The Demand for Money in Nepal

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1. INTRODUCTION

Monetary authorities in most developing countries seek to attain maximum feasible output, fuller employment, price stability and healthy trends in the balance of payments through various monetary policy instruments. Changes in the stock of money inevitably play a key role in the achievement of these goals. If the changes in money stock are not adequate enough to subserve the growing needs of the economy, the level of aggregate economic activity and the real income growth would be restrained. On the other hand, unwarranted growth in money supply would generate inflationary pressures and create balance of payments difficulties. An understanding of the nature and behaviour of the money demand function is, therefore, vital in the process of monetary management. If it can be established that the demand for money is a stable function of a few measurable variables, and if the value of these variables are known, it will then be possible to predict the demand for money and suitably adapt its supply. Yet, in Nepal this key issue has not received the kind and amount of attention it deserves for working out a meaningful exercise on monetary planning. The present study attempts to eliminate this gap in knowledge in a limited way, by empirically estimating the demand functions for money in Nepal.

The plan of the study is as follows: In section 2, we provide a broad review of major theories of demand for money and discuss the main problems concerning empirical estimation, with the purpose of obtaining a proper perspective for specifying and estimating the demand functions for money in Nepal. Section 3 presents and analyzes the empirical estimates of the specified functions. Apart from estimating the conventional equations of demand for money, the McKinnon hypothesis of complementarity between physical capital and money balances is also tested. The key problems associated with the quantitative analysis in the Nepalese context are also discussed in this section. The last section provides a brief summary of the main findings of the study.

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2. THEORIES OF THE DEMAND FOR MONEY AND EMPIRICAL PROBLEMS

2.1 Theories of the Demand for Money

Unlike other assets, money has the unique characteristic of being universally accepted as the medium of exchange. Because conversion of other assets into money often entails some costs and trouble, and because money yields the convenience of holding the means of payments, it comes to be demanded. Several alternative theories have been postulated to provide an explanation to the demand for money. They are: (a) the Cambridge Approach [Marshall, 1920 and Pigou, 1917], (b) the Keynesian Theory [Keynes, 1936], (c) the Inventory - Theoretic Approach [Tobin, 1956 and Baumol, 1952] and (d) the Portfolio Theory [Friedman, 1956,1959]. Although the range of hypotheses implicit in these theories differ considerably, they all tend to suggest that demand for money can be explained in terms of a few key variables. Actually speaking, we find that the variables posited by these theories to explain the demand for money are often similar but they differ only in terms of importance assigned to each.

The Cambridge approach to the theory of the demand for money postulates that the demand for money is a fixed proportion of money income, $M^d = k\ (PY)$. Though simple, this approach overlooks the influence of other important variables, such as the interest rate that led to the development of Keynesian theory. Keynes classifies the motives for holding money into transactions, precautionary and speculative categories and accepts income as the main determinant of the demand for money for transactions and precautionary purposes, but stresses the importance of interest rate in determining the speculative demand for money. The Keynesian demand function for money may be written as:

$$M^d = M_1\ (Y) + M_2\ (i)$$

where M_1 is the transactions cum precautionary demand for money which is related positively with income and M_2 is the speculative demand which is related negatively with the rate of interest.

Though Keynes' theory of the demand for money represents a significant improvement over the Cambridge Approach in as much as it is based on realistic analysis of the motives for holding money, it also suffers from some inconsistencies. Tobin, among others, argues that even the transactions component of the demand for money is sensitive to interest rate. Working on the transactions demand for money, Baumol and Tobin formulate the so-called inventory-theoretic model in the line of the well-known general approach to the problem of inventory

management. In this model, the demand for money balances is conceived to be determined by the consideration of minimizing the total cost of making transactions. The total cost comprises interest foregone if money is held instead of bonds, and the "brokerage fee" involved in converting bonds into cash. In the final analysis, the model shows that the demand for cash balances is proportional to the square root of the value of transactions and is inversely proportional to the square root of the rate of interest[1]. The Keynesian theory also appears to be inconsistent on the ground that public does not hold two stocks of money, M_1 and M_2, but instead holds just one stock, M, to be used for various purposes. This is widely reflected in the subsequent literature which shows a tendency of treating money demand in aggregate form.

Friedman refurbishes the quantity theory of money into what is known as asset-choice or portfolio balance approach to the demand for money. Unlike the Keynesian theory, this approach abstains from viewing the demand for money as arising from different motives. Instead, it treats money as one of the many assets including physical and human assets[2] and posits the relative yield of money with respect to other assets as the major determinant of demand for money. In this view, one can think of real money as being like any other commodity, with the quantity that people desire to hold depending on the opportunity cost of holding it, subject to a wealth constraint. As such, a general form of the demand function for money may be written as:

$$\frac{M^d}{P} = f(I, R, \frac{W}{P})$$

which states that demand for real money is a function of its own rate of return (I), yields on alternative financial and physical assets (R being a vector) and the real wealth ($\frac{W}{P}$). In the absence of direct estimates of wealth, Friedman suggests permanent income - a weighted average of current and past values of income -- as a measure for wealth

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[1] $M^d = \sqrt{\frac{2bT}{i}}$, where T is the value of transactions, b is the brokerage fee, and i is the interest rate.

[2] Friedman argues that money can be regarded as one of the five broad forms of holding wealth: money, bonds, equities, physical goods and human wealth.

While the foregoing discussion of the alternative theoretical approaches to analysing the demand for money has been very sketchy, it seems clear that a number of conceptual and methodological issues are likely to crop up in the estimation of the demand relationship. The empirical studies in this field by different authors also bring out the key issues to which we have to direct our attention in attempting to specify and test the alternative theories of money demand. But the empirical studies being accumulated over the years are too extensive to be given even a fairly cursory treatment in this study[3]. So, instead of trying to present a paper-wise review of these studies, we concentrate on highlighting the major conceptual and empirical problems that seem to be commonly surfacing in these studies.

2.2 Empirical Problems

Virtually all of the empirical studies that have come to our attention reveal that the central problem at issue is the specification of money demand relationship in a form which best represents the reality and is suitable for statistical fitting. In this regard, we will be concerned with the selection of appropriate scale variable (income or wealth), the choice of relevant interest rate and other important factors which are believed to exert significant influence on money holding. We shall also discuss the issue of adjustment lag in the demand for money function and other relevant empirical issues.

2.2.1. Selection of Scale Variable

The first key issue to be settled is whether income or some wealth variable should enter the demand function for money. It is, however,difficult to get a clear view on this matter from the empirical studies because the evidence is somewhat mixed. If one looks at the studies relating to the U.S. economy, most of these [Meltzer, 1963; Brunner and Meltzer, 1963; Laidler, 1966 a; and Chow, 1966] indicate the superiority of wealth or permanent income over the measured income in explaining money demand. On the other hand, the study by Goldfeld [1973] shows that income performs better than wealth. He, however, adds that short-run changes in wealth also help to explain the data. These tend to suggest that income and wealth are both important in determining the demand for money, but it is difficult to separate their relative influence. The studies made in the British context do not also provide definite evidence on this issue. While the study by Laidler and Parkin [1970] shows that income has a significant influence on money demand, Laidler's study [1971] reveals that the use of permanent income leads to better results. Empirical studies made

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[3]Detailed survey of the empirical studies on demand for money is to be found in Laidler [1977] and Boorman [1980].

in the Indian context also do not provide any definite guidance as to whether income or wealth is the most relevant scale variable. On the one hand, we find evidence of significant influence of income on the demand for money in Rangarajan [1965], Chowdhary and Krishnamurty [1966], Gujarati [1968] and Gupta [1979]. On the other hand, the study by Bhattacharya [1984] shows that while income rather than wealth has the stronger effect on currency demand, the opposite is true in the case of demand and time deposits[4].

