CHAPTER THREE

THE DEMAND FOR MONEY IN THE SUDAN

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This chapter offers a perspective on estimation of money demand functions in a developing country and supplements the on-going research in the Sudan with annual models, for the first time covering the bulk pre and post Islamisation of banking. This chapter is in two parts, denoted by the Money and Demand for Money in the Sudan. It is mainly, focusing on the theoretical and empirical definitions as well as the determinants of demand for money in the Sudan. This chapter is organised as follows: the first section is concerned with introduction. Section two presents a brief of the concepts of money. The third section highlights the functions of money. The fourth section is concerned with the approaches of different schools of economic thoughts with regard to money. The fifth section presents the development in the demand for money analysis. The sixth section is concerned with the empirical analysis of demand for money in the Sudan. The last section provides the results and concluding remarks.

3.1 INTRODUCTION

Crowther (1959)[1] states that, every branch of knowledge has its important discovery:

"every branch of knowledge has its fundamental discovery. In mechanics it is the wheel, in science fire, in politics the vote. Similarly, in economics, in the whole commercial side of Man's social existence, money is the essential invention on which all the rest is base." [*Crowther, 1959, p. 4*].

Money was undoubtedly an invention; as Growther said: *"-the invention, perhaps, of some lazy genius who found himself oppressed by the task of calculating how many bushels of corn should exchange for on tiger-skin... it needed the conscious reasoning power of man to make the step from simple barter to money accounting." [Growther, 1959, pp. 2-3].*

Money is so important that it has made economics relatively, more exact science as compared to other social sciences like psychology. Economists can predict more exactly about human behaviour than any other social science because of money. Money has made possible quantification of every prediction, which is difficult in other social sciences. In economics we can measure everything in terms of money. Even satisfaction which can be measured in terms of money which is not possible in other social sciences, therefore, money as a measuring rod measures each human activity which has made economics an important science these days. [*Dr. Saiyed, S.A.: "How exact Economics Laws Are" -Under Publication"*].[2]

3.2 CONCEPTS OF MONEY

Money is important and indispensable of modern civilisation. In ordinary usage, what we use to pay for things is referred to as money. To a common man on the street, thus, a Pound; Dollar or Dinar in England, USA or the Sudan respectively is money. However, to an economist, Pound, Dollar and or Dinar are merely different units of money. Hence, the question still remains, what is money? How will you define it, in scientific terms? The complex

economies of the modern world are unable to function without the use of money, if money is not employed, production or distribution of goods and services must be completely planned by the state or all transactions must be carried on by barter system, therefore some difficulties are associated with the barter, hence, money comes into existence, [*Hanson, 1983, pp. 3-4*].[3] One of the main reasons for studying money is to get better idea of what should be done about it. Description, theoretical analysis and historical review are all valuable, because they provide a guide to wise public policies in the future, [*Trescott, 1965, p.513*].[4] In the post-war period interest in money was augmented by the occurrence of inflation and unemployment, due to the very inconvenient device and problems of barter system, it was in course of time replaced by money proper, [*Gibson and Kaufman, 1970*].[5] Etymologically, the word money is derived from the Latin word Moneta "*title of Goddess Juno, in whose temple at Rome, money minted*". [*Oxford Encyclopedia English Dictionary p.936*],[6] although money has been used for centuries, the concept of money is not easy to define. Keynes (1936)[7] said that, the origin of money is deep-rooted in antiquity, and it is a far more ancient institution, in his words:

> *"Its origins are lost in mists when the ice was melting, and may well stretch back into the paradisiacal intervals in human history of the inter-glacial periods, when the weather was delightful and the mind free to be fertile of new ideas – in islands of the Hesperides or Atlantics or some Eden of Central Asia." [Keynes, 1936; p.3].*

The definition of money is still an unsolved issue of monetary economics. Though we are all familiar with the term money, it is a concept, which still lacks absolute clarity in scientific terms. Different economists in defining money have adopted different criteria. According to Hicks (1967)[8]: "*In a world of bank and insurance companies, money markets and stock exchanges,*

money is quite different thing from what it was before these institutions came into being." [*Hicks, 1967, p.158*], and in his last work, he qualified his earlier statement in one important respect by arguing that all monetary economics, and not just these with developed financial institutions, have basic credit element, so that the concepts of credit and payment of debts are fundamental to understanding the role of money in market systems. [*Hicks, 1989 pp. 48-49*].[9] The other definition of money given by Hart and Kenen (1961)[10] is that: *"... property with which the owner can pay of a definite amount of debt-with certainty and without delay..."* [*Hart and Kenen, 1961, p.4*]. The widest definition of money is the following:

> *"Money: A medium of exchange; an instrument, token, or commodity, whether metal or paper, by which payment is made for the transfer of values from one person to another. The essential characteristic of good money is that it is readily acceptable in payment for goods and services and in settlement of debts, without reference to the credit worthiness of its specific form of the person tendering it in payment. Acceptability of specific forms of money in settlement of debts is important by law's prescribing them to be legal tender; i.e. money which by law a debtor is authorized to offer in payment of debt."* [*Encyclopedia of Banking and Finance, 1994, p. 752*].[11]

Most of the economic schools defined money on the bases of its functions and purposes i.e. the classical economics have defined money as a medium of exchange, therefore, people hold money for transaction purpose. The Keynesian economists do not find any particular definition of money and was not important, thus, they view money simply as one element in a vast spectrum of debt, and people hold money for transaction purposes and risk and cost avoidances. The modern quantity theory economists have defined money as a medium of exchange and store of value, and to be held for

transactions and for utility derived from its services. While Patinkin (1965) has defined money as, an economic variable that causes economic systems to function in a way different to the rudimentary (barter) economy.

The economic philosophers of yester-years (19th and 20th centuries), argued that money was simply veil behind which action of real economic forces is concealed, one of their clearest exponents was put by Mill (1923)[12] as:

> *"It must be evident, however, that the mere introduction of a particular mode of exchanging things for one another, by first exchanging a thing for money and then thing exchanging the money for something else, makes no difference in the essential character of transactions... There cannot, in short, be intrinsically a more insignificant thing in the economy of the society, than money; except in the character of a contrivance for sparing time and labour... The reasons, which make the temporary or market value of things depend on the demand and supply...are as applicable to a money system as to a system of barter. Things which by barter would exchange for one another will, if sold for money, sell for an equal amount of it, and so will exchange for one another still, though the process of exchanging them will consist of two operations instead of only one. The relationships of commodities to one another remain unaltered by money."* [*Mill, 1923; pp.22-23*].

