

THE DEMAND FOR MONEY IN KENYA:
A TEST OF THE MCKINNON-SHAW MODEL

BY

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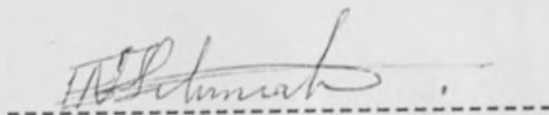
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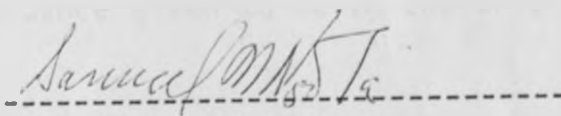
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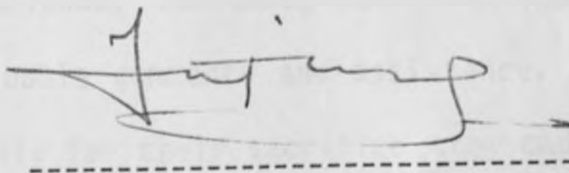


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This Research Paper has been Submitted for examination with our approval as University Supervisors.



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ABSTRACT

This paper examines the relevance and suitability of the Mckinnon-Shaw model for money demand in Kenya and the implications for monetary policy administration. The results reported show that there exists significant complementarity effects between money assets and other physical assets in the Kenyan economy.

The paper shows that the real demand for money in Kenya is considerably influenced by real income, return on physical assets and the return on money assets. The results further indicates that the broad definition of money(M2) performs better than M1 or M3 in the specification of money demand function. The results also indicates that there is no significant difference in real demand for money when current actual and expected income are used.

Based on these findings, the paper concludes that the Mckinnon-Shaw model is appropriate and suitable for the Kenyan economy. Policy administrators should therefore consider all the three variables when they want to control the demand for money in Kenya.

CHAPTER ONE: INTRODUCTION

1.1. BACKGROUND INFORMATION.

The demand for money plays an important role in linking the nominal money supply to the behaviour of domestic prices, real income and balance of payments. One reason for which people demand money is that money is needed in any economy in which almost everyone, persons as well as firms, sells commodities in turn to buy the goods and services offered by others. It is because of the central importance of money demand to both economic theory and policy that it has generated a lot of interest. Augustine (1989) has argued that the demand for money has probably been studied more intensively than the demand for any other asset real or financial.

In Kenya, little systematic analysis of the demand for money exists. Such studies are of potential importance in that inappropriate monetary policies can deprive a country part of the benefits of its development effort no matter how well the economic growth program is in other respects. In the context of economic development, it may seem that monetary policy is irrelevant to developing economies primarily because of lack of well developed

financial and capital markets. However, as stressed by Mckinnon (1973) and Bhatia and Khatkhate (1975), monetary policy can still play a major role in mobilising savings into real capital and promoting financial stability, this would, in turn, contribute to the development of efficient financial and capital markets. Indeed the Kenyan government has relied heavily on the traditional money demand model in formulating her monetary policies.

Classical theory explained the demand for money as essentially a demand resulting from the need as a medium of exchange. In the keynesian theory, money becomes much more than a medium of exchange or a device for mediating transactions in the market place. People also demand money as security against unforeseen needs and for speculative purposes.

The keynesian portfolio approach to the theory of the demand for money has been the dominant framework of monetary analysis in modern times. This approach has been particularly fruitful in the development of keynes's concept of the demand for money. Its modern source, can be traced to Hicks(1935), who treated the problem of the demand for money as one of allocating a given net wealth among alternative assets so as to maximize returns while

taking into account of risks. Since the time of Keynes, the fundamental theoretical work has been pursued most vigorously at Yale University. The distinctive feature of this work is the development of models based on utility theory of a special kind: the utility theory developed by Von Neumann and Morgenstern(1944) for analysing choices in situations of risk.

One conclusion of the portfolio approach is that the demand for money is not only a function of income and the relative returns on alternative assets (the rate of interest) but it also depends on the total level of wealth. A further aspect of the portfolio approach has been demonstrated by Harris(1981). In this most general formulations of the approach, money is not divided into separate balances, such as "active and idle" balances or "transactions", "speculative", and "precautionary" balances of Keynes's General theory. Harris, by combining the three major elements from each model, shows that it is possible to determine an optimal level of cash balances that simultaneously satisfies the wish to hold cash to speculate against bond prices, to hedge against risk, and to bridge the interval between payments and receipts. It answers the problem left unanswered by the separate post-Keynesian developments: How much money should a rational

individual hold to simultaneously satisfy the three motives?. Moreover, he demonstrates that post-keynesian liquidity preference theory does not preclude the existence of undiversified money holdings and a liquidity trap.

When the effectiveness of monetary policy is under consideration, the demand for money plays a vital role. Due to this importance, the past several decades have witnessed considerable empirical research on the money demand function. However, in Kenya, only three studies have been conducted on money demand function which we review later in the relevant section.

The amount and specific kind of money or asset held by an economic unit (household) will depend on:

- (1) the nature and size of its business if it is a producer or the standard of living, if it is a consumer. The larger the size of the business the higher the demand for money. The standard of living of the household depends on the income (nominal, real or permanent). It is reasonable therefore to say that the higher the standard of living, the higher will be the demand for money.
- (2) the expectation about the level of prices and availability of

goods and services in the market. If the prices are expected to go up, the demand for money will be less and vice versa.

(3) interest rate of other real capital assets. Here the relationship can be either positive or negative between the interest rate on other real capital assets and money depending on whether the two are substitutes or complements.

(4) the preference of the economic unit. Some people or firms may prefer money to any other physical assets or vice versa.

(5) the degree of development of the economic system. For a well developed economic system, there will be less need to hold money balances as there will be many other forms of transacting business.

(6) the level of development of the financial market. For an underdeveloped financial market, the demand for holding money is lower. This is because most transactions go on without the use of money. As money becomes acceptable as a medium of exchange, a store of value and a unit of account, more of it will be demanded.

(7) indivisibilities between household, firm and investment. In some cases, one may need to save so much money before investing because of the type of investment (lumpy). This could arise in a situation where self-financing is a common

feature.

The last two (6 and 7) points are important to demand for money in developing countries like Kenya. In such economies, the financial market is underdeveloped and entrepreneurs rely mostly on their own finance to set up businesses.

1.2. KENYA'S FINANCIAL SYSTEM SINCE INDEPENDENCE

In 1963, Kenya inherited a Currency Board serving Uganda, Tanzania and Kenya as well; a commercial banking sector dominated by two London-based banks; a Post Office Savings Bank (POSB) and a small number of specialized institutions providing housing finance, insurance and other services.

In 1966, the Central Bank of Kenya (CBK) was created following the breakdown of the East African Currency Board. The CBK started its operation in September the same year. Under the CBK Act, 1966, and the Bank Act, 1968, the Bank can, inter alia:

- (a) require each commercial bank to maintain minimum deposit with it;
- (b) prescribe the minimum holdings of liquid assets which must be maintained by banks and other financial institutions;

- (c) regulate the rates of interest payable on deposits with banks and other financial institutions; and
- (d) control the level and pattern of advances granted by banks and other financial institutions.

