}^{\frac{1}{2}} + a_9v_2^{\frac{1}{2}}v_4^{\frac{1}{2}} + a_{10}v_3^{\frac{1}{2}}v_4^{\frac{1}{2}} + a_{11}v_1^{\frac{1}{2}}v_2^{\frac{1}{2}}v_3^{\frac{1}{2}} + a_{12}v_1^{\frac{1}{2}}v_2^{\frac{1}{2}}v_4^{\frac{1}{2}} +$$
$$a_{13}v_1^{\frac{1}{2}}v_3^{\frac{1}{2}}v_4^{\frac{1}{2}} + a_{14}v_2^{\frac{1}{2}}v_3v^{\frac{1}{2}}{}_4 + a_{15}v_1^{\frac{1}{2}}v_2^{\frac{1}{2}}v_3^{\frac{1}{2}}v_4^{\frac{1}{2}} \qquad \ldots\ldots\ldots 3.5$$

Where v1, v2, v3 and v4 are the normalized prices and user costs and

$a_1, a_2, \ldots\ldots\ldots a_{15}$ are the parameters of indirect utility function.

The utility[3] derivable from consuming each of the above four products in the market can be solved using Roe's identity (Telser and Graves, 1972; Berth and

Jonas, 1983). Thus, the share equation for each of the commodity can be derived as:

$Sh_1 = s_1/S$

$Sh_2 = s_2/S$

$Sh_3 = s_3/S$

And $Sh_4 = s_4/S$ OR $1-(Sh_1 + Sh_2 + Sh_3)$ …… .3.6

Where $s_1 = a_1v_1^{½} + a_5v_1^{½}v_2^{½} + a_1v_1^{½}v_3^{½} + a_7v_1^{½}v_4^{½} + a_{11}v_1^{½}v_2^{½}v_3^{½} + a_{12}v_1^{½}v_2^{½}v_4^{½} + a_{13}v_1^{½}v_3^{½}v_1^{½} + a_{15}v_1^{½}v_2^{½}v_3^{½}v_4^{½}$

$S_2 = a_2v_2^{½} + a_5v_1^{½}v_2^{½} + a_8v_2^{½}v_3^{½} + a_9v_2^{½}v_4^{½} + a_{11}v_1^{½}v_2^{½}v_3^{½} + a_{12}v_1^{½}v_2^{½}v_4^{½} + a_{14}v_2^{½}v_3^{½}v_4^{½} + a_{15}v_1^{½}v_2^{½}v_3^{½}v_4^{½}$

$S_3 = a_3v_3^{½} + a_6v_1^{½}v_3^{½} + a_8v_2^{½}v_3^{½} + a_{10}v_3^{½}v_4^{½} + a_{11}v_1^{½}v_2^{½}v_3^{½} + {}_{13}v_1^{½}v_3^{½}v_4^{½} + a_{14}v^{½}{}_2v_3^{½}v_4^{½} + a_{15}v_1^{½}v_2^{½}v_3^{½}v_4^{½}$

$S_4 = a_4v_4^{½} + a_7v_1^{½}v_4^{½} + a_9v_2^{½}v_4^{½} + a_{10}v_3^{½}v_4^{½} + a_{12}v_1^{½}v_2^{½}v_4^{½} + a_{13}v_1^{½}v_3^{½}v_4^{½} + a_{14}v_2^{½}v_3^{½}v_4^{½} + a_{15}v_1^{½}v_2^{½}v_3^{½}v_4^{½}$

$S = a_1v_1^{½} + a_2v_2^{½} + a_3v_3^{½} + a_4v_4^{½} + 2a_5v_1^{½}v_2^{½} + 2a_6v_1^{½}v_3^{½} + a_7v_1^{½}v_4^{½} + 2a_8v_2^{½}v_3^{½} + 2a_9v_2^{½}v_4^{½} + 2a_{10}v_3^{½} + 3a_{11}v_1^{½}v_2^{½}v_3^{½} + 3a_{12}v_1^{½}v_2^{½}v_4^{½} + 3a_{13}v_1^{½}v_3^{½} + 3a_{14}v_2^{½}v_3^{½}v_4^{½} + 4a_{15}v_1^{½}v_2^{½}v_3^{½}$

Only the first three equations in 3.6 are independent. The fourth is dependent on these three. The three independent equations can be summarized as:

Shi = si/S = di(v,a) for i=1,2,3, …….3.7

It seems plausible to impose an additional normalization on the model at this stage. For example,,

$$a_1 + a_2 + a_3 + a_4 = 1 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.8$$

Given equation 3.8, one parameter (e.g. a4) can be eliminated by substitution and the model (3.6) is left with 14 free parameters.

The share equations[3] are non-linear with respect to normalized prices. Since normalized prices are the product of income and prices, the share equations can be said to be non-linear with respect to income and prices.

Quite possibly, the estimated parameters and share equations can be used to compute the income and price elasticities for both consumer goods and monetary assets. Alternatively, the elasticities can be computed using a close-form expression of the demand equation based on expenditure shares. For the purpose of this study, however, we shall use the former.

3.3 Characteristics of the Model

It is important, at this point to briefly explain the characteristics of the microeconomic model presented above. The model may be referred to as asymptotically ideal model because they are globally regular and asymptotically flexible. According to Telser and Graves (1972), Muntz-Szatz series converges to a point-continuous function, which are integrable and generally lie in Hilbert space. The series can be used to approximate a neo-classical utility function asymptotically (Berth and Jones, 1983).

A Muntz-Szatz[3] series is a linear combination of a set of power functions, which has components of the form, $q^{1/2}$, $q^{1/4}$, ….. that are neoclassical functions. Therefore, the series are monotonically increasing and quasi concave with respect to the variables qi and qj. However, the Muntz-Szatz series meet the neo-classical criteria only if all the coefficients of a_1, a_{1j}, b_{ij}, are non-negative. This is because only positive linear components are necessarily regarded as neo-classical. As a result of this conditional restriction on Munt-Szatz series, the function can tend to be neo-classical but cannot at the same time approach a continuous function. Meanwhile, the restriction guarantees that the estimated function does not violate the regularity conditions[3].

Any series of models can be defined by increasing degrees of the Muntz-Szatz approximation. Thus, given the parameter constraint, these models are globally regular and the respective utility functions are neo-classical everywhere in the domain. As the sample size increases, it becomes possible to specify higher-order models with more free parameters that can best fit the data and derive the elasticities of substitution. There are usually problems with lower-order approximation. Irrespective of the order, the series require a fairly large number of approximations to be estimated and hence, even though it has the necessary properties, finite samples may limit our ability to fully utilize them.

There are two other attractive features of the model[3]. These are found in the noise of the data and the periodicity. Even though the numbers of the parameters to be estimated are fairly large, it is impossible to over-fit the noise of the data. This is because movements resulting from errors of measurement are irregular and are not expressible in neo-classical component functions.

They are simply ignored by the model. Second, the component functions are not periodic and hence, the high periodic movements in the data are similarly ignored.

3.4 Data and Sample Size

A sample of twenty-eight years (1970 – 1998) was chosen for the study. Presently, there exist the problems of incomplete and inconsistent data arising from conflicting figures between published data. Data for very recent periods were inadequate, scarce and seemingly inaccurate. This was more critical with respect to quarterly data.

To overcome these problems there is need of placing reliance on publications whose data appear to be more consistent. Data are compiled from various issues of the International Financial Statistics of the International Monetary Fund, Annual Report and Statement of Accounts of the Central Bank of Nigeria and the Statistical Bulletin of the Central Bank of Nigeria.

3.5 Mode of Analysis

The results of the field study are analysed using measures of central tendency and deviations. The results are presented in tables, graphs and charts.

3.6 Estimation Procedure

Secondary data are analysed using various statistical packages. The macroeconomic models[3], which are linear and single equations, were estimated using the ordinary least squares procedure using both single and multiple regressions. The "SPSS/PC" package was used.

The micro-economic models are non-linear. Hence, a non-linear computer programme (GZG2) was used to accomplish their analysis. The maximum likelihood estimation procedure was adopted. To obtain true maximum likelihood that are global, an extensive search of the parameter space using initial values of unknown parameters was employed. To estimate equation 3.6, we further assumed that each share equation has an error term. Thus, the equation was restated as:

21. $Shi = Zi(v,a) + \varepsilon i, \quad I = 1,2,3,. . .$

Where εi is the error term.

As usual, the error terms are assumed to be independent and has a multivariate normal random distribution with zero and covariance matrix. The covariance matrix of the sample is defined as:

$\hat{\sigma} = (?^{N}_{t-1}\hat{\varepsilon}_t \hat{\varepsilon}_t^{1})/N$ ……..3.9

From equation 3.9, $\hat{\varepsilon}_t$ can be estimated as:

$\hat{\varepsilon}_t = Sh_i - Z_i(v,a)$ for i = 1,2,3.

Throughout the estimation, we assumed that maximizing the likelihood function is equivalent to minimizing the generalized variance.

All the parameters are subject to non-negativity constraints. This is to ensure that global regularity conditions are not violated. In line with the tradition (Dufour, 1989; Kodde and Palm, 1986; and Wdok, 1989) inequality constraints hinder the applicability of sampling distribution theories to studies, we are, therefore, unable to carry out the usual test of hypothesis.

The complexity of the share equation makes derivation of explicit functional forms for the demand equations difficult. This is, perhaps, the price of correctly embedding utility maximization into an econometrically estimable demand system that can be used to compute economically meaningful income and price elasticities (Diewert, 1974; Berneth, Geweke and Yue, 1991).

The elasticities of substitution and income are defined as (Familoni, 1990; Barnerth and Yue, 1988):

$$\sigma_{ij} = \frac{\partial A_i P_j}{} = [1 \ \frac{\partial Sh_i}{} + \frac{Sh_i}{} (1 \ \frac{\partial Sh_i}{} + \frac{Sh_j}{})]EV_iV_j$$

$$\partial P_j A_i \quad [Vi \ \partial P_j \quad V_j \quad V_i \ \partial E \quad P_i \ ] \ Sh_iSh_j$$

for $i \neq j$

$$\sigma_{ij} = \frac{\partial A_i P_j}{} = [1 \ \frac{\partial Sh_i}{} - \frac{Sh_i}{} + Sh_i \ (1 \ \frac{\partial Sh_i}{} + \frac{Sh_j}{})]EV^2_i$$

$$\partial P_i A_i \quad [V_i \partial P_i \quad V_j P_i \quad V_i \quad V \partial E \quad P_i \quad] Sh_i^2$$

for i = j

where P_i are the prices (and user costs)

A_i are the income compensated demand function for the i_{th} asset

Sh_i are the expenditure shares and

E denotes total expenditure. The elements σ_{ij} constitute a symmetrical matrix called the Allen partial matrix.

The income elasticities are defined by:

$$\eta_{i0} = \frac{\partial A_i E}{\partial E A_i} = \frac{\partial Sh_i E}{\partial E Sh_i} + 1$$

The uncompensated price elasticities are denoted by:

$$\eta_{ij} = \frac{\partial_{AiPj}}{\partial Pj A_i} = Sh_i \delta_{ij} \eta_{i0}$$

where A_i are the ordinary or uncompensated demand functions.

The relationship between the compensated and uncompensated functions is given by the Slutsky equation as earlier mentioned.

3.7 Expected Results of the Microeconomic Model

It is important[3] at this point to state some of the expectations of the model and their implications for theory. The uncompensated price elasticities should yield the cross substitution and the complementary elasticities. Goods i and j are substitutes if n_{ij} is positive. Thus, an increase in the price of i leads to a rise in demand for j, which is used to replace i whose demand is now low. A negative n_{ij}, implies complementarity of the goods i.e. an increase in the price of commodity i causes the demand for both commodities to decline.