3.3 FUNCTIONS OF MONEY

The definition of money must be in functional terms. Money includes all those things that perform the functions of money and excludes all others. Virtually, all economists agree that we should include in money supply all those things that are in fact generally acceptable in payment of debt and for goods and services, and generally used as a medium of payments (Irving Fisher), it is money whatever it may be its legal status [*Chandler, 1969, pp.13-14*].[13]

According to Crowther, money performs three functions or something that performs all three functions and pre-eminently the function of being a medium of exchange ('anything that is generally acceptable as a medium of exchange'), and that at the same time acts as a measure and as a store of value, [C*rowther, 1959; p.20*].

The term money serves its basic purpose as: "*the great wheel of circulation, the great instrument of commerce.*" by performing four specific functions, each of which obviates on of the difficulties of pure barter system. These functions are to serve as: (i) a medium of exchange, (ii) unit of value, (iii) a store of value, and (iv) a standard of deferred payments. The first two functions are usually called the primary functions of money, while the remaining two are called derivative functions because they are derived from the primary functions. Kent (1966)[14] has defined money as: "*anything that is commonly used and generally accepted as a medium of exchange or as a standard of value*" [*Kent, 1966; p.4*]. Therefore, money is defined as a generally acceptable means of payments, or of settling debt, and fulfills the four main functions as: medium of exchange between buyers and sellers; unit of account for accounts, debts, financial assets etc.) Involving no exchange; standard of deferred payments (rents interest, salaries, pensions, insurance premium, etc.), and, store of value or purchasing power enabling income-earners to set aside a part of their income to yield future consumption. In addition to these functions, there are contingent functions of money like a measure the national income; national income can be distributed to different factors of production by making payments to them in money terms; Measurement of consumer marginal utilities of different commodities purchased through the help of

money; money also transfers purchasing power from person to person, place to place, and time to time; modern economy is a credit economy. The base of credit in an economy is the monetary system, without a monetary reserve it is impossible to create credit; money is superior to all assets in terms of liquidity. The traditional function of money can be regarded as the static functions of money, while the dynamic functions of money are the influences that money exerts on the economy. These influences are particularly pronounced in the sphere and so on. In fact, the price mechanism plays a significant role in directing, guiding and controlling economic activities. Money also leads to a trade cycle-boom or a trough, and has been pointed out that after all money matters. [*Ghosh and Ghosh, 2000; pp.25-27*].[15]

3.4 THEORETICAL FOUNDATION OF DEMAND FOR MONEY

The literature on demand for money is enormous; with the vast majority of research efforts directed at money demand relationships. But a substantial works have not been directed at the empirical relationship between money and growth in less developed counties. Most governments in developing counties relied heavily on domestic monetary policies, large expenditure in development in the 1970s while faced the twin problems of high domestic rate of inflation and a deficit in the balance of payments, [*Khan and Knight, 1981; pp.1-5*].[16] This is particularly true for the Sudan, which witnessed both rapid increases in the monetization of economy and massive development expenditure in 1970s, 1980s and until late 1990s as well. Here, we would like to have a glance at the theoretical foundation of demand for money.

The monetary theory is extremely practical; every modern economy has some sort of monetary policy. If a particular policy action is taken, it must be on the basis of some theory as to how the policy will affect the economy. [*Horvitz 1979; p.400*].[17] The earliest monetary theory postulated some sort of direct relationship between money stock, output and price level, which constitutes a basic building block in so many macroeconomics theories, wherein monetary economics lie at the core. This relationship is encapsulated in the form of a demand function for money [*Jadhav, 1994; p.52*].[18] [*Goldfeld and Sichel, 1990; p.300*].[19] The monetisation of an economy provides the potential to generate a real investible surplus in several ways. As fiat money may replace barter system in transactions, the demand for money rises in relation to income, which releases real resources of equal value, [*Thirlwall, 1999; p. 335*].[20]

The study of the demand for money is important and essential to know the monetary equilibrium position between demand for and supply of money. By the demand for money we mean: *"the demand to hold money, rather than use it for some other purpose such as buying goods and services, purchasing financial assets, giving it away and so on."* [*Pierce and Shaw 1979, p.82*].[21] The demand for money is a demand for real balances. It is the purchasing power, not the number, of their money papers that matters to the holders of money. [*Dornbusch and Fischer, 1990].*[22] The theory of demand for money is mainly concerned with the determinants of the public's demand for money and why do people hold money rather than exchange it for other things? Macroeconomic policies are sometimes geared to control the demand for money. Hence it is necessary to appreciate the existing demand for money in

the economy before the development of any policy for the purpose of stabilising, the economy at full employment level. There are many theories regarding the demand for money, which are divided into the following:

(a) The Classical Approach.
(b) The Keynesian Analysis.
(c) The Post-Keynesian Development.
(d) The Modern Quantity theory.

3.4.1 THE CLASSICAL A PPROACH

In classical approach or the transactions balance version, demand for money was based on the view that money was simply a medium of exchange. Nobody really desired to hold money, but did so because in fact they were forced to, simply, because receipts of money did not coincide in time with expenditure, [*Pierce and Shaw, 1979; p.83*]. The only reason for holding money in the classical theory is to bridge the gap between time of receipts and expenditures; all money hold is kept in transaction balances kept to finance future transactions. Irving Fisher's equation of exchange is expressed as:

$$\mathbf{M\,V = P\,T}$$

Where, **M** stands for the stock of money, **V** stands for the velocity of circulation of money [*Fisher, 1911; p. 24*].[23] **P** is the average price level involved in all transactions that take place in the economy during the year. This includes purchases of all goods as well as financial transactions. **T** represents the physical volume of transaction taking place during the year. It is important to stress that the equation of exchange is **MV** equals **PT** always under any circumstances because the way in which it has been defined in

various terms. And the equation itself does not tell which factor will change.

In the words of Irving Fisher:

> *"a double in the velocity of circulation of money will double the level of prices, provided the quantity of money in circulation and the quantities of goods exchanged for money remain as before... we must distinctly recognize that the quantity of money is only one of three factors, all equally important in determining the price level."* [*Fisher, 1911, pp.20-21*].