In the 1970s, the Government of Kenya pursued a rigorous policy to extend saving facilities and to rectify the deficiencies in the loan facilities. The Government entered the fields of commercial banking, housing finance, insurance, and the provision of development finance for all major sectors of the economy. Between 1979 and 1990, the number of commercial banks rose from 15 with 280 outlets to 27 with more than 460 outlets. Non-bank financial institutions (NBFIs) which were initially not important have grown from 41 with 55 outlets in 1985 to 58 with 100 outlets in 1990. In 1989 alone, six new banks and NBFIs had entered the local market. The institutions were African mercantile banking company (AMBank), Consolidated Bank of Kenya Ltd, Barclays Merchant Finance Ltd, Trust Finance Ltd, Indosuez Finance Ltd, and the Post Bank Credit Ltd.

Kenya's financial system has exhibited most of the features associated with financial repression. Interest rates have been controlled throughout, and at negative real rates in most of the

1970s and early 80s'.

TABLE 1.

1966-70	+1.90
1971-75	-7.20
1976-80	-7.74
1981-85	-0.75
1886-90	+3.8

From 1984, interest rates have been structured to yield a positive real return on savings and investment. In the current development plan (1989-93), this policy is to be continued to make interest rates more market-driven. The liberalisation of the markets for bonds and bills in May, 1990 has also brought the discount rates more in line with market conditions.

A fixed exchange rate policy was maintained during the 1960s and 70s, with the currency gradually becoming over-valued. Exchange controls have been continued into the 80s and the Kenyan shilling has never been a freely convertible currency.

Substantial volume of involuntary lending is another factor that has been observed in the past by the banking sector to the central government and parastatals. The central Bank also attempts to manipulate the sectoral composition of bank lending which has created disincentives to the development of the banking system. The current development plan states that.....Increasing

proportions of total credit to the private sector will be directed to the productive sectors of the economy particularly Agriculture and Manufacturing. The plan goes further to state that "since more credit will be extended to the productive sectors of the economy, greater selective credit controls will be applied". Such controls have been applied in the case of credit to the Agricultural sector since 1975. Commercial banks are required to lend at least 17% of their deposit liabilities to this sector. Issuing such credit ceilings or controls is a form of direct control which tends to be inflexible and cumbersome to administer.

In the current plan, the main objective of monetary policy will be to contain inflation while ensuring adequate growth of money supply consistent with the projected growth in GDP. The growth in broad money supply (M_2), will remain the principal index of monetary policy and will be closely monitored throughout the plan period. To maintain the desired growth rates in money supply, the CBK will increasingly apply various monetary policy tools at its disposal, including liquidity ratio, selective credit controls, minimum cash ratios, discount rates and open market operations. One can therefore argue that the financial system is dominated by controls.

Despite the relative sophistication of Kenya's financial system, its capital markets are still in their infancy. The market for short term securities is dominated by the treasury bill and the introduction in 1986 of longer-dated treasury bonds has yet to change this situation. During the current plan period the government intends to improve the structural and operational characteristics of the money and capital markets. These markets are interlinked through rates of return on assets, their risks and liquidity and the institutional frameworks under which they operate. A capital market development advisory council has been established to work out the modalities for the creation of the Capital Markets Development Authority which will stimulate and oversee developments in this area. Bearer bonds were recently launched for the categories which prefer to remain "discreet". The certificates of deposits being issued by financial institutions and the proposed foreign exchange certificates are meant to cater for special savers. The bearer bonds and the foreign exchange certificates will broaden the capital market in Kenya if they become acceptable.

1.3.

THE STATEMENT OF THE PROBLEM

Accepted theories of monetary and financial processes-whether they be classical, keynesian or monetarists cannot explain the dominance of real money balances in the operation of capital markets in poor countries¹. These prevailing theories assume that capital markets are essentially perfect with a single governing rate of interest or term structure of interest rates, whereas the brute fact of underdevelopment is overwhelming fragmentation in real rates of interest. The models used do not capture the peculiar situations in developing countries. They (models) treat money as a form of wealth that competes with other assets whereas in the real life situation in developing countries, real money balance is treated as complementary to capital assets, through which capital accumulation takes place. The problem of imperfect capital markets has been omitted. No consideration is given to the optimal commitment of real resources to the monetary system. Further, the model does not allow for the nature of fiscal constraints on governments in less developed countries (LDCs) in adjusting the aggregate rate of capital accumulation.

¹Ajewole, J.O. (1989).

These omissions, have led to biased conclusions regarding for example: the substitution effect between real money balances and real capital accumulation; the independence from monetary policy of the private rate of saving; and the use of the inflation tax as an instrument to promote social saving.

As shown in section 1.2, Kenya's financial system exhibits most of the features associated with financial repression. Interest rates have been controlled throughout and at negative real rates in most of the 1970s and the early 80s. The CBK has also actively manipulated the sectoral composition of commercial bank lending which, has created disincentives to the development of the banking system. Kenya's monetary policies emphasize the use of money supply and control of interest rates as the principal indices. The growth in money supply is monitored at the rate of growth in GDP. The capital market in Kenya is also underdeveloped with treasury bills dominating the market for short-term securities. Interest rates are kept at low levels and this in turn discourages savings and hence investment.

Studies that have been conducted in Kenya on money demand use the traditional model with minor modifications. The basic traditional

assumptions of money demand have been utilized in such studies. These assumptions include: (a) capital markets operate perfectly and costlessly to equate returns on all real financial assets with a single real rate of interest; (b) inputs (including capital) and outputs are perfectly divisible; (c) real money balances are virtually socially costless to produce for satisfying transactions motive; (d) money plays no direct role in capital accumulation.

The assumptions, omissions and the biased conclusions emerging from the studies when used by policy makers could result into extra costs in an economy. The situation is that this model does not generate a determinate demand for money in developing economies like Kenya. In Kenya, monetary policies are based on the model which treats ^{the demand for} money as being a function of real income and the rate of interest. This study tries to test another model to see its relevance in Kenya.

1.4.

THE OBJECTIVES OF THE STUDY

This study intends to provide an alternative money demand model for Kenya that captures the special features of a developing economy.

The specific objectives of the study are as follows:

- (a). To test for the suitability and appropriateness of Mckinnon-Shaw model of money demand in Kenya.
- (b). To determine the relative significance of the variables in the model that influence money demand in Kenya.
- (c). On the basis of (a) and (b) suggest policy recommendations to monetary policy administrators.

1.5.

SIGNIFICANCE AND JUSTIFICATION OF THE STUDY

The major significance of this study lies in its departure from the traditional assumptions in the test of the suitability and appropriateness of the Mckinnon-Shaw model of demand for money in underdeveloped money markets which is a common feature in developing countries like Kenya. The study also makes a contribution towards the number of studies in developing countries that have tested this model. This may assist in the rejection or acceptance of the model in developing economies as suggested by Mckinnon and Shaw. Further, we shall be able to know which variables have a greater influence on money demand in Kenya.

These studies have been conducted in India, Bangladesh, Nigeria etc.

If the model works in the Kenyan situation, policy makers will have an alternative to the existing traditional model that seems not to reflect the economic realities in developing countries. This way, our monetary policies can be reformulated. This will contribute to improved decision making regarding the monetary sector in various ways.