Despite these differences, however, there appears to be a general consensus that either income or wealth must be involved in the explanation of demand for money. The inclusion of both income and wealth is problematic because they move together with similar trends. From the theoretic point of view, income rather than wealth presumably would serve as the better scale variable if the interest is to examine the transactions motive of holding money. Alternatively, wealth would be the more relevant scale variable if asset demand is to be examined. In a situation where series on wealth are not available, income may be considered as the most relevant scale variable. Indeed, there are convincing prima facie arguments supporting the use of income in the analysis of demand for money. Firstly, the higher the level of income the higher the level of economic activity and hence the larger the amount of money balances required for transaction purposes. Secondly, in so far as income can be regarded as a steady stream of returns to wealth ($Y = rW$), income would serve as a surrogate for wealth. The appropriate concept of income would,however, be the permanent income, a variable free from transitory elements to which measured income is subject. Since permanent income as such is not directly observable, it is derived as a weighted average of past incomes. But computation requires sufficiently long series of national income and where this is not available, as in Nepal's case, one is forced to be content with the use of measured income in the empirical studies.

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[4]In the absence of published data on wealth, Bhattacharya [1984] derives time series on real net worth of private sector which he considers as the proper substitute for wealth, as follows:

$$XNW = XKP + (M + DT + CINS + CPF + CSS)/PX$$

Where XNX is the real net worth of the private sector, XKP is the real private capital stock and M,DT,CINS,CPF and CSS are money supply, time deposits, insurance funds, provident funds and post office deposits, respectively; PX is the general price index.

2.2.2. Choice of Interest Rate

As in the case of scale variable, we find divergent views and evidences on the choice of relevant interest rate. The theoretical logic as well as the empirical studies overwhelmingly agree that the demand for money function should contain some interest rate so as to represent the opportunity cost of holding money. There is, however, substantial disagreement as to which interest rate would serve best as the opportunity cost variable. In reality, we have a wide variety of assets that could be considered as alternatives to holding money in the asset portfolio of the public. Corresponding to these assets, there is a wide variety of rates of interest and hence the problem is to decide which rate best represents the general opportunity cost of holding money. To the extent we view the demand for money in the framework of broader portfolio selection, yields on equities as well as on bonds would be the more relevant measures of opportunity cost. The Keynesian theory also provides support to the long-term rate because it links a long-term rate to investment and income through the demand for and supply of money. On the other hand, if we consider short-term assets as the closest substitutes of money, short-term interest rate would be the more relevant argument. An alternative to using either a short-term, or a long-term or any other rate is to use a weighted average of the different rates offered by the commercial banks on deposits of different durations. Though this measure appears to be the 'representative rate', it does not contribute to explain the degree of substitutability between money and other assets, which is considered to be more important for the conduct of monetary policy.

Since theory does not provide any clear-cut guidance on the choice of interest rate, empirical studies have tried different rates depending upon the availability of suitable data and the investigator's theoretical approach. While some studies have used either the short or the long rate, others have employed both alternatively to see which contributes most to the explanation of demand for money. The study by Meltzer [1963] in the context of the US economy uses the rate of interest on 20-year bonds and finds a significant negative relationship between this rate and the demand for money, however defined, and regardless of the other variables included in the function. Similar work carried out by Laidler [1966 b] on US data using alternatively the long rate and the short rate shows that either interest rate has a significant negative effect on the demand for money. The study by Hamberger [1966] shows that both the yield on long-term bonds and yields on equities also exert significant influences in determining money demand. Lee [1967] finds that rate of interest offered by other financial institutions, such as savings

and loan associations are also important. These evidences tend to support that long-term interest rate is the more relevant rate in explaining the demand for money. There are, however, many other studies which find short rate to be of greater importance in the money demand function. Heller [1965] in his study of the demand for money in the US tries alternative specifications with long rate as measured by the rate on US government bonds and short rate measured as the yield on 60-90-day commercial paper and finds strong evidence in support of short-term rate. The study by Gupta [1970] in the Indian context also shows that short rate as measured by the yield on treasury bills is more important than other rates in explaining the demand for money. At the disaggregated level, while the same fact is reflected for the demand for currency, demand deposits appear to be relatively more sensitive to the rate of interest on time deposits. Gupta's findings are supported by evidence produced by Bhattacharya [1984], using market bill rate as the measure of opportunity cost of holding currency[5].

Not all the studies, however, provide evidence in support of either the long rate or the short rate. Of the studies that have come to our notice, a few have failed to find a significant negative relationship between the rate of interest and the demand for money. Studies by Laidler and Parkin [1970] for Britain for the period 1955-67, and Gujarati [1968] and Gupta [1979] for India for the period 1948-64 and 1950/51 - 1975/76 respectively do not reveal any influence of the rate of interest on the demand for money. The interest rate variable is the treasury bill rate in Laidler and Parkin, long-term as well as short-term rate in Gujarati and rate of interest on 12-month deposits in Gupta.

The empirical evidences presented above by no means settle whether the interest rate that is relevant for the demand for money is a short-rate or a long-rate. Since these studies relate to different countries at different stages of development, and cover different time-spans even for the same country, it would be unwise to attempt to draw any firm conclusion. The issue is, therefore, purely an empirical one. It is only by trying out various interest rates we may be able to state confidently which interest rate yields the most stable money demand relationship in a particular economic environment.

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[5]Bhattacharya [1984] argues that the market bill rate, which is determined competitively in the private sector, is the proper measure of liquidity preference than the interest rates which prevail in the organised market.

2.2.3. The Effects of Inflation

Inflation has the effect of lowering the value or the purchasing power of money and its closest substitutes. The value of durable goods - producers' or consumers' - however, remains roughly constant as goods prices rise along with the general price index. If these goods also serve as alternative assets to money, an increase in the expected rate of inflation would cause a shift out of money and bonds into consumer durables. A number of studies based on country-specific as well as cross-country data provide evidence to support this. These studies in general show that variations in the expected inflation rate systematically explain the variations in the proportion of a country's assets held in liquid form [Laidler, 1977]. Expected rates of inflation are not,however, directly observable. A popular method to generate inflationary expectation is Cagan's [1956] approach of adaptive expectation which can be expressed as a weighted average of past rates of inflation. From the empirical point of view, where the series on prices are not available for a relatively long period as in the case of Nepal, it may not be possible to generate expected rates of inflation as weighted average of past rates. Under such circumstances, we can approximate inflationary expectation either by the actual rate, or by the rate prevailing in the previous period. The first approximation procedure amounts to assuming that expectations are 'static', or are realized immediately and fully, that is, in the same period, or an adjustment co-efficient of unity in the adaptive expectation model. In the second case, the expected rate of inflation for the current year is assumed to be determined by the behaviour of prices in the immediate past.

2.2.4. Other Variables

Apart from income or wealth, interest rate and expected rate of inflation, other variables, such as wage rate [Laidler, 1977] and the distribution of income [Gupta, 1979],may also exert important influence on the demand for money. Moreover, in the context of developing countries where the financial structure is relatively less developed, money will be held not just for transactions and precautionary purposes but also as a convenient way of storing wealth in liquid form. In such a situation, the growth of financial intermediaries will also play a significant role in determining the public's money holding behaviour as the store of wealth motives of holding money can easily be satisfied by holding the liabilities of these institutions. However, because of the difficulties in finding suitable measures, these variables have not received much attention in the empirical studies.