PT expresses the demand for money and **MV** represents the supply of money, the equation can also be written as: **MV=PY**, where **Y** is the real income and **PY** is money income, where the demand for money can be further expressed as:

$$M = \frac{PY}{V} = M^d = \frac{1}{V}.PY$$

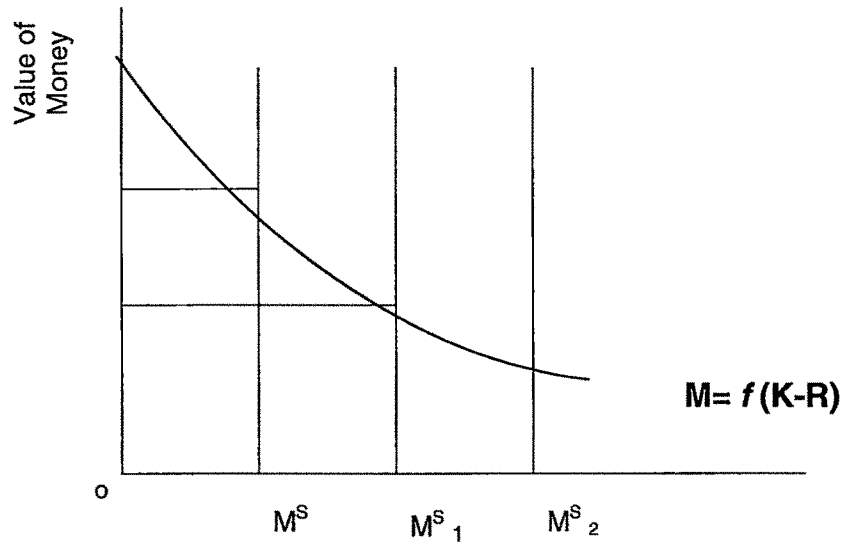
The demand for money is expressed as demand for real balances, and then the equation becomes:

$$\frac{M}{P} = \frac{Y}{V}$$

An alternative approach to the quantity theory of money was developed by Cambridge economists (Marshall, Pigou etc.), they attempted to analyze the demand for money by asking just what are the factors that determine the amount of money individuals desire to hold. This approach is known as Cambridge Cash Balance Approach, where **M=K.PY**, Where, **K**= the proportion of real income held in form of cash and it is equivalent to **1/V**. In the classical theory, the demand for money varies directly with money value of national income. And their demand functions for money can be written as: $M^d = f(Y, P)$.

The mentioned figure indicates proportionate relationship between price level and the demand for money, such demand curve [**M = *f* (K-R)**] for money, assuming full employment in the economy, it can be said that the classical approach for demand for money has unitary elasticity.

Figure 3:1



3.4.2 THE KEYNESIAN ANALYSIS

Keynes's treatment of transactions and precautionary motives add nothing that is particularly new to analysis developed by Fisher, Marshall and Pigou. But rather develops that earlier a little further. To understand the Keynesian theory of demand for assets some questions need to be separated; Keynes's starting point was to ask: Why should a person prefer to hold his wealth in a form that yields little or no interest? And what is the degree of liquidity preference? [*Keynes, 1936; p.166*].[24] More concretely, Keynes shows how these questions are interrelated, by stating that:

"The three divisions of liquidity-preference which we have distinguished above may be defined as depending on (i) the transaction-motive, i.e. the need of cash for the current transaction of personal and business exchanges; (ii) the precautionary-motive, i.e. the desire for security as to the future cash equivalent of a certain proportion of total resources; and (ii) the speculative-motive, i.e. the object of securing profit from knowing better that the market what the future will bring forth." [*Keynes,1936; p.170*].

Keynes's famous demand for money is governed by the liquidity preference, which is in turn governed by the three motives; and he recognises the function of money not only for transactions, but also as an asset. He believes that the transaction demand for money is a function of the level of the income (Y). The transaction demand for money arises from the use of money in making regular payments for goods and services. [*Keynes, 1936; pp.195-196*]. The amount of money, which consumers require for their daily transactions, depends on their incomes, spending habits and the interval time of their incomes. Other things remaining the same, the higher the income, the higher is the amount of money required, thus, $\mathbf{M_1 = L_1(Y)}$.

The precautionary motive of demand for money arises because people are uncertain about the payment they might want or have to make. Therefore, the individual also requires for meeting the unforeseen contingencies. The precautionary demand for money is also a direct function of the level of income **(Y).** According to Keynes, transactions motive and precautionary motive of demand for money are not influenced, by the rate of interest, and Keynes lumped them under $\mathbf{M_1}$. Thus, the demand for money on these two accounts of motives (active balance) is $\mathbf{M_1=L_1}$ **(Y).**

Keynes's analysis of the speculative motive is the most important contribution made to the theory of demand for money. Keynes considered only a financial portfolio composed of money and bonds. The bonds are sensitive to the interest rates. If interest rate changes while an individual is holding a bond, then the market value of the bond will change, rising when the interest rates rise, and vice versa, bond-holding offers the possibility of a capital gain as well as a capital loss. Any increase of interest rate above the normal rate would create expectations of rising bond price and would raise the demands for bonds and reduce the demand for money. A rate lower than normal would entail a rise in demand for money as the demand for bonds began to decline, however, Keynes states:

> *"different people will estimate the predominant opinion as expressed in market quotations may have a good reason for keeping liquid resources in order of profit, if he is right, from its turning out in due course that the present discounted value of investments on the basis of the term structure of interest rates were in a mistaken relationship to one another".* [*Keynes, 1936, pp. 168-169*].

Therefore, speculative demand for money is inversely related to the interest rates, and is expressed as: $M_2=L_2(r)$. **However,** $L_1(Y)=K.PY$. Therefore the complete Keynesian theory of demand for money can be expressed in the following equation:

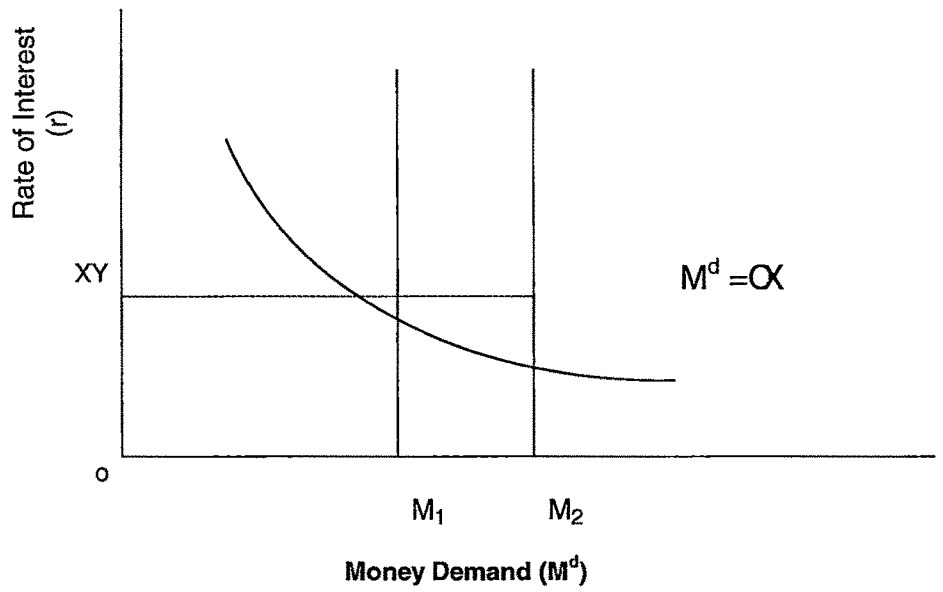
$$\frac{M}{P} = K.Y + L_2(r)$$

Where, $\frac{M}{P}$ = demand for real balance, **P** = price level, **Y** = real income

K is Marshallian proportional constant, $L_2(r)$ is speculative demand for money.