The own compensated price elasticities ($Sh_i\sigma_{ij}$ and (σ_{ii}) should be negative if the utility function is regular. By implication, therefore, the compensated price elasticity matrix refers to potential movements along the consumer's indifference curves. Hence, the function will also serve to enable us determine the degree by which the estimated utility function meets the regularity conditions.

The elasticity coefficients shall be presented in off diagonal matrix. Due to the complexity of the share equations, we expect problems using the Fortran code based computer. Consequently, the partial derivatives of the expenditure shares with respect to price and income are computed through the numerical method. The computation of elasticities is done using the estimated equations. Time series of elasticities are produced by substituting time series of normalized prices and their respective partial derivatives into the elasticity formula given above.

APPENDIX 3.1

Splicing of the Price Index

The original price indexes obtained were not based on a uniform base year. We had to splice the base year. The method used is as described below:

Given the following consumer prices:

	1980 Base Year	**1985 Base year**
1980	100	NA
1981	124	NA
1982	148	NA
1983	176	NA
1984	196	91
1985	216	100
1986	261	121

To splice (bring up to date) the old series on the basis of the new, it is necessary to determine the relationship between the two series. To do this,, add the old series from 1980 to 1986. The total is 673. Also add the new series. The total is 312. Divide the new sum by the sum of the old series, i.e.:

$$\frac{\text{Sum of New Series}}{\text{Sum of Old Series}} = \frac{312}{673} = 0.46.$$

This ratio (constant multiplier) was applied to the old series, which has 1980 as base year.`

For more information, please see: Service Retirement, State Teacher Retirement Systems, Ohio, No. 2 Leaflet. Or,

Statistical Technique in Business and Economics, (pp 151 – 155).

APPENDIX 3.2

Derivation of New Structuralist Money Demand Equation.

Md = f(Y, P, Pe, W, RT, rc) ……. A3.1

rc = g((Y, Pe, rT, w, Pm, Cp) ……. A3.2

where the variables are:

Y = real income

P = price level

Pe = inflationary expectation

W = wealth

rT = rate of return on money

rc = curb market rate of return

w = real wages

Pm = import price

CP = real banking sector credit to the private sector.

Totally differentiating A3.1 and A3.2 and substituting for ?rc yields:

?Md = f1?Y + f2?P = f3?W + f4?Pe + f5?rT + f6(g1?Y + g2?Pe + g3rT + g4?w + g5?Pm + g6?Cp) …… A3.3

This can be re-arranged as:

?Md = (f1 +f6g1) ?Y = f2?P + f3?W + f4 + (f6g2)?Pe + (f5 +f6g3?rT + (f6g4) ?w + (f6g5) ?Pm + (f6g6) ?Cp ……A3.4

ENDNOTES

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF RESULTS

1.6 4.36 INTRODUCTION

The results obtained from the various methods and models outlined in the preceding chapter are presented in this chapter. The chapter is organized into three sections. The first is this brief introduction. The second section presents the results obtained from the field survey. The results are presented in tabular forms with the corresponding frequencies. Section three details out the outcome of the econometric study. This section is further organized into the various money demand models studied – conventional, complementary, the new structuralist and the microeconomic models.

It is pertinent to stress that one of the major contention in the demand for money debate is the definition of variables and their magnitudes. Therefore, the magnitudes of the variables are extracted and discussed. This is to enable the selection of the relevant variables adopted throughout the study[1]. In the last section, the asymptotically ideal model is estimated and the income and substitution elasticities are compared. In addition, characteristics of monetary assets relative to consumer goods are compared.

1.7 4.37 RESULTS OF THE FIELD STUDY

A total of one hundred (100) copies of the designed questionnaires were administered on residents of Lagos. Of these, ninety (90) were successfully retrieved. This implies a response rate of 90%, which we consider representative of the intended sample. Of the balance, six (6) were returned with errors and could not be used, while four (4) could not be retrieved. The results, as presented below is, therefore, based on the responses of 90 respondents.

The objective of the field survey is to determine, amongst other things, the cash holding behaviour of Nigerians. This includes the cash holding habits as well as the decision making process for allocating incomes earned by economic agents to expenditure items and the balance to be held unspent.

In sorting, collating and analyzing the results, our focus was to process the data in such a way as to throw light on the following burning issues:

1) What are the frequency distributions of the various categories of respondents?
2) How can any logical inference be drawn from the features identified?
3) What is the relationship between the independent and the dependent variables?
4) Are such identified relationships significant?
5) Are such relationships positive or negative? and

6) In what ways does the relationship validate our hypothesis that the demand for money function is a microeconomic problem that can be better approached through microeconomic models?

The results are presented in tables showing frequency distribution and percentages.

4.21. Distribution of respondents by Sex

Table 4.2.1 below shows the distribution of respondents by sex. Although there is no formulated hypothesis in the study that is related to sex, it is a crucial variable that should not be relegated to the background in the analysis.

TABLE 4.2.1

DISTRIBUTION OF RESPONDENTS BY SEX

Sex	Frequency	%
Males	65	72.22
Females	25	27.78
Total	90	100.0

Seventy two (72%) percent of the respondents are males while the balance 27.8% are females. The results in the table show that sex is not an important determinant of money holding. Both sexes can and do hold money in Nigeria, although more males are involved than women. This is quite distinct from the colonial days when women were mere appendages to their husbands and do not aspire to be financially independent.

1.6 4.36 Distribution of Respondents by Age

The distribution of respondents by age is presented in Table 4.2.2. The table indicates that all the respondents are adults. None is below the age of 20 and only a paltry 0.5% are between the ages of 20 and 30 years. The respondents seem skewed in favour of maturity and this, it may be argued, is capable of introducing biases into the results. On the contrary, it may well be argued that because the issues involved in the study is money, maturity is needed to understand and provide the necessary practical experiences on the instruments being traded in the money and capital markets. Therefore there was a deliberate attempt not to include very young persons in the sample.

TABLE 4.2.2

DISTRIBUTION OF RESPONDENTS BY AGE

Age (Yrs)	Frequency	%
Under 20	0	0.0
20 – 30	5	0.5
31 – 40	33	36.67
41 – 50	37	41.11
51 – 60	15	16.67
Total	90	100.0

The average age of respondents is 42 years. The table indicates that majority of the respondents fall within the age bracket of 41 – 50 years. This is followed by the age bracket of 31 - 40 years. From the table it could be gleaned that age structure is a very important consideration in money holding decision. The reasons for this are clear. First, at the average age (41 – 50 years) people are less risk averse and therefore the pattern of their investment is skewed in

favour of high yield and high risk. A significant number in this group may have financial assets that may not qualify for our definition of money. Second, most of the economic responsibilities (especially the extended family responsibility) are concentrated on this economically productive population segment.

1.6 4.36 Distribution of Respondents by Sources of Income

The sources of income of respondents are summarized in Table 4.2.3.

TABLE 4.2.3

DISTRIBUTION OF RESPONDENTS BY SOURCES OF INCOME

Income Source	Frequency	%
Self Employed	35	61.11
Employees	55	38.89
Total	**90**	**100.0**

Table 4.23 shows that 61% of the respondents are employees of companies while 39% are businessmen and women. The table indicates that both employees and self employed persons hold money. On other words, the reasons for holding money transcend educational, professional and family background.

4.24 Distribution of Respondents by Income

Table 4.24 shows the distribution of respondents by income. The average[2] income of respondents is N34,855.56 while the standard deviation[3] is 17.03. This implies that 82.97% of the observation of the distribution is included in the sample and that only 8.525% fall on either side of the normal distribution. The minimum monthly wage approved by the Federal Government in 2000 is N7,500.00.

Thus, the average[3] income of our respondents is an indication that those surveyed are living above the poverty line by the Nigerian standard. This is a plus for the study. The chosen sample is made up of those members of the society that are capable of making effective financial decisions. It seems plausible to conclude that although money holding varies with income levels, other variables may also be critical[3].

TABLE 4.2.4

DISTRIBUTION OF RESPONDENTS BY INCOME

Income (Per Month)	Frequency	%
1-10,000	8	8.89
11-20,000	13	14.44
21-30,000	21	23.33
31-40,000	18	20.00
41-50,000	12	13.33
51-60,000	11	12.23
61-70,000	7	7.78
Total	**90**	**100.0**
Average income	**N34,855.56**	
Variance	**17.05**	

1.6 4.36 Allocation of Incomes/Expenditure Pattern

As shown in Table 4.2.5, all the respondents indicated that money earned from their income stream is expended on food, rent, transportation, savings and cash at hand. Those that indicated that they do not spend money on rent fall into two classes. First, there are those that live in owner occupied houses. Obviously, they failed to consider the imputed costs of living in owner occupied houses.

TABLE 4.2.5

ALLOCATION OF INCOME

Expenditure Items	**Frequency**
Food	90
Rent	81
Transportation	90
Savings	90
Cash at hand	90
Others	90

Second, those that are squatting with others do so either because their stay in Lagos is temporary or because they are yet to fully settled down.

Generally, these expenditure items are the basic necessities of life. For the purpose of this study, however, the table showed that all respondents are involved in one form of savings or another. It also showed that all respondents hold cash balances, which facilitates the bridging of the cash gap created by the imperfect synchronization between the inflows of income and the need to meet regular expenditures. It is this imperfection between inflows of income and expenditure that created the need, in the first place, to hold cash balances (Keynes, 1933); Tobin, 1963; Baumol 1952).

4.26 Forms of Holding Cash Balances

From the foregoing, it is obvious that people do hold money. All the respondents agree that some proportion of their cash balances are held in bank accounts and others in the form of cash at hand. The distribution of the forms in which money is held is presented in Table 4.2.6.

TABLE 4.2.6

FORMS OF CASH BALANCES

Medium	Frequency
Bank account	90
Cash at Home	90
Curb Account	15
Trading items	5
Short-term Investments	55
Left with Neighbours	0
Others	23

All the respondents agree that some proportion of their earnings are not immediately spent. There are a variety of options for storage of the unspent portion. Among the available media are bank accounts, cash at hand/home, curb accounts with the traditional moneylender and osusu. The money holding habit is necessary to be able to meet daily expenses. Whereas, the inflows from income does not come in on a daily basis to enable the synchronization of income and expenditure. This habit of people seems to agree with the transaction, speculative and precautionary motives propounded by Keynes (1933).

Fifty-two (52%) percent of our respondents hold money in the form of short-term investments such as treasury bills, bank deposits, etc. An insignificant number (about 5%) admits to holding instruments whose tenor is longer than 180 days. A relatively significant number (15%) of the respondents also patronize the curb money market either for deposit or credit facility. Most of

them, however, noted that such patronages are for short-term transactions. Particular notice must be made of the number of respondents that keep cash at home (90) and those that patronize the curb money market (45). Two issues are brought to mind:

i. First, the financial market is still largely underdeveloped and lacked depth. Financial instruments are few while not much of the population are adequately informed about the opportunities of the formal financial sector.

ii. Second, the Nigerian economy is a cash economy. This observation seems to be the reason why a significant amount of narrow money supply is outside the banking system.

4.27 Determinants of the Volume of Cash Balances

The purpose of this question is to determine the factors that influence the proportion of income earned that is held outside the earning period. Distribution of respondents according to the factors that influence their holding of cash balances is presented in Table 4.2.7.

All the respondents admitted that earnings, generally is very important. Ninety five (95%) believes that interest rates operating in the formal banking system are key to the decision to hold money while 17.8% would also consider the curb market rate. This group specifically explained that curb deposits (with the moneylender) pays them interest on monthly basis, which cumulates to a higher interest rate than any bank could pay.