CHAPTER TWO

LITERATURE REVIEW

2.1. EMPIRICAL AND THEORETICAL LITERATURE:

Generally, the empirical literature on the money demand function in the LDCs has provided little that is new in the way of approaches to the problem of estimation compared to the large amount of equivalent work undertaken for developed economies. However such studies have yielded useful additional evidence on the role of expected prices in demand for money, and of the varying monetary frameworks and varying degrees of monetisation in different countries.

Many of the studies on demand for money in both the developed and underdeveloped countries use the conventional neoclassical model with minor adjustments. In India for example, it was found that in a majority of the cases the elasticity parameters of interest and price variables were all statistically insignificant². This

²Indian Economic Journal Vol. 29 1981.

raises serious doubts about the appropriateness of conventional specifications of money demand function in the context of the experience of developing countries such as India.

In Kenya, only a few studies (three) have been conducted on money demand function. These studies were by Pathak (1981), Darrat (1985) and Mwega (1990). The study by Pathak was mainly concerned with the stability of demand for money in Kenya. He used the traditional money demand model in his analysis. In this model, money demand is functionally related to the income, interest rate and some types of wealth. After Pathak found that data on wealth was not available, he defined the demand for money at time t as

$$M_t = L(Y_t, R_t) \quad \text{where}$$

M_t - the demand for money

Y_t - the nominal GNP and

R_t - the short term rate of interest.

His results showed that the demand for money in Kenya is positively related to national income and negatively to the interest rate. Although a major objective of his study was to test for the

stability of money demand function in Kenya, he fails to carry out tests on this aspect. Another weakness contained in his study are the assumptions that are inherent in the traditional model of money demand. Such assumptions like - a well developed capital market with a single interest rate; a competitive capital market; etc are irrelevant in a less developed country like Kenya.

Darrat(1985), recognizes that the demand for money function occupies a central role in most theories of aggregate economic activity, especially in the formulation and execution of effective monetary policy. He paid special attention to the model specification, its dynamic structure and to its temporal stability.

Darrat also used the traditional model of money demand with a few modifications:-

$$(M/P)_t = f(X_t, \pi_t^e, R_t).$$

He argues from theory that desired real money balances, (M/P) is positively related to a scale variable such as real income (X) and negatively related to the opportunity cost of holding money that is, the yields on alternative real and financial assets. The

expected rate of inflation (π^e) is usually taken to represent the foregone yield on real assets, and the rates of interest (R) is used to represent the foregone yield on financial assets.

On interest rate(s) to represent the foregone yield on financial assets, he argues that the few interest yields available in LDCs are pegged by authorities and hence he chooses to use foreign interest rate as a potential alternative to holding domestic money balances.

The empirical results by Darrat showed that for both conventional definitions of money (the narrow and the broad), the theoretical model fits the Kenyan data quite well, and the proposed variables were statistically significant and with the anticipated signs. The results further suggest, based on a battery of tests, that the estimated money demand equations for Kenya are temporarily stable. His study, indicated that some measure of foreign interest rates play a significant role in the Kenyan money demand equations as in any other open economy. He argues that monetary policy in Kenya must therefore take into account the response of domestic money demand to changes in external factors.

We are doubtful of the surprising results Darrat obtained. Addison and Demery point out that foreign interest rates generally do not have a well determined influence on the demand for money even in developed countries with sophisticated financial sectors. More so, studies like that of Darrat which exclude a measure of the opportunity cost of holding money vis-a-vis domestic financial assets in estimation of the demand for money in Kenya and perhaps other less developed countries may suffer from omitted variables bias in the coefficients of the other determinants. He should have included both rates (domestic and foreign) to see which one comes out to be more important.

A more recent study by Mwega (1990)⁷ on demand for money function in Kenya had very similar objectives to the two earlier studies examined above. His major concern was to find out the effect of recent developments in the economy on the stability of demand for money. These developments includes external and exogenous shocks; policy shocks as the authorities have attempted to stabilise the economy by applying adjustment and liberalization policies mainly prescribed by the IMF and the World Bank in their credit conditionalities; and a very rapid growth in the private non-bank financial intermediaries (NBFIs) as a consequence of the coffee

exports boom of 1976-77 that was not sterilized with NBFIs historically subjected to less control than commercial banks.

Indeed such developments were adequate to attract one into a re-examination of money demand stability in this country. It is a well known Gurley and Shaw hypothesis that a rapid growth in NBFIs may alter the structure of the money demand function by changing its elasticity with respect to various determinants. On the estimation model, Mwega used the general practice and adopted the semi-log- linear model attributed to Cagan:-

$$\log M_t^r = \alpha_0 + \alpha_1 \log Y_t^e + \alpha_2 \pi_t^e + \alpha_3 \log R_t^e + u_t \dots\dots(1)$$

with $\alpha_1 > 0$, $\alpha_2 < 0$, and $\alpha_3 > 0$. Where t denotes the time period and u is a log-linear error term.

M^r is the desired demand for real money balances.

Y^e is the expected real income.

π^e is the expected rate of inflation.

R^e is expected rate of interest relevant (he uses the treasury bill rate).

Due to among other factors inertia and asset portfolio adjustment costs, the desired real money balances are not equal to the measured real money balances. To make equation (1) estimable, he employed Chow logarithmic partial adjustment process

$$\delta \log M_t = k (\log M_t^* - \log M_{t-1}) \dots \dots \dots (2) \quad \text{where } 0 < k < 1$$

At the same time, money holders are postulated to formulate their expectations in such a manner as to minimize the discrepancy between the measured and the expected values of a variable as captured by this quadratic loss function

$$L = [X_t^e - X_t]^2 \dots \dots \dots (3)$$

Where the expected values are estimated values from the measured current and past values as given by

$$X_t^e = \sum_{j=0}^n w_j X_{t-j} \dots \dots \dots (4)$$

where w_j are weights.

Given (3) and (4), an expected variable is predicted from a regression of measured values on their current and previous values to give \hat{X}_t .

Making the substitutions, Mwega obtained the following money demand model for estimation:

$$\log M_t = k\alpha_0 + \alpha_1 \log \hat{Y}_t + k\alpha_2 \hat{\pi}_t + k\alpha_3 \log \hat{R}_t + (1-k) \log M_{(t-1)} + V_t \dots (5)$$

where V_t is a log-linear error term and the other variables are as definite above.

His study found the demand for money statistically stable. This was despite a significant decrease in the expected income elasticity of demand for real M_1 and M_2 and a significant increase in the expected inflation elasticity of demand for real M_2 . These elasticity changes he explained them as resulting from deflationary monetary shocks and by the rapid growth in NBFIs which have reduced demand for money for given income and by the increased sensitivity of M_2 holders to a higher rate of expected inflation. He however argues that these elasticities were counteracted by movements in the other coefficients to leave the demand for money in Kenya statistically stable. We question Mwega's argument as he does not say which variables counteracted the other ones. Further, from the results, one can not be able to see the movements of each variable.

It can be seen that all the three studies that have been conducted in Kenya on money demand function have utilized the traditional model of demand for money. This model regards the process of

substitution between money and non-money assets resulting from changes in the money supply schedule as the central relation to be studied in the macroeconomic context.