Uncertainty of the rates of interest, therefore the price of asset is the basis of the speculative demand for money refers to the desire to hold cash in order to take advantage of the anticipated fall in the prices of securities.

Figure 3:2 The Hypothesis of Liquidity Trap



Liquidity trap, which happens during a deep depression, the rates of interest touches the critical minimum level, and at this interest rate the demand for money curve becomes perfectly perceptual elastic as shown in the above figure. Putting all Keynes's motives together, the demand for money depends on a transactions-precautionary motive determined mainly through the level of income; and on the speculation motive base mainly on the rate of interest and expectations; Keynes states that:

> *"Let the amount of cash held to satisfy the transaction-and precautionary-motive be M_2. Corresponding to these two compartments of cash, we then have two liquidity functions L_1 and L_2 ... $M = M_1 + M_2 = L_1 (Y) + L_2 (r)$, where, L_1 is the liquidity function corresponding to income (Y), which determines M_1, and L_2 is the liquidity function of the rate of interest (r), which determines M_2."* [*Keynes, 1936; pp. 199-200*].

3.4.3 THE MODERN QUANTITY THEORY'S RESTATEMENT

The modern quantity theory has its genesis in the work of Prof. Milton Friedman (1956),[25] the Chicago School's economist. [*Cuthbertson, 1985, p.16*].[26] Friedman has challenged Keynes's theory, and observes that quantity theory is primary a theory of demand for money, then his restatement is partly Keynesian and partly non-Keynesian, and he states that: "*The quantity theory is in the first instance a theory of output, or of money income, or of the price level*." [*Friedman, 1956; p.4*]. Friedman asserts that money does matter, money is an asset, and money supply is independent of money demand. Whereas, money supply is unstable, the demand for money is not. Friedman states:

> "*It was a theoretical approach that insisted that money does matter-that any interpretation of short-term movements in economic activity is likely to be seriously at fault if it leaves unexplained why people are willing to hold the particular nominal quantity of money in existence*", [*Friedman, 1956; p.3*].

According to Friedman there are five alternatives of holding wealth (i) money, (ii) bonds, (iii) equities, (iv) physical capital, and (v) human capital. In his words:

> "*equities (E), interpreted as claims to stated pro-rata shares of the returns of it will suffice to bring out the major issues that these considerations raise to consider five different forms from which wealth can be held: (i) money (M); interpreted as claims or commodity units that are generally accepted in payment of debts at a fixed nominal value; (ii) bonds (B) interpreted as claims to time streams of payments that are fixed in nominal units; (iii) enterprises; (iv) physical non-human goods (G); and (v) human capital (H), consider now the yield of each.*" [*Friedman, 1956, p.5*].

Therefore, Friedman's demand for money function can be expressed as [*Friedman,1956; p. 9*]:

$$M = f(P, r_b - \frac{1}{r_b}\frac{dr_b}{dt}, r_e + \frac{1}{p}\frac{dp}{dt} - \frac{1}{r_e}\frac{dr_e}{dt}, \frac{1}{p}\frac{dp}{dt}, w, \frac{Y}{r}, u)$$

In real terms Friedman's demand for money function can be written as:

$$\frac{M}{P} = f(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, w, \frac{Y}{P}, u)$$

$$= \frac{1}{v\left(r_b, r_b, \frac{1}{P}\frac{dp}{dt}, w, \frac{Y}{P}, u\right)}$$

OR

$$Y = v\left(r, r_e, \frac{1}{P}\frac{dP}{dt}, w, \frac{Y}{P}, u\right) M$$

In this form the equation is in the usual quantity theory form, where **v** is income velocity. **M** is demand for money, **P** stands for the real return (price level), **Y** stands for permanent income (nominal), **w** is the ratio of income from non-human wealth, **u** stands for tastes and preferences of wealth owners, $\mathbf{r_e}$ is the market interest rate (Equity yields), $\mathbf{r_b}$ stands for the ratio of the (coupon) sum. (Bond yields) and **1/P.dP/dt** is Expected rate of change price level.

In this theory money is considered as a medium of exchange and as a store of value; and people hold money for transactions purpose, as well as for utility derived from its services for the ultimate wealth-holders, as well as business enterprises. The theory is unified one within a static framework, focusing attention on a limited range of assets/debts. Wealth is important, as well as interest rate in addition to price expectation. Level of permanent income and wealth, other things like preference of wealth-holder, and the alternative cost of holding money; are the major factors affecting demand for money. In his conclusion, Friedman has mentioned the following points: the stability of the

demand for money, independence from factors affecting demand for and supply of money, and predictability of the relation among money, price level and income. Thus, in his words:

> "*The quantity theorist accepts the empirical hypothesis that the demand for money is highly stable-more stable than functions,*", "*... not regards the demand as function for money as stable; he also regards it as playing a vital role in determining variables that he regards of great importance for the analysis of the economy as a whole, such as the level of money income or of prices.*" As well as he states that: "*... also holds that there are important factors affecting the supply of money that do not affect the demand for money. ... A stable demand function is useful precisely I order to trace out the effect of changes in supply,*" [*Friedman, 1956, pp.16-17*].

5.4 DEVELOPMENT IN THE DEMAND FOR MONEY ANALYSIS

The most important issue in the demand for money analysis in recent years is the question of stability of demand for money, which dominated the empirical studies till the mid 1970s. In recent years, the demand for money analysis is taking into account different types of assets had been exhaustively surveyed and has been found that, a stable demand for money function for developed as well as developing countries can be estimated on the same lines, expected price changes rather than interest rates seem to be important. The demand for money has been studied very intensively at both theoretical and empirical levels. There is by now almost total agreement that the demand for money should, as a theoretical matter, increase as the level of real income rises, and decreases as the nominal interest rises. Much empirical works bear out these two properties of the demand for money function [*Dorbusch and Fischer, 1990; p. 346*]. The various theories of demand for money which are surveyed above or their reformulation all contain hypothesis can be, and to greater or lesser

extent have been subjected to empirical evidence [*Pierce and Shaw, 1979; p.125*]. Consequently, much empirical works have gone into identifying it and estimating best values of its parameters using econometric technique of multiple regression analysis for several individual developed countries viz the UK, the USA, Canada, Australia, and developing countries such as middle-eastern countries, like India, Korea, Thailand; and in Africa; Kenya, Ghana, South Africa, Morocco, Nigeria, the Sudan and others [*Gupta, 2001, pp.197-198*].[26] Empirical works before 1974, showed very stable simple demand-for-money function, with real balances demanded increasing with the level of income and decreasing with the interest rates.