TABLE 4.2.7

DETERMINANTS OF CASH BALANCES

Factor	Frequency	%
Income Level	90	100.0
Bank interest rate	86	95.0
Fear of inflation	17	20.9
Fear of bank failure	15	16.7
Fear of N devaluation	56	62.2
Curb market interest rate	16	17.8

The investigations showed that with the exception of big financial institutions such as banks, discount and insurance houses, most non-bank financial institutions are involved in this trade. Interest rates are significantly higher and are regularly paid on a monthly basis. On the lending side, such institutions lend to traders, importers, contractors, etc at interest rates that are significantly higher than banks' lending rates. The curb market derives its impetus from the inability of those involved to produce the collateral needed by formal banks.

4.28 Money as a Special Product

The essence of this question is to determine how money is regarded by those who hold it and its place in the decision making process. As indicated in table 4.2.8, only 31% of the respondents see money as a special product. About 69% believes that money is like every other commodity. This seems to agree with Friedman (1956), and Yue (1991) that money is like every other commodity. Respondents explained that when there is an inflow of income, it is allocated between the pressing needs and the amount of cash held is determined by how well off the individual is. It is also determined by the need for the rich to hold much cash to meet precautionary needs.

TABLE 4.2.8		
IS MONEY A SPECIAL COMMODITY?		
	Frequency	%
Yes	28	31.11
No	62	68.89

By implication, therefore, economic agents consider what proportion of income or wealth to spend on physical assets and services and that to hold in cash or save in liquid assets. The proportion eventually held or saved is part of the budgetary process and is not in any way inferior or special to that spent on physical assets. This is why a school of thought now believes that the demand for money function should be model from a microeconomic perspective.

4.3 RESULTS OF THE ECONOMETRIC STUDY

As earlier mentioned, the various theories of the demand for money was subjected to econometric test because of the obvious limitations of field survey. Field survey could not provide precise estimates on magnitudes, direction of impact and levels of significance of the identified variables. In carrying out this portion of the study we consistently place before us the fact that the essence of the money demand function is to present an effective model to the monetary authorities that could be relied upon to adjust the various levels of macroeconomic aggregates.

Four models are econometrically tested in the study. These are the conventional, complementary, new structuralist and microeconomic models. The definition of variables, especially the scale variable has generated much controversy in the literature. As indicated in the foregoing section, the measure of income is vital to the money demand function. Therefore, it is important to

determine an appropriate definition of the variables included in the money demand function.

4.30 RESULTS OF THE CONVENTIONAL EQUATIONS

4.31 Definition of the Scale Variable

We defined income as Gross Domestic Product (GDP) and Gross National Product (GNP)[3]. The real and nominal values of the two variables were used in estimating equations 1-18 presented in the preceding chapter. The estimation showed that income elasticity varied significantly for different demand for money models and different definitions of money, implying that the different equations have varying degree of acceptability. It equally implies that some definitions of the scale variable and money supply are capable of introducing some measure of bias into the money demand equations.

For both definitions of money, the income elasticities were closer for the nominal definitions of income, although consistently the elasticities of the GDP is higher than for GNP, lending credence to the belief in some quarters that GDP may be a better definition of income.

The income elasticities for M_2 are consistently higher than the income elasticities for M_1. Only 2.8% of the equations with M_1 definition of money (equation 1 with nominal GNP and equation 15 with real GNP) are not significant at 95% confidence level. For M_2 definitions, 5.6% of the 72 equations are not significant at 95% confidence level. These are equations 3 and 4 with real GDP and equations 8 and 15 with real GNP.

The lowest income elasticity obtained from the study is 0.0885 whilst the highest is 1.7630. For M_1 definition of money only 13 out of 72 estimates are greater than 1.0. The results, also, show that only 5 of the 18 equations using real GDP is less than 1.0. These 5 are all the equations containing lagged money supply. Similarly of the 72 equations using M_2 money, only 14 have elasticities greater than 1.0. These are the 14 equations using real GDP as the scale variable. The 4 equations containing M_{t-1} has income elasticities that are less than 1.0.

Table 4.3.1 showed that all the equations containing long-term interest rates and using lagged money supply (M_{t-1}) tend to have lower income elasticity than short-term interest rate. The reverse is the case using M_2 definition of money. Also the introduction of the rate of inflation tends to marginally lower the income elasticity whilst the introduction of the rate of change of inflation tends to increase it. A comparison of equation 3 and 17 makes this very clear.

TABLE 4.3.1

DEFINITION OF THE SCALE VARIABLE

	M1				M2			
Equation	Nominal GDP	Nominal GNP	Real GDP	Real GNP	Nominal GDP	Nominal GNP	Real GDP	Real GNP
1	0.3400*	0.3325	1.5664*	0.6248*	0.3820*	0.3747*	1.6486*	0.6649*
2	0.6296*	0.5769*	1.4949*	0.5615*	0.6696*	0.6166*	1.5327*	0.5793*
3	0.4945*	0.4662*	1.5373*	0.6029*	0.5319*	0.5035*	1.6054	0.6329*
4	0.6386*	0.5716*	1.5767*	0.5371*	0.6666*	0.6141*	1.6357	0.5572*
5	0.6351*	0.5758*	1.4444*	0.7129*	0.6659*	0.6085*	1.4429*	0.7495*

6	0.6420*	0.5825*	1.3657*	0.7160*	0.6697*	0.6467*	1.3581*	0.7478*
7	0.5189*	0.4838*	1.3996*	0.6215*	0.5441*	0.5111*	1.4006*	0.6533*
8	0.2713*	0.2153*	0.5152*	0.1216*	0.3035*	0.2536*	0.4175*	0.1091
9	0.1857*	0.1646*	0.4910*	0.1113*	0.1994*	0.1857*	0.4276*	0.1061*
10	0.4718*	0.3513*	0.5463*	0.1351*	0.3205*	0.2009*	0.4319*	0.1108*
11	0.5891*	0.5504*	1.5266*	0.5914*	0.6225*	0.5841*	1.5769*	0.6131*
12	0.6249*	0.5726*	1.4792*	0.5422*	0.6655*	0.6129*	1.5314*	0.5635*
13	0.5899*	0.5506*	1.5669*	0.5974*	0.6233*	0.5843*	1.6189*	0.6194*
14	0.6267*	0.5746*	1.5599*	0.5278*	0.6691*	0.6168*	1.6183*	0.5495*
15	0.3180*	0.2290*	0.5103*	0.0953	0.3343*	0.2598*	0.4269*	0.0885
16	0.6670*	0.6140*	1.6012*	0.5421*	0.7044*	0.6526*	1.6212*	0.5469*
17	0.5159*	0.4875*	1.6594*	0.5767*	0.5499*	0.5223*	1.7121*	0.5917*
18	0.6600*	0.6079*	0.6600*	0.5418*	0.7009*	0.6503*	1.7630*	0.5223*
Note: * = Significant at 95% confidence level								

The magnitude of the income elasticity does not support any of the existing theories. Majority is less than 1.0, which indicates economies of scale. However, only 42 (or 29%) of the elasticities are close to the 0.5 suggested by Baumol- Tobin. It is lower than 0.5 in 29 cases (20%) and higher in 73 (or 51%) cases. Thus, the results neither validate the Baumol and Tobin forecast that it should be 0.5, nor the classical version that income elasticity is unity or the Friedman prediction of 1.8. Neither does the result support the empirical findings of Crocket and Evans.

4.32 Interest Rate Elasticities

We tested models 2 to 18 with respect to interest rate elasticity and the results are presented in table 4.3.2. Please recall that equation 1 has no interest rate variable. The results show that the long-term interest rates, exerts a negative

influence on money holding. The impact is more pronounced on nominal balances and narrow definition of money. For instance, in all the equations with nominal income (GDP and GNP) interest rate has the right sign and in 32 out of the 36 equations are statistically significant at 95% level of significance. Furthermore, all the elasticities are greater than 1.0, except in equations containing lagged money, exchange rate and rate of change of inflation.

For real income equations, long-term interest rate came out with inconsistent signs and are statistically insignificant (except equation 18) for real GDP. For real GNP, only four are statistically significant but the signs remain inconsistent.

For the wider definitions of money (M_2) nominal incomes (GDP and GNP) generally came out with the right signs, with the exception of equation 4 (on nominal GNP). All are statistically significant at 95% confidence level. Consistent with the results obtained for M_1, real income definitions produced interest elasticities with the wrong signs and are generally statistically insignificant.

TABLE 4.3.2

INTEREST RATE ELASTICITIES

	M1				M2			
	Nominal GDP	Nominal GNP	Real GDP	Real GNP	Nominal GDP	Nominal GNP	Real GDP	Real GNP
Long-term Interest Rate Elasticities								
2	-1.5183*	-1.3409*	0.2290	0.4136	-0.5050*	-1.3272*	0.3710*	0.5564
4	-1.3739*	-0.2019*	-0.1787	0.7532	-1.4302*	-1.2626*	-0.0901	0.8704
5	-1.3649*	1.1976*	0.3605	-1.0053*	-1.4342	-1.2685*	0.3406	1.0577*

6	-1.4998*	-1.3308*	-0.0508	-1.0473*	-1.5048*	-1.2931*	-0.0069	-1.0337*
8	-0.7110*	-0.6318*	-0.0922	-0.1371*	-0.7409*	-0.6141*	0.0057	-1.0308
10	-0.8934*	-0.5681*	-0.0876	-0.1489*	-0.7868*	-0.5377*	0.3857	-0.0419
12	-0.5936	-0.4094	0.4016	1.1663	-0.7142	-0.5295	0.3857	1.1749
14	-0.6200	-0.4491	0.0469	1.3330	0.7813*	-0.6056	0.0040	1.3344
15	-03635	-0.2231	-0.1940	0.0235	-0.5410*	-0.4222	-0.3068	-0.1299
16	-1.5905*	-1.4132*	0.2431	0.3962	0.5948*	-1.4010*	0.3763	0.5319
18	-1.4233*	-1.2660*	-1.4234*	0.7989	-1.4921*	-1.3455*	0.2057	0.8945
Short Term Interest Rate Elasticities								
3	-0.6372*	-0.5811*	0.1764*	0.1825	-0.6164*	-0.5596*	0.2623*	0.2679
4	-0.0892	-0.0867	0.2761	-0.2413	-0.0464	-0.4030	0.3123	0.2188
5	-0.0851	-0.8380	0.2268	-0.0270	-0.0467	-0.0429	0.2443	0.0155
7	-0.6207*	-0.5668	0.0578	-0.4516*	-0.6081*	0.5534*	0.0827	-0.4311
9	-0.3686*	-0.3363*	-0.0549	-0.1109*	-0.3083*	-0.2853*	0.0150	-0.0329
10	-0.2619	0.0936	0.0389	0.0097	-0.0583	-0.0639	0.0057	-0.0041
13	-0.0935	-0.0555	0.3101	0.1370	-0.0957	0.0556	0.3229	0.1342
14	-0.0294	0.0341	0.2991	-0.1607	-0.0572	0.0652	0.3219	-0.1537
15	-0.1279	-0.1762	-0.1670	-0.2560	-0.0457	-0.0833	0.0028	-0.1907
17	-0.6611*	-0.6030*	0.1948	0.1651	0.6362	-0.5787*	0.2778*	0.2463
18	-0.1028	-0.0904	-0.1028	-0.2803	-0.0509	-0.0342	0.3932	-0.2523
Note: * = Significant at 95% confidence level								

The short-term interest rate variable came out with lower elasticity, lying within the range 0.0028 and 0.6611. The variable has the wrong sign in 30 out of 88 times. This is consistent with the results obtained for long-term interest rate. It also tends to have the right sign in nominal income equations as well as real GDP equations. For instance, the variable came out with the right sign in only 3 out of the 22 real GDP equations and 14 for the real GNP. The elasticity seems to be higher in equation 3, where it features alone with income and has very low elasticity when long-term interest rate is introduced.

