The Demand for Money in an Underdeveloped Economy*

by Jae-Yoon Park**

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I. Introduction

The demand for money is an old subject in monetary economics—a great amount of theoretical and empirical works on the subject has substantially improved our understanding of the nature and determinants of money demand, though our profession has not produced unanimous conclusions on several aspects of the problem. It is doubtful, however, that our knowledge on the demand for money accumulated from investigation of the subject in the context of developed economies could straightforwardly be applied to our understanding of the demand for money in underdeveloped economies, though many empirical works on the latter economies have assumed so.

This paper postulates an alternative explanation of the nature of money demand in the context of underdeveloped economies (Section II. 1); based

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**The author is full-time instructor in economics, Seoul National University.

on this explanation, formulates (Section II. 2) and estimates (Section III) money demand functions, specifically for the Korean case; and analyzes the estimation results to confirm our alternative explanation and to draw some unknown aspects of money demand behavior in Korea (Section IV).

II. A Money Demand Hypothesis

1. Nature of Money Demand in Underdeveloped Economies

Most of the recent studies on the subject of the demand for money in the context of developed economies treat money holdings as a form of portfolio choice (the portofolio balance approach)[1] or as one way of holding wealth (the capital-theoretic approach).[2] Thus, the growth of the real money stock has a substitution effect on the accumulation of physical capital in the sense that large real money balances will inhibit the accumulation of physical capital in the private sector.

This asset preference approach to money demand[3] is, however, *a priori* inadequate in explaining money demand in most underdeveloped economies. First, the high rate of inflation in most underdeveloped economies eliminates money holdings as a safe way of holding wealth.[4] This does not mean that the real money balances held by an individual are not his private wealth, but that the individual would not choose to hold his wealth in the form of money balances, which are certainly subject to a substantial decrease in their real value over time.

Second, money is not a riskless asset in underdeveloped economies

(1) For a representative example of this approach, see J. Tobin, "Liquidity Preference as Behavior Towards Risk," *The Review of Economic Studies* 25 (February 1958): 65-86.

(2) For a representative example of this approach, see M. Friedman, "The Demand for Money. Some Theoretical and Empirical Results" *Journal of Political Economy* 67 (August 1959): 327-51.

(3) The asset preference approach includes both the portopolio balance approach and capital-theoretic approach, according to R.S. Thorn, Introduction to Part II in *Monetary Theory and Policy*, ed. R S. Thorn (New York: Random House, 1966), p. 61.

(4) "It may be true in developed countries that 'there is nothing more certain than death and taxes,' but in developing nations perhaps 'inflation' should replace 'taxes' in the proverb. The record of increase in consumer prices in some of the most inflationary of the developing countries between 1963 and 1970 is as follows: Uruguay 1,940%, Brazil 638%, Argentina 284%, Chile 454%, and Korea 143%. By contrast, the degree of inflation in most major developed countries was about 30% in the same period." (R.E. Baldwin, *Economic Development and Growth*, 2nd ed. [New York John Wiley & Sons, Inc., 1972], p. 112.)

because the variability of inflation rates makes the real rate of return on money subject to considerable variance.(5) Presumably, the variance in the real return on money might be greater than that in the real return to some other assets bearing escalated nominal yields, since the latter yields are adjusted—although imperfectly—to the price-level changes. The risks associated with those assets bearing unescalated nominal yields, money in particular, are likely to divert the portfolio demand for riskless assets to other assets bearing escalated yields.

Despite the high inflation rates and their great variability, money is still demanded in underdeveloped economies because of the economy of transaction costs associated with its use. Needless to say, an individual's transactions balances need not necessarily be money. These balances may be held in money or any other asset, depending on the difference between the direct and indirect costs of holding money, on the one hand, and the costs of holding the other assets and converting them to money or using them directly as means of payments, on the other hand. However, "the greater the individual sets his average cash holdings, the lower will be both the yield of his transactions balances and the cost of his transactions."(6)

The importance of the transactions demand for money in underdeveloped economies does not mean, however, that money is demanded only for current-period transactions but, depending again on the transaction costs involved, money may also be held as a means of accumulation to be used for transactions in future periods. This aspect of money demand—which we may label its "accumulation" aspect—is important in underdeveloped

(5) For 53 countries (including thirteen industrial, ten other developed and thirty developed countries), Adekunle reported as follows: "When the countries are ranked for the period 1949-65 starting with the country with the highest coefficient of variation [=the standard deviation of the annual price increases divided by the average], the less developed countries tend to have relatively higher rankings. Of the countries having the 30 highest coefficients during the period 1949-65, less developed countries form 73 per cent. The same conclusion is reached about the relative degree of the variability of price movements in the less developed countries compared with industrial and other developed countries, if one compares the group average coefficients of variation ···it will be seen that the average coefficients for the less developed group are almost invariably higher than those of the developed countries." (J.O. Adekunle, "Rates of Inflation in Industrial, Other Developed, and Less Developed Countries," *IMF Staff Papers* 15 [November 1968]: 540.)

(6) J. Tobin, "The Interest Elasticity of Transactions Demand for Cash", *The Review of Economics and Statistics* 38 (August 1956). 241-42.

countries because of the following characteristics of the representative money holder and his economic environment.

First of all, the representative money holder in underdeveloped economies is a household-firm. Though, over two thirds of all financial assets in the United States are held by households and corporations,[7] no statistical data are available concerning the distribution of the money stock among different types of economic units in underdeveloped economies. However, the dominance of household-firms in general economic activities in underdeveloped economies[8] would justify our treatment of the representative money holder in underdeveloped economies as a household-firm.

It is generally assumed that the approach to the demand for money by households and firms can be applied equally well to the demand for money by household-firms.[9] The following considerations of characteristics of the household-firm, however, indicate that this assumption may be an oversimplification.

A household-firm is an economic unit, but little useful distinction can conceptually be made between its behavior as a household and as a firm. It provides labor, makes technical decisions, consumes, and, above all, saves and invests. The household-firms in underdeveloped economies use their savings mainly for their own investment, though they lend part of their savings to other investors or intermediaries. They also finance their investment mainly from their own savings, though some of their investment depend on the borrowings from other savers or intermediaries. That is, self-finance is the dominant way of finance in underdeveloped

(7) J.S. Duesenberry, "The Portfolio Approach to the Demand for Money and Other Assets," *The Review of Economics and Statistics* 45 (February 1963): S 9.

(8) In underdeveloped economies, the household-firm sector generally receives a larger proportion of national income and contains a larger proportion of the population than the household or firm sector. In the case of Korea, the average proportion of national income received by household-firms for the period 1957-72 was 48.6%, of which 67.5% went to farmers, while the proportion of households' income was 35.2%. Farmers constituted 53.7% of the population for 1957-72. If we take into account the household-firms in other industries (mainly the wholesale and retail traders and small manufacturers), household-firms would constitute an even higher proportion of the population.

(9) Duesenberry, "Portfolio Approach," S. 9.

economies.[10]

Before identifying the implications of the dominance of self-finance to the demand for money, we need to consider the poor development of financial markets as one of the important backgrounds for the dominance of self-finance in underdeveloped economies.

Goldsmith has shown statistically that newly issued primary securities are much smaller proportions of GNP and of aggregate saving in underdeveloped economies than in developed economies.[11] In most underdeveloped countries, there are few lending agencies of importance other than commercial banks. There are no discount houses, and savings institutions (including life insurance companies) are in the early stages of development. Even the extent of intermediation through the banking system is relatively limited, and lowcost bank finance usually goes to a small number of privileged units. Some types of existing credit cooperatives in several industries perform their functions poorly. These organized financial markets are almost beyond the reach of household-firms.