Other studies elsewhere in the world have also been consulted. Gujarati (1968) provides a relatively early study for a developing country (India) using a standard approach. A simple demand function is assumed, namely

$$M_t = f (R_t, Y_t), \text{ where}$$

M_t _ aggregate real cash balances demanded at time t.

R_t _ is a long term rate of interest at time t.

Y_t _ is the aggregate real national income at time t.

In Gujarati's empirical results which are based on annual data from 1948/49 to 1964/65, income proved to be the most significant determinant of the demand for real cash balances, the interest rates being a statistically insignificant variable. Gujarati comments that the Indian money market is comparatively underdeveloped and the finding on interest rates supports the contention of Kaufman and Latta (1966) that the interest elasticity

of the demand for money function would be more significant in countries with well_developed money markets. Gujarati also found some evidence that the long run income elasticity was greater than unity a result that may be interpreted as indicating that money is a luxury asset.

A more extensive analysis covering Japan, Taiwan, Korea, India, Pakistan, Burma, Sri Lanka, Philippines, and Thailand was undertaken by Fan and Lin (1970/71). Essentially the same model used by Gujarati was adopted with broadly similar results. Interest elasticities were very low (except for Taiwan). All income elasticities were significantly different from zero.

The role of price expectations has also been central to the studies of Chile by Hynes (1967) and Deaver (1970). Hynes used estimates of both the expected rate of change of prices and expected income rather than current income which is often the variable used in these studies. In the Hynes study, money interest rates were excluded as necessary data was unavailable, but since it was believed that the major changes in the money rate of interest were due to alterations in the expected rate of change of prices, this latter variable may be taken to represent the cost of holding

money. The evidence on the long run income elasticity was surprising in that, it was found that a narrow definition of money had a higher elasticity than a broader definition. This reverses the pattern found for most studies of developed countries (e.g. Fisher, 1968; Meltzer, 1963).

Other studies for individual countries yield little more information than that above. Fry (1973) finds income elasticities in excess of unity for Iran, Pakistan and Turkey for the 1960s. For each of these countries, expected inflation series based on arbitrarily chosen weights for an adaptive model, extrapolative expectations or a combination of both yielded at least marginally significant parameter estimates with the correct (or expected) signs.

Leiderman uses the traditional model for Brazil which postulates that the amount of real money balances demanded by the public depends on the level of real income and on the opportunity cost of holding money relative to other assets and goods. The opportunity cost consists of the yield on alternative assets, measured by their expected rates of interest, and the return on holding goods, measured by their expected rate of inflation. Expected inflation

is generally an unobservable variable. Therefore, in order to implement empirically a money demand equation that includes this variable, an assumption about the formation of expectations is required. The common assumption in the early literature was the one of adaptive expectations. This assumption has two serious limitations: first, only information about past rates of inflation is assumed to affect agents' expectations of current and future inflation; second, the adaptive formula is arbitrarily postulated without paying explicit attention to the actual process followed by the inflation rate. To overcome these difficulties, Leiderman uses the rational-expectations hypothesis postulated by (Muth 1961). Empirical results using the Brazilian data appeared to support a specification of the demand for money that embodies rational expectations of inflation.

Ghosh and Kazi (1977) uses a model for Nigeria similar to that used by Laidler and partkin (1970) for the U.K. and like Hynes above, find evidence in favour of the demand for money in nominal terms being homogenous of degree one in the price level. A broad definition of money yielded the most stable parameter estimates over the sample period (1958 to 1974). The elasticity of demand for real balances with respect to permanent income came out at

about unity with an insignificant parameter estimates on the interest rate variable, results which confirm earlier results for Nigeria.

Wong (1977) has presented some interesting evidence on the role of credit restraint variables on demand for money functions over the period 1954 to 1971 for five developing Asian countries (Korea, Philipines, Sri Lank, Taiwan and Thailand). The results are at least suggestive of the conclusion that in LDCs, where relatively underdeveloped money markets make interest rate variable largely unimportant some attempt to include measures of credit restraint could prove useful.

What seem to emerge from many of the studies conducted in less developed countries is the use of the conventional equations of demand for money. The equations however, do not perform satisfactorily in explaining the demand for money in LDCs. In particular, we find that in a majority of the cases the elasticity parameters of interest and price variables were statistically insignificant. This raises serious doubts about the appropriateness of conventional specifications of money demand in the context of the experiences of developing countries such as Kenya.

Mckinnon (1973) came up with an alternative model. According to him, the accepted theories of monetary and financial processes_ whether they be keynesian or monetarists are not appropriate for explaining the dominance of real money balances in the operation of capital market in LDCs. The assumptions of the models namely competitive capital market with a single interest rates or a term structure of interest rates with real money balances being treated by people as a substitute for physical capital and vice versa are totally unrealistic and inappropriate in the context of economic realities of developing countries.

Mckinnon argues out that the relationship between physical capital and real money balances is one of complementarity rather than of substitutes. The capital markets in LDCs are fragmented in which there is a large self-financed household sector along with an imperfectly financed corporate sector. Entrepreneurs with potential production opportunities lack resources of their own as well as access to external financing. Those with substantial endowments of capital often lack internal production opportunities and have no external investment outlets at rates of return that accurately reflect the prevailing scarcity of capital. Further, the business sector in LDCs issues very limited amounts of primary

securities (due to the number of restrictions imposed by the government and sector's inclination more toward self-finance than borrow) and that too is bought mostly by financial institutions such as commercial banks, investment brokers, etc rather than the ultimate saver or the general public. There is also little knowledge and information about the credit repayment capability (as they themselves are new entrants) available in the market so it is difficult to market them.

2.2. COMPLEMENTARITY BETWEEN MONEY AND PHYSICAL CAPITAL:

The average time interval between income and expenditures is longer in the case of investment than it is in the case of pure consumption. Correspondingly, the demand for real money balances will strongly be influenced by the propensity to save (invest). If the desired rate of capital accumulation (and hence private saving) increases at any given level of income, the average ratio of real cash balances to income will also increase. This will be so because of the limited sources of external finance, which makes people to rely on their own savings in LDCs (and mostly in ^{the} form of money balances).

The function L in equation (below) includes the investment/income ratio I/Y , as one of the determinants of the real stock of money, M/P ; and hence L incorporates the demand for money arising directly from the process of capital accumulation itself. The conventional transactions motive for holding money is still captured by current income, Y ; and, of course the real return on holding money also enters L explicitly with its variance or instability left implicit. The money demand function is

$$(M/P) = L (Y, I/Y, d-p).$$

From the above analysis, all the partial derivatives of L are positive. In particular, $\delta L / \delta I/Y > 0$ so as to reflect the basic complementarity between money and physical capital in fragmented economies.

In contrast, I/Y does not even enter the traditional money demand function. The conventional approach is to use r the real return to physical capital in the money demand function in place of I/Y . However, this conventional approach is of limited usefulness in LDCs, where actual rates of return vary greatly both marginally and intra-marginally. It is misleading to assume that there is a single real rate of return that is also the uniform opportunity cost of holding money. Money like everything else is used with

varying marginal efficiency. The traditional portfolio approach treats money and physical capital as substitutable forms of wealth-holding in a quite static sense where the accumulation process per se is ignored. However, if money is viewed as a conduit through which accumulation takes place-rather than as a competing asset - the demand for money rises paripassu with the productivity of physical capital.