The improved performance in signs and level of significance in nominal equations implies that Nigerians regard interest rate as an opportunity cost for holding money while in terms of real income, interest rates play a less significant role.

1.6 4.36 Price Elasticities and The Rate of Inflation

The variable exhibited a particular pattern in terms of statistical significance. In both narrow and broad definition of money, the variable came out with mixed results in terms of statistical significance.

TABLE 4.3.3

PRICE ELASTICITIES

	M1				M2			
	Nominal GDP	Nominal GNP	Real GDP	Real GNP	Nominal GDP	Nominal GNP	Real GDP	Real GNP
5	-0.5183*	-0.3409*	0.2187	0.4134	-0.5050*	-0.3272*	0.1363	0.5468
6	-0.3739*	-0.2019*	-0.1699	0.7568	-0.4302*	-0.2626*	-0.0932	0.0744
7	-0.0993	-0.0911	-0.1005	-0.2831	-0.0514	-0.0325	0.3876	-0.2488

Note: * = Significant at 95% level of confidence

The variable tends to be statistically significance in models 5 and 6 with nominal income and statistically insignificantly elsewhere. This serves to contradict the monetarists' stand that real income values perform better in the money demand function.

The magnitudes of the price variable vary from a low of 0.0325 to a high of 0.5184. This range seems to be quite wide. Its link with the various

hypotheses, therefore, becomes suspect. The results are neither close to zero nor 0.5. Thus, we believe that the result significantly differ from 1-b, (or close to zero) thus casting on the linear homogeneity theory. In terms of money illusion, the result does not lend itself to a definite interpretation. On the other hand, the low signs and statistical insignificance implies that the variable can be expunged from the demand for money equation without much damage to the model.

One of the reasons for holding money is that it has a store of value characteristic. When prices are expected to rise, money loses some of this attribute. Money holders will, when faced with inflationary environment, try to adjust their money holdings to minimize their losses by switching to other assets- either bonds or physical assets. This effect is expected to be more pronounced with narrow money, which conventionally has a zero yield than in the case of broad money.

The results of the inflation variable are reported in table 4.3.4. The results indicate that in 19 out of 25 cases, the variable has negative sign. This confirms the work of Bleja (1979) and Ojo (1974b). However, the magnitudes of the coefficients are very low (an average elasticity of 0.05) and are statistically insignificant at 95% confidence level. It seems proper, therefore, to infer that the impact of inflation on money demand is rather weak.

TABLE 4.3.4								
INFLATION RATE ELASTICITIES								
	M1				M2			
	Nominal GDP	Nominal GNP	Real GDP	Real GNP	Nominal GDP	Nominal GNP	Real GDP	Real GNP
16	-0.0574	-0.0543	-0.0097	-0.0424	-0.0387	-0.0029	0.0057*	-0.0075
17	-0.0722	-0.0643	-0.0125	-0.0327	-0.0465	-0.0411	0.0094	0.0002
18	-0.0564	-0.0468	-0.0645	-0.0413	-0.0468	-0.0292	0.0114	-0.0216
Note: * = Significant at 95% level of confidence								

1.6 4.36 Elasticities of Lagged Money Supply[3]

The variable features in four equations, 8,9,10 and 15.

TABLE 4.3.5								
LAGGED MONEY ELASTICITIES								
	M1				M2			
	Nominal GDP	Nominal GNP	Real GDP	Real GDP	Nominal GDP	Nominal GNP	Real GDP	Real GDP
8	0.5975*	0.6612*	0.7267*	0.8924*	0.6038*	0.6577*	0.8203*	0.9491*
9	0.6997*	0.7219*	0.7334*	0.9033*	0.7281*	0.7385*	0.8007*	0.9548*
10	0.5986*	0.7113*	0.7291*	0.8899*	0.7103*	0.6901*	0.8169*	0.9496*
15	0.5114*	0.6282*	0.7371*	0.9186*	0.5483*	0.5987*	0.8370*	0.9839*
Note: * = Significant at 95% level of confidence								

The empirical results are displayed in table 4.3.5. It came out statistically significant in all 32 equations with values ranging from 0.5114 to 0.98391 and hence emerging as one of the variables whose magnitudes fall within a close

range. This clearly indicates that economic agents, next only to income level are sticky in their money holding balances.

4.35 The Open Economy

The general observation from the table is that foreign exchange rate exerts negative influence on money holding. The variable came out with negative sign in 29 out of 40 equations.

TABLE 4.3.6

FOREIGN EXCHANGE RATE ELASTICITIES

	M1				M2			
	Nominal GDP	Nominal GNP	Real GDP	Real GNP	Nominal GDP	Nominal GNP	Real GDP	Real GNP
11	-0.4889*	-0.4474*	-0.0582	0.0943	-0.4710*	-0.4301*	0.1129	0.1423
12	-0.3367*	-0.3398*	-0.0634	-0.2682	-0.2879*	-0.2910*	0.0085	-0.2215
13	-0.4458*	-0.4215*	0.0832	0.0341	-0.4242*	-0.4042*	-0.0308	0.0854
14	-0.3414*	-0.3453*	-0.0924	-0.2490	-0.2971*	-0.3013*	-0.0269	-0.0176
15	-0.1135	-0.0638	0.0375	0.0700	-0.0653	-0.0244	0.0946	-0.1267

Note: * = Significant at 95% level of confidence

It is also significant to note that the coefficient ranges from 0.0085 to 0.4889. In 16 out of 20 cases where the variable feature in nominal income equations, exchange rate came out significant at 95% confidence level. It is important to note that the variable is insignificant in all real income equations.

4.36 Empirical Results of the Conventional Demand for money Equations

Nominal Equations:

The regression results for the nominal money demand equations are reported in Table 4.3.7 and 4.3.8. The results show that M_2 clearly and consistently outperforms M_1 in terms of explanatory power. This finding, which implies that M_2 is the better of the two definition of money, seems to confirm most empirical results in the literature. From the results presented in the table the following inferences can be deduced:

1. The simple classical version of demand for money does not perform as well as other multiple equations for both definitions of money in terms of explanatory power. The classical assertion that income elasticity of demand for money was unitary was not substantiated since the estimates are significantly different from unity.

2. The long-term rate of interest (R_L) has the expected sign in all equations. All the estimates are statistically significant at 95% confidence level with the exception of one equation (equation 15 with M_1 definition).

3. The short-term rate of interest has the expected sign in all but two equations. These are equations 14 and 15 with M_1 definition and equations 14 and 17 with M_2 definition. The estimates show one pattern. They are statistically significant only in equations where the long-term rates of interest are absent (equations 3, 7, 9 and 17) with the exception of equation 7 for M_2 definition. Equations with only short-term rates performs below the long-term rate in terms of explanatory power while their combination enhances it.

TABLE 4.3.7

REGRESSION RESULTS OF CONVENTIONAL MODELS:

M1 Vs NOMINAL GDP

	Con	Y	RL	RS	P	Mt-1	X	DP	R^2	$\bar{R}^2$	SE	F-St	DW
1	1.52	0.3401 (0.0429)							0.67	0.65	0.34	55.02	
2	1.71	0.6296* (0.0429)	-1.5183* (0.1845)	-	-	-	-	-	0.90	0.90	0.18	129.41	1.29
3	1.06	0.4945* (0.0439)	-	-0.6372* (0.1214)	-	-	-	-	0.84	0.82	0.34	68.32	1.37
4	1.63	0.6386 (0.0447)	-1.3739 (0.3122)	-0.0897 (0.1553)	-	-	-	-	0.91	0.89	0.18	84.17	1.94
5	1.55	0.6351* (0.0561)	-1.3649* (0.3189)	-0.0851 (0.1587)	-0.0186 (0.0542)	-	-	-	0.91	0.89	0.19	60.93	2.2
6	1.62	0.6420* (0.0537)	-0.4998* (0.1934)	-	-0.0210 (0.0532)	-	-	-	0.91	0.89	0.19	83.53	2.44
7	0.92	0.5189* (0.0638)	-	-0.6207* (0.1269)	-0.0376 (0.0703)	-	-	-	0.84	0.82	0.25	44.39	2.41
8	0.85	0.2713* (0.0487)	0.7711* (0.1745)	-	-	0.5975 (0.0994)	-	-	0.96	0.95	0.12	194.5	2.14
9	0.26	0.1857* (0.0492)	-	0.3686* (0.0819)	-	0.6997* (0.0835)	-	-	0.96	0.95	0.12	197.74	1.86
10	0.85	0.5778* (0.0664)	0.8934* (0.1745)	0.2619 (0.2184)	-	0.5980* (0.0994)	-	-	0.96	0.95	0.12	194.51	1.99
11	-0.99	0.5891* (0.0319)	-	-	-	-	-0.4889* (0.0475)	-	0.93	0.93	0.15	187.17	1.76
12	0.14	0.6249* (0.0338)	-0.5936* (0.2663)	-	-	-	-0.3367 (0.0814)	-	0.94	0.93	0.14	145.48	2.09
13	-0.84	0.5899* (0.0338)	-	-0.0935 (0.1176)	-	-	-0.4459* (0.0722)	-	0.93	0.92	0.15	123.23	2.5

14	-0.14	0.6267* (0.0353)	-0.6281* (0.3093)	0.0294 (0.1263)	-	-	-0.3414* (0.0853)	-	0.94	0.93	0.15	104.99	2.41
15	0.18	0.3180* (0.0778)	-0.3603 (0.2566)	0.1279 (6.1363)	-	0.5114* (0.1317)	-0.1181 (0.0886)	-	0.96	0.96	0.11	132.56	2.67
16	1.62	0.6670* (0.0465)	-1.5905* (0.1841)	-	-	-	-	-0.0638 (0.0385)	0.91	0.90	0.18	80.51	2.1
17	1.07	0.5159* (0.0498)	-	-0.6611* (0.1357)	-	-	-	-0.0742 (0.0535)	0.83	0.81	0.25	38.39	2.35
18	1.54	0.6600* (0.0481)	-04234 (0.3101)	-0.1088 (0.1527)	-	-	-	-0.0665 (0.3918)	0.91	0.89	0.18	59.06	2.48

Note: * = Significant at 95 % confidence level

Standard errors are in parenthesis

This implies that models with multiple interest rates are inappropriate. Rather, the short-term rate could be taken as a substitute for the long-term rate. They are not complements. The sign of the short-term rates corroborate the finding of Crouch 1977, White 1976, Santomero and Seater, 1978.