2.3 Functional Forms

The foregoing discussion suggests that although there is no agreement as to which scale variable and which interest rate are more important, most formulations of the demand for money relate real money balances to some measure of income or wealth, interest rate and other variables representing the structural composition of the economy. The functional form specified is linear in some studies and exponential in others. These alternative specifications considering only two explanatory variables, income and interest rate, will take the following functional forms:

$$M_t^d = \alpha_0 + \alpha_1 Y_t + \alpha_2 r_t + u_t \quad \ldots \quad (1)$$

$$M_t^d = \beta_0 Y^{\beta_1} i^{\beta_2} e^{V_t} \quad \ldots \quad (2)$$

where M_t^d is the demand for money and Y_t and r_t are income and rate of interest, respectively. The signs of the parameters are expected to be:

$$\alpha_1 > 0, \alpha_2 < 0 \text{ and } \beta_1 > 0, \beta_2 < 0$$

In order to estimate the exponential function, we have to transform it into logarithic form. As such, the estimating equation will take the following form:

$$\ln M_t^d = \ln \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln r_t + V_t \quad \ldots \quad (3)$$

This form has a particular advantage in that the co-efficients β_1 and β_2 directly give the elasticity of money demand with respect to income and interest rate, respectively.

The simple linear (Eqn.1) and log-linear (Eqn.3) specifications, as they stand, imply that the money market is always in equilibrium so that the desired money balances equal the actual money stock reported in the official statistics. In other words, the estimation of either specification requires the assumption that there is instantaneous adjustment of actual stock of money balances to its desired level. This may not, however, be true in reality and only a part of the desired balances may actually be held in a given period. A convenient

framework for examining the adjustment of actual stock of money balances to its desired level is provided by the partial adjustment model developed by Nerlove [1958]. Indeed, the empirical studies that attempt to introduce the mechanism by which actual holdings adjust to desired levels have mostly employed this model. It has been shown by Chow [1966] that the application of partial adjustment model would make it possible to identify the long-run or equilibrium demand and short-run demand functions. In view of these considerations, it may be useful to provide a brief sketch of the theoretical underpinnings of the partial adjustment mechanism as applied to money demand function.

2.4 The Partial Adjustment Mechanism

The partial adjustment model postulates that actual change in money balances at any given time period is some fraction of the desired change for that period. This is algebraically stated as follows:

$$M_t^d - M_{t-1}^d = \gamma (M_t^{d*} - M_{t-1}^d) \quad \ldots \quad (4)$$

where $(M_t^d - M_{t-1}^d)$ is the actual change in the demand for money balances, $(M_t^{d*} - M_{t-1}^d)$ is the desired change and γ is the adjustment co-efficient. The co-efficient γ is expected to take the value between 0 and 1 $(0 < \gamma < 1)$ implying that the discrepancy between the actual and desired money balances will be eliminated by some constant proportion within a single period. If $\gamma = 1$, then the actual and desired balances are equal or the actual money balances adjust to desired level instantaneously. On the other hand, if $\gamma = 0$, it means that actual change at time t is the same as that observed in the previous period. If the desired level of money balances is represented by the following equation,

$$M_t^{d*} = a_0 + a_1 Y_t + a_2 r_t + u_t \quad \ldots \quad (5)$$

then the substitution of this equation into equation (4) and rearranging we get:

$$M_t^d = \gamma a_0 + \gamma a_1 Y_t + \gamma a_2 r_t + (1-\gamma) M_{t-1}^d + u_t \quad \ldots \quad (6)$$

When considering the exponential form of the money demand function, the partial adjustment mechanism will be as follows:

$$\frac{M_t^d}{M_{t-1}^d} = \left(\frac{M_t^{d*}}{M_{t-1}^d}\right)^{\delta}$$

Logarithmic transformation of this expression and substitution of the equation representing desired money balances (i.e. $\ln M_t^{d*} = \ln b_0 + b_1 \ln Y_t + b_2 \ln r_t + u_t$) into it will yield the following relation:

$$\ln M_t^d = \delta \ln b_0 + \delta b_1 \ln Y_t + \delta b_2 \ln r_t + (1-\delta) \ln M_{t-1}^d + V_t$$

As can be seen, the partial adjustment mechanism corresponds to au-regressive model of the Koyck type in which the effect of the lag declines geometrically as the lag lengthens.

Before concluding this section of the theoretical review of money demand functions and empirical problems, it is worth drawing attention to a few other issues that need to be resolved before the demand functions can be estimated.

2.5 Other Issues

2.5.1. Real or Nominal

Rationality would dictate that the demand for money should be viewed as a demand for certain stock of real cash balances because money is demanded not for its own sake but for the real services it yields to the holder. The real value of the purchasing power of a certain stock of money balances will decline in proportion with the rise in prices. This means that maintenance of a constant purchasing power would require doubling of the money balances, if prices double. The implication of this is that demand for nominal balances is proportional to the price level, or the price elasticity of nominal money balances is unity. This, in turn, implies that the public is free of money illusion in its demand for real money balances. On these grounds, the money demand functions are generally cast in real terms. But from the viewpoint of monetary authority, the nominal stock is more important because it is supposed to control nominal rather than real stock of money.

2.5.2. Monetized Income or Total Income

It has been argued by Prasad [1969] and Bhattacharya [1975] in the context of Indian economy that monetized rather than total income should enter the demand function for money. The logic behind this contention is that since income received and disposed of in kind has no bearing on money demand, what is relevant for monetary analysis is not so much total national income as monetized income. Of course, in a predominantly agricultural economy where majority of the farmers are engaged in subsistence farming and where most economic transactions are conducted on barter basis, the use of total income may not be a relevant income measure in explaining the demand for money. But it is very difficult to get information on monetized income. Apart from this problem, the monetized income approach to the demand for money suffers from several shortcomings. According to Gupta [1979], there are four major objections to the use of monetized income in the analysis of demand for money. Firstly, it links the demand for money to only the transactions demand for it to the total neglect of asset demand. Secondly, it is not necessarily true that the agricultural activities do not generate any demand for money. Since farm households are both consuming units and producing enterprises, there is no guarantee that foodgrains produced will be used for consumption and for payments in kinds and not sold for money in the market. As a matter of fact, farmers used to applying modern inputs will have to sell some portion of their production in the market in order to acquire money to pay for the purchase of these inputs. Furthermore, the need to buy consumer goods which are not possible to produce in the farm will also give rise to demand for money. Thirdly, the monetized income approach does not appear to be consistent with the modern theory of demand for money which links the demand for money to income or wealth rather than to the value of monetary transactions. Fourthly, from the viewpoint of designing a suitable monetary policy to influence the course of money income, the appropriate concept of income to be used in the demand function for money would also be total income and not monetized income. For all these reasons, Gupta [1979] uses total income in his estimation of money demand function of India. In consideration of the non-availability of data series on monetized income and arguments put forward by Gupta, we also use total income in our estimation of money demand function of Nepal.

2.5.3. Empirical Definition of Money

In the empirical investigation of demand for money, researchers have tried out both the narrow (M_1 = currency + demand deposits) and broad (M_1 + time deposits) definitions of money. The evidence is, however, somewhat mixed.

Nevertheless, it seems strong enough to argue that if we focus on those theories that emphasize the transactions motive for holding money, the narrow definition of money would serve as the best measure. On the other hand, if our interest is to examine the asset motive of holding money, M_2 or time deposits or other longer term assets would be the more relevant measure because the demand for these assets arise from somewhat different motives. Indeed, if we follow the approach of portfolio behaviour, it would require that we fit arrays of demand functions for a variety of assets and investigate the responsiveness of the demand for each asset to the rates of return on all other assets.