The more important sources of external finance for household-firms in underdeveloped economies are the so-called "unorganized" money markets. The lenders in these markets consist of professional money lenders, large traders, landlords, shopkeepers, relatives and friends. These markets are imperfect, fragmented and heterogeneous; there is very little contact between the lenders and borrowers in different localities, and thus lenders and borrowers are not aware of loan rates in other parts of the country.

(10) Though the available data do not distinguish between household and household-firm sectors, the table below shows how, in Korea, the two sectors together finance their investments and financial transactions. For 1963-72, the proportion of self-finance in total finance was more than twice that of external finance. Though this proportion might be somewhat lower when applied to the household-firm sector only, we may safely say that self-finance is the primary method of finance for household-firms.

Sources of Funds for Households and Household-firm (Percentage)

	1963	1965	1967	1969	1971	1963-72
Self-finance	74.4	80.7	67.1	56.7	56.8	67.0
External finance	25.6	19 3	32.9	43 3	43.2	33.0
(bank loans)	(15.7)	(14 9)	(31.3)	(37 7)	(31.8)	(24.2)

Source Computed from the flow-of-funds accounts in Bank of Korea, *Economic Statistics Yearbook*, 1964-73 eds

(11) R.W. Goldsmith, *Financial Structure and Development* (New Haven. Yale University Press, 1969), p 374.

This fragmentation of unorganized money markets severely restricts financing opportunities for the household-firms in underdeveloped economies.

Moreover, interest rates in the unorganized money markets of underdeveloped economies are generally very high in relation to rates in the organized money markets and to the standards of general productivity in underdeveloped economies.[12] This high cost of borrowing is another factor restricting the availability to the household-firms of finance from the unorganized markets. Loans in the unorganized markets are usually small and short-term, factors further aggrvating the financial environment for household-firms. In short, financing from outside the individual household-firm is either unavailable or extremely limited.

However, the investment required to adopt markedly improved technologies is enormous in the eyes of householdfirms, which are generally of small size. It is virtually impossible for a household-firm to finance from its current saving the whole investment needed to adopt the new technology.

These limited opportunities to obtain external finance, associated with the indivisibilities of investment, creates a special relationship between money balances and physical capital. That is, 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. According to Mckinnon, this positive relationship between average cash holdings and the propensity to invest (save) may be called the "complementarity" between money and physical capital.[13] This implies that a rise in the average rate of return to physical capital would increase the demand for money and, thus, that money is a kind of conduit through which capital accumulation takes place. This is in contrast to the implications of the standard asset preference approach, which treats money and physical capital as "substitutable" forms of wealth holding.

The preceding argument means neither that money holding is the only means through which capital accumulation takes place nor that capital

(12) U.T. Wai, "Interest Rates Outside the Organized Money Markets of Underdeveloped Countries," *IMF Staff Papers* 6(November 1957)·80.

(13) For further discussion of this relationship, see R.I. McKinnon, *Money and Capital in Economic Development* (Washington, D.C.: The Brookings Institution, 1973), pp. 55–67.

accumulation is the only purpose of money holding by household-firms. However, the underdevelopment of financial markets offers them poor opportunities to make other financial investments, and the yields on other financial assets traded in the organized markets cannot be attractive in relation to the high inflationary pressures that tend to afflict underdeveloped economies. The high rates of interest in unorganized markets are not easily available to small-size saving household-firms, because money lending in the unorganized markets is associated with such a high risk of default that a nonprofessional saver cannot afford it. These poor opportunities for financial investment by household-firms imply that the substitution effects for the demand for money stemming from financial assets would be relatively small in underdeveloped economies.

However, the substitution effects from real commodities should be important, especially because household-firms are familiar with commodity markets; several kinds of commodities are easily available even to small household-firms, and the high rate of inflation compensates for the high storage costs associated with real commodities. Thus, it is implied that there would be an important negative relationship between the yields on the real commodities and the demand for money.(14)

This substitution relationship between money and real commodities is relevant not only to household-firms' investment behavior but also to their general transactions. Depending on the difference between the direct and indirect costs of holding money,(15) on the one hand, and the costs of holding real commodities and converting them to money or using them as means of payments, on the other, the household-firm may hold either money or real commodities for any transaction purpose, including the purchases of investment and consumption goods.

In summary, the basis of demand for money in underdeveloped

(14) This substitution relationship between money and real commodities might seem to contradict the complementarity relationship between money and physical capital. This is merely a reflection of the dual role of a household-firm, the role as a saver as well as an investor. Note that the real commodities which are substitutable for money need not be technically indivisible, thus requiring no complementarity with money holdings, even under the restriction of self-finance.

(15) The holding cost of money in this statement includes the negative of interest rates, if any, paid on money balances, the storage cost of money and the depreciation of purchasing power of money (which is the same as the yields on real commodities in our case).

economies is the service it performs in clearing the payments matrix and in economizing the cost of future as well as current transactions. Money, therefore, is not merely a means of payment but also a conduit through which accumulation takes place,thus holding a complementarity relationship with physical capital. Depending on the holding costs of money, however, this accumulation may take place in the form of real commodity hoardings, thus establishing a substitution relationship between money and real commodities.

2. Money Demand Functions

The discussion in the preceding section suggests that the inventory approach to the demand for money is relevant for our purposes. The inventory approach to money demand draws particular attention to the problem of minimizing the transaction costs involved for any given transactions volume.(16) The application of this approach to our case, however, is not straightforward since it is restricted to the transactions in the current period and since it ignores what we have labelled the "accumulation" aspect of money demand. We attempt to extend the basic results of the inventory approach to money demand by allowing for the above-mentioned constraints.

First, the transactions relevant to our household-firm's money demand in the current period include both consumption expenditures and purchases of inputs in both current and some relevant future periods. The changes in transaction demand for money related to purchases of investment goods can be reflected in the changes in the rate of return to investments, which will be discussed separately in this subsection. No statistical data are available for transaction volume including the household-firm's consumption expenditures and purchases of noninvestmetnt inputs and, moreover, the transacitions planned for future periods after some accumulation are not directly observable; therefore, we have to depend on the major determinant of the volume of these transactions. We assume that the major determinant of the volume of transactions in current and future periods is expected income. As for current consumption expenditures,

(16) The representative examples of the inventory approach are W.J. Baumol,"The Transactions Demand for Cash. An Inventory Theoretic Approach," *The Quarterly Journal of Economics* 66 (November 1952): 545-56, and Tobin, "Interest elasicity."

our assumption is supported by Friedman's permanent-income hypothesis of consumption. The household-firm's current expenditures for non-investment inputs is also likely to depend on expected income. Moreover, the household-firm is most likely to ignore the transitory component of its income in planning its consumption expenditures in future periods (mainly, purchases of consumer durables). Thus, the first determinant of the household-firm's demand for money is assumed to be its expected income $[(Y/P)^e]$.

It should be noted, however, that our hypothesis that money demand depends on expected income is different from Friedman's permanent-income hypothesis of money demand in its basic intent. Our hypothesis is based on the assumption that current and future transactions depend on expected income, while Friedman's hypothesis explains money demand as a form of wealth holding.

Second, regarding the transaction costs related to money holdings, the important element is the difference between the direct and indirect costs of holding money, on the one hand, and the costs of holding other assets and converting them to money or using them directly as means of payments, on the other hand. In the following formulation, however, the latter costs may be assumed to be constant over time. Moreover, the direct cost of holding money, i.e., the storage cost of money, may also be assumed constant over time. Thus the other set of arguments in the money demand functions would be the depreciation rate of the purchasing power of money and the negative of the interest rates paid on money balances.