This complementarity works both ways; the conditions of money supply have a first-order impact on decisions to save and invest-again unlike the traditional model. If the real return on holding money increases, so will self-financed investment over a significant range of investment opportunities. The increased desirability of holding cash balances reduces the opportunity cost of saving internally for the eventual purchase of capital goods from outside the firm-household. The financial "conduit" for capital accumulation is thereby enlarged.

The sources of the increased attractiveness of holding money are several. In some relatively primitive economies, simply opening up new physical facilities for deposit banking will increase the demand for money. In both primitive and more mature economies, a

reduction in the rate of inflation and/or variance of the price level can increase the demand for real cash balances. Alternatively, the nominal interest rate on deposits can be raised. In all of these cases, the resulting increase in the real return on money can raise sharply investment-savings propensities because of the importance of money as a store of value. In contrast, $d-p^*$ does not directly affect the propensity to save within the traditional model because all firms have perfect access to external sources of finance at a uniform real rate of return, even in periods of high and unstable inflation.

This complementarity between money and physical capital is reflected in the investment function, F , given below:

$$I/Y = F(r, d-p^*), \text{ where}$$

r = real return on holding money.

$$\delta F / \delta r > 0, \text{ and } \delta F / \delta (d-p^*) < 0.$$

Although the "conduit" effect has been emphasized, the traditional "competing-asset" effect between money and physical capital can prevail in particular circumstances. The mixture of the two yields the ambiguous sign of the second partial derivative of above equation. Can one generalize about when one effect or the other

would be dominant?. Mckinnon argues that in the early stages of development, the conduit effect is dominant. After some time however, the competing-asset effect begins to reduce investment.

Shaw (1973) argues that the LDCs are tethered to poverty by inept policy affecting particularly the financial, fiscal and international sectors. Policy sacrifices the leverage for growth that could be realized from financial deepening, improved fiscal performance, and closer integration with external markets. Unlike the dominant traditional development theory, he maintains that the financial sector of an economy matter in economic development, assisting accelerated growth, or if repressed, intercepting impulses to development.

Q According to Shaw, domestic financial policy in LDCs misses its chance for financial deepening. Instead of inducing growth in real amounts demanded of money and other financial claims, as a source of funds for capital market, it increases growth in nominal money at an excessive pace and so uses the "inflation tax"³ to draw savings into investment.

³Inflation tax is the decline in purchasing power of average reserve money due to inflation. If the money issue exceeds the increase in the economy's willingness to hold money, the result is inflation, which operates like a tax. Asset holders "pay" the tax by losing purchasing power on their money holdings.

Mckinnon argues that conditions that make M/P attractive to hold enhance rather than inhibit private incentives to accumulate physical capital. In turn, large real money holdings are normally the result of the monetary system's maintaining a high and stable real return to holders of money.

The Mckinnon-Shaw model has also been tested in individual countries (India, Nigeria, Bangladesh). The findings support the complementarity hypothesis in these LDCs. In Nigeria, the results for money demand broadly definite was found to be:

$$M_{2t} = 4.8209 + 0.4982Y_t + 0.5413R_t + 0.0123RS_t$$

$$(2.2340) \quad (2.5569) \quad (8.4284) \quad (0.4249)$$

$$R^2 = 0.9762 \quad F = 204.626 \quad D.W.=1.8958.$$

Thornton uses annual data for India for the period 1964-84 to test the hypothesis put forward by Mckinnon. He used both two stage least squares (TSLS) and the Ordinary Least Squares (OLS). The two sets of results obtained were similar and showed strong support for Mckinnon's complementarity hypothesis in both the demand for money and the saving functions. In the demand for money function, the adjusted R^2 was found to be 0.996.

The conventional monetary growth theories have been extended and modified to study the demand for money both in LDCs and the developed world. However, in LDCs, the models do not perform well in explaining the demand for money. The basic traditional assumptions seem not to work in LDCs. Such authors as Gujarati, Hynes, Deaver, Wong, Darrat, Ghosh and Kazi all use these assumptions to generate similar conclusions about the demand for money, although their approaches differ in detail and emphasis. They treat money as a form of wealth that competes with other assets in the portfolios of consumers and producers. The models that have been used omits issues of particular importance to less developed countries, and contains unfortunate biases when used as a basis for policy.

Mckinnon and Shaw both take direct issue with the neoclassical model, showing that crucial assumptions in this paradigm are erroneous in the context of developing countries. Mckinnon produces an alternative model in which money balances are complements rather than substitutes to tangible investment. Shaw rejects neoclassical growth models in favour of the debt-

intermediation view which he himself pioneered in the 1950s (Gurley and Shaw, 1960). Shaw maintains that expanded financial intermediation between savers and investors resulting from financial liberalization increases incentives to save and invest and raises the average efficiency of investment. The model by Mckinnon and Shaw has been tried in a number of LDCs with good results. We test the same model in Kenya given the imperfect nature of the financial and money markets in the country. This alternative approach to money demand in LDCs could reverse monetary policies that may have been wrongly applied for quite some time.

CHAPTER THREE

METHODOLOGY

This study employs a model developed separately by Mckinnon and Shaw in (1973). This model has also been used in Nigeria, Bangladesh, India and other Asian countries.

3.1. THEORETICAL FRAMEWORK

This study is based on the complementarity hypothesis which undermines the existence of substitution effects and views the demand for money or real cash balances and the demand for physical capital as highly complementary, at least, in the context of underdeveloped economies. In developing economies the economic environment is fragmented and financial institutions are underdeveloped. There are few, if any, organized markets for primary securities such as bonds, mortgage, or common stock. There is little direct contact between the primary borrower and the ultimate lender. A quite obvious result of this fragmented financial structure is that money broadly defined is almost the only financial asset available to wealth holders. In developed economies, on the other hand, there is much wider spectrum of

available financial assets, some of which are very close substitutes for money. This difference in financial structure of developed and underdeveloped economies, forms the basis of the complementarity hypothesis developed by Mckinnon (1973, pp. 37-67).

3.2. THE MCKINNON-SHAW MODEL OF MONEY DEMAND

Due to the lack of organised financial market and the inadequacy of government substitutes for financial processes, Mckinnon suggested the following assumptions for the purpose of model building:

- (a). All economic units are confined to self-finance;
- (b). The small size of the firm-household implies indivisibilities in investment are of considerable importance; and
- (c). Government revenues are used only to finance current government consumption.

Thus Mckinnon-Shaw model can be stated as follows:

$$M/P = M_t = f (Y_t, I/Y, d-p^*) \dots\dots\dots(6)$$

where, M_t — real money demand.

Y_t — aggregate real GDP at time t .

I/Y — investment/income ratio at time t .