A key problem concerning the narrow measure of money in developing countries like Nepal is the treatment of saving deposits of the commercial banks. Some proportion of these clearly belongs to demand deposits because commercial banks offer withdrawal facilities on these deposits subject to certain limits in terms of amount and frequency of withdrawal. In order to resolve this problem, the Reserve Bank of India had, way back in 1951, framed a regulation advising commercial banks "to classify that portion of saving deposits with them which could be withdrawn without notice as demand deposits, and the rest as time deposits" [Gupta, 1979]. Because the individual banks might arbitrarily decide the proportion or apply rule of thumb practices, this type of information alone would not provide a sound basis for the partitioning of saving deposits into demand and time deposit. A realistic approach would be to carry out sample survey on a regular basis, say twice a year, with the objective of obtaining information on the amount deposited in the saving account and withdrawal facilities utilized with reference to certain point/period of time.

The foregoing review of the theories of demand for money and problems involved in empirical estimation of money demand functions provides us the background to specify and estimate the functions suitable for the developing economy like that of Nepal.

3. ESTIMATION OF THE DEMAND FOR MONEY FUNCTIONS IN NEPAL

Before empirical tests are carried out, it may be relevant to say a few words about the data problems associated with the quantitative analysis of the sort we are attempting for Nepal's economy.

3.1 Data Problems and Definitions

Econometric research work in Nepal is seriously inhibited by a wide range of data shortcomings. For the purpose of this study, we require consistent time series data on variables that are believed to influence the demand for money. However, the statistical information available in Nepal is not adequate for this. Some of the existing inadequacy of statistical information has already been referred to in the previous sections. For a start, there are no quarterly series on GDP. This has forced us to use annual data, which is of limited usefulness for analyzing the seasonal variations in the demand for money. There is complete absence of any information on certain key variables like wealth, capital stock and monetized income. Besides, there is no suitable price index, such as the general price index, to convert the nominal money stock variables into constant prices. Though not a satisfactory way to do, values of M_1 and its components, and time deposits are converted to constant prices by using GDP deflator. Because of its wider coverage, the implicit GDP deflator is assumed to be more superior to CPI as a means of deflator.

The interest rate variable also poses some problems. While demand deposits with commercial banks do not carry any interest earnings, the rates of interest on time deposits differ according to length of the time period to which they are committed. We have alternatively used these different rates with a view to ascertain the degree of substitutability between money and financial assets of different durations. Besides, we have also constructed a weighted average of the different rates and used it to check whether this would serve best to represent the opportunity cost of holding money. In the case of narrow money (M_1), it would have been preferable to use the treasury bill rate as treasury bills are highly liquid assets, and clearly an alternative to money. However, in Nepal, even though the treasury bills have been issued since 1961/62, they have not yet become a market-oriented instrument. The ownership of treasury bills by individuals is virtually nil. We have, therefore, chosen the rate of interest on saving deposits as the yield on competing assets for M_1. This rate may not, however, be relevant in the case of time deposits or M_2 since time deposits, as a rule, bear higher interest rate than saving deposits. So, for time deposits and M_2, we have taken rates of interest on 12-month and 24-month deposits as the relevant interest rate variables. The rate of inflation is represented by the changes in consumer price index.

The statistical estimates of the parameters of the functions are based on the time series data for the period 1974/75 to 1986/87. We have not extended data series prior to 1974/75 mainly because the GDP series released since 1974/75 are based on a better methodological procedure and hence not comparable with the earlier series. Apart from this consideration, the developments that have occurred in the monetary sector since mid 1970's are somewhat different in purpose and approach from those that had occurred earlier. As a matter of fact, concerted efforts made in the last decade towards maintaining appropriate interest rate structure and developing banking system might have brought about some structural shifts in the monetary sector and changes in the attitude and behaviour of public towards holding money. Hence, by choosing a shorter term period we will be able to capture these structural changes that might have occurred over the period. In the case of longer time period, we have to make the assumption of absence of structural shifts. The choice of 1986/87 as the closing date is mainly guided by the consideration of the fact that data for the most recent years may be revised when the final figures come. Because money stock data are end-of-year figures, we have derived comparable series by computing annual averages of mid-monthly figures. The data are from the Quarterly Economic Bulletin, Nepal Rqastra Bank (various issues), and Economic Survey, Ministry of Finance (various issues). Within the limitations imposed by data problems, we have tried out various formulations of the demand functions for money rather extensively although by no means exhaustively.

The formulations of the demand function have been made for narrow money (M_1), time deposits (quasi-money, TD) and broad money (M_2), all measured in real terms, on a step by step basis. The variables used are defined as follows:

Y = GDP at 1974/75 prices, Rs million.
YAG = GDP originating in agriculture at 1974/75 prices, Rs million.
YNAG = GDP originating in non-agriculture at 1974/75 prices, Rs. million.
M_1 = Money held by the public (narrowly defined) at 1974/75 prices, Rs. million.

CUR = Currency held by the public at 1974/75 prices, Rs. million.
DD = Demand deposits of banks held by the public at 1974/75 prices, Rs. million.

TD = Time deposits of banks held by the public at 1974/75 prices, Rs. million.

M_2 = M_1 plus TD at 1974/75 prices, Rs million.
r = Rate of interest
$\dot{r}$ = Real rate of interest.

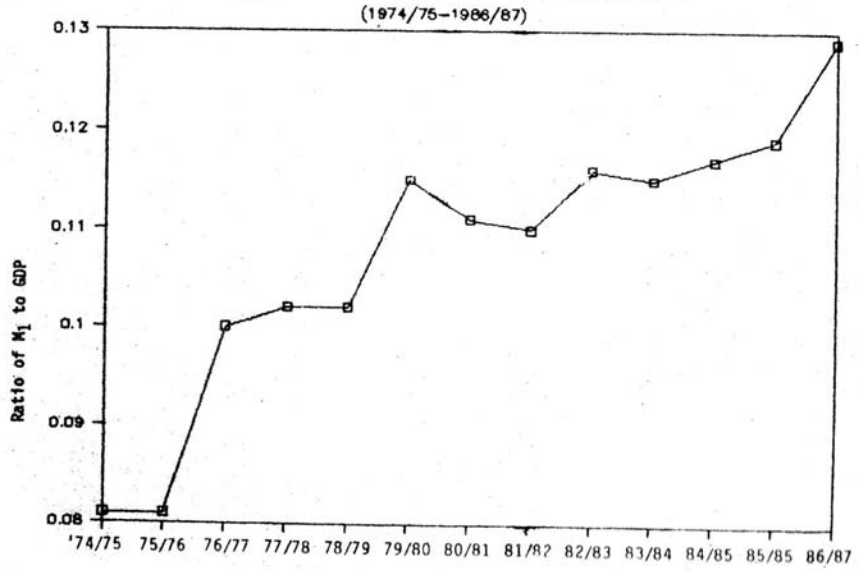
The equations are estimated by applying the method of ordinary least squares. It is well known that such estimates implicitly assume that the independent variables are exogenously determined, i.e., they are independent of the error term in the demand for money equation. The reverse connection from money to income, interest rates and other variables does not exist. This bias can be eliminated only by specifying a complete system in which the simultaneous interrelations between the dependent and the independent variables are fully incorporated. It has not, however, been possible to develop such a system at the present stage of the work. One important point to be noted here is that quantity of money demanded is not an observable variable. All that can be measured is the quantity of money supplied, and it is only by assuming equilibrium in the money market that the quantity of money in existence can be taken as the quantity demanded. Most empirical studies of the demand for money, indeed, treat the quantity of money in existence as the equilibrium amount.