The depreciation of the purchasing power of money may be measured in terms of the exchange ratio of money against either real commodities or financial assets. It was argued in the previous section that the substitution effects for money demand stemming from other financial assets would be minimal and that, instead, the substitution effects stemming from real commodities would be important. Thus, the depreciation of the purchasing power of money would be better represented by the substitution effect between money and real commodities.

It is questionable whether this latter substitution effect would be better represented by the rate of change in the general price index or by the

prices of a particular group of commodities which are more easily substitutable for money. This essentially empirical question will be investigated in the process of empirical estimation below. It should be noted that the more relevant depreciation rate of the purchasing power of money is the expected rate (p^e) rather than the measured one. Since the relevant cost of holding money is not only the current inflation rate but also the inflation rate in the relevant future periods, the household-firm is more likely to ignore the transitory component of the measured inflation rate in determining its money demand.

The interest rates on bank deposits are essentially policy variables in Korea as in many other underdeveloped countries. The maximum interest rates payable on demand, time and savings deposits are determined by the central bank (the Bank of Korea) while their effective rates are determined by the Korean Bankers Association. The latter rates, however, have changed only when the maximum rates are changed by the central bank, and have been within the range of 5% below the maximum rates.

During the period under study, the rate of interest on the pass-book account deposit, which accounts for the greatest proportion of demand deposits, has been fixed at the level of 1.8% per annum while the rates on less important types of demand deposits have undergone minor changes. Similarly, the interest rates on time and savings deposits were raised only twice and decreased only seven times during the period under study. However, the rise in September, 1965 was drastic, and since then the interest rates have been gradually lowered only six times. These observa tions suggest that we may more appropriately delete the rates of interest on deposits from our money demand functions and instead add dummy variables to reflect the impact of the increase (DMT1) and decrease (DM T2) in the interest rates on time and savings deposits.

We will now consider the allocation of total money baances among the three alternative forms of money, which were included in the broad definition of money—currency held by the nonbank public(N), demand deposits(D) and time and savings deposits(T) at the commercial banks. For this examination, the following three assumptions are useful.

First, suppose that, for the given transaction costs involved in making payments with each alternative form of money, a household-firm determines

the allocation of its total money balances among alternative forms of money, together with the total amount of its money holdings and payment schedules. The allocation would be such that marginal net yields (in the from of saving the transaction cost) from different forms of money holdings are equal.

Assume also that this optimal allocation is such that the currency holdings are associated with a shorter payment period (the time interval between subsequent payments) than the demand deposit holdings, and that the time and savings deposits are held for payments of longer interval after some more accumulation, than the demand deposits. This assumption is likely to hold, at least in Korea, since the use of either demand deposits or time and savings deposits for payment requires a trip to the bank, which incurs both pecuniary cost and some annoyance;[17] since the demand deposits are paid interest, though modest; and since the interest rates on time and savings deposits are much higher than those on demand deposits if the former fulfills the contracted maturity.

Finally, assume that the portion of total transactions to be financed by accumulation over longer periods increases as income and, accordingly, total transaction volume increases. That is, it is plausible that as income rises there would be a rise in the proportion in total money balances of the money balances to be accumulated to finance purchases of, for example, consumer durables or investment goods which cannot be financed by current savings in spite of the income rise.[18]

The above three assumptions lead us to infer that the expected-income elasticity of demand for time and savings deposits should be greater than that for demand deposits and that the latter should be greater than the elasticity of currency demand. This implies that, as income rises, the proportion of bank deposits in total money would increase, *ceteris paribus*. In reality, this tendency is restrained primarily by the development of

(17) Note that demand deposits in Korea do not carry checking-account services except for the checking-account deposits, which were only 13.3% of total demand deposits for 1962-73.

(18) The evidence to support this assumption is very difficult to obtain because the data on consumption expenditures, at least in Korea, do not distinguish between the expenditures on durable and nondurable consumption goods Concerning investment goods, the assumption seems to be largely supported by the fact that the ratio of annual capital formation to GNP has risen during 1953-72 (except for five years) as GNP rises.

other financial instruments in the long run, and also by the positive inflation rate in the short run—since bank deposits are more sensitive to inflation rates than currency, as will be discussed below.

Regarding the inflation-rate elasticities of demand for alternative forms of money, we may also make inferences similar to those regarding income elasticities. Barro has demonstrated that the optimal payment period is negatively related to the rate of inflation.[19] That is, a higher rate of price change reduces the optimal payment interval (i.e., increases velocity) and produces a corresponding reduction in average money holdings. If we can associate different forms of money with different lengths of payment periods, as assumed above, the reduction of the average payment period as a consequence of a rise in the inflation rate means the reduction of the fraction of money holdings associated with longer payment periods in the total money holdings.[20] That is, the inflation-rate elasticity of demand for the money associated with longer payment periods would be higher (in absolute value) than that for the money associated with shorter payment periods.

In the preceding discussion of income elasticities, we have associated a longer payment period with time and sevings deposits, than with demand deposits, and a longer payment period with demand deposits, than with currency holdings. Therefore, we may infer that the inflation-rate elasticity of demand for time and sevings deposits is higher (in absolute value) than that for demand deposits, and that the elasticity of demand for demand deposits is higher (in absolute value) than that for currency demand.

Finally, in relation to the preceding inferences concerning the allocation of total transaction balances among the alternative forms of money, we may elaborate on the positive relationship between money demand and the rate of return to investments (z), which was introduced in the preceding

(19) R.J. Barro, "Inflation, the Payment Period, and the Demand for Money," *Journal of Political Economy* 78 (November/December 1970): 1230-239.

(20) This is because the money holder's costs of holding money over the whole relevant period by transferring a more proportion of his money balances associated with longer payment periods to other transaction balances (primarily real commodities) are less than the costs of holding money by transferring all types of money equiproportionally to the other transaction balances.

subsection. For given levels of expected income and holding costs of money, a household-firm with a current income too small to finance its desired increase in investments in response to a rise in the rate of return to the investments and that must rely mainly on self-finance is likely to reduce its consumption expenditures and increase its money holdings to be spent after the required accumulation for investment. This is the basic hypothesis.

During this prccess of money accumulation, however, some changes in the allocation of money holdings are likely to occur. If the desired increase in investment requires accumulation during the payment period associated with a particular form of money, the demand for that particular form of money would increase in reaction to a rise in z. In addition, a shift from other forms of money might take place if the desired increase in investment requires an accumulation large enough to justify the shift for the given real cost of making that shift. Then the demand for these latter forms of money would be negatively related with z. If neither is the case for a particular form of money, the demand for that money might not react to the change in z. Thus, the positive relationship between total money balances and z does not necessarily imply the same positive relationship for each alternative from of money. Which of the three possible relationships does hold between z and each form of money depends, among other factors, upon the payment period associated with each form of money and the accumulation period required for the increase in investment to which the rate of return rises. Thus, the relationship cannot be inferred *a priori*, but should be left to be empirically investigated. The significant *a priori* inference is that total money balances are positively related with z.