$d-p^*$ — difference between the return on time and saving deposit and the rate of inflation (real interest rate)

$$\delta M_t / \delta Y_t > 0, \quad \delta M_t / \delta I/Y > 0, \quad \delta M_t / \delta (d-p^*) > 0.$$

Assuming an average return to capital R_t with a given dispersion around it measuring the variable productivity of capital among firm-households, Mckinnon's investment function is written as follows:

$$I/Y = f (R_t, d-p^*) \dots\dots\dots(7)$$

$$\text{where } \delta f / \delta R > 0, \quad \delta f / \delta (d-p^*) <> 0 \dots\dots(8)$$

The ambiguous sign of the second partial derivative in equation (8) shows that although the complementary effect has been emphasized, the traditional competing_asset effect between money and physical capital can prevail in particular circumstances. From Mckinnon money demand function with interest rate exogenously determined, changes in R is obtained

$$(M/P) = M_t = f (Y_t, R_t, (d-p^*)) \dots\dots\dots(9)$$

where,

$$\delta M_t / \delta Y_t > 0, \quad \delta M_t / \delta R_t > 0, \quad \delta M_t / \delta (d-p^*) > 0.$$

3.3.

MODEL SPECIFICATIONS:

The observed stock of money demand function can be written in log form as:

$$M_t = b_0 Y^{b_1} R^{b_2} RI^{b_3} e^{u_t} \dots\dots\dots(10), \text{ where } RI = (d-p^e)$$

$$\ln M_t = \ln b_0 + b_1 \ln Y_t + b_2 \ln R_t + b_3 \ln RI_t + u_t \dots\dots\dots(11). \text{ But since}$$

RI can take both positive and negative values, we use a semi log-linear model: $\ln M_t = \ln b_0 + b_1 \ln Y_t + b_2 \ln R_t + b_3 RI_t + u_t$

Introducing adaptive expectation model the demand function is written as:

$M_t = f(Y^e, R, RI)$, $Y^e =$ expected income. We assume that $R^e = R$, and $RI^e = RI$. These emanate from the fact that the expectations of complementarity and substitution effects between physical capital and money assets over the time period are sustained.

Using Nerlove's expectation function:

$N_t^e = N_{t-1}^e + k(N_t - N_{t-1}^e)$ where, k -elasticity or coefficient of expectation with respect to a variable N_t and $0 < k < 1$ (expectation is non-static).

Specification of the model in log form may be written as:

$$\ln M_{it} = \ln b_0 + b_1 \ln Y_t^e + b_2 \ln R_t + b_3 RI_t + u_t \dots\dots\dots(12)$$

$$\ln Y_t^e = \ln Y_t + (1-k) \ln Y_{t-1}^e \quad 0 < k < 1$$

Substituting Y_t^e in equation (12),

$$\ln M_{it} = \ln b_0 + b_1 (k \ln Y_t + (1-k) \ln Y_{t-1}^e) + b_2 \ln R_t + b_3 RI_t + u_t \dots(13)$$

Further substitution lead to an infinite log specification of M_t .

However, the final specification will be⁴:

$$\ln M_{it} = \ln k b_0 + k b_1 \ln Y_t + k b_2 \ln R_t + k b_3 RI_t + (1-k) \ln M_{it-1} + u_t \dots(14)$$

where $i = 1, 2, 3$.

This is the real demand for money function. Using expected income (Y^e) if $k = 1$, $Y_t^e = Y_t$. So the equation is equal to the one specified above (11) i.e.

$$\ln M_{it} = \ln b_0 + b_1 \ln Y_t + b_2 \ln R_t + b_3 RI_t + u_t \dots\dots\dots(11)$$

Equation (11) and (14) are the ones to be estimated for $i = 1, 2, 3$.

The estimation technique to be used in this study is the Ordinary Least Squares method (OLS).

The following assumptions are made in using the Ordinary Least

⁴According to Mirer (Economic Statistics and Econometrics 1983).

Squares:

- (a). u_i is a random real variable. The value which it may assume in any one period depends on chance.
- (b). The mean value of u in any particular period is zero.
- (c). The variance of u is constant in each period. For all values of x , the u 's will show the same dispersion around their mean.
- (d). The variable u has a normal distribution.
- (e). The random terms of different observations (u_i, u_j) are independent. Where i is not equal to j .
- (f). u is independent of the explanatory variables. $\text{Cov}(xu) = 0$.
- (g). The explanatory variables are measured without error. The u absorbs the influence of omitted variables and error of measurement.

3.4. Definitions of terms and figures used:

FRAGMENTED ECONOMY- is one where firms and households are so isolated that they face different effective prices for land, labour, capital, and produced commodities and do not have access to the same technologies.

INDIVISIBILITIES- typically, investments associated with the adoption of markedly improved technologies bulk and large in the eyes of small-scale entrepreneurs. Most investments require quantum

changes in cash outlays from a net income that may be barely sustaining of the entrepreneur and his family.

SELF-FINANCE- this is the investment within a particular enterprise (or economic unit) of savings accumulated in that enterprise.

APPROPRIATENESS- this refers to the form of variables that best explains changes in demand for money. For example, should we emphasize actual, nominal or expected income; interest rates etc.

SUITABILITY- we shall consider the significance of the parameters in the estimated model. If a particular parameter is significant at say 5% level of confidence, then it can be regarded as suitable in our Kenyan situation.

M_1 = (narrow money) defined as currency in circulation and demand deposits

M_2 = M_1 plus savings and time deposits

M_3 = M_2 plus post office savings deposits

d = Interest rate on time and saving deposit (weighted)

p^* = rate of change in price level

RI = real rate of interest on time and saving deposit ($d - p^*$).

R = I/GDP (average return on physical capital).

Y = GDP (income).

Y = expected income.

δ = refers to a change in a variable.

Assumptions Used

- (a). Money stock is used and treated as a proxy for demand for money (M_1^d , M_2^d , M_3^d).
- (b). Investment/income ratio is used as a proxy for average return to physical capital ($I/GDP = R$).

3.5. DATA AND DATA SOURCE

The study uses time series secondary data from various Government publications (Statistical Abstracts, Central Bank of Kenya Quarterly and annual financial reports, Economic Surveys) and the International Financial Statistics year book (IMF). The period covered in our study is twenty three years, from 1967 to 1989.

The data used include real national income(GDP), Real rate of interest(R), Return on investment($I/GDP = RI$), M_1 , M_2 and M_3).

The period considered for our study is from 1967 to 1989.

3.6. EMPIRICAL HYPOTHESES TO BE TESTED INCLUDE THE FOLLOWING:

- (1) that average return to capital(R_t) is positively related to real demand for money and is statistically significant;
- (2) that the expected income(Y_t^e) is more appropriate or not in the sense that expectation is less static in real demand for money relationship in Kenya.
- (3) that real return on money asset(RI_t) is positively related to

real demand for money and the coefficient is statistically significant.

(4) that both actual and expected income are positively related to real demand for money and the coefficients are statistically significant.

(5) to test whether M1 or M2 or M3 definition of money is more relevant to real demand for money in Kenya.