TABLE 4.3.8

REGRESSION RESULTS OF CONVENTIONAL MODELS:

M2 Vs NOMINAL GDP

	Con	Y	RL	RS	P	Mt-1	X	DP	R^2	$\overline{R}^2$	SE	F-St	DW
1	1.45	0.3820* (0.0453)	-	-	-	-	-	-	0.72	0.71	0.34	71.18	1.44
2	1.63	0.6696* (0.0423)	-0.5050* (0.1845)	-	-	-	-	-	0.72	0.71	0.18	159.31	1.58
3	1.00	0.5319* (0.0449)	-	-0.6164* (0.1228)	-	-	-	-	0.92	0.85	0.25	80.03	1.89
4	1.59	0.6666* (0.0442)	-1.4302* (0.3086)	-0.0464 (0.1535)	-	-	-	-	0.96	0.91	0.19	102.52	2.49
5	1.59	0.6659* (0.0555)	-.14308* (0.3161)	-0.0467 (0.1573)	-0.0012 (0.0537)	-	-	-	0.92	0.91	0.19	73.82	2.68
6	1.63	0.6697* (0.0530)	-1.5048* (0.1907)	-	-0.0002 (0.0525)	-	-	-	0.92	0.91	0.18	102.12	2.49
7	0.93	0.5441* (0.0647)	-	-0.6081* (0.1289)	-0.0187 (0.0714)	-	-	-	0.92	0,84	0.25	51.47	1.49
8	0.79	0.3035* (0.0622)	0.7409* (0.1634)	-	-	0.6038* (0.0930)	-	-	0.86	0.86	0.11	259.11	1.63
9	0.24	0.1994* (0.0507)	-	0.3082* (0.0846)	-	0.7281* (0.0862)	-	-	0.97	0.96	0.12	215.56	1.78
10	0.64	0.3205* (0.0617)	0.7868* (0.1634)	0.5831 (0.1638)	-	0.7103* (0.0851)	-	-	0.96	0.96	0.11	269.07	2.37
11	-0.98	0.6625* (0.0347)	-	-	-	-	-0.4710* (0.0517)	-	0.93	0.92	0.17	185.23	1.29
12	0.05	0.6655* (0.0359)	-0.7142* (0.2831)	-	-	-	-0.2879* (0.0865)	-	0.94	0.94	0.15	151.08	1.9
13	0.82	0.6233* (0.0350)	-	-0.0957 (0.1281)	-	-	-0.4270* (0.0787)	-	0.94	0.94	0.15	109.65	2.31

14	0.05	0.6691* (0.0374)	-0.7813* (0.3279)	0.0572 (0.1339)	-	-	-0.2971* (0.0905)	-	0.94	0.94	0.15	109.65	2.31
15	0.42	0.3343* (0.0784)	-0.5410 (0.2586)	-0.0457 (0.1374)	-	0.5483* (0.1227)	-0.0725 (0.0893)	-	0.97	0.96	0.11	151.52	2.51
16	1.53	0.7044* (0.0465)	-1.5948* (0.1851)	-	-	-	-	-0.0482 (0.0385)	0.92	0.91	0.18	95.09	2.2
17	0.99	0.5499* (0.0512)	-	0.6362* (0.1292)	-	-	-	-0.596 (0.0550)	0.84	0.83	0.25	43.19	1.69
18	1.49	0.7001* (0.0458)	-1.4921* (0.3134)	-0.0509 (0.1539)	-	-	-	-0.0497 (0.0395)	0.92	0.91	0.18	68.58	2.41
Note: * = Significant at 95 % confidence level Standard errors are in parenthesis													

1. Price level seems to influence only a marginal increase in the explanatory power. All the equations where it features with long-term interest rate and a combination of the long- and short-term interest rates tend to have higher R^2 (Equation 5 & 6). However, in equation 7, where it features with only the short-term rate of interest the explanatory power declined although it is an improvement on equation 3 where short-term rate featured alone. In spite of its influence on the explanatory power, the price elasticity coefficient significantly differs from what is expected under the linear homogeneity assumption. Moreover, the results are not statistically significant even at 90% confidence level.

2. For both definitions of money, inclusion of the short-term rate of interest tends to lower the income elasticity (equation 4, 9, 13 and 17) whilst the long-term rate of interest increases it. Inclusion of the price level as well as lagged money supply also weakens the income elasticity whilst exchange rate and inflation rate tends to strengthen it. With the exception of equation 15, which combines lagged money and exchange rate the long-term interest rate variable emerges with higher coefficient in all equations where it features. The variable has the right sign, although its magnitude does not agree with any of the existing theories.

We may conclude, therefore, that in terms of nominal equations interest rate is a more important determinant of money balances than other variables.

Real Equations

The regression results for real equations of demand for money are presented in tables 4.39 and 4.310. Consistent with our observations in nominal equations estimates, the classical versions of the demand for money does not seem to perform as good as other versions. The inclusion of other variables enhances the explanatory power of all the models. We can draw the following inferences from the results:

TABLE 4.3.9

REGRESSION RESULTS OF CONVENTIONAL MODELS:

M1 Vs REAL GDP

	Con	Y	RL	RS	P	Mt-1	X	DP	R^2	$\bar{R}^2$	SE	F-St	DW
1	-5.42	1.5664* (0.1595)	-	-	-	-	-	-	0.78	0.77	0.28	96.4	057
2	-5.41	0.4949* (0.1653)	-0.2290* (0.1660)	-	-	-	-	-	0.79	0.78	0.27	50.77	1.1
3	-5.53	1.5373* (0.1545)	-	0.1764 (0.0999)	-	-	-	-	0.80	0.79	0.27	53.54	1.09
4	-5.59	1.5767* (0.1793)	-0.1787 (0.3939)	0.2761 (0.2422)	-	-	-	-	0.80	0.78	0.27	34.67	1.69
5	-4.62	1.4444* (0.1997)	-0.3605 (0.4076)	0.2268 (0.2403)	-0.0989 (0.0706)	-	-	-	0.82	0.79	0.27	27.5	2.43
6	-4.37	1.3656* (0.1810)	-0.0508 (0.2141)	-	-0.1087 (0.0697)	-	-	-	0.81	0.79	0.27	36.72	2.13
7	-4.69	1.3996* (0.1923)	-	0.0578 (0.1419)	-0.0791 (0.0666)	-	-	-	0.81	0.79	0.27	36.72	1.79
8	-1.84	0.5152* (0.1111)	-.0922 (0.0747)	-	-	0.7267* (0.0654)	-	-	0.96	0.96	0.11	218.72	1.9
9	-1.81	0.4910* (0.1169)	-	0.0549 (0.0499)	-	0.7334* (0.697)	-	-	0.96	0.96	0.11	215.9	1.22
10	-1.69	0.5463* (0.1261)	0.0876 (0.0691)	0.0389 (0.1139)	-	0.7291* (0.0699)	-	-	0.96	0.96	0.11	225.41	1.66

11	-5.15	1.566* (0.1624)	-	-	-	-	-0.0646 (0.5659)	-	0.79	0.77	0.28	49.4	0.68
12	-5.66	1.4792* (0.1729)	-0.4016* (0.4798)	-	-	-	-0.0622 (0.1618)	-	0.79	0.77	0.78	32.78	0.51
13	-5.96	1.5669* (0.1609)	-	-0.3101 (0.2072)	-	-	-0.0840* (0.1136)	-	0.80	0.78	0.27	35.25	1.17
14	-5.99	1.5599* (0.1840)	-0.0469 (0.5396)	0.2991 (0.2487)	-	-	-0.0935 (0.1625)	-	0.88	0.77	0.28	25.39	2.20
15	-1.62	0.5103* (0.1375)	-0.1940 (0.2531)	-0.1670 (0.1570)	-	0.7371* (0.0786)	-0.0442 (0.0758)	-	0.96	0.95	0.12	122.32	2.4
16	-6.12	1.6012* (0.1936)	0.2431* 0.1730)	-	-		-	-0.0155 (0.0601)	0.78	0.75	0.28	27.53	1.35
17	-6.36	1.6594* (0.1823)	-	-0.1958* (0.1032)	-	-	-	-0.0128 (0.5789)	0.79	0.76	0.27	29.82	0.91
18	-1.54	0.6600* (0.0481)	-1.4234* (0.3108)	-0.1028 (0.1527)	-	-	-	0.0666 (0.0392)	0.91	0.89	0.18	59.06	1.66
Note: * = Significant at 95 % confidence level Standard errors are in parenthesis													

1 4 Inclusion of the short-term rate of interest tends to have a positive impact of income elasticity coefficient while the long-term rate of interest tends to depress it. Interest rate parameters (long and short) have a combination of correct and wrong signs and hence not consistent. Where the signs are right they are statistically insignificant.

TABLE 4.3.10

REGRESSION RESULTS OF CONVENTIONAL MODELS:

M2 Vs REAL GDP

	Con	Y	RL	RS	P	Mt-1	X	DP	R^2	$\bar{R}^2$	SE	F-St	DW
1	-5.62	1.6486* (0.1886)	-		-				0.73	0.72	0.33	76.37	0.69
2	-5.61	1.5327* (0.1890)	0.3710* (0.1898)		-				0.77	0.75	0.32	44.09	1.31
3	-5.78	1.6054* (1.1763)	-	0.2620* (0.1140)	-				0.78	0.76	0.31	44.87	1.1
4	-5.81	5.6253* (0.2052)	5.6901 (0.4508)	-0.0901 (0.2772)	-				0.78	0.75	0.31	30.11	1.44
5	-4.46	1.4429* (0.2243)	-0.3406 (0.4579)	0.2443 (0.2698)	0.1363 (0.0793)				0.80	0.77	0.30	25.09	2.03
6	-4.20	1.3581* (0.2030)	-0.0069 (0.2708)	-	0.1468 (0.0781)				0.80	0.77	0.30	33.43	1.97

7	-4.53	1.4006* (0.2149)	-	0.0827 (0.1587)	0.1175 (0.0745)				0.80	0.77	0.30	33.88	2.17
8	-1.50	0.4175* (0.1297)	-0.0057 (0.0873)	-	-	0.8203* (0.0765)			0.95	0.95	0.13	183.84	1.65
9	-1.54	0.4276* (0.1356)	-	0.0150 (0.0579)	0.8251* (0.0809)	-			0.95	0.95	0.13	184.34	1.52
10	-1.55	0.4319* (0.1347)	0.0080 (0.0734)	0.0057 (0.0293)	-	0.8169* (0.0739)			0.96	0.96	0.13	201.18	2.43
11	-5.13	1.5769* (0.1856)	-	-	-	-	-0.1165 (0.0647)		0.76	0.75	0.32	42.99	0.57
12	-5.62	1.5314* (0.1983)	0.3857* (0.5504)	-	-	-	-0.0053 (0.1857)		0.77	0.74	0.32	28.26	0.84
13	-5.97	1.6189* (0.1853)	-	0.3229 (0.2385)	-	-	-0.0382 (0.1308)		0.78	0.75	0.31	30.19	1.12
14	-5.97	1.6183* (0.2119)	-0.0040 (0.6443)	0.3219 (0.2864)	-	-	-0.0390 (0.1871)		0.78	0.74	0.32	71.74	1.80
15	-1.01	0.4269* (0.1552)	-0.3068 (0.2860)	-0.0021 (0.1776)	-	0.8370* (0.1552)	-0.1089 (0.0851)		0.96	0.95	0.13	110.33	2.36
16	-6.23	1.6212* (0.2230)	0.3763 (0.2001)	-	-			-0.0057 (0.0695)	0.75	0.71	0.33	23.04	1.52
17	-6.55	1.7121* (0.2102)	-	0.2778* (0.1190)	-			-0.0109 (0.0668)	0.76	0.73	0.32	25.25	1.64
18	-6.68	1.7630* (0.2445)	-0.2057 (0.4782)	0.3932 (0.2945)	-			-0.0154 (0.0688)	0.76	0.72	0.32	18.31	1.87
Note: * = Significant at 95 % confidence level- Standard errors are in parenthesis													

1 4 With the exception of equations 8, 9, 10 and 15 where the lagged money supply features and which have very low-income elasticity (between 0.4910 and 0.5463) the general magnitude of the income elasticity falls between 0.4949 and 1.6594. This range of values does not support any of the theoretical estimates. On the contrary, the average elasticity it lies between the Keynesian prediction of 1.0 and the Friedman's estimate of 1.8. The income elasticity is higher for M_2 than M_1

2 5 With the exception of equation 11 where exchange rate features exclusively with income, and equation 15 which includes two measures interest rates, exchange rate tends to have a positive effect on the magnitude of income elasticity and has negative sign implying that

exchange rate volatility discourages holding of money balances. It is, however, ironical that the variable came out insignificant in all the equations where it features.

3 6 Lagged money reduces the income elasticity and is statistically at 95% confidence level. It also lends to increase the explanatory power (equations 10 and 15) of the equations.