3.2 Empirical Results

3.2.1. Test of Cambridge Equation (M = kPY)

Money balances as a proportion of GDP have increased from 8.0 per cent in 1975 to 13 per centin 1987. The increase, however, appears to be taking place after being constant for a couple of years. As can be seen in Figure 1, the ratio

Figure 1. Ratio of M1 to GDP.
(1974/75–1986/87)



of M_1 to GDP has shifted upwards only four times during the period of 13 years from 1975 to 1987. The upward shift took place in 1977, 1980, 1983 and 1987. It thus appears that the Cambridge hypothesis of money demand being some constant proportion of money income is true for a relatively shorter time period spanning two to four years.

3.2.2. Income Elasticity of Demand

As a first step towards a satisfactory specification of demand function, we regress real money balances of various definitions on income. The results are given in Table 1.

Table 1: Income Elasticity of Demand for M_1, Time Deposits and M_2

Eqn. No.	Dependent Variable	Intercept	Independent Variables			$\bar{R}^2$	F	DW
			ln Y	ln YAG	ln YNAG			
1.1	ln M_1	-10.56* (- 6.31)	1.84* (10.89)			0.91	118.63	1.20
1.2	ln M_1	-4.81* (- 3.33)		0.29 (1.31)	1.09* (10.44)	0.97	169.77	2.04
1.3	ln TD	-29.80* (-7.43)	3.77* (9.31)			0.87	86.76	0.91
1.4	ln TD	-19.76* (-4.20)		0.91 (1.28)	2.09* (6.13)	0.92	66.15	1.22
1.5	ln M_2	-18.63* (-7.60)	2.72* (10.99)			0.91	120.76	0.98
1.6	ln M_2	-11.54* (-4.35)		0.69*** (1.72)	1.49* (7.75)	0.95	107.86	1.33

Note: Figures in parantheses are t-statistics. The asterisks*, ** and *** wherever shown indicate that the co-efficient is significant at 1 per cent, 5 per cent and 10 per cent level, respectively.

All categories of money (i.e. M_1, TD and M_2) are highly elastic with respect to aggregate income -- the income elasticity co-efficients are greater than unity and statistically significant. The income elasticity of demand for M_1 balances turns out to be 1.84 which is lower than the estimates for India (obtained by Gupta, 1970) and Burma, and higher than those for some other developing countries. The following are the estimates of income elasticity of demand for real money balances for India and some other developing countries.

Table 2: Estimates of Income Elasticity of Demand for Money for Some Developing Countries

Country	Author	Estimates of Income Elasticity of Demand	Period
India	Gujarati [1968]	1.39	1948/49 - 1964/65
India	Gupta [1970]	2.10	1949/50 - 1965/66
India	Fan and Liu [1971]	0.91	1953 - 68
Ceylon		0.82	
Pakistan		0.86	
Burma		2.55	
Thailand		0.79	
India	Bhattacharya [1975]	0.45	1948/49 - 1967/68
India	Gupta [1979]	1.02	1950/51 - 1975/76

It is interesting to observe that the estimates of income elasticity of demand for money in India obtained by different authors differ markedly. This may be due to the use of different sets of data of varying degrees of reliability and different combinations of explanatory variables. It is important, however, to point out that the functional form employed by all these studies to derive the estimates of elasticity also include interest rate variable. The present omission of interest rate in our functional form has, therefore, lent a bias to the estimated income elasticities of demand for money. In the case of M_1, the income elasticities are biased downwards because they have absorbed the negative effect of interest rate with which the demand for M_1 is inversely related.

The income elasticity of time deposits is 3.77. Since time deposits are one of the important media of financial savings, the elasticity with respect to income is expected to be greater than unity. However, at this stage, the income elasticity of time deposits is biased upwards because the income variable has picked up the positive effect of interest rate on time deposits. The negative intercept term is consistent with an a-priori expectation that savings in the form of time deposits will take place only after a minimum level of income.

The income elasticity of M_2 reflects the combined effect of income changes on M_1 and TD. The income elasticity of M_2 turns out to be higher than that of M_1 because of the relatively higher income elasticity of its TD component. The relatively higher income elasticity of demand for broad money can be taken to reflect a switchover of more traditional forms of savings into time deposits of different durations as the financial system becomes more developed and as the rate of return on time deposits becomes more attractive [Thirlwall, 1974].

While the use of aggregate income is useful to guage the overall income elasticity of demand for money, it conceals the differences in elasticity among income classes or among sectors. It is, therefore, desirable to have a breakdown of aggregate income by major sectors or income groups. The lack of data does not, however, make it possible to introduce any other distributional variables except incomes originating in agriculture and non-agriculture. As can be seen from Table 1, the co-efficient of agricultural income, while with the right sign, is statistically insignificant in the equations for M_1 and TD. This tends to suggest that M_1 and TD are not elastic or have very low elasticity with respect to agricultural income. The reasons for this may be the archaic agrarian structure and low level of monetization in the agricultural sector. When M_2 is considered, the co-efficient of agricultural income is significant only at 10 per cent level and hence its reliability is very low. The findings are, however, quite different with respect to non-agricultural income. The co-efficients of non-agricultural income are all greater than unity and statistically significant at 1 per cent level. The non-agricultural income elasticity is of the order of 1.09 for M_1, 2.09 for TD and 1.49 for M_2.

The values of the $\bar{R}^2$ show that the equations are all satisfactory in explaining the observed variations in M_1, TD and M_2.

It might be desirable to study the demand for money in terms of its components, namely currency and demand deposits, as these may be differently related to aggregate income and its major components. In Nepal, currency has been accounting for about 63 per cent to 70 per cent of the total money demanded during 1975 to 1987. This would mean that the demand for total cash balances is likely to be dominated by the factors determining the demand for currency. However, in reality, the factors which determine the demand for currency may not influence the demand for demand deposits. Even when the determinants of the demand for currency and demand deposits are the same, their relative importance may be different. Such differences in the determinants of the demand for currency and the demand for demand deposits do not get reflected in the aggregate equation. We have, therefore, estimated separate regressions for currency and demand deposits with income as the sole explanatory variable. In alternative specifications, the income variable is disaggregated into agricultural income and non-agricultural income. The results are reported in Table 3.

Table 3: Income Elasticity of Demand for Currency and Demand Deposits

Eqn. No.	Dependent Variable	Intercept	Independent Variables			$\bar{R}^2$	F	DW
			ln Y	ln YAG	ln YNAG			
3.1	ln CUR	-11.97* (- 8.92)	1.94* (14.3)			0.94	205.23	1.67
3.2	ln CUR	-7.66* (- 5.17)		0.64* (2.87)	0.99* (9.22)	0.97	172.93	2.20
3.3	ln DD	-9.72* (- 3.68)	1.64* (6.17)			0.76	38.13	0.86
3.4	ln DD	-1.09 (- 0.53)		-0.42 (-1.36)	1.30* (8.72)	0.93	76.33	1.73

Note: Figures in parantheses and asterisks carry the same meanings as explained in the note to Table 1.

From the results, it does not appear that there is a marked difference in the elasticities of demand for currency and demand deposits with respect to income. The income elasticity of demand for currency is 1.94 as compared to 1.64 for demand deposits. These elasticity values are close to that obtained for M_1. The results are, however, quite different with respect to agricultural and non-agricultural income. While the co-efficients of both the agricultural and non-agricultural income are statistically significant in the equation for currency, the co-efficient of agricultural income, while with the right sign, is insignificant in the equation for demand deposits. Thus, demand deposits do not seem to be elastic with respect to agricultural income and this is quite plausible. The elasticity of demand for demand deposits with respect to non-agricutural income is 1.30 as compared to 0.99 for currency.