Keynesian economists predict that demand for money would be found to be interest-elastic, some low interest rates would be definitely so. Modern theories of the transactions demand for cash predict that demand for money will increase less than proportionately to increases in income-bond-holding will affect demand for money at a given interest rate. The modern quantity theory predicts that wealth, including human wealth will be an important argument in the demand for money function. Though, in the 1980s, the shifts generally showed lower real balances being demanded at a given levels of income and interest rates than before. There is stable demand function for $\mathbf{M_2}$. The demand has unit income elasticity with respect to the commercial paper rate. Because of this stability $\mathbf{M_2}$ is currently the focal point of monetary policy [*Dornbusch and Fischer, 1990; p. 346*]. The first statistical study of demand for money; was in fact of Keynes's liquidity preference function, based on a distinction between active and idle balances and were undertaken by some economists. So many economists and economic writers have taken the

empirical study of demand for money functions: the first was Arthur Brown (1939) and James Tobin (1947), in the late of 1950s appeared the works Friedman (1959), Adekunle (1968), Gujarati (1968), Trescott (1972), Shahi (1977), Crockett and Owen (1980), Van Heerden (1981) Pathak (1981), Artis an d Lewis (1984), Gupta (1987), Domowitz and Elbadawi (1987), Cuthbertson (1988), Darrat (1988), Swamy and Tavlas (1989), Kremers and Lane (1990), Hendry and Ericsson (1991), Hoffman and Tahiri (1994), Abu Rasheed (1996) Ghartey (1998), Howard (2002) and so many in the case of India. The followings are few studied works cited from different periodicals and have been summarized as follows:

Adekunle (1968)[27] in his study of nine developed and less developed countries (**DCs** and **LDCs**) suggests that the demand for money is a rather stable economic force; by taking narrow money, and considering inflation and the rate of interest as additional explanatory variables, he gives estimates of demand for money of 0.77 for Ceylon (Sri Lanka); 0.81 for China; 0.94 for Costa Rica; 1.35 for India and 0.60 for Mexico. The real income is an important determinant of the demand for money.

Gujarati (1968)[28] the purpose of his paper was to present an empirical finding on the demand for money in India. He has applied the partial adjustment model for Indian data covering the period 1948-1964; using linear equation, R^2 and **D-W** and making distinction between long-run and short-run demand function by introducing a mechanism for adjustment of actual stock of real cash balance to it's derive level. He concluded that the aggregate real income was the most significant determinant of the demand for real cash balance; the

interest rate elasticities were statistically insignificant, also he found that the estimates of income and interest elasticities derived from demand function are likely to be biased.

Trescott (1972),[29] in his extensive empirical paper, which surveys Thai financial development using data for the period from 1947 to 1967, currency, demand and time deposits, government savings, bank and government securities out-side the commercial banks. He applied the standard error of individual coefficients and their t-test, **D-W** statistic and coefficient of determination (R^2). His regression analysis indicates that public's demand for government securities responded positively to increase in national money and to the interest offered on government securities, demand for securities was influenced by a number of other factors, such as income tax status; repurchase provisions, and possible interest rates on international financial assets. The increase on interest rates offered on government debt contributed to rise in income elasticity of demand for money, and virtually has been found to be constant and behaves like transaction demand. He uses money income rather than real income, which changes the primary of change in output or change in prices.

Shahi (1977)[30] in his specification and empirical estimation, study of 22 developing countries demand for money function using variable data from 1960 to 1974; he concluded that his simple specification came out to be the best for 50% of those 22 developing countries. The income-elasticity of the demand for money is greater than unity. The interest-elasticity of demand for money is exceptionally, high for some countries. And on the basis of overall

performance, in the sense of both income and interest coefficients obtaining the correct sign and also being statistically significant. The simple models that he has pointed out were simple ones and might be more fruitful in order to confirm the theoretical hypothesis.

Crockett and Owen (1980)[31] attempt to estimate a relatively simple formulation of the demand for money for nineteen Middle-Eastern countries. Robust income elasticity was obtained across the nineteen countries in the model, with significant coefficients being obtained in eighteen countries. Elasticity estimates clustered from 1:00 to 1:50 for narrow money (M_1), the inflation rate was found to be significant only with three countries. In the case of the Sudan, their study covers the period from 1964 to 1977 as a non-oil producing country, and they used narrow money ("**ln (M1/CPI**") and broad money ("**ln (M2/PCI**"). The results were reasonable, with no evidence of instability at 95%, confidence level between 1964-73 and 1974-1977.

Pathak (1981)[32] in his empirical study of demand for money in developing Kenya from 1969-1978, he has chosen annual average treasury bill rate as an interest rate, and also took the variables narrow money (M_1) and national income for the analysis. His empirical study shows demand for money function is positively and statistically significant, the interest elasticity of demand for money was though very low and still it is not very significant statistically. Income-elasticity of demand for money is unity, which strongly supports the monetarist contention that the quantity theory is a theory of demand for money. The demand for money function is stable and hence

provides suitable basis for the monetary analysis in a developing economy of Kenya.

Van Heerden (1981)[33] has pointed out some problems that arise from the article of Shahi (1977) in which the definition of currency in South Africa has been changed, but Heerden's article agrees with Shahi's one that the functional form of the demand-for-money in South Africa is a log-linear. Van Heerden used Zarembka's (1968) method to suggest a functional form for the demand-for-money; quarterly data is used, which covers the period 1970 QIV to 1979 QII. The followings are his conclusions: The demand-for-money in South Africa is more income-elastic than interest-elastic. The elasticity of the demand-for-money, with respect to interest rate, could not be shown that differs on a 5 % significance level from zero. And the income-elasticity of demand-for-money in South Africa is greater than 0.95 but smaller than 0.965.

Gupta (1987)[34] has examined the relevance of Friedman's permanent income hypothesis in the Indian context in his empirical examination. He applied the demand for money function, **OLS, R^2, DW** statistics, residual sum of squares (**RSS**) and standard error of estimates (**SEE**), on the data (M_1, M_3, P, Y, i, p^I of inflation) for the period 1954-55 to 1982-83.His findings are quite encouraging and explain up to 96% in the narrow money (M_1) and 98% in broad money (M_2) holding, and the money demand elasticities depend an the definition of the relevant variables. He found that permanent income out performs the measured demand for narrow as well as broad money. In regard with the interest rates experiment, he also finds that the treasury bill rate works much better than the yield on government bonds, and short-term rate of

interest has proved to be the relevant. The ratio of non-agricultural income to agricultural income was found to be irrelevant argument in the demand for money function; Also he found the money demand function in India to be unstable over time on the narrow definition but inconclusive on its broad definition.