The analysis above makes it obvious that the conventional demand for money equations (nominal and real) does not make for an easy selection of an appropriate empirical demand for money model. The classical model has low explanatory power, relative to others. Interest rates have inconsistent signs, magnitude and are often statistically insignificant. The model that combines all the interest rate variables as well as lagged money and exchange seems to perform consistently (15) better in terms of explanatory power whilst the income elasticity neither supports the Baumol/Tobin nor Keynesian forecast. Interest rates, in this equation, have the right sign and are statistically insignificant. Apart from these inconsistencies, it is doubtful if the model can be accepted as the appropriate model, since the lagged money seems to be a more important variable than income. We believe that the wrong algebraic signs of parameters and statistical insignificance are due to improper specification of the models. This calls for further investigation.

1.6 4.36 Results of the Complementary Models

Following the contentions of Mckinnon (1973) and Shaw (1973), we tested equation 19 and the results are presented in Table 4.3.11

The followings can be observed from the results:

1. The income elasticity for both definitions of money are not significantly different from unity and hence seems to validate the classical assertion on income elasticity of demand for money.
2. In terms of explanatory power the broad money performs much better than a the narrow definition of money. This seems to confirm the results obtained using the conventional models.
3. All the estimated parameters ($\frac{I}{Y}$, D-RP) have the expected signs and are statistically significant at 95% confidence level. From the result we observed that a percentage increase in investment – income ratio (I/Y) would lead to a 1.025 increase in M_1 (i.e. almost unitary) and 1.11% increase in M_2 (a more than proportionate increase). Similarly for every 1% increase D-RP, the demand for money rises by 0.40% for $M_1$and 0.33% for M_2.

TABLE 4.3.11
REGRESSION RESULTS OF THE COMPLEMENTARY MODELS

	$\frac{M1}{P}$	$\frac{M2}{P}$
Constant	1.6967	2.3974
Y	0.8458* (2.2361)	0.9304* (1.6145)
$\frac{I}{Y}$	1.0255* (2.0463)	1.1154* (2.8310)
D-RP	0.4067 (1.7400)	0.3309 (0.2612)
Summary Statistics		
R^2	0.8086	0.9175
$\overline{R}^2$	0.8002	0.8973
F-Statistics	24.53	60.34
D.W - Statistics	2.1415	1.7972
Note: *Significant at 95% confidence level t-statistics are in parenthesis		

1. The results are consistent with expectations as well as explanatory power. The complementary models seems to perform better than the

traditional conventional models whilst on the basis of explanatory power alone, the models perform as well but failed to show signs of superiority. It seems plausible to conclude as Fry (1978) and Galbis (1979) did that the coefficients cast doubts on the validity of the complementary hypothesis.

4.37 Results of the New Structuralist Demand For Money

In spite of the intense debate on the specification of the traditional conventional demand for money functions, the relevance of the basic monetary framework to developing countries, of which Nigeria is one, have been disputed by Shaw (1973), Wijinbergen (1982) and Mckinnon (1973).

Equation 20 was estimated using two definitions of price level (consumer price index and GDP deflator) and the results are presented in Table 4.3.12

In the two equations estimated, income and price level (P) came out statistically significant at 95% level of significance. Expected rate of inflation (Pe) is statistically insignificant and has inconsistent signs.

TABLE 4.3.12

RESULTS OF THE NEW STRUCTURALIST MONEY DEMAND MODEL

	Model 20A	Model 20B
Constant	2.5431	-3.3891
Y	0.5999* (0.1865)	0.8961* (0.3162)
P	1.8460* (0.7518)	1.3893* (0.3771)
Pe	-0.1039 (0.9041)	0.3371 (0.2683)
Rc	0.3689 (0.2504)	0.5944 (0.4765)
Pm	0.0931 (0.1186)	0.2163 (0.1085)
W	0.2003 (0.1856)	0.1821 (0.0924)
Cp	0.0010 (0.0031)	-0.2853 (0.2269)
w	0.1650 (0.2745)	0.3401 (0.3755)
Summary Statistics		
R^2	0.9813	0.9965
$\bar{R}^2$	0.9781	0.9807
F- Statistics	206.19	310.69
D.W. Statistics	2.1281	2.0584

Note:* Significant at 95% confidence level
t-statistics are in parenthesis

The rate of return on money (rc) also has positive sign whilst it is statistically insignificant. This leads us to believe that curb market effect was absent or very minimal during the period under study. This is contrary to the suggestions of the new structuralist school. Considering the existence of the Osusu institutions in Nigeria and the fact that the economy is generally regarded as under banked in terms of modern banking, this observation can only be interpreted to imply that the impact of informal banking on the demand for real balances is insignificant.

Furthermore, the cost variables in the equations (pm and w) have positive signs and are statistically insignificant. This confirms our doubt of the existence of curb market of any meaningful size. Thus, we may conclude that the new structuralist model does not apply to Nigeria and that the curb market in Nigeria, though exists, is insignificant.

4.38 Empirical Results Of The Microeconomic Model

The research objective is to estimate the microeconomic model with the hope that its results will outperform the other models (both in the microeconomic and macroeconomic realms). We estimated the model represented by equation 31 for parameters a1, a2, …. A15 for income and substitution elasticities.

We also analysed the characteristic of monetary assets relative to consumer goods. The results of our estimation of the coefficients are presented in Tables 4.3.13 and 4.3.14.

TABLE 4.3.13

ESTIMATES OF COEFFICIENTS OF THE MICROECONOMIC MODEL

a_1	a_2	a_3	a_4	a_5	a_6
0.0000	0.0000	0.0122	0.9878	0.2225	0.2857
a_7	a_8	a_9	a_{10}	a_{11}	a_{12}
0.2299	0.4466	0.3568	0.0515	0.4446	0.3961
a_{13}	a_{14}	a_{15}			
0.4056	0.4536	0.4489			

Table 4.3.13 displays the coefficient estimates from the microeconomic model. The parameters represent the consumer's taste or preference and determine the utility function that underlies the estimated demand system. Because the taste parameters are assumed to be constant overtime, the consumer's utility function and parameters did not change. The estimates of a_1 and a_2 came out zero because of the non-negativity constraint. In other words, the estimated parameters would have been negative if not constrained[3]. This implies that the model is at odds with data.

The figure presented in Table 4.3.14 represents averages of the elasticities over the sample period while their standard deviation are presented in parenthesis. The results show that the own price elasticities are negative whilst the cross price elasticities are positive. The diagonal elements are negative and the off diagonals are positive. This seems to imply that monetary aggregates as well as the composite of physical assets are substitutes for one when there is income compensation. Furthermore, we noticed that the pure substitution effects between each of the three monetary assets are significantly higher than between the composite physical assets and any of the monetary assets.

TABLE 4.3.14

ALLEN PARTIAL MATRIX OF INCOME AND SUBSTITUTION ELASTICITIES

	Income	A1	A2	A3	A4
A1	0.5201 (0.005)	-16.4659 (1.9880)			
A2	0.6723 (0.108)	2.9307 (1.3605)	-16.1315 (2.1409)		
A3	0.4958 (0.0045)	5.7035 (0.8174)	5.6634 (1.0003)	-30.0577 (7.6649)	

A4	1.0546 (0.0099)	0.4294 (0.0019)	0.2999 (0.0021)	0.1178 (0.0189)	-0.0439 (0.0082)
Note: Standard deviations are in parenthesis					

It is pertinent to note that the income elasticity for all assets are positive. This indicates that none of the assets used in the study is an inferior good. The income elasticity[3] of the composite physical asset is approximately unitary while the income elasticities of the monetary assets are about 0.5. This observation is important for one other reason. It implies that monetary assets are not regarded luxuries in Nigeria.

TABLE 4.3.15

UNCOMPENSATED PRICE ELASTICITIES

	A1	A2	A3	A4
A1	-0.5611 (0.0057)	0.0853 (0.0115)	0.0911 (0.0135)	-0.0996 (0.0112)
A2	0.0679 (0.0151)	-0.5287 (0.0081)	0.0963 (0.0111)	-0.1382 (0.0091)
A3	0.2005 (0.0155)	0.1327 (0.0081)	-0.4243 (0.0076)	-0.2963 (0.0045)
A4	-00234 (0.0063)	-0.0227 (0.0050)	-0.0161 (0.0048)	-0.9978 (0.0019)
Note: Standard deviation are in parenthesis.				

The uncompensated cross price elasticities are presented in Table 4.3.15. The table shows that the uncompensated price elasticities for (A1, A2) and (A2, A3) are positive. This implies that assets are gross substitutes. On the other hand, the uncompensated cross price elasticities (A1, A2), (A2, A3) and (A3, A4) are negative. This is an indication that the composite physical asset and the monetary assets (A1, A2, A3) are gross complements.

It is possible to draw the relationship between the various assets from Table 4.3.15. This will be exhaustively discussed in the following chapter.

CHAPTER FIVE

DISCUSSION AND FURTHER ANALYSIS OF THE RESULTS

1.65.1 Introduction

The essence of studies into the money demand function is to find a stable equation that can be manipulated and whose variables would have predictable impact on the economy as a whole. A stable demand function, therefore, forms the core of the conduct of monetary policy as it enables the formulation and implementation of target driven change in monetary aggregates to have expected influence on output, interest rate, inflation, exchange rate and employment levels. Due to the importance of the relationship between money and these variables, a stream of research have been carried out worldwide over the past several decades. However, the bulk of these studies have been carried out with respect to developing countries.

In general, the investigation of the subject for developing countries falls into three broad categories:

(i) (i) Those that mimic developed country models and analysis;

(ii) (ii) Those maintaining that the problems of developing countries be specially taken into account when models of demand for money are being considered or developed; and

(iii) (iii) The relatively new approach that maintains that the demand for money is a microeconomic problem that can be most appropriately solved by a recourse to estimations of price elasticities and income and substitution effects of the commodities consumed by economic agents.

Those in the first category are the conventional equations, which postulate that money holding is a function of income and the opportunity cost of holding money. The conventional equations presume that the relationship between money and physical assets is one of substitution.

The second category comprises of two groups. These are the complementary model and the new structuralist model. These models seem to suggest that the relationship between money and physical assets is complementary. Some proponents of this school believe that whatever the relationship, there is a curb market in developing countries, which distorts the smooth flow of money between the sectors of the economy. The argument is that the curb market exists because of the low level of development of the banking sector, credit rationing and arbitrary pegging of interest rates in the formal money markets.

The third category, which is relatively less studied and unarguably yet to receive much attention in developing countries, proposes that determining the elasticity of the demand for various goods consumed would provide a better and more predictable lead to the holding of money.

The three broad models were tested in the preceding chapter and their results presented. The focus of this chapter is to discuss the results in the light of theoretical postulations and existing empirical evidence. In addition, tests are carried out to determine the stability or otherwise of the models. On the microeconomic model, a dynamic analysis is carried out to determine its ability to predict the growth path of the variables employed as well as its stability.

1.75.2 Results of the Conventional Models

To identify the strengths and weaknesses, if any, of the models, a critical appraisal and econometric analysis of the models need to be undertaken. The principal issues involved in the specification of the demand for money function for any country have been identified as: appropriate definition of income, appropriate definition of the money stock and the opportunity cost variables. Traditionally, for all countries (developed and developing) and with respect to all macroeconomic models (conventional, complimentary and new structural) the demand for money has been consistently related to a scale variable such as income, current or permanent.

The literature reviewed in the foregoing chapters showed that neither the theoretical considerations nor empirical evidence is conclusive in demonstrating whether narrow or broad definition of money yields a stable function of macroeconomic variables whose values monetary policy is intended to effect.