By formalizing all of the above considerations, we have the household-firm's demand functions for alternative forms of money as follows:[21]

$$(1)\quad (N/P)^d_t = N^d[(Y/P)^e_t,\ p^e_t,\ DMT1_t{}^*,\ DMT2_t{}^*,\ z_t{}^*];$$
$$\partial(N/P)^d_t/\partial(Y/P)^e_t > 0,\quad \partial(N/P)^d_t/\partial p_t{}^e < 0,$$
$$\partial(N/P)^d_t/\partial DMT1_t < 0,\quad \partial(N/P)^d_t/\partial DMT2_t > 0,$$
$$\partial(N/P)^d_t/\partial z_t \cdot 0,$$
$$(2)\quad (D/P)^d_t = D^d[(Y/P)^e_t,\ p^e_t,\ DMT1_t{}^*,\ DMT2_t{}^*,\ z_t{}^*];$$

(21) See Appendix for an explanation of the notations. The superscript * indicates that the corresponding variable is exogenous to the structural model which is fully specified in the above-mentioned doctoral dissertation by the author.

$$\partial(D/P)^d_t/\partial(Y/P)^e_t>0,\ \partial(D/P)^d_t>0,$$
$$\partial(D/P)^d_t/\partial p^e_t<0,\ \partial(D/P)^d_t/\partial DMT1_t<0,$$
$$\partial(D/P)^d_t/\partial DMT2_t>0,$$
$$\partial(D/P)^d_t/\partial z_t\gtrless 0;$$

(3) $(T/P)^d_t=T^d[(Y/P)^e_t,\ p^e_t,\ DMT1_t^*,\ DMT2_t^*,\ z_t^*]$;

$$\partial(T/P)^d_t/\partial(Y/P)^e_t>0,\ \partial(T/P)^d_t/\partial p^e_t<0,$$
$$\partial(T/P)^d_t/\partial DMT1_t>0,\ \partial(T/P)^d_t/\partial DMT2_t<0,$$
$$\partial(T/P)^d_t/\partial z_t\gtrless 0,$$

where $\dfrac{\partial(N/P)^d_t/\partial(Y/P)^e_t}{(N/P)^d_t/(Y/P)^e_t}<\dfrac{\partial(D/P)^d_t/\partial(Y/P)^e_t}{(D/P)^d_t/(Y/P)^e_t}<\dfrac{\partial(T/P)^d_t/\partial(Y/P)^e_t}{(T/P)^d_t/(Y/P)^e_t}$;

$-\dfrac{\partial(N/P)^d_t/\partial p^e_t}{(N/P)^e_t/p^e_t}<-\dfrac{\partial(D/P)^d_t/\partial p^e_t}{(D/P)^d_t/p^e_t}<-\dfrac{\partial(T/P)^d_t/\partial p^e_t}{(T/P)^d_t/p^e_t}$; and

$$\frac{\partial(N/P)^d_t}{\partial z_t}+\frac{\partial(D/P)^d_t}{\partial z_t}+\frac{\partial(T/P)^d_t}{\partial z_t}>0.$$

In the above formulation, we have not introduced the frequently encountered assumption of partial adjustment of money holdings, which is based on the distinction between the desired and actual levels of money holdings. The usual justification for this distinction is that a money demander will change his actual money balances to the desired level by comparing the cost associated with being out of equilibrium and the cost of changing his money balances. It is doubtful, however, that a money demander will determine his desired level of money holding without considering the cost of achieving that level of money balances. His actual level of money holdings is likely to be his desired level of money holdings for the given cost of adjusting his money balances. If we assume the constancy of this adjustment cost over a relatively short period, we may suppose that the observed changes in money balances are the same as the changes in the desired money balances. On the basis of this argument, we have rejected in the above formulation the assumption of partial adjustment of money holdings.

In the following formulations, z is treated as an exogenous variable. This treatment is based on the presumption that z would not be influenced by the demand for and supply of money but would influence the money demand. Moreover, we suppose the money holder to assume that z remains unchanged.

Now we suppose that the expected income and rate of price change are generated by the following conventional adaptive expectation hypotheses:

(4a) $(Y/P)^e_t-(Y/P)^e_{t-1}=\lambda\{(Y/P)_t-(Y/P)^e_{t-1}\}$; $0\leqslant\lambda\leqslant 1$,

and

(5a) $p^e_t-p^e_{t-1}=\theta(p_t-p^e_{t-1})$; $0\leqslant\theta\leqslant 1$,

where λ and θ are the adaptation coefficients for income and price expectations, respectively.

Thus, the expected values of income and price change rates are formulated in terms of weighted averages of current and past values of measured income and price change rates as follows:

(4) $(Y/P)^e_t=\lambda\sum_{i=0}^{\infty}(1-\lambda)^i(Y/P)_{t-i}$;

(5) $p^e_t=\theta\sum_{i=0}^{\infty}(1-\theta)^i p_{t-i}$.

In aggregating the above individual money demand functions over the whole economy, we have to assume away two possile distribution effects. First, we have to assume that the aggregate function remains unaffected by any change in the distribution of real income among individuals. This might be a far-reaching assumption, but it is a conventional one in any macro model. In addition, we represent the aggregate money demand function for the economy as a whole by the aggregate demand function for the household-firm sector, assuming that the proportion of money demand by the latter sector in the whole economy remains unchanged. This is again a heavy assumption, but must be made because we do not have any data on sectoral money demand. Assuming away all these distribution effects, the above functions may be interpreted as the aggregate demand functions for the alternative forms of money.

III. Estimation

1. Estimation Procedures

The hypothesized money demand functions will be estimated using the quarterly data for 1957-72. The statistical data for each variable used in our estimation are described in detail in Appendix. In relation to the availability of statistical data, a special mention should be made of the rate of return to investments (z). For the annual data, one could use the ratio of capital income to net investment (taken from GNP statistics) as

a proxy for z.[4] This proxy, however, is not available in quarterly eriess for our study.

We decided, therefore, to take ratio of consumer goods' price to the producer goods' price as a proxy for z. According to the conventional theory of the firm, the demand for real capital stock will vary positively with the product price and inversely with the price of capital. That is, the desired investment depends positively on $P/\{P_k(d+r)\}$ where P is the product price, P_k the price of capital goods, d the depreciation and r interest rates. Assuming the constancy of d and r(mainly due to the data availity), we decided to take the ratio of consumer goods' wholesale price index to producer goods' wholesale price index as a proxy for the rate of return to investment.

It should be noted that the statistical data for any of the variables included in our estimation are not seasonally adjusted. So in estimating each eguation three seasonal dummy variable (DM1, DM2 and DM3 for the first, second and third guarters, respectively) will be added. Moreover, although some of the variables involved in our study s how atime trend of some extent, the conventional ways of eliminating the trend—for example, to take trend regression residuals, first differences or some forms of ratio appear infeasible. Thus no efforts to eliminate time trend were made, but there is little possibility that the obtained regressions reflect merely the time trends inherent in both dependent and independent variables.

One of the major econometcic tasks involued in our estimation is the estimation of geometrically distributed lag structures of income and inflation rate expectations, and the other is the estimation of structural equations in a simultaneous-equation system.

Two major techniques have been developed to obtain the maximum likelihood (ML) estimator of a geometrically distributed lag structure—the search technique and the iterative technique.[5] We depend on the former,

(4) If we assume one-year lag in the income-investment ratio, the ratio of capital income to net investment may be expressed as (GNP/I_{-1}) times NIC(GNP-D), where GNP is the increase in gross national product, I_{-1} the net investment in the previous year, NIC the national income that accrues to capital, D depreciation.

(5) P.J. Dhrymes, *Distributed Lags. Problems of Estimation and Formulation* (San Francisco: Holden-Day, Inc , 1971), pp. 98-103.

initiated by Klein.[6] Briefly, this technique runs the ordiary least squares (OLS) on the following truncation of the model

$$y_t=\beta(1-\lambda)\sum_{i=0}^{\infty}\lambda^i x_{t-i}+u_t \tag{1}$$

$$\text{Define } \eta_o=E(y_o)=\beta(1-\lambda)\sum_{i=0}^{\infty}\lambda^i x_{-i} \tag{2}$$

Now (1) can be written as:

$$y_t=\beta(1-\lambda)\sum_{i=0}^{t-1}\lambda^i x_{t-i}+\beta(1-\lambda)\sum_{i=t}^{\infty}\lambda^i x_{t-i}+u_t=\beta z_{1t}+\eta_0 z_{1t}+u_t \tag{3}$$

where $z_{1t}=(1-\lambda)\sum_{i=0}^{t-1}\lambda^i x_{t-i}$ and $z_{2t}=\lambda^t$.