3.2.3. Marginal Propensity to Hold Money

It might prove useful to know the estimates of marginal propensity to hold money (MPM). For this, the demand functions for money have to be estimated in linear forms. The derivative of money demand with respect to $\frac{(dM)}{dY}$ gives the marginal propensity to hold money. The results of linear regressions are presented in Table 4.

Table 4: Estimates of Demand for Money Functions in Linear Form

Eqn. No.	Dependent Variable	Intercept	Independent Variables			$\bar{R}^2$	F	DW
			Y	YAG	YNAG			
4.1	M_1	-1697.38*	0.19*			0.94	198.04	1.53
		(-6.02)	(14.07)					
4.2	M_1	- 931.18*		0.07***	0.29*	0.97	179.78	2.06
		(-2.85)		(1.65)	(8.74)			
4.3	TD	-5032.56*	0.35*			0.95	245.98	1.48
		(-10.86)	(15.68)					
4.4	TD	-4838.69*		0.32*	0.37*	0.95	113.17	1.48
		(-6.49)		(3.39)	(5.00)			
4.5	M_2	-6729.94*	0.54*			0.96	280.14	1.56
		(- 10.03)	(16.74)					
4.6	M_2	-5769.87*		0.39*	0.66*	0.96	147.90	1.63
		(-5.71)		(3.04)	(6.52)			

Note: Figures in parantheses and asterisks carry the same meanings as explained in the note to Table 1.

The marginal propensity to hold M_1 is of the order of 0.19, which means that for every rupee increase in real GDP, the demand for M_1 increases approximately by 19 paisa. When income is disaggregated into agricultural and non-agricultural parts, the regression co-efficient for YNAG (0.29) turns out to be four times higher than that for YAG (0.07). From these estimates, it can be inferred that while every rupee increase in real non-agricultural income results in an increase in demand for money by 29 paisa, the increase is 7 paisa with respect to every rupee increase in real agricultural income. The overall goodness of fit as judged by the values of $\bar{R}^2$ is quite satisfactory in both the equations for M_1.

The co-efficient of income in the equation of time deposits is of the order of 0.35, implying that out of every rupee increase in real GDP approximately 35 paisa is held in the form of time deposits. This can also be interpreted as marginal propensity to save in the form of time deposits. The co-efficient of YAG and YNAG turns out to be 0.32 and 0.37 respectively. This means that the propensity to save in the form of time deposits out of non-agricultural income is somewhat higher than that out of agricultural income.

The income co-efficient of broad money balances (M_2) is of the order of 0.54,which is almost three times higher than the co-efficient of M_1. Since the co-efficient of income in M_2 reflects the combined effects of income on M_1 and TD, it is bound to be higher than the co-efficient of income in the two latter equations. As can be seen, the co-efficient of income in M_2 is the sum of the co-efficients of income in M_1 and TD. The same is true for the co-efficients of YAG and YNAG.

The results on the disaggregated functions for M_1 in terms of demand for currency and demand deposits are presented in Table 5.

Table 5: Estimates of Demand for Currency and Demand Deposit in Linear Form

Eqn. No.	Dependent Variable	Intercept	Independent Variables			$\bar{R}^2$	F	DW
			Y	YAG	YNAG			
5.1	CUR	-1337.74* (-8.82)	0.14* (18.74)			0.97	351.18	2.07
5.2	CUR	-1009.12* (-4.93)		0.08* (3.27)	0.18* (8.69)	0.97	232.98	2.26
5.3	DD	- 359.64** (- 2.32)	0.05* (7.25)			0.81	52.51	1.07
5.4	DD	- 77.94 (0.45)		-0.02 (-0.74)	0.11* (6.27)	0.90	55.71	1.71*

Note: Figures in parentheses and asterisks carry the same meaning as explained in the note to Table 1.

As can be seen, except for the co-efficient of agricultural income in the case of DD function, the co-efficients of income variables are statistically significant and of the expected sign in all functional forms. The co-efficient of YAG in the DD function is negative but statistically insignificant, suggesting that agricultural income has no effect on demand deposits. This is quite plausible because demand deposits are mainly held by the business community and the private corporate bodies engaged in various non-agricultural activities. When we compare the co-efficient of aggregate income in CUR and DD functions, the marginal propensity to hold currency appears to be thrice as large as the marginal propensity to hold demand deposits, 0.14 as against 0.05. This is also in consonance with the monetary feature expected in the early stage of development that the propensity to hold currency is substantially larger than the propensity to hold demand deposits. Unlike in the case of demand for demand deposits, the demand for currency is influenced both by the agricultural as well as non-agricultural income, the latter having larger influence than the former. The

co-efficient of YNAG is more than twice the co-efficient of YAG, 0.18 as against 0.08, suggesting that, on an average, while an increase of one rupee in YNAG leads to an increase of 18 paisa in the demand for currency, the increase is only 8 paisa with respect to one rupee increase in YAG

The results show that the sum of the co-efficients of Y in CUR and DD functions yield the co-efficient of Y in M_1. The same holds true for the co-efficients of YAG and YNAG.

3.2.4. Interest Elasticity of Demand

In the analysis of consumer expenditure, the demand for a commodity is postulated to be a function of own price, price (s) of substitute (s) and income (or expenditure). Similarly, in estimating the demand function for money, account must be taken of own rate of return and yield on substitute assets. But it is difficult to measure the own rate of return of M_1. The rate of return of holding money balances is the convenience of having the purchasing power readily available. Since this convenience is not measurable, most empirical studies ignore the return to money and only consider the rate of interest on financial or non-financial assets which are closest substitutes to M_1. While the assumption of zero return is justified in the case of M_1 as currency and demand deposits do not fetch any interest earnings, it is not so in the case of TD or M_2, since time deposits, as a rule, carry some interest earnings. For reasons explained in section 3.1, we can take saving deposits as the closest substitute to M_1 in Nepal. Another asset which is as liquid as M_1 is gold. Over the years, gold price has increased rapidly from as low as Rs 875 per tola in 1975 to Rs 5,220 per tola[6] in 1987 . We may, therefore, expect gold prices to influence public's decision to hold money.

It can be observed from Table 6 that the rate of interest on saving deposits, while in the right sign, is not statistically significant in explaining the observed variations in real M_1 balances. This tends to contradict the Keynesian liquidity preference hypothesis. The poor performance of interest rate variable would mean either the money holders are insensitive to the rate of return on alternative financial asset as represented by saving deposits or the

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[6] One tola is equivalent to 11.6638 grams. These gold prices are the maximum prices prevailing in the respective years.

interest rate on saving deposits is not an appropriate measure of the opportunity cost of holding money. Substitution of the rate of interest on saving deposits by the gold price does not also yield plausible results. We try yet another measure of the opportunity cost of holding money, the weighted average interest rate,

Table 6 :Income and Interest Elasticity of Demand for M_1, Time Deposits and M_2

Eqn. No.	Dependent Variable	Intercept	Independent Variables		$\bar{R}^2$	F	DW
			ln Y	ln r+			
6.1	ln M_1	-10.43* (5.86)	1.94* (6.03)	-0.54 (-0.38)	0.90	54.77	1.26
6.2	ln TD	-30.23* (-7.44)	3.67* (8.70)	0.57 (0.92)	0.88	43.20	1.01
6.3	ln M_2	-18.73* (-7.28)	2.69* (10.10)	0.14 (0.36)	0.90	55.67	1.05

+ r in M_1 is rate of interest on saving deposits, r in TD and M_2 is rate of interest on one year deposits.