The results of conventional models presented in the preceding chapter show that the demand for money in Nigeria is highly dependent on the level of

national income. They show that GDP (Gross Domestic Product) is the most appropriate measure of the scale variable. In terms of elasticity, the result failed to validate the magnitudes suggested by any of the major theories.

The interest rate elasticities failed to emerge with a clearly defined pattern except that the long-term rate seems to perform better than the short-term interest rate. Whilst the short-term interest rate seems to validate the results obtained by Tomori, Ibi Ajayi and Ojo, where the interest variables have wrong signs and are statistically insignificant, the long-term rate has the expected signs and are statistically significant in nominal income equations. In real income equations, long-term interest rates has the correct sign most of the times but are generally statistically insignificant. We believe, however, that this could have been caused by the underdeveloped money market, which is characterized by government intervention and other inherent market imperfections.

Interest rate was institutionally determined during a significant part of the period covered by this study (1970 – 1998). It was only from 1986 that interest rates became partially deregulated. Thereafter, there were periods of guided deregulation, which is an admixture of deregulation and government controls. The variable became fully deregulated after 1995, with the CBN using only stabilization securities as the direct control tool. Under this situation, there can hardly be any meaningful substitution between money and other financial assets. The size of primary securities (especially, treasury bills) issued by the Central Bank of Nigeria (CBN) was equally small. Thus, there existed a very small market, which lacked depth for highly liquid substitutes to money. In addition to this, the level of awareness by the populace of the existence of highly liquid monetary assets is low while the contact between primary savers and primary borrowers was limited. Therefore, the inconsistence in magnitudes and wrong signs of the interest

variables is understandable, as the model should be considered out rightly miss-specified.

The price variable, like interest rates, did not come out with an expected result. The variable consistently has the expected sign (negative) under the narrow definition of money and nominal income but statistically insignificant. The parameter is positive for real income under (M_1) but statistically significant for real GNP. Under this scenario, we are unable to infer much from the result especially when the issue of theoretical ambiguity is considered.

One variable that emerged with consistent result is the lagged money supply. It has the expected sign (positive) and is statistically significant. The magnitude of the parameter seems to indicate that it is the most important variable in the money demand equation, next only to income.

Inflation rate came out statistically insignificant although it has the expected sign (negative). The sign supports the findings of Darrat (1984), Bleja (1979) and Ojo (1974).

The exchange rate variable also shows a consistent pattern in the conventional models. The variable came out with the right (negative) sign everywhere it features. It is statistically significant in all nominal equations and insignificant otherwise. Thus, for nominal balances, the exchange rate is an important variable. This also says much for the degree of openness of the Nigerian economy. Due to the high level of dependence on the external economy, especially given the marginal propensity to import of about 0.8 and reliance on

crude oil for foreign exchange earnings, the exchange rate is of vital importance to economic agents.

5.3 Results of the Complementary and New Structuralist Models

The complementary models seem to give a clear and consistent explanation of the demand for money but still not free of interpretational problems. The results show that the demand for money is a function of income, investment – income ratio and the real return on money holding (which has the wrong sign). The wrong sign of this variable makes it difficult for us to wholly accept the complementary hypothesis of Mckinnon and Shaw.

The new structuralist results are equally not free of interpretational problems. For example, the return on deposit is positive and this could be interpreted as suggesting that an increase in the return on deposit leads to portfolio substitution in favour of deposits. This is contrary to the properties of a dynamic curb market, which ought to maintain the difference between it and the return on deposits. Contrary to expectations, the variable is statistically significant. The multiple of unexpected and inconsistent coefficient leads ambiguity when efforts are made to interpret the results.

New structuralists had argued that with the rate of return on money in the official money market administratively determined and set at low levels (as was the case during a significant part of the period covered by this study), economic agents would switch to deposit money into the curb market as well as hold curb market loans. Furthermore, credit rationing in the official money

market would force credit seeking economic agents into the curb market where the cost of credit is higher but easily accessible. Another reason for this drift to the higher curb money market is the difficulty in providing the official money markets with acceptable collateral for loans. This higher cost is in turn passed on to consumers in the form of higher prices. Thus, Shaw (1973) and Mckinnon (19730 advocate increases or deregulation of interest rates on time, demand and savings deposits, with the belief that it will stimulate increases in savings and credit, thereby loosing working capital bottlenecks. It was further expected that this will encourage real investment and stimulate economic growth.

However, we noted that increases in deposit rates may not necessarily lead to increases in savings held in, and thus, credit granted by banks. This is because credit brokers in the curb market will respond to such increases by raising the curb market interest rate in an attempt to maintain the supply of funds to their market. Buffie (1984) argued that in the short-run, but before interest rate could induce increase in savings, as suggested by Mckinnon, ignoring the element of competition between the curb market and the organized money market, which we have added, increased interest rate on deposit will only increase the availability of credit if such increases are coupled with reductions in the banking sector reserve ratio. If the reserve ratio is constant or even increased, increases in deposit rate would only serve to control the volume of money outside the banking system.

As earlier indicated, the estimated coefficients reported in Table 4.3.12 are opened to a variety of interpretations. The positive and statistically significant

coefficient on the return on deposits can be interpreted as suggesting that an increase in the return on deposits leads to portfolio substitution in favour of deposits, thus, refuting the characterization of the curb market as being the more dynamic. If dynamism is defined to mean market response to changes in demand and supply, it may be expected, a priori, that the curb market interest rate will adjust to maintain the differential between it and the deposit rates, thereby preventing the portfolio shifts in favour of the organized money market. In other words, the coefficient on the return on deposits was expected to be statistically insignificant. However, the empirical evidence thrown up by this study does not support this expectation.

The ambiguity (Salami, 1985) in interpreting the estimated coefficients and their signs leads us to hold the view that, in the Nigerian context, the curb market, though present occupies an insignificant place in the scheme of monetary activities or that a great deal of more information is required about the nature, structure and extent of the curb market.

Generally and by implication, the empirical investigations using the suggested variables and forms can not be useful in predicting the demand for money and in formulating effective monetary policies.

5.4 Stability of the Conventional Models

To test for the structural stability of the conventional models, we took the 7^{th} equation with broad definition of money (M_2) using Gross Domestic Product (GDP). Our choice is based on the explanatory power of the equation as

defined by R^2. We then conducted the Chow (1960) test for structural stability for the conventional models. The results are as follows:

Overall Sample: $\ln M_2 = 0.42\ln GDP - 0.54\ln R_L - 0.045\ln R_S + 0.54\ln P - 0.07\ln X$

$$\Sigma \hat{e}^2_t = 0.143175$$

First sub-sample: $\ln M_2 = -3.33 + 0.9\ln GDP - 1.52\ln R_L + 0.21\ln R_S + 0.51\ln P - 0.061\ln X$

$$\Sigma \hat{e}^2_{1t} = 0.063866$$

Second sub-Sample: $\ln M_2 = -0.70 + 0.45\ln GDP - 2.14\ln R_L + 0.51\ln R_S + 1.67\ln P - 0.081\ln X$

$$\Sigma \hat{e}^2_{2t} = 0.046986$$

Net sample errors is computed as: $\Sigma \hat{e}^{*2}_t = \Sigma \hat{e}^2_t - (\Sigma \hat{e}^2_{1t} + \Sigma \hat{e}^2_{2t})$

$$\Sigma \hat{e}^{*2}_t = 0.143175 - (0.63866 + 0.046986)$$

$$= 0.032323$$

The computed F –Statistic is obtained by the equation : $F = \dfrac{\Sigma \hat{e}^{*2}_t / K}{\Sigma \hat{e}^2_{1t} + \Sigma \hat{e}^2_{1t} / (T-2K)}$

$$F = \frac{0.032323/5}{0.110852/8}$$

$$= 0.4665$$

The computed F Statistic (0.4665) is less than the tabulated F-Value (6.63) at 99% level of significance. We, therefore, accept the hypothesis that the two sets of regression coefficient are the same and that they refer to the same structure. Consequently, the conventional money demand models for Nigeria is structurally stable.

5.5 Stability of the Complementary/New Structural Models

To test for the structural stability of these models we assume that due to the similarities between the complementary models (see Salami, 1988) on account of which many studies have in fact combined them, that their stability can be studied together. Consequently, we take the equation with broad definition of money (M2), i.e. the second equation in Table 4.3.11.

$$\frac{\ln M2}{P} = 2.39 + 0.93\ln Y + 1.12\ln\frac{I}{Y} + 0.33\ln(D\text{-}RP)$$

$$\Sigma \hat{e}^2_t = 0.40715$$

First Sample: $$\frac{\ln M2}{P} = 10.81 + 1.25\ln Y + 1.03\ln\frac{I}{Y} + 0.16\ln(D\text{-}RP)$$

$$\Sigma \hat{e}^2_{1t} = 0.01533$$

Second Sample: $$\frac{\ln M2}{P} = -1.56 + 0.69\ln Y + 1.46\ln\frac{I}{Y} + 0.44\ln(D\text{-}RP)$$

$$\Sigma \hat{e}^2_{2t} = 0.1377$$

$$\Sigma \hat{e}^{*2}_t = \Sigma \hat{e}^2_{1t} - (\Sigma \hat{e}^2_{1t} + \Sigma \hat{e}^2_{2t})$$

$$\Sigma \hat{e}^{*2}_t = 0.40715 - (0.01533 + 0.1377) = 0.25412.$$

F – Calculated = $F = \frac{\Sigma \hat{e}^{*2}_t / K}{\Sigma \hat{e}^{2}_{1t} + \Sigma \hat{e}^{2}_{1t} / (T-2K)}$

$$= \frac{0.25412/4}{0.15303/10}$$

F – Computed = 4.15

Thus, the computed F statistics (4.15) is less than the tabulated F value (5.99) at 99% level of significance. Hence, we accept the hypothesis that the two regression and their coefficients refer to the same structure and therefore, that the complementary models of demand for money is structurally stable.

However, this is not to say that the results of the test of stability for the macroeconomic models could go without contention. Arize (1987) who estimated a long-run money demand function concluded that the demand for money in Nigeria became unstable following the rise in prices of oil in 1973/74 and the subsequent monetisation of oil revenues. The instability reported by Arize has been criticized as being due to misspecification of the money demand equation (Salami, 1988).

In discussing the parameter estimates with respect to the neoclassical opportunity cost of holding money, our results consistently underestimated the price and inflation variables. This was highlighted in the statistical insignificance of the estimates. Arize had use slope dummy, with values of zero prior to 1971/72 and values of one from 1971/72 to 1981/82. This shows that only the slope dummy of the variability of inflation (a variable which we

believed should not have been included in the first place) is statistically significant at 90% or less. Finally, Darrat (1986) also attempted to estimate the demand for money in Nigeria using quarterly data and included foreign interest rates as one of his proxies for opportunity cost of holding money. He found, using different tests, that the demand for money in Nigeria is stable.

Thus, the conventional, complementary and new structuralist models have failed in both the developed and developing countries to provide, on a consistent basis, stable money demand function that can be manipulated to yield predictable results on macroeconomic aggregates.

5.6 Analysis of the Results of the Microeconomic Model

The results of the microeconomic model (Tables 4.3.13 – 4.3.15) show that monetary aggregates and the composite physical assets are substitutes for each other, in the presence of income compensation. Also, the pure substitution effect between the three monetary assets is significantly higher than between the composite physical asset and any of the three monetary assets.

Furthermore, the results indicate that income elasticity for all the assets are positive. This implies that none of the assets used in the study is an inferior good. It is important to note that income elasticity of the composite physical asset is unitary while the income elasticities of the monetary assets are about 0.5. This observation is important for two reasons. First, it indicates that monetary assets are not luxuries, and second, it shows that the results differ from those obtained by Seretis (1986) and Fisher (1989). Both studies had

found contrary income elasticities using the Translog and Fourier demand series respectively. The results of this study suggest that physical assets and monetary assets are normal goods. Thus, confirming the criticism of Keynes by Friedman that money is like other commodities, and therefore, it should be studied as such.