For given λ, we can generate the synthetic variables z_{1t} and z_{2t}, estimate β and η_0 in (3) by OLS and compute the residual sum of squares. Under the assumption that $u_t\sim\text{IN}(0,\delta^2)$, the values of λ that gives the minimum residual sum of squares will be the ML estimates of β, and the corresponding estimates of β and η_0 are the ML estimates of these parameters.[7]

We assume that the income expection would be best represented by consumption behavior and thus depend on the following consumption function[8] to estimate the adaptation coefficient in the income expectation (λ in Eq. 4):

$$(C/P)_t=\beta_0+\sum_{i=1}^{3}\beta_i DM_i+\beta_4\lambda\sum_{i=0}^{\infty}(1-\lambda)^i(Y/P)_{t-i}+\beta_5 z_t+\epsilon_t.$$

$$(C/P)_t=85040.667+.633(.500)\sum_{i=0}^{\infty}(.500)^i(Y/P)_{t-i}$$
$$(12.726)\quad(54.149)\quad(2.931)$$
$$-11955.524\text{DM1}-51881.826\text{DM2}-51764.850\text{DM3}$$
$$(2.690)\qquad(9.402)\qquad(9.387)$$

(6) L.R. Klein, "The Estimation of Distributed Lags," *Econometrica* 28 (April 1960) 393-406.

(7) G.S. Maddala and A S. Rao, "Maximum Likelihood Estimation of Solow's and Jorgenson's Distributed Lag Models," *The Review of Economics and Statistics* 53 (February 1971) 80.

(8) The complete structural model fully specified in the author's dissertation, includes this consumption function as one of the 17 equations involved. In explaining consumption, the model relies heavily on the permanent income hypothesis developed by Friedman, and represents the permanent income by our expected level of income which has already been introduced in Section III of this paper. Consumption is hypothesized to depend negatively on the rate of return to investment(z), in view of the fact that our representative economic unit is a household-firm that is an investor as well as a consumer. It should be noted that our money demand hypothesis, which do not view money as a form of individuals, wealth holdings, excludes the real balance effect from our consumption hypothesis.

$R^2=.979$ $s.e.=16323.44$ $D.W.=1.82$
(T ratios in the parentheses)

Empirically, z_t has been deleted since it has a statistically insignificant coefficient with unexpected (positive) signs. Using $\hat{\lambda}=.500$ and the observed values of Y/P for 1954 to 1972 (to obtain$(Y/P)^e_t$ for 1957-72), we compute $(\hat{Y}/P)^e_t=\hat{\lambda}\sum_{i=0}^{12}(1-\lambda)^i(Y/P)_{t-i}$ which will be used below. (Since the weight for the thirteenth previous quarter is less than .0001, given $\hat{\lambda}=.500$, the maximum lag is set to the twelfth previous quarter.)

By the same token, we depend on the following demand function for total money to estimate θ, the adptation coefficent in inflation rate expectation, assuming that the price expectation would be best represented by money demand behavior:

$$ln\left(\frac{N+D+T}{P}\right)_t=\beta^0+\beta_1\theta\sum_{i=0}^{\infty}(1-\theta)^i p_{t-i}+\beta_2 ln(Y/P)^e_t$$
$$+\beta_3 z_t+\beta_4 DMT1_t+\beta_5 DMT2_t+\epsilon_t.$$

For p_t (inflation rate), we have alternatively tried the wholesale price index, consumer price index and weighted average of wholesale price indexes of rice, barley, gold, silver and cotton sheet. The wholesale price index worked best. The obtained results are as follows:

$$ln\left(\frac{N+D+T}{P}\right)_t=\underset{(4.361)}{-7.116}-\underset{(12.039)}{.189}(.050)\sum_{i=0}^{\infty}\underset{(38.460)}{(1-.050)^i p_{t-i}}$$
$$+\underset{(12.751)}{1.589}ln(Y/P)^e_t+\underset{(4.889)}{.011}z_t$$
$R^2=.969$ $s.e.=.17$ $D.W.=1.42$

When we assumed a linear form of the above money demand function, we obtained the same estimate of adaptation coefficient as shown below;

$$\left(\frac{N+D+T}{P}\right)_t=\underset{(1.700)}{-171340.602}-\underset{(6.2143)(5.116)}{43494.269}(.050)\sum_{i=0}^{\infty}(1-.050)^i p_{t-i}$$
$$+\underset{(16.071)}{1.659}(Y/P)^e_t+\underset{(2.341)}{2304.223}z_t$$
$R^2=.941$ s.e.=77598.81 D.W.=1.56

Empirically, the dummy variables $DMT1$ and $DMT2$ had statistically insignificant coefficients with wrong signs. We take $\hat{\theta}=.050$ to synthesize $ZP1_t=\hat{\theta}\sum_{i=0}^{t-1}(1-\hat{\theta})^i p_{t-i}$ and $ZP2_t=(1-\hat{\theta})^t$, which is used in the estimation of

individual money demand functions.

In the following subsection, the estimation results for each individual money demand functions are presented in terms of both the ordinary and two-stage least squars estimates.[9]

2. Estimation Results

In presenting the estimation results, the subscript t for each variable is deleted for simplicity unless necessary for clarity, and the T ratio for each coefficient is given in the parentheses below the coefficient. R^2 denotes the coefficient of determination adjusted for the degree of freedom; s.e. the standard error of the estimate; D.W. the Durbin-Waton test statistic; and G the Geary test statistic.[10]

Although in the actual estimation we have utilized $ZP1$ and $ZP2$ instead of p^e, as indicated earlier, the estimated coefficient for $ZP1$ is equivalent to the coefficient for p^e, and the coefficient for $ZP2$ is irrelevant for our purposes. Therefore, in presenting the estimated equations below, we incorporate p^e instead of $ZP1$ and delete $ZP2$. For each equation we present its finally adopted specification first, and then the relevant alternative specifications are presented for later discussions, together with a brief comment on the estimation procedures.

Eq. (1):

$$\begin{aligned}
\text{(OLS)}\quad ln(N/P) &= \underset{(-1.408)}{-1.322} \underset{(-2.068)}{-.102DM1^*} \underset{(-2.809)}{-.108DM2^*} + \underset{(.879)}{.034DM3^*} \\
&\quad + \underset{(15.277)}{1.040}ln(Y/P)^e \underset{(-12.209)}{-.095p^e} \\
&\quad R^2=.965 \qquad \text{s.e.}=.102 \qquad \text{D.W.}=1.737 \\
\text{(2SLS)}\quad ln(N/P) &= \underset{(-2.659)}{-3.041} \underset{(-2.644)}{-.098DM1^*} \underset{(-2.833)}{-.106DM2^*} + \underset{(1.161)}{.043DM3^*} \\
&\quad + \underset{(14.277)}{1.169}ln(Y/P)^e \underset{(-10.536)}{-.094p^e} \\
&\quad \text{s.e.}=.105 \qquad G=24
\end{aligned}$$

From the final specification of Eq. (1), z, $DMT1$ and $DMT2$ have been

(9) For the instrumental variables used for the two-stage least square estimation, see the author's dissertation mentioned above.

(10) For the Geary test, see H. Habibagahi and J.L. Pratshke, "A Comparison of the Power of the von Neumann Ratio, Durbin-Watson and Geary Tests," *The Review of Economics and Statistics* 54(May 1972)·179-85. This test is preferaeble to the conventional Darbin-Watson test since the latter depends on the distributi on table prepared under the assumption of nonstochastic independent variables.

deleted since they have statistically insignificant coefficients. The deletion causes only minor differences as shown below (Eq. 1a). It is also shown below that the expected values of income and inflation rate work better than their current values (Eq. 1b) and that the results are qualitatively the same when the equation is specified in a linear form (Eq. 1c).