CHAPTER FOUR
EMPIRICAL RESULTS OF THE STUDY

4.1. Real Money Demand Using M1

The semi log-linear form using M1 is:

$$\log M1_t = \log b_0 + b_1 \log Y_t + b_2 \log R_t + b_3 R_t + U_t \dots\dots\dots(15.1)$$

Assuming $k=1$, $Y_t^e = Y_t$

The estimated equation is obtained as:

$$\log M1_t = -7.062 \quad + \quad 1.502 Y_t + 0.488 R_t + 0.009 R_t$$

$$(-1.779) \quad (4.738) \quad (2.595) \quad (3.013)$$

$$R^2 = 0.993 \quad \hat{R}_t = 0.992 \quad D.W. = 1.614 \quad F = 918.017.$$

Equation (15) shows that the elasticities of income and real interest rate are statistically significant at 99 per cent confidence interval. The average return on physical capital is significant at 95 per cent confidence level. Both R^2 and \hat{R}_t are very high and the F-statistics are significant at 99 per cent confidence level. Durbin-Watson test shows indeterminate result. However, using Cochrane-Orcutt iterative technique it shows no problem of autocorrelation ($\rho=0.193$). No multicollinearity was suspected in the equation because both t-statistics and F-statistic are significant.

Using adaptive expectation model $0 < k < 1$; $M1_t$ = Money demand when expected income is used.

The semi log-linear form:

$$\log M1_t = \log kb_0 + kb_1 \log Y_t + kb_2 \log R_t + kb_3 RI + (1-k) \log M1_{(t-1)} + V_t$$

.....(15.

2)

The estimated results showed the following:

$$\log M1_t = -7.854 + 1.663 Y_t + 0.539 R_t + 0.003 RI_t - 0.105 M1_{(t-1)}$$

(-1.847) (3.944) (2.570) (3.017) (-0.593)

$R^2 = 0.993$ $\hat{R}^2 = 0.992$ D.W. = 1.526 F = 665.413.

The observation is that the elasticity of lagged real demand for money is negative and statistically insignificant. Durbin-Watson statistic cannot be used to detect first order autocorrelation in lagged equations. Using Cochrane-Orcutt iterative procedure no positive autocorrelation was detected (Rho = 0.237).

The elasticities of income and the real return on money are statistically significant at 99 per cent confidence level. The real return on physical capital is still significant at 95 per cent confidence level. By dividing throughout with k and rearranging the equation, the real demand for money when expected income is used is:

$$\log M1_t = -8.267 + 1.751 Y_t + 0.567 R_t + 0.009 RI_t.$$

There is no significant difference between real money demand when expected and current actual income is used for Kenya. The coefficient of lagged money demand is negative and insignificant statistically.

Equation (15.1) is more appropriate for Kenya (k=1) expected income is equal to the current actual income.

4.2. Real Demand for Money Using M2:

We want to see whether real broad money has any significant influence on real demand for money in Kenya than using narrow money (M1).

The semi log-linear form using M2:

Assumption k=1 (static expectation);

$$\log M2_t = \log b_0 + b_1 \log Y_t + b_2 \log R_t + b_3 R I_t + U_t \dots \dots \dots (15.3)$$

The result of fitting equation 15.3 above is:

$$\log M2_t = -4.019 + 1.339 Y_t + 0.781 R_t + 0.009 R I_t$$

$$(-1.114) \quad (4.649) \quad (4.574) \quad (3.554)$$

$$R^2 = 0.995 \quad \hat{R}^2 = 0.994 \quad D.W. = 1.555 \quad F = 1451.984.$$

Except for the constant term, all the elasticities are statistically significant at 99 per cent confidence level. R^2 and \hat{R}^2 are very high and together with the f-statistics are significant at 99 per cent confidence level. Durbin-Watson test is indeterminate. Cochrane-Orcutt iterative technique shows positive autocorrelation ($Rho = 0.223$). Both t-statistics and f-statistics are significant, so there is no serious problem of multicollinearity. After correcting for the problem of autocorrelation, the fitting equation is:

$$\log M2_t = -4.020 + 1.340Y_t + 0.782R_t + 0.009RI_t$$

$$(-0.969) \quad (4.030) \quad (4.065) \quad (3.450)$$

$$R^2 = 0.996 \quad \hat{R}^2 = 0.995 \quad D.W. = 1.607 \quad F = 1127.471$$

Next, we focus our attention on the impact of expected income on real money demand using M2: $0 < k < 1$.

$$\log M2_t = \log b_0 + b_1 \log Y_t^e + b_2 \log R_t + b_3 RI_t + u_t$$

We write it as;

$$\log M2_t = \log kb_0 + kb_1 \log Y_t + kb_2 \log R_t + kb_3 RI_t + (1-k)M2_{t-1} + u_t$$

.....(15.4).

Estimated equation is:

$$\log M2_t = -2.991 + 1.169Y_t + 0.742R_t + 0.009RI_t + 0.087M2_{t-1}$$

$$(-0.715) \quad (2.655) \quad (3.914) \quad (3.059) \quad (0.518)$$

$$R^2 = 0.995 \quad \hat{R}^2 = 0.994 \quad D.W.= 1.610 \quad F= 1047.213$$

The elasticity of the constant is insignificant at 95 per cent confidence interval. Elasticities of income, returns on physical capital and returns on money are all significant using the t-statistics at 95 per cent confidence level. R^2 and \hat{R}^2 are high and f-statistics are significant at 99 per cent confidence level. Cochrane-Orcutt was used to correct the problem of autocorrelation and the resulting fitting equation is:

$$\log M2_t = -2.992 + 1.170Y_t + 0.743R_t + 0.009RI_t + 0.087M2_{t-1}$$

$$(-0.555) \quad (2.068) \quad (3.677) \quad (2.749) \quad (0.468).$$

$$R^2 = 0.996 \quad \hat{R}^2 = 0.995 \quad D.W.=1.666 \quad F= 844.903.$$

The real demand for money using expected income is:

$$\log M2_t = 3.148 + 1.231Y_t^e + 0.781R_t + 0.009RI_t$$

There is no significant difference in real demand for money when expected income and actual income is used.

4.3. Real Demand for Money Using M3:

We want to see whether M3 has any significant influence on real demand for money in Kenya than using M1 or M2;

The semi log-linear form is:

Assumption $k=1$ (static expectation).

$$\log M3_t = \log b_0 + b_1 \log Y_t + b_2 \log R_t + b_3 RI_t + u_t \dots (15.5).$$

The result of fitting equation (15.5) is:

$$\log M3_t = -5.248 + 1.489Y_t + 0.899R_t + 0.009RI_t$$

$$(-1.099) \quad (3.904) \quad (3.971) \quad (2.852)$$

$$R^2 = 0.994 \quad \hat{R}^2 = 0.993 \quad D.W.=1.325 \quad F=1057$$

All the elasticities are statistically significant at 95 per cent confidence interval, except for the constant term. R^2 and \hat{R}^2 are high and f -statistics are significant at 95 per cent confidence level. D.W. test was indeterminable. Cochrane-procedure shows positive autocorrelation ($\rho = 0.326$). Both t -statistics and f -statistics are significant, hence we do not have a serious problem of multicollinearity.