Furthermore, the study demonstrated that the uncompensated price elasticties for (A1, A2) and (A2, A3) are positive. This connotes that monetary assets are gross substitutes. On the other hand, the uncompensated cross price elasticities of (A1, A4), (A2, A4) and (A3, A4) are negative. This indicates that composite physical assets and monetary assets are gross complements.

Further deductions can be drawn from the results. For example, if the user costs of savings rise, the representative consumer shifts his funds to demand deposits or to other money market accounts. Conversely, if the user cost of currency rises, funds will be shifted to other monetary assets.

Significantly large enough changes in user-costs, ignoring the cross price effect amongst monetary assets, will produce large errors in their demand functions. Notice that the income elasticity of the composite physical asset is negative. This shows that price inflation will affect the demand for monetary assets. This is because monetary assets and physical assets are consumed jointly. Therefore, as the demand for physical assets rises, the demand for monetary assets also rises. This direct relationship is borne out of the fact that economic agents hold monetary assets to be able to finance future consumption of physical goods.

It is important to compare the own price elasticities with their cross price counterparts. The own price elasticities of the monetary assets have higher values than their cross elasticities. The cross price elasticity of a change in the price of a physical assets on monetary assets are greater than the cross price of effects of a change in the price of monetary assets on physical assets. This finding seems to be consistent with traditional conventional dictates of the demand for money.

5.7 Dynamic Analysis of the Microeconomic Model.

The estimates of the microeconomic model discussed above offers two other advantages, which could be easily drawn on. First, the static nature of the model, which allows for a dynamic analysis and second, a dynamic growth simulation series can be easily derived from it[3].

The dynamic analysis and growth simulation are important because a critical feature of an economic model is "*…apart from the understanding that the model gives of the system, we may predict and possibly control those movements to improve economic welfare*" (Johnson, 1972:2). Therefore, the simple fact that most of the macroeconomic models cannot significantly help in predicting future movements, future direction of macroeconomic aggregates can not be directed along a predetermined path. They could, therefore, be said not to have met set objectives. It is pertinent to examine the extent to which the microeconomic model can assist in predicting future movements.

To achieve this, we assume in line with the dictates of microeconomic models, that the economy is not divided into distinct sectors since in microeconomics, market information flows are usually assumed to be perfect.

The works of Friedman and Schwarts (1991) and Henry and Ericsson (1991) show clearly that constructing a dynamic model for a demand for money function have been very difficult. This is due to the current state of economic knowledge about dynamic behaviour which is "... *'incomplete and are still very much a blackbox mystery"* (Henry and Ericsson, 1991: 38).

Our model is subject to some initial constraints as well. Unlike most multivariate time series models, the ideal model developed in chapter three is static. It does not consider specific dynamic effects among monetary assets and household consumption goods. The utility function cannot be said to be inter temporal and its parameters are time invariant, since the consumers' preference are not permitted to change overtime.

However, a simple dynamic analysis can still be used to examine the models demand system. We adopted time series of income and price elasticities by using the estimates of the share price equations. Changes in the elasticities reflect changes in user costs of monetary aggregates and consumers' reaction to changes in rates and prices. These changes are reflected in the shares (shi). The dynamics of the model can be investigated even though we assume that demand for money is stable.

The dynamic analysis was done for income, own price and cross price elasticities. The results are presented in figures 6.1, 6.2 and 6.3. As shown in figure 6.1, the income elasticities of all the monetary aggregates were relatively constant over the entire period. On the other hand the income elasticity for the aggregate physical commodity was much higher indicating that a higher proportion of additional income was spent in acquiring physical assets than monetary assets

The own price elasticities as well as the cross price elasticities reflect a higher level of volatility. The price elasticities (figure 6.2) show major shifts in the period 1973 to 1978 and then 1986-90. Whilst the 1978-78 period marked the height of the oil boom and rising income, the 1986-90 period was the period of structural adjustment programme, which saw some growth in the level of economic activities. During the first period, the massive inflow of petrodollars, which were consequently monetised and released to members of the public in the form of Udoji salary award (1975) led to a surge in money supply aggregates.

Price and user cost elasticities move drastically during these periods. The cross price elasticities rose by over 50 per cent of its 1972 level. This imply that the demand for currency and demand deposits (A_1) became more sensitive than it was previously to changes in opportunity costs of holding the savings and money markets accounts (A_2).

Consequently, during the period a rise in savings rate led to a run in current account in favour of savings and money markets accounts. Money market deposits rate in 1992 rose from 45% pa to 107% pa. During this period the number of licensed banks rose from 41 in 1986 to 129 in 1993 whilst the

number of finance houses and mortgage institutions stood at 745 in 1993. The rise in A_2 was a reflection of the attractiveness of depositors to

opportunities that existed in the market.

The opposite price elasticity, η_{21}, also rose by 20 percent. However, it was less than 80 percent of the value of η_{12} and the rise in the rate of A_1 was more modest than A_2. It was observed that the opportunity cost of A_2 increased much faster than that of A_1. Hence the actual flow of funds from A_1 to A_2 might not be significant. The issue therefore is that A_2 may have attracted much funds from other sources.

We observed that the cross price elasticity, η_{13}, dropped 30 per cent in 1983 and 1994, implying that the demand for A_1 was less sensitive to changes in

the rates of A_3. There was a flow of funds from A_3 to A_1. The shift of funds persisted until the introduction of the structural adjustment programme when

this cross elasticity receives some corrections and then rose by 40 per cent. Consequently, the flow of funds to A_1 from A_3 was controlled.

These results are consistent with developments during the period 1970 to 1986. Interest rates were pegged in the 1970's, and the type of account maintained by savers make little or no difference. Real returns on savings, demand and time deposits were largely negative. This was the case until 1986 when the

structural adjustment programme (SAP) was introduced and the other monetary aggregates became attractive forms of savings. Banks were directed during this period to commence payment of interest on current accounts. Although interest on current accounts was low, relative to savings and time deposits, the gesture did alter the sentiments of the markets.

Furthermore, it is now possible to transfer funds easily from savings account to call accounts, to current and vise versa. A high measure of flexibility was introduced into banking operations. These may have increased the sensitivity of various monetary aggregates in the period 1986 to 1998[3].

5.8 The Growth Of Monetary Aggregates

We further sought to confirm the superiority of the microeconomic model by investigating the growth rate of monetary aggregates. This we did by investigating the behaviours of monetary aggregates by dynamic stimulation. To stimulate the model, let us assume that A_i was derived by the utility maximisation approach and expressed by the ordinary demand function of price, user costs and total expenditure.

Thus: $A_i = hi(u_1, u_2, u_3, u_4, e)$ …… 6.1

Totally differentiating equation (6.1) yields

$$dA_i = \Sigma dh_i/du_j \, du_j + dh_i/de \, de \text{ ……..} \quad 6.2$$

Now divide both sides of equation (6.2) by (6.1) and using the definitions of the uncompensated price elasticities as well as the income elasticity yields

$$dA_i / A_i = \Sigma\eta_{ij}(du_j u_j) + \eta_{i0}(de/e) \text{ ……...6.3}$$

Using already known statistics the right hand side of equation (6.3) can be computed. For example, we used the time series of the elasticities and the growth rates of price and interest costs and total expenditures, the right hand equation (6.3) are computed. Consequently the growth rates of demand for A_1 were simulated[3].

The actual and simulated growth rates of demand for various monetary aggregates and consumption were simulated and presented in figures 6.4 to 6.8. The results show that the simulation values match the actual growth rates fairly closely for all the aggregates. Large fluctuations were observed around the growth rates in the periods of 1973 to 1977 and 1986 to 1990. It is our opinion that this large fluctuation was due to the high rate of inflation during the first period and both the influence of high rate of inflation and fluctuation in interest rates during the second period. It is also observable that the changes are also reflected directly in the simulation growth rates.

In the equation for A_1, we observed 'that there are more effecting elements of other aggregates. The own and cross price effects of A_2, A_3 and A_4 are very important in simulating the growth of A_1. On the other hand, the growth rates of demand for the other two monetary aggregates are determined, mainly, by their own price effects and cross-price effects, η_{23}.

This observation points to our direction. For example it can be interpreted to suggest that ignoring the substitution effects on non-M_1 components of M_2 might be one of the factors that discredit reliability of the conventional M_1 money demand function.

It is pertinent that we explain further the large fluctuations in the simulation growth rates. The asymptotic model derived and used in this study is static. Therefore, sharp changes in interest rates are directly reflected as corresponding sharp changes in the simulated growth rates of aggregates. Hence it is not surprising that the simulation errors are large in period of sharp changes in interest costs. In spite of this shortcomings, the graph presented above, suggest that the microeconomic model capture many of the features of the Nigerian monetary system during the period 1970-1998. This alone testifies to the superiority of the model to the usual macroeconomic demand for money models.

5.9 Stability Of The Microeconomic Money Demand Function

One of the most vexed issues in the demand for money controversy is the issue of stability of the function. Many researchers have found support for both side of the divide at various times. According to Stone and Thornton (1987:7):

> *"The erratic behaviour of conventional money demand functions and, more recently, the income velocity of M_1, have led many researchers to assert that the demand for money is unstable".*

Friedman (1956) and Lucas (1968: 61) asserted that money demand is stable based on the observed stability of the consumption function.

One of the major differences between our model and others is that it integrates the demand for both consumption of physical assets and money and then estimate them simultaneously. The results of our estimates suggest that, while the own price and cross price elasticities show considerable variation due to changes in the price level and interest rates, they change little on the average over the period under study (see figures 6.2 and 6.3).

Furthermore, the estimated income elasticities for all three monetary aggregates are nearly constant as shown in figure 6.1[3].

We weigh these against the backdrop of the constraints of our model. For instance, it may be argued that the results are obtained from a model where the estimated parameters are time invariant. That is, the preference function is constant. Thus, it is necessarily true that the demand functions are stable. Nevertheless, the relatively good overall performance of the microeconomic money demand function provides some promise that, like consumption, the demand for money will ultimately be confirmed to be a stable function of a relatively few economic variables. Our study has shown that it is a stable function of income and interest rates.

End Notes

[3] This situation occurs in a recent debate in economic literature; see Hendry and Ericsson (1991) and Friedman and Schwartz (1991)

[3] See Goldfeld (1976) and Friedman (1984). Also see Thornton and Stone (1991) for a discussion of this possibility.

[3] Some terms are essentially zero and can be ignored. The following growth rate equations are accurate enough to produce the simulations:

$dA_1/A_1 = \eta_{11}du_1/u_1 + \eta_{12}du_2/u_2 + \eta_{13}du_3/u_3 + \eta_{44}du/u_4 + \eta_{10}dE/E$

$dA_2/A_2 = \eta_{22}du_2/u_2 + \eta_{23}du/u_3$

$dA_3/A_3 = \eta_{33}du_3/u_3$

$dA_4/A_4 = \eta_{42}du_2/u_2 + \eta_{43}du_3/u_3 + \eta_{44}du_4/u_4 + \eta_{10}dE/E$

In the equation for A1 there are more affecting elements; the own and cross-price effects of A2, A3 and A4 are important in simulating the growth rate of A1. The growth rates of demand for the other two monetary aggregates, however, are determined mainly by their own price effects and cross-price effect, η23. This suggests that ignoring the substitution effects of non-M1 components of M2 might be one of the factors that discredit reliability of conventional M1 demand function.

[3] In the parlance of modern time-series analysis, these elasticities are said to be stationary, that is, mean reverting. However, no formal tests of stationarity were performed in this aspect of the study.