Note: Figures in parentheses and asterisks carry the same meanings as explained in the note to Table 1.

and the co-efficient of the variable comes out with the right sign but it is not statistically significant. The estimated equation is:

$$\ln M_1 = \underset{(-5.92)}{-10.53^*} + \underset{(10.08)}{1.84 \ln Y^*} - \underset{(-2.12)}{0.04 \ln RWA}$$

$\bar{R}^2 = 0.90$
F = 54.01
DW = 1.16

It can be argued that in a situation of rising prices, nominal interest rate may not be the best proxy for the opportunity cost of holding money. In Nepal, over the sample period, the rate of inflation was in double digits in six out of twelve years while the saving deposit interest rates remained virtually unchanged. Hence, it would be desirable on statistical as well as economic grounds to relate the demand for money to real and not to the nominal interest rate. Substituting the interest rate on saving deposits by the real interest rate (rate of interest minus inflation rate), we get the following result[7]:

$$M_1 = -1260.91^{*} + 0.17\ Y^{*} - 16.21\ \dot{r}^{**}$$
$$(-4.33) \quad (12.25) \quad (-2.16)$$

$$\bar{R}^2 = 0.95, \quad F = 112.39, \quad DW = 2.33$$

The co-efficient of the real interest rate has the right sign and is statistically significant. This suggests that the demand for money is inversely related to the real rate of interest. The same holds true for currency and demand deposits, as revealed in the following equations:

$$CC = -1166.58^{*} + 0.13\ Y^{*} - 9.27\ \dot{r}^{**}$$
$$(-6.93) \quad (16.01) \quad (-2.14)$$

$$\bar{R}^2 = 0.97$$
$$F = 135.54$$
$$DW = 2.52$$

$$DD = -94.33 + 0.04\ Y^{*} - 6.93\ \dot{r}^{**}$$
$$(-0.66) \quad (6.11) \quad (-1.88)$$

$$\bar{R}^2 = 0.85$$
$$F = 32.29$$
$$DW = 2.09$$

It may be noted that with the interest rate effect being separately accounted for, the downward bias of the income elasticities for M_1 which we noted earlier has been corrected. But the magnitude of income elasticity is not much different, 1.94 now (Table 6) as compared to 1.84 earlier. When the rate of interest on saving deposits is substituted by the weighted average rate, the income elasticity turns out to be exactly the same as before.

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[7] Estimation in logarithmic form was not possible because real interest rates were negative in some years.

As regards time deposits, own rate of return can be represented by the rate of interest on one-year and two-and-more years deposits and hence such deposits should increase as the rate of return increases. However, when the rate of return on alternative assets increases, time deposits should decrease. The rate of interest on one-year deposits has a co-efficient with the right sign but it is not statistically significant (see equation 6.2 in Table 6). There is no change in the significance of the co-efficient of interest rate variable even when the function is estimated in linear form. The use of alternative rate of return as represented by the rate of interest on two-and-more years deposits produces a near singular matrix when estimated in logarithmic form. The linear form, however, yields a positive but insignificant co-efficient. The use of real rates of return do not also yield expected results. Despite the sharp increase in the price of gold over the years, gold is not found to be a substitute asset for time deposits. The price of land in urban areas could well be taken as the rate of return on alternative asset to time deposits. Since the price of land has been rising sharply year after year during the last decade one has reason to believe that there should be a tendency to switch over to real estates away from time deposits. But the data problems relating to land prices do not permit us to test this hypothesis.

It is difficult to interpret the interest elasticity of M_2. In purely statistical term, it is the net combined result of the effects on M_1 and TD. In any case, it is not statistically significant.

3.2.5. Effects of Inflation

As already noted, in an inflationary situation peope would shift out of money into inflation-proof assets and spend more on consumer goods. This hedging against inflation should bring about a reduction in real money balances. The rate at which such balances are reduced depends upon how public expect inflation rate to move in the future. As noted in Section 2.1.3, since inflationary expectation is not an observable variable, it has to be generated as weighted average of past rates of inflation, or approximated by the current rate or the rate prevailing in the preceding years. We estimated the demand function for M_1 by adding alternatively the current rate and one-year lagged rate as proxy for expected inflation, but the results did not turn out to be satisfactory. The co-efficient of inflation rate came out with wrong sign both in the current rate and last year's rate and was also significant at 10 per cent level in the case of current rate. This is quite awkward. The co-efficient of interest rate also

changed sign, but was statistically insignificant. We also tried expected inflation, estimated by using the polynomial technique suggested by Almon [1965], but it did not perform any better. Perhaps the inclusion of interest rate and inflation amongst explanatory variables is not desirable as the results obtained earlier suggest that it is the real rate of interest that influences public's decision to hold money. In view of the insignificant co-efficient of the nominal rate of interest in the estimates obtained earlier, it may not be illogical to drop it from the function and retain the price variable. In so doing, we would be assuming that expected real rate of interest is essentially determined by the variations in expected inflation. This may not be unrealistic given the situation of rising prices and more or less unchanged rate of interest on saving deposits over the sample period of our study. As earlier, we approximated the expected rate of inflation alternatively by the current rate and the lagged rate, but neither rate showed expected results. However, expected inflation generated by applying Almon lag technique had a co-efficient with the proper sign but it was not statistically significant.

3.2.6. Partial Adjustment Mechanism

We have thus far assumed that actual money balances held by the public are equal to the desired stock, that is, actual balances adjust to desired level instantaneously (within the same time period). However, in reality, because of the costs involved in making portfolio adjustment and presence of various obstacles complete adjustment may not be possible within a defined period - one year in our case. Keeping this in view, we also estimate the demand functions in the framework of partial adjustment model, discussed earlier in section 2.3. In view of the insignificant co-efficients of interest rate and inflation as found earlier,we have dropped them from the functions. The results are as follows:

(1) $\ln M_1 = -3.25^{***} + 0.63 \ln Y^{***} + 0.61 \ln M_1(-1)^{*}$

(-1.42) (1.74) (3.18)

$\bar{R}^2 = 0.95$

$F = 96.93$

$DW = 2.61$

(2) $\ln TD = -5.60 + 0.84 \ln Y^{***} + 0.66 \ln TD(-1)^{*}$

(-1.13) (1.40) (4.53)

$\bar{R}^2 = 0.96$

$F = 134.12$

$DW = 2.70$

(3) $\ln M_2 = -2.92 + 0.53 \ln Y^{***} + 0.73 \ln M_2 (-1)^{*}$
(-1.08) (1.43) (5.56)

$\bar{R}^2 = 0.98$
$F = 230.96$
$DW = 3.18$

As can be seen, income remains insignificant at 5 per cent level but is significant at 10 per cent level in all cases. The lagged dependent variable is significant at 1 per cent level in all cases. The co-efficient of adjustment in M_1 is 0.39 (γ =1-0.61) which is significantly different from unity. This suggests that only about 39 per cent of the discrepancy between the desired and actual money balances is eliminated in a year. The short-run income elasticity of demand for M_1 balances is 0.63. The long-run demand function is obtained by dividing the short-run demand function by Y and dropping $\ln M_1(-1)$. The resulting equation is:

$\ln M_1 = -8.33 + 1.62 \ln Y$

The long-run income elasticity of demand for M_1 is 1.62 which is much higher than the corresponding short-run elasticity.

In the case of TD, the co-efficient of adjustment is 0.34 which implies that about 34 per cent of the discrepancy between the desired and the actual TD balances is realised in one year. The long-run income elasticity of demand for TD is 2.47, which is much higher than the short-run elasticity.