Domowitz and Elbadawi (1987),[35] in the case of the Sudan as other developing countries, with a developing economy, few studies on the demand for money have been undertaken. Whatever little investigations have been made by different writers such as ElGhoul (1977) and, Domowitz and Elbadawi (1987). Domowitz and Elbadawi in their empirical analysis of money demand behaviour in the Sudan, illustrating the potential role of open economics in the estimation of money demand. Their paper illustrates how error correction techniques can be used to estimate and test the effects in the long-run; influences short-run adjustment and proportional equilibrium conditions. The model is estimated annually over the period 1956 to 1982 annual data for all variables, they use only narrow money (M_1) as monetary variable, **GDP** as income, consumer price index (**CPI**) and they use the exchange rate:

> *"It is argued therein that during periods in which foreign currency is considered an important alternative to domestic currency in the wealth portfolio, omission of such a variable may bias a model towards overstating the influence of inflation, in context of domestic currency devaluation."* [*Domowitz and Elbadawi, 1987; p. 260*].
>
> They have considered the interest rate in equation (1') in their words: *"Ordinarily, the interest rate would be included as it is in (1'). The recorded interest rate in the Sudan, however, changed only twice during the period of our study, and appears to have little empirical relevance here."* [*Domowitz and Elbadawi, 1987; p. 260*].

And they apply the ordinary-least-square (**OLS**) technique. They find that the short-run adjustment elasticity was 0.43, while the levels impact elasticity with respect to inflation was -0.45, and the value connotes that the parameter on the lagged money demand when estimated in framework of partial adjustment has a magnitude of 0.82 for the Sudan. The demand for money function appeared to be quite stable in 1950s and 1960s era, and extending to part of the following decade, they check the stability claim and observed:

> *"Thus, there is little surface evidence of predictive failure, despite the fact that the sample correlations of the variables evidence relatively strong changes in behaviour pre and post 1978, as shown in table 3."* [*Domowitz and Elbadawi, 1987; pp.270-271*].

Like several authors, they conclude putting emphasis on the need for such a quantitative examination in the context of stabilisation policies, thus, they point;

> *"The question of a general paradigm for empirical money demand analysis in developing nations arises naturally, if one believes in the necessity of demand-oriented monetary policy. While one example is certainly not evidence, the performance of error-correction model in this case bodes well for its continued use."* [*Domowitz and Elbadawi, 1987; p. 273*].

Cuthbertson (1988)[36] states that demand for money differs depending on whether shocks are anticipated or unanticipated, he has used data of 1964-1979 extended to 1982; he suggested that buffer stock ideas apply more powerfully to broad money than to narrow money and it is useful in modeling demand functions for a wide range.

Darrat(1988),[37] has studied the behaviour of demand for money in Tunisia (1960 to 1984), under the Islamic interest-free baking system. Explaining the

differences between the Islamic banking system and the conventional banking system and mainly testing empirically the hypothesis that the financial system becomes more stable without interest-bearing assets. In his words he summed the empirical results as:

> *"Both tests strongly suggests that the public's demand for non-interest-bearing assets is structurally stable over time, but the public's demand for interest-bearing assets suffers from structural instability over time. Such finding renders the presence of interest-bearing monetary assets a potential nuisance with the Tunisian financial system. With an unstable demand, financial institutions would be unable to forecast future changes in the public demand for interest-bearing financial assets, though adequate forecasting is essential for successful planning and portfolio management." [Darrat, 1988; p.422].*

Swamy and Tavlas (1989),[38] their empirical results provide evidence that financial deregulation has led to a breakdown in the well-behaved money demand relationship that held in the regulated financial environment. Demand for money instability perhaps because of the increased proportion of investment balances held within M_3 (broad money), the rationale for fixed-coefficient estimation is highly suspect.

Kremers and Lane (1990),[39] their empirical results are consistent with the view that the demand for narrow money (M_1) is essentially a demand for a transaction medium and is shown to be stable function of **ERM**-Wide income, inflation, interest rates, and the **ECU**-dollar exchange rate. And a well-specified **ERM**-wide demand for money function can be identified is striking. It suggests that monetary policy guided by money supply targets would, at least in principle, be feasible for the **ERM** countries collectively.

Hoffman and Tahiri (1994) [40] examine a long-run money demand function for Morocco, using quarterly error-correction-techniques, and others. Their results hold up in both M_1 models and M_2 models, and their study's illustrates how the stability of along-run relation may be examined. They conclude:

> *"Estimators designed to accommodate inherent nonstationarity that prevails in a sample of Moroccan data reveal that the Swiss TB rate can adequately serve as a proxy for the opportunity cost of maintaining domestic dirham balances.... Results reveal considerable evidence of stability in recursive sample and consistency with a simple model of money balances....The approach may be viewed as a prerequisite to subsequent estimates of the short-run dynamics of the system (error correction analysis) or investigations designed to identify common trends that underlie the system."*, [*Hoffman and Tahiri 1994, p322*].

Abu-Rasheed's (1996)[41] work is about demand for financial assets and economic development of Jordan. He finds that the demand for total financial assets has higher interest elasticity than that of income, and that of highly liquid financial assets indicates higher income elasticity, find the one with less liquid financial assets indicates interest elasticity with greater than unity and was highly significant and he notices the progressive fall in the price elasticity of demand for total financial assets. In his conclusion, he states: "*Demand for financial assets is positively and strongly related to GNP variable. About 92 percent changes in financial assets are caused by GNP variable alone. It also reveals that income elasticity for financial assets is greater than unity*" [Abu Rasheed, 1996; *p.137*]

Ghartey (1998)[42] empirically has studied the monetary dynamics in Ghana and has tested the structural stability of the money demand function and its associated parameters over the sample period 1970 Q I to 1992 Q IV. He

finds that the cointegration results imply that narrow money (M_1) provides price, real **GNP**, exchange rate and exchange risk. The error-correction-model (**ECM**) results satisfying all desirable statistical tests, price and income are also both weak and super exogenous in the demand for money in Ghana. He concluded that empirical researchers have been fascinated by the estimation of money demand for less developed countries, and in his words said," a stable demand for money in Ghana is very scare, and often scanty with associated empirical analysis improperly done" [*Ghartey, 1998, p.485*].