After the correction for the problem of autocorrelation, the fitting equation (15.5) is:

$$\log M3_t = -5.252 + 1.486Y_t + 0.896R_t + 0.010RI_t$$

$$(-0.972) \quad (3.438) \quad (3.597) \quad (2.806)$$

$$R^2 = 0.995 \quad \hat{R}^2 = 0.994 \quad D.W.=1.426 \quad F= 684.614$$

We finally focus on the impact of expected income on real money demand using M3 ($0 < 1 < 1$):

$$\log M3_t = \log kb_0 + kb_1 \log Y_t + kb_2 \log R_t + kb_3 RI_t + (1-k) \log M3_{t-1} + V_t.$$

The estimated equation is:

$$\log M3_t = -1.946 + 0.901Y_t + 0.692R_t + 0.008RI_t + 0.305M3_{t-1}$$

$$(-0.395) \quad (1.817) \quad (2.816) \quad (2.249) \quad (1.739)$$

$$R^2 = 0.994 \quad \hat{R}^2 = 0.993 \quad D.W.=1.679 \quad F=878.616.$$

Except for the constant term and the lagged variable, all the other elasticities are statistically significant. The elasticity of $M3_{t-1}$ is positive and insignificant at 95 per cent confidence level. R^2 and \hat{R}^2 are high and f-statistics are significant at 99 per cent confidence interval. Cochrane-Orcutt was used to correct for the problem of autocorrelation which yielded the following results:

$$\log M3_t = -1.948 + 0.901Y_t + 0.692R_t + 0.008RI_t + 0.305M3_{t-1}$$

$$(-0.319) \quad (1.459) \quad (2.745) \quad (2.085) \quad (1.630)$$

$$R^2 = 0.995 \quad \hat{R}^2 = 0.994 \quad D.W.=1.836 \quad F= 736.701.$$

The real demand for money using expected income is:

$$\log M3_t = -2.048 + 0.948Y_t^e + 0.728R_t + 0.008RI_t$$

The results are not statistically different from those we obtained when actual income is used.

CHAPTER FIVE

SUMMARY, POLICY IMPLICATIONS AND CONCLUSIONS

5.1. SUMMARY OF THE ESTIMATED RESULTS OF THE STUDY.

All the six equations specified in this study show a high degree of goodness of fit. Both R^2 and \hat{R}^2 are high and f-statistics are significant at 99 per cent confidence level. All coefficients or elasticities have correct signs, some after correcting for the problem of autocorrelation. There was no problem of multicollinearity because many of the t-statistics and all f-statistics are significant. Cochrane-Orcutt procedure was used to correct for the presence of positive autocorrelation in equations (15.3), (15.5) and (15.6). As a result of the fitting, equations (15.3), (15.5) and (15.6) coefficients are assumed to be unbiased and with normal variance. The use of adaptive expectation method in equations (15.2), (15.4) and (15.6) introduced the problem autoregression and that of first-order serial autocorrelation. However, Durbin-Watson statistics could not be used to detect whether the error terms are autocorrelated because the lagged dependent variable biased D.W. Value towards 2.

Table 3 below shows a summary of the estimated results in the study

we conducted. The figures in parentheses indicates the t-values. Equations 15.1, 15.3, and 15.5 are for the demand for money using actual current income. The other equations are for the expected income.

TABLE 3: ESTIMATED RESULTS:

Equation	15.1	15.2	15.3	15.4	15.5	15.6
Dependent Variable	M1t	M1t	M2t	M2t	M3t	M3t
Constant	-7.062 (-1.774)	-7.544 (-1.547)	-4.020 (-0.969)	-2.992 (-0.555)	-5.252 (-0.972)	-1.948 (-0.319)
In (Y_t)	1.502 (4.738)		1.340 (4.030)		1.486 (3.438)	
In (Y_t^e)		1.663 (3.944)		1.170 (2.068)		0.901 (1.459)
In (R_t)	0.488 (2.595)	0.539 (2.570)	0.782 (4.065)	0.743 (3.677)	0.896 (3.597)	0.692 (2.745)
RI_t	0.009 (3.013)	0.009 (3.017)	0.009 (3.450)	0.009 (2.49)	0.010 (2.806)	0.009 (2.055)
R^2	0.993	0.993	0.996	0.996	0.995	0.995
\bar{R}^2	0.992	0.992	0.995	0.995	0.994	0.994
D.W.	1.614	1.526	1.607	1.66	1.426	1.53
F	915	665	1125	544	684	73
Rho	0.193	0.237	0.223	0.324	0.325	0.16

Cochrane-Orcutt method was used to correct the problem when it was found to be positive. The coefficients of elasticities of equations (15.2), (15.4) and (15.6) are biased but consistent.

It was found that the expected income has no significant impact on the real demand for money than actual income. It can therefore be concluded that the most relevant equations for Kenya in this paper are equations (15.1), (15.3) and (15.5). It was clearly shown that broad money(M2) definition has more significant impact on the coefficients of the explanatory variables, especially log of (Y_t) .

Equation (15.3) has higher R^2 than equations (15.1) and (15.5). We can therefore conclude that the broad definition of money(M2) is still the more relevant to demand for money in Kenya. All the explanatory variables had correct signs and all are statistically significant. The major conclusion from the study is that the real demand for money in Kenya is considerably influenced by real income, average return on physical assets, real return on money assets and that the broad (M2) definition is more appropriate and suitable for Kenya than M1 and M3 definitions.

5.2. POLICY IMPLICATIONS OF THE RESEARCH PAPER AND CONCLUSION:

The average return to physical capital (I/Y) is positively related to real demand for money and the elasticity is statistically significant at 95 per cent confidence level (using the t-statistic test). This result confirms one of the hypothesis put forward in an earlier section; that real money demand is treated in less developed countries like Kenya as complementary to capital assets through which capital accumulation takes place. Therefore the government in Kenya should use the rates of returns to capital assets to control the demand for money. For example, if the government wants to increase money demand, it should raise the rates of return on capital goods. This can be done by raising the rate of interest in the economy. Keeping the rate of interest at low levels will discourage people from holding money and hence less capital accumulation.

The results obtained showed that real return on money asset is positively related to real demand for money and statistically significant at 95 per cent confidence level. This indicates that interest rate has an appreciable impact on real demand for money in Kenya. Although traditional theory suggests a negative relationship, empirical evidence shows that the coefficient is positive and significant. This implies that policy administrators

should direct their policy on interest rate, if they want to control the real demand for money in Kenya.

The results also indicate that the level of National income (GDP) affects the real demand for money in Kenya. The elasticity of National income is positive, greater than one and statistically significant at 95 per cent confidence level. This implies that with increase in the level of National income, the real demand for money will increase. Policy makers should therefore direct policy instruments on the level of National income in order to control the real demand for money. The result of elasticity being greater than one is similar to what has been obtained in other less developed countries (Gujarati). The result of the study also indicate that the M2 definition of money is more relevant than M1 or M3 to real demand for money in Kenya.

The major policy implication of the research paper is the provision of support to show that the Mckinnon-Shaw model is suitable and appropriate to Kenya. The evidence we have achieved so far, if accepted, will influence the formulation of monetary policy in Kenya.

Also, the use of credit constraint as a proxy for the rate of interest can serve a useful purpose in Less developed countries.

However, we did not have this variable in our study as it does not appear in the model we were testing. Other variables that may be tested in future to see their relevance would include exchange rate and foreign interest rate.

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