We have also obtained the estimates of the demand functions for currency and demand deposits in the framework of partial adjustment model. The results are as follows:

(1) $\ln CC = -5.38^{**} + 0.87 \ln Y^{**} + 0.56 \ln CC (-1)^{**}$
(-2.04) (2.13) (2.64)

$\bar{R}^2 = 0.96$
$F = 123.86$
$DW = 2.44$

(2) $\ln DD = -1.58 + 0.47 \ln Y^{***} + 0.55 \ln DD(-1)^{*}$
(-0.69) (1.47) (3.25)

$\bar{R}^2$ = 0.88
F = 40.22
DW = 2.59

Looking at these equations, we can note that as in the case of aggregate equation M_1, actual balances of both currency and demand deposits do not match their desired levels in the same time period. The speed of adjustment is,however, almost the same in both the cases i.e., 44 per cent in the case of currency and 45 per cent in the case of demand deposits. The short-run income elasticity of demand for currency is higher than that for demand deposits, 0.87 as compared to 0.47. This is indicative of the fact that Nepalese people tend to prefer cash over demand deposits in the short-run. The same appears to hold true even in the long run. The long-run elasticity of demand for currency is 1.98 as compared to 1.04 for demand deposits.

3.2.7. Some Conclusions

From the above results and discussion, we can draw the following conclusions:

(a) Aggregate real income is the most statistically significant determinant of the demand for narrow money (cash balances), time deposits (quasi-money), and broad money, all defined in real terms.

(b) The income elasticity of demand for M_1 is substantially greater than unity, lying within the range of 1.41 to 1.94. Hence, money appears to be a luxurious commodity. The elasticity of demand is, however, higher with respect to non-agricultural income than with respect to agricultural income.

(c) The marginal propensity to hold M_1 is of the order of 0.19. Income originating in the non-agricultural sector has a higher marginal propensity to hold money than income originating in the agricultural sector -- 0.29 as compared to 0.07. The marginal propensity to hold currency is about three times larger than that of demand deposits-- 0.14 as against 0.05.

(d) The interest elasticity of demand for M_1, though with correct sign, is statistically insignificant. However, when real rate of interest is used, it emerges with a significant negative co-efficient. This tends to suggest that it is the real rate rather than the nominal rate that is relevant in explaining the demand for money in Nepal.

(e) The actual balances for M_1 do not fully adjust to their desired levels within one year. The co-efficient of adjustment is 0.39, indicating that about 39 per cent of the discrepancy between the desired and the actual balances is eliminated in a year. The long-run income elasticity of demand for M_1 is substantially larger (1.62) than the short-run elasticity (0.63). The components of M_1 also do not indicate instantaneous adjustment between the actual and the desired balances.

(f) The income elasticity of demand for time deposits is 3.77. The interest rate variable (12-month deposit rate) is statistically insignificant, though with correct sign.The inclusion of interest rate, however, slightly lowers the elasticity parameter. Unlike in the case of M_1, the real rate of interest has no influence on time deposits. The propensity to hold time deposits is of the order of 0.35. This propensity is of about the same size with respect to agricultural and non-agricultural income, 0.32 and 0.37 respectively.

(g) The broader definition of money (M_2) also has greater than unitary ncome elasticity, its magnitude being 2.72.

3.3 An Alternate Approach to the Demand for Money in Nepal

In an important book McKinnon [1973] suggested the hypothesis that the demand for money in the developing countries is complementary to the demand for physical capital. According to him, the monetary and the financial processes in the developing countries can not be appropriately explained by the prevailing theories - whether they be Keynesian or monetarists, because of the assumptions underlying these theories. The assumption of competitive capital market with a single interest rate or term structure of interest rate with real money balances being treated as a substitute for physical capital and vice versa does not hold good in the context of developing countries. On the other hand, capital markets in the developing countries are fragmented, private firms are mostly small sized, implying lumpiness in investment, and there is lack of finance external to the

firm. When firms are predominantly self-financed, the desire to add physical capital by a firm would be possible either by storing inventories of its output for eventual sale or by steadily accumulating cash balances. Money is viewed, to use McKinnon's word, as a conduit through which accumulation takes place rather than as a competing asset - the demand for money rises pari passu with the productivity of physical capital. If the desired rate of capital accumulati (and hence private saving) increases at any given level of income, the average ratio of real cash balances to income will also increase. The basic complementarity between money and physical capital is reflected in the following demand for money function:

$$(M/P)^d = L(Y, I/Y, d-P^*)$$

where I is investment and d-P* is the real return on holding money. The test for complementarity is provided by the sign of the partial derivative with respect to the ratio of investment to income.

In testing McKinnon's theory, we use the following equations:

$$\ln M_1 = a_0 + a_1 \ln Y + a_2 \ln(I/Y) + a_3 \ln P^*$$

$$\ln M_2 = a_0 + a_1 \ln Y + a_2 \ln(I/Y) + a_3 \ln p^*$$

For reasons explained in section 3.2.5, we have substituted the expected rate of inflation, p*, for the expected real rate of interest, d-p*. It is assumed that inflationary expectations are formed on the basis of present as well as past rates of inflation and p* is estimated by using the Almon polynomial lag technique.

The regression results pertaining to the above equations are as follows:

$$\ln M_1 = \underset{(-1.79)}{-2.68^{***}} + \underset{(8.68)}{1.13 \ln Y^*} + \underset{(2.58)}{0.47 \ln I/Y^{**}} - \underset{(-0.44)}{0.02 \ln p^*}$$

$\bar{R}^2 = 0.97$
$F = 39.98$
$DW = 2.45$

$$\ln M_2 = \underset{(-5.78)}{-6.02^*} + \underset{(16.93)}{1.53 \ln Y^*} + \underset{(4.62)}{0.58 \ln I/Y^*} + \underset{(2.78)}{0.10 \ln p^*}$$

$\bar{R}^2 = 0.99$
$F = 163.78$
$DW = 3.28$

As can be seen, the co-efficient of I/Y is positive and significant in both definitions of money. The income elasticity parameter also carries the expected sign and is statistically significant in both the equations. The inflation variable, though with proper sign, is not statistically significant in the equation for M_1 while in the equation for M_2, the sign is perverse and significant. But this does not invalidate the complementarity hypothesis since the variable I/Y is statistically significant and the overall explanatory power of the complementarity model is quite high. According to the result, for every 1 per cent increase in investment - GDP ratio, the demand goes up by 0.47 per cent for M_1 and by 58 per cent for M_2.

4. SUMMARY AND CONCLUSIONS

In this study we have made a detailed quantitative analysis of the demand for money in Nepal. The equations developed in the study appear to provide a reasonably good explanation of the demand for different monetary aggregates in Nepal. For all types of money, GDP emerges as the principal determinant of demand. The income (aggregate) elasticities of demand are found to be greater than unity in all cases, which means that money is a luxury commodity. Though gold is as liquid as money, its price does not seem to influence the demand for real M_1 balances. Even the rate of interest on saving deposits, which constitute the closest substitute to money, has no influence on the quantity of money demanded. But when we take the real rate of interest, the demand for money turns out to be significantly affected by such rates. This tends to suggest that the nominal rate of interest is not the appropriate rate in explaining the demand for real money balances in Nepal. The results also show strong support for McKinnon's complementarity hypothesis.

The experiment with stock adjustment model has produced satisfactory results for all types of money. It appears that about 39 per cent of the discrepancy between the desired and the actual balances is eliminated in a year. The speed of adjustment is slightly lower in the case of time deposits.

Throughout the analysis presented in the study, we have referred to the problems created by the non-availability of data on certain important variables Some of the existing inadequacies could be alleviated by collecting new data in particular directions. It is suggested that efforts should be initiated to collect data on wealth, general prices, income distribution, and the level of monetization and its rate of growth. Some refinement in the existing data is also in order. For example, the data on M_1 should account for the demand depos component of saving deposits. Future studies could be helpful if they incorpor new variables and adopt simultaneous equation system.

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