Eq. (1a):

$$\begin{aligned}(2SLS)\ ln(N/P) = &-3.006 - .099DM1^* - .103DM2^* + .039DM3^* \\ &(-2.192)(-2.656)\ (-2.752)\ \ (1.009) \\ &+1.167ln(Y/P)^e - .093p^e - .0003z^* \\ &(11.201)\ \ \ \ (-8.001)(-.178) \\ &+.009DMT1^* + .033DMT2^* \\ &(.659)\ \ \ \ (.128) \\ &\text{s.e.} = .104 \ \ \ \ G = 28\end{aligned}$$

Eq. (1b):

$$\begin{aligned}(2SLS)\ ln(N/P) = &-8.433 + .062DM1^* + .075DM2^* + .172DM3^* \\ &(-8.967)(.849)\ \ \ \ (1.010)\ \ \ \ (2.811) \\ &+1.345ln(Y/P) - .004p \\ &(24.096)\ \ \ \ (-1.403) \\ &\text{s.e.} = .167 \ \ \ \ G = 18\end{aligned}$$

Eq. (1c):

$$\begin{aligned}(2SLS)\ N/P = &71215.526 - 10896.661DM1^* - 11314.184DM2^* \\ &(8.630)\ \ \ \ (-4.795)\ \ \ \ \ \ (-4.926) \\ &-5766.987DM3^* + .138(Y/P)^e - 1737.312p^e \\ &(-2.535)\ \ \ \ (22.930)\ \ \ \ \ \ (-2.938) \\ &\text{s.e.} = 6128.282 \ \ \ \ G = 26\end{aligned}$$

Eq. (2):

$$\begin{aligned}(OLS)\ ln(D/P) = &1.585 + .094DM1^* + .067DM2^* + .179DM3^* \\ &(1.059)(1.579)\ \ \ \ (.986)\ \ \ \ \ \ (2.973) \\ &+.739ln(Y/P)^e - .110p^e \\ &(3.485)\ \ \ \ (-4.199) \\ &R^2 = .747 \ \ \ \ \text{s.e.} = .195 \ \ \ \ \text{D.W.} = 1.730\end{aligned}$$

$$\begin{aligned}(2SLS)\ ln(D/P) = &-2.019 + .105DM1^* + .0552DM2^* + .205DM3^* \\ &(-.743)(1.767)\ \ \ \ (.811)\ \ \ \ (3.315) \\ &+1.243ln(Y/P)^e - .081p^e \\ &(3.287)\ \ \ \ (-2.270) \\ &\text{s.e.} = .205 \ \ \ \ G = 26\end{aligned}$$

The above estimation was obtained after the Cochrane-Orcutt transformation. All the comments on Eq. (1) above are applied exactly in the same fashion to Eq. (2).

Eq. (2a):

(2SLS) $ln(D/P)=-2.366+.109DM1^*+.047DM2^*+.222DM3^*$
$(-.788)(1.771)\quad(.683)\quad(3.240)$
$+1.282ln(Y/P)^e-.081p^e+.000001z^*$
$(3.097)\quad(-1.863)\quad(.0009)$
$-.071DMT1^*-.095DMT2^*$
$(-.536)\quad(-1.153)$
s.e.=.204　　G=26

Eq. (2b):

(2SLS) $ln(D/P)=-10.897+.168DM1^*+.159DM2^*+.290DM3^*$
$(-10.559)(1.639)\quad(1.528)\quad(3.360)$
$+1.677ln(Y/P)++.006p$
$(21.279)\quad(1.588)$
s.e.=.236　　G=17

Eq. (2c):

(2SLS) $D/P=58763.663+3372.736DM1^*+1172.433DM2^*$
$(4.312)\quad(.851)\quad(.293)$
$+2176.597DM3^*+.221(Y/P)^e-1305.498p^e$
$(.549)\quad(21.466)\quad(-1.347)$
s.e.=11224.023　　G=13

Eq. (3):

(OLS) $ln(T/P)=-2.239+.35DM1^*+.114DM2^*+.139DM3^*$
$(-1.277)(.400)\quad(1.429)\quad(1.910)$
$+1.351ln(Y/P)^e-.270p^e+.021z^*$
$(5.203)\quad(-7.571)\quad(4.213)$
$R^2=.929$　　s.e.=.225　　D.W.=1.329

(2SLS) $ln(T/P)=-86.37+.064DM1^*+.142DM2^*+.016DM3^*$
$(-1.808)(.917)\quad(1.776)\quad(2.681)$
$+2.003ln(Y/P)^e-.263p^e+.016z^*$
$(3.899)\quad(-4.789)\quad(2.904)$
s.e.=.240　　G=20

The above results were also obtained after the Cochrane-Orcutt transformation. The dummy variables to reflect the impact of interest changes (DMT1 and DMT2) had statistically insignificant coefficients with wrog signs as shown below(Eq.3a). And Eq. 3b below shows that the expected values of income and inflation rate work better than their current values. It is also shown below(Eq. 3c) that the results are qualitatively the same when the equation is specified in a linear form.

Eq. (3a):

(2SLS) $ln(T/P)=-19.029+.103DM1^*+.134DM2^*+.221DM3^*$
$(-4.717)(.931)\quad(1.210)\quad(1.916)$
$+2.428ln(Y/P)^e-.248p^e+.019z^*-.044DMT1^*$
$(7.926)\quad(-7.268)(4.200)(-.192)$

$$+.004DMT2^{*}$$
$$(0.024)$$

s.e.=.307 G=13

Eq. (3b):

$$(2SLS)\ ln(T/P)=-45.715+.599DM1^{*}+.743DM2^{*}+.819DM3^{*}$$
$$(-20.206)(3.495)\quad(4.288)\quad(5.255)$$
$$+4.348ln(Y/P)-.004p-.001z^{*}$$
$$(21.981)\quad(-.667)(-.112)$$

s.e.=.419 G=16

Eq. (3c):

$$(2SLS)\ T/P=9660.537-2067.249DM1^{*}+734.048DM2^{*}-3604.145DM3^{*}$$
$$(.461)\quad(-.357)\quad(.125)$$
$$+.984(Y/P)^{e}-6388.961p^{e}+848.325^{*}$$
$$(51.314)\quad(-3.316)\quad(3.663)$$

s.e.=16390.609 G=21

Eq. (4):

$$(OLS)\ (Y/P)^{e}_{t}=(.50)\sum_{i=0}^{\infty}(1-.50)^{i}(Y/P)_{t-i}$$
$$(2.93)$$

As explained in the preceding section, the above estimation of the adaptation coefficient of income expectation (.50) was obtained from the estimation of consumption function.