Howard (2002)[43] has studied the demand for money in a small economy of Barbados for the period of 25 years (1973-1998). He has employed a cointegration and error correction modeling (**ECM**) approach. He uses the narrow and broad money definitions with the concept of exogeneity as it relates to the variables in money demand function. His analysis is significant for the conduct of monetary policy, as he said the weak exogeneity of inflation and the endogeneity of money stock have important implications for small open economy of Barbados, and the monetary authorities need to stimulate the demand for other financial assets such as bond, treasury bills, mutual funds and certificates of deposits. He concludes that the demand for narrow money balances is determined by real income, inflation and error correction mechanisms, and his results show that there is strong transactions motive for holding money in Barbados, and income elasticity of demand for real money balance is quite high.

We highlight the main results of these studies as follows:

(i) The studies have extensively studied the stability aspect of demand for money function.

(ii) Most of them have used simple methods and models and few have extended to use error-correction models and co-integration.

(iii) Demand for money responds negatively to the expected rate of inflation, as the opportunity cost for holding cash money.

(iv) In a developed country such as the UK or the USA the empirical evidence clearly shows the demand for money to be a decreasing function of the rate of interest, while in a developing country e.g. Thailand or India most of the studies show the rate of interest has been found to be satisfactorily significant.

(v) Real income has been found as the major determinant of the real demand for money.

(vi) Lastly, this part is unique as we are going to take an extensive study of the demand for money function as well as using error correction model.

In the case of co-linearity in interest rates, an important empirical simplification in asset money demand function has been the introduction of only one interest rate to represent the entire menu of opportunity costs of holding money. The conclusions of pre-1973 studies, reached about demand for money functions mostly based on annual evidence, The permanent income or wealth, out-performed measured income in producing a stable demand function for money, several investigators have examined, whether a broader definition of money showed as much instability as compared to narrow money (M_1)? Their empirical results all suggest that a measure of money including small time and savings deposits

3.6 DEMAND FOR MONEY IN THE SUDAN

The lively debates between Monetarists and Keynesians and on the relative effectiveness of monetary and fiscal policies continue partly due to unsettled issues pertaining to money demand function [*Gupta, 1987; p. 463*].

Theoretically, the money demand is generally hypothesized to be an increasing function of some measure of income, and some other variables representing the structural composition of the economy. The scale variable was in accordance with transaction theories of money, which viewed money essentially as an inventory, held for transaction purpose. The rate of return (interest or **PLS**) as a measure of the opportunity cost of holding money in conformity with the assets theories of money, that presumed the money demand to be a problem of portfolio choice. In the Sudanese context, ElGhoul (1977) has considered narrow money and argued that time deposits are not considered to be important, but right now the Islamic banking system depends on investment deposits of short-and-medium-term, here, we should consider the board money also. We assume that the price level to be given at the level (**P**), we also take income (**Y**) and expected inflation (P^e). With the price level, the level of income and expected inflation fixed, money demand also depends only on rate of return (since interest rate is prohibited in the Sudan) but also on the foreign exchange rate, due to dollarisation of the Sudanese economy in 1980s and 1990s and mass remittance by Sudanese national working abroad, here, we consider the exchange rate.

3.6.1 BEHAVIOUR OF VELOCITY OF MONEY

The relationship between money, output and prices is the cynosure of monetary theory and policy alike. Analytically, what lies at the heart of this relationship is velocity of money (**V**), i.e. the ratio of nominal income to the stock of money. As well known, velocity of money plays a fundamental role in macroeconomic analysis and has profound implications for general economic

stability. Traditionally, **V** is called the income 'velocity of money'– the average number of times a unit of money is spent (changes hands in income transactions) [*Jadhav, 1994; p.86*]. The quantity theory of money is often associated with the assumption of a constant **V**- that **V** is something of a natural constant. Fisher's version **V** was interpreted as transactions velocity ($\mathbf{MV_T = P_TT}$) and taken to determine by payments practices and other structural features of the economy influencing the use of money as the medium of exchange. [*Gupta, 2001, p.202*].

Several theoretical and empirical studies that are related to the velocity of money have been made available i.e. Bordo and Jonung (1987) study covers as many as 84 countries. **Friedman and Schwartz (1963) and (1982)** examined the behaviour of velocity of money in the USA. **Short (1973)** studied the velocity of money and per capita income in Malaysia and Singapore. **Jadhav (1994)** in his book, has studied the behaviour of velocity of money in India covering the period, 1951/52 through 1989/90 based on **GDP** at current price and relevant money stock measured as average for end-month figures. **Darrat (1988)** has studied the historical behaviour of velocity of money in Tunisia under the Islamic interest-free banking system, among others.

In the Sudan, money stock ($\mathbf{M^S}$) is defined as narrow money ($\mathbf{M_1}$) and broad money ($\mathbf{M_2}$). Accordingly, two separate measures of income velocity of money could be defined, i.e. $\mathbf{V_1}$ corresponding to narrow money and $\mathbf{V_2}$ corresponding to broad money. This section examines the behaviour of velocity of interest bearing (1980-1984) and non-interest money supply

(**NIMS**) is defined as currency with the public plus their demand deposits at the commercial banks. As is typically the case in most developing countries, all demand deposits in the Sudan are non-interest bearing. While on the other hands profit-loss-scheme money supply (**PLS-M^S**) is defined as the public's time and savings deposits with commercial banks, well known as investment deposits and Bank of Sudan categorizes them under Quasi-money. The behavioural explanations for velocity of money in the Sudan, is defined and measured by Bank of Sudan as: **$V= GDP/M_2$,** which is nothing but a reciprocal of demand for money function, expressed as a ratio of income. In our study, we apply a different model to measure the velocity of money in the Republic. Here, we adapt the model, which is applied by Jadhav (1994) as follows:

$$\log V_t = a + (1-\beta) \log Y + \gamma (R) \qquad (2)$$

Where, **V** is velocity of money; **Y** is the income (**GDP**) at current prices; **R** is the rate of return (**PLS**); parameters **β** and **γ** are positive by construction. In the Sudanese context, for the much of the post bank nationalisation (1970) period and Islamisation (1984), monetisation spurred by rapid commercial and Islamic banks branch expansion and financial sophistication are reflected in the rate of money substitutes relative to money appears to be dominant characteristic of the evolution of the Sudanese financial system. Attention has been focused on two institutional variables. Firstly; a decline in population per bank-branch implies greater spread of banking and hence higher of monetisation that is expected to be correlated negatively with velocity of money. Secondly, a fall in the share of monetary asset in gross household savings in financial assets signifies greater financial sophistication, which is believed being positively correlated with velocity of money, and hence, the coefficient corresponding to this variable is expected to be negative. Here, for

the analyzing the predictability of velocity function for the Sudan, we should enter both the institutional variables and combined them with the conventional explanatory variables such as real income and rate of return **"PLS"** to formulate an expanded velocity function, [Jadhav, 1994]. The generalised velocity function thus takes the form:

3.6.2 MODEL SPECIFICATION

There are mainly two forms of the demand for money function that are considered by researchers, viz.