Eq. (5):

$$(OLS)\ p^{e}_{t}=(.050)\sum_{i=0}^{\infty}(1-.050)^{i}p_{t-i}$$
$$(16.143)$$

This estimation of the adaptation coefficient of inflation rate expectation was obtained from the total money demand function. It is interesting to note that we obtain the same estimate from separate estimations of the demand functions for alternative forms of money as shown below.

$$(OLS)\ ln(N/P)_{t}=-.481-.104(.050)\sum_{i=0}^{\infty}(1-.050)^{i}p_{t-i}$$
$$(-.115)(9.463)\quad(31.358)$$
$$+.972ln(Y/P)^{e}_{t}+.001z_{t}^{*}$$
$$(10.968)\quad(.625)$$

$R^{2}=.948$ s.e.=.12 D.W.=1.71

$$(OLS)\ ln(D/P)_{t}=-.851-.113(.050)\sum_{i=0}^{\infty}(1-.050)^{i}p_{t-i}$$
$$(-.536)(-7.508)\quad(4.351)$$
$$+1.015ln(Y/P)^{e}_{t}+.003z_{t}^{*}$$
$$(8.364)\quad(1.369)$$

$R^{2}=.335$ s.e.=.17 D.W.=1.08

$$(\text{OLS})\quad \ln(T/P)_t = \underset{(-4.810)}{-14.953} \underset{(-8.980)}{-.258(.050)} \sum_{i=0}^{\infty}(1-.050)^i p_{t-i} \underset{(7.675)}{}$$

$$\underset{(8.952)}{+2.074 \ln(Y/P)^e_t} \underset{(5.742)}{+.024 z_t}{}^*$$

$$R^2 = .963 \qquad \text{s.e.} = .32 \qquad \text{D.W.} = .92$$

IV. Analysis of Estimation Results

1. Income and Money Demand

Our estimation of the demand function for each alternaitve form of money confirms for Korea the well-established hypothesis that expected income is a major determinant of money demand.

Let us consider, fiirst, the economic time horizon as revealed by our estimation of expected income. Friedman utilized the adaptation coefficient of .4 for income expectation, which he obtained from his estimation of the *annual* consumption function for the United States (1905-51).[1] Our study relied on the coefficient of .5, which was estimated from our *quarterly* consumption function. Our estimate of the adaptation coefficient implies an economic horizon of about three years in the formulation of income expectations; Friedman's estimates implied a horizon of more than seventeen years.[2]

This difference is consistent with the general agreement that the representative time horizon in the less developed economic environment is shorter than in the developed economic envirovment. Less developed countries have a low level of per capita income, relatively high social and political instability and market imperfections; they are also especially prone to seasonal and external factors that cause the economic structure to have less stability. As a result, the public is unable to make long-range forecasts and thus prefers to choose short-term projects and to apply

(1) M. Friedman, "Demand for Money."

(2) The difference could be partly a reflection of the temporal aggregation problem in the distributed lag models. When we ran the same consumption function using the annual data for 1953-72, we obtained, as shown below, the estimate of the adaptation coefficient as .8, implying the economic horizon of about six years. Thus, the temporal aggregation problem does not appear to impair qualitatively our discussion.

$$(C/P)_t = \underset{(4.944)}{36986} \underset{(147.767)}{+.761(.800)} \sum_{i=0}^{\infty}(1-.800)^i (Y/P)_{t-i} \underset{(2.535)}{}$$

$$R^2 = .915 \quad s.e. = 25.34 \quad D.W = .71$$

high rates of discount to future values.[3] As revealed by the high value of our estimate of the adaptation coefficient of income expectation, Korea appears to be no exception to this general tendency of short economic horizon in underdeveloped economies.

This does not mean that the money demanders in underdeveloped economies do not formulate expectations about their income or other economic variables. We may assume that any economic unit, however unsophisticated it may be, formulates some form of expectation about the economic variables concerned. A static expectation is equivalent to the unitary adaptation coefficient in our model of adaptive expectation, and the relevant value for the expectation would be only the current value of the economic variable.

When static expectations about income and the inflation rate were assumed in Seetion III, the current variables worked less well than the expected ones in all of the three money demand functions. Thus the expectations of Korean money demanders do not appear to be static, but their economic horizon for expectations seems to be relatively short.

Some studies which estimated the adaptation coefficient directly from money demand functions have also shown similar differences in economic horizons between developed and underdeveloped countries. For example, Feige obtained the estimate of .37 (for M1) and .30 (for M2) from annual U.S. data (1915-63), while Adekunle estimated the coefficient as .760 for nine industrial countries, .901 for four other developed and .989 for five less developed countries in his cross-section study.[4]

Turning to money demand behavior itself, let us examine the income elasticities of demand for alternative forms of money. They are summarized together with other elasticities of money demand in Table 1. The relative magnitudes of income elasticities of demad for the three alternative forms of money are generally consistent with our conjectures

(3) For a discussion of this point, see J.O. Adekunle, "The Demand for Money: Evidence from Developed and Less Developed Economies," *IMF Staff Papers* 15 (July 1968): 226-34.

(4) E.L. Feige, "Expectations and Adjustments in the Monetary Sector," *The American Economic Review* 57 (May 1967): 462-73; Adekunle, "Demand for Money." Since these numbers are based on the annual time series, they are not directly comparable to our estimate which is based on quarterly time series. The presented adaptation coefficients, .37, .30, .760, .901 and .989 imply the economic horizons of approximately 20, 25, 7, 5 and 2 years, respectively.

in Section II. This observation confirms the conjecture that the demand for time and savings deposits is associated with paymet periods that are longer than periods associated with the demand deposits and currency. In addition, as income rises, the proportion of money demand associated with accumulation for future payments increases.

Table 1. Elasticities of Money Demand

	N/P	D/P	T/P
$(Y/P)^e$	1 169	1 243	2 003
Y/P^1	.584	.621	1.001
p^{e2}	− 762	− 651	−2.123
p^3	−.036	− 031	−.101
z	*	*	1.591

*Insignificant.

[1] Computed by multiplying the expected-income elasticities by .499 (the mean elasticity of expected income with respect to the current income).

[2] Computed from the mean value of ZP1 (8.087) times the coefficients for p^e in Eqs (1), (2) and (3), respectively.

[3] Computed from the expected-inflation-rate elasticities times .0473 (the mean elasticity of expected inflation rate with respect to current inflation rate).

It appears, however, that the inferences we made about the expected-income elasticities in Section II should be qualified somewhat. The difference between the expected-income elasticities of demand for currency and demand deposits are statistically insignificant. This result might be related to the regional differences in the availability of banking services in Korea.

Although the number of banking offices per million persons in Korea increased from 30.7 in 1964 to 39.1 in 1972, the regional differences in the availability of banking services appear to be great. Banking facilities are actually concentrated in one or two largest cities in each province. Thus, especially for many farm households, banking services are very limited and the banking habits are not developed. For these money holders, currency holdings might be almost the only form of money accumulation.

Our observed expected-income elasticity of currency demand might reflect the money accumulation by these money demanders outside the access of bank services as well as the currency demand behavior by the bank-using money demanders. Then .the elasticity of currency demand

may not be significantly smaller than that of demand for demand deposits; this is our observation.(5)

In short, our observed elasticities imply that bank deposits and, partly, currency holdings for some money demanders are used as a means of accumulation for future transactions. This point will be discussed again in the third subsection of this section.

We shall next compare our estimates with the results obtained by some other studies. All of the previous studies of Korea are concerned not with the demand for each alternative form of money, but with the demand for total money, i.e., M1(currency and demand deposits) and/or M2 (M1 plus time and savings deposits). Therefore, their results are not directly comparable to ours. This comparison is deferred to the final subsection of this section.

Of the studies of other countries, the six studies summarized in Table 3 are to some extent comparable to our study. Estimates by Diz of the expected-income elasticities of money demand in Argentina are, in general,

(5) Our observations show that the expected-income elasticity of demand for all three forms of money are greater than unity. It should be noted that the expected income elasticity of the transactions demand for money could be greater than unity under our money demand hypothesis.

Our hypothesis says that $T=f(Y^e)$, where T is the transactions volume in the current and some relevant future periods and Y^e is the expected income. Suppose that $S=g(T)$, where S is the demand for money and $(\partial S/\partial T)/(S/T)=1$. [See K. Brunner and A.H. Meltzer, "Economies of Scale in Cash Balances Reconsidered," *The Quarterly Journal of Economics* 81 (August 1967). 422-36 for a demonstration that under the inventory approach the elasticity of demand for money with respect to transactions volume would approach unity for a large volume of transactions.]

$$\text{Now } \frac{\partial S/\partial Y^e}{S/Y^e} = \frac{\partial S/\partial T}{S/T} \cdot \frac{\partial T/\partial Y^e}{T/Y^e} \gtreqless 1 \qquad \text{as} \frac{\partial T/\partial Y^e}{T/Y^e} \gtreqless 1.$$

The elasticity of the transactions volume with respect to the expected income is more likely to be greater than unity if the elasticity with respect to the current income is unity (as usually assumed in the conventional transactions demand approach to money demand). This is because the expected income changes less in proportion to the current income.