(i) A linear from which states that money demand is a linear function of the independent variables.

(ii) A log-linear form, and according to this view the natural logarithm of the demand for money is a linear function of the natural logarithms of the independent variables.

There is no economic theory, which guides one in selecting the most appropriate form of money demand function. It can be decided whether the linear or the log-linear form, but a more generalized form is suggested. [Zarembka, 1968],[44] Heller and Khan (1979),[45] give preference to the log-linear form because it is very easy to derive the elasticities from a log-linear from [*Heller and Khan, 1979; p.110*].

As it is evident from the survey of relevant literature presented in section II of this chapter, very few or would rather to say that only two works ever related to money demand functions are available in the Sudanese context. In economic theory, desired money demand is related to scale variable and opportunity cost measures. We begin by posing a general long-run equilibrium

relationship for desired nominal cash balance, from the general form to specific modeling process forms. Equation (1) shows the demand for real narrow money, while equation (2) gives the demand for real broad money, as follows:

$$log\ M_t = a_0 + b_1 P_t + b_2 Y + b_3 INF_1 + b_4 Xr_t + U_t \qquad (1)$$

$$log\ M_t = a_0 + a_1 P_t + a_2 Y + a_3 INF_1 + a_4 Xr_t + + U_t \qquad (2)$$

Where, a_1 , $a_2 > 0$ a_3 a_4 and $a_5 \leq 0$, and $a > 0$, **M** is money supply; **P** is price level, **Y** is the income; **Xr** is the exchange rate (Pound and Dinar relation to US dollar); **U** is error term. Small letters are the logarithmic forms of the respective variables, and subscript **t** denotes time period. In empirical studies the presence of lagged dependence variable, which uses partial or adaptive expectation mechanism to transform permanent, desired and expected variables into current values often causes auto-correlation problem. This is corrected by the equations, which are adopted from the works of Domowitz and Elbadawi (1987) and Michael Howard (2002). Employing a two steps error-correction model (***ECM***) procedure, which is developed by Engle and Granger (1987), and was used also by Domowitz and Elbadawi (1987) to capture both long-term equilibrium relationship and short-term dynamics among the variables. It yields the following equation:

$$log\ M_t = a_0 + \beta_1 P_t + \beta_2 Y + Xr_t + + \beta_3 EC_{t-1} + \sigma_{1_t} P_{t-1} + \sigma_2 Y_{t-1} + V_t \qquad (3)$$

Where, $EC_t = M_t - P_t - Y_t$ is an error correction term determined from the level form estimate of the long-term money demand, β_1 and β_2 and $\beta_3 \geq \beta_4 \leq 0$ and $-1 \leq \beta_1 < 0$ and error term (V_t) has white noise innovation. The

significance of the EC_{t-1} term confirms the existence of co-integration among nominal money, price, and real income, and can be used to test the price homogeneity postulate, and long-run unit income elasticity by imposing the restriction $\sigma_1 = \sigma_2 = 0$.

THE EMPIRICAL EVIDENCE

The followings are the out come of the statistical analysis

(a) Demand for Narrow Money

$$\log M_1 = \underset{(1.899)}{P\ .900682} + \underset{(.160)}{Y\ .034467} + \underset{(.156)}{INF\ 0.10502} + \underset{(.082)}{Xr0.37682}$$

R2 = .94006 F = 62.72 Significance F = .000

DW = 2.41818

(b) Demand for Broad Money

$$\log M_1 = \underset{(2.730)}{P\ 0.944926} + \underset{(-.348)}{Y\ -.054599} + \underset{(-.700)}{INF\ -.034428} + \underset{(.258)}{Xr\ .08607}$$

R2 = .96807 F = 121.2546 Significance F = .000

DW = 2.11504

(c) Demand for Broad Money (Errors Correction)

$$\log M_1 = \underset{(.0000)}{P\ 1.54923} + \underset{(.0000)}{Y\ 0.060116} + \underset{(.0000)}{Xr\ -\ .618888} \underset{(000000)}{ECM\ .231325}$$

R2 = 1 .0000 F = is undefined Significance F = .000

DW = 2.41818

(d) Velocity of Demand for Money

$$\log V_1 = \underset{(-.490)}{R\ -.179515} + \underset{(-.064)}{Y\ -.023423}$$

R2 = .94006 F = .36821 Significance F = .6971

DW = 2.05335

The reporting results of the above regressions estimates, we typically reproduce the **t** value for each individual regression coefficient in part theses individual below it. The equation data quite well as indicated by the values of **R2, F** and **DW**. The above regression results strongly suggest that the there is positive correlation among the variables, with significant at 5%, and DW at more that 2.

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Table No 3:1

Stock of Money

(in millions of Sudanese Dinars)

Year	Currency with the public (CU)	Demand Deposits (DD)	Time Deposit (TD)	Narrow Money (M_1)	Quasi-Money (QM)	Broad Money M_2
1981	62.98	65.34	26.41	153.09	26.41	179.50
1982	82.04	88.41	44.31	209.10	44.31	253.41
1983	102.22	116.49	76.10	233.61	77.43	311.04
1984	124.72	132.63	85.21	276.42	95.48	371.98
1985	194.59	192.51	186.19	414.46	196.35	610.81
1986	276.03	263.57	187.49	584.88	196.40	781.28
1987	362.47	363.29	271.98	786.83	289.52	1,066.38
1988	532.21	474.39	275.63	1,121.80	294.58	1,416.38
1989	924.30	847.00	259.3	1,889.90	281.70	2,171.60
1990	1,311.3	1,144.3	437.5	2,765.90	464.30	3,230.20
1991	2,166.29	2,116.94	942.8	4,283 23	986.32	5,269.55
1992	4,351.50	5,298.52	3,400.0	9,650.17	4,509.28	14,159.45
1993	9,453.79	6,568.98	10,100.0	16,049.5	10,817.90	26,853.40
1994	14,790.20	9,947.61	13,700.0	24,737.81	15,797.48	40,535.29
1995	24,863.10	16,786.59	25,700.0	41,649.69	28,937.00	70,586.69
1996	44,438.96	32,810.00	36,100.0	77,249.90	39,350.00	116,599.90
1997	58,494.4	43,154.5	55,000.0	101,648.9	58,064.8	159,713.7
1998	82,139.8	48,721.8	72,700.0	130,861.6	76,089.7	206,951.3
1999	108,108	61,505.0	85,100	169,613	88,305	257,918
2000	142,082	92505	106,100	234,587	112,084	346,671
2001	153,836	117551	n.a	271,387	160,826	432,213

Sources: (1) Central Bureau of Statistics (Government of Sudan).
(2) Bank of Sudan (BS).

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