Moreover, the recently emerging "transaction cost" approach to money demand alleges that the value of time is an important determinant of money demand (because money is demanded in order to economize the transactions time), and that the value of time for an individual increases as his income (wage rate) rises. Thus, the income elasticity of the transactions demand for money could be greater than unity. For a demonstration of this point, see E Karni, "The Transactions Demand for Cash. Incorporation of the Value of Time into the Inventory Approach," *Journal of Political Economy* 81 (September/October 1473): 1216-225.

In short, our observation of the expected-income elasticity greater than unity does not appear to deny our basic aipproach to money demand in terms of the transactions demand.

higher than our estimates, and their relative magnitudes among the different forms of money are quite opposed to those in our observations.[6] We cannot discuss the implications of these differences, since Diz is not concerned with the differences in the elasticities among different forms of money.

The relations among the relative magnitudes of elasticities of different forms of money demand shown by Deaver and Gupta are again opposite to those in our study.[7] Since neither of these studies has paid careful attention to the implications of the differences in income elasticities,[8] we cannot discuss their results in detail It may be indicated, however, that the use of measured income instead of expected income as explanatory variable in these two studies might have produced their results. It is very likely that the demand for bank deposits, especially time and savings deposits, may be completely uncorrelated with the transitory component determined entirely on the basis of the permanent component of income. of income but Currency and, to some extent, demand deposits may be partially correlated with the transitory component of income.

For the United States, most of the single-equation estimations of money demand functions have been interested in aggregate money, M1 and/or M2, implicitly assuming its components as homogeneous, while the structural estimations of the monetary-sector model have derived the demand functions for components of money stock. Of the latter studies, the results by Teigen are quite consistent with our results in terms of

(6) A C. Diz, „Money and Prces in Argentina, 1935-62," in *Varieties of Monetary Experience*, ed. D. Meiselman (Chicago University of Chicago Press, 1970), pp 69-162

(7) J V Deaver, "The Chilean Inflation and the Demand for Money," in *Varieties of Monetary Experience*, ed D. Meiselman (Chicago University of Chicago Press, 1970), pp. 7-67; K.L. Gupta, „The Demand for Money in India. Further Evidence," *Journal of Development Studies* 6 (January 1970)· 159-69.

(8) Deaver himself did not seriously accept these results He indicated that "since time deposits are far more sensitive to change in the cost of holding money than demand deposits and cash, the result of omitting R [the rate of return on investments] from the cost variable [the expected rate of inflation] will be to pull down the income elasticity of time deposits much more than it will pull down holdings of cash and demand deposits." (Deaver, "The Chilean Inflation," p. 41.)

Gupta mentioned that "this [the high income elasticity of currency demand, prsumably relative to that of demand for demand deposits] is not surprising in view of the large preference for cash in the Indian economy still prevailing." (Gupta, "Demand for Money," p. 163.)

both the absolute magnitude of each elasticity and the relationships among relative magnitudes of three elasticities.[9] As shown in Table 5, however, Goldfeld reported a different result concerning the income elasticities of demand for time deposits.[10]

Table 2. Income Elasticities of Money Demand: Other Countries

	N/P	D/P	T/P
Chile[a]	.937[b]		.283
Argentina[c]	2.208~2.913	1.607~2.245	.117~1.880
India[d]	2.040~3.009	1.127~1.420	N A.
47 countries[e]	−.204~.011	.52~ 500	N A.
United States[f]	−.337[g]	1 114	2.089
United States[h]	.64	.80	.65

N.A.=Not available.

[a] With respect to the current income; 1932-55 covered; Deaver, "Chilean Inflation," p. 40.

[b] The elasticity of demand for (N+D)/P.

[c] With respect to the expected income; 1938-62 covered, Diz, "Money and Prices," pp 107-09.

[d] With respect to the current income; 1949-66 covered; Gupta, "Demand for Money," pp.164-65.

[e] With respect to the current income, 1952-61 covered; Perlman, "International Differences," pp. 315-27.

[f] With respect to the current income, 1953-64 covered; Teigen, "Aggregate Quarterly," p. 212.

[g] The elasticity of N/D with respect to the current income.

[h] With respect to the current income; 1950-62 covered; Goldfeld, *Commercial Bank*, p.117.

Finally, the international study by Perlman must be mentioned briefly. On the basis of his 1952-61 cross-section study of forty-seven countries representing different social, economic and institutional characteristics, Perlman observed that the income elasticity of demand for demand deposits is much higher than that for currency and that the currency/deposit ratio has a statistically significant negative correlation with income.[11] These results are consistent with our demand-for-currency and demand-deposits findings for Korea. The demand for time and savings deposits is not covered by this study.

The results of comparing our observations with other studies are mixed, both in terms of the absolute values of income elasticity of money

(9) R.L. Teigen, "An Aggregate Quarterly Model of the U.S. Monetary Sector, 1953-64," in *Targets and Indicators of Monetary Policy*, ed. K. Brunner (San Francisco: Chandler Publishing Co., 1966), pp. 175-218.

(10) S.M. Goldfeld, *Commercial Bank Behavior and Economic Activity: A Structural Study of Monetary Policy in the Postwar United States*(Amsterdam: North-Holland Pub. Co., 1966).

(11) M. Perlman,"International Differences in Liquid Assets Portfolios," in *Varieties of Monetary Experience*, ed. D. Meiselman (Chicago: University of Chicago Press, 1970), pp. 297-337.

demand and in terms of the relative elasticities of different forms of money demand, so we can hardly draw clear conclusion from them. None of the studies mentioned attempted to derive implications from the differences among the elasticities of different forms of money, but has merely observed their differences.

2. Inflation Rate and Money Demand

Our estimation of money demand functions shows the expected rate of inflation to be another determinant of money demand in Korea. Let us consider, first, price expetation behavior as reveald by money demand behavior.

Surprisingly, the adaptation coefficient for price expectation is very low (.05), which means formally that the economic horizon with respect to price expectation is more than twenty years long. This formal interpretation is very difficult to accept at face value, in view of the general agreement that the economic horizon is short in underdeveloped economies and the economic horizon implied in income expectation, as discussed in the preceding subsection.

One might suspect that the above result reflects a bias due to our assumption of instantaneous adjustment of the actual money stock to the desired level. This is unlikely, however, in view of the fact that the same adaptation coefficient for price expectation was obtained from each money demand function. (See Section III.) The adjustment coefficient, if money demand is partially adjusted, is more likely to be different for different forms of money, and thus our estimated adaptation coefficient should be different for different forms of money. That is, the fact that the same estimate is obtained for different forms of money mayi mply that the effect of partial adjustment, if any, is not important.

One plausible interpretation of the low adaptation coefficient is that the inflation rate is so variable that money demanders are slow to adjust their expectations to recent changes in the inflation rate. Actually, the mean of change in the wholesale price index in Korea during the period under study was 10.91% at an annual rate while its standard deviation was 15.14%. Thus, the coefficient of variation(=standard deviation/mean) of the inflation rate was 1.39.

In this situation, it is quite plausible that the current change in the

inflation rate would appear temporary to money holders. In other words, a greater variation in the inflation rate may lead people to put little trust in recently observed rates and to look for more extensive evidence on which to base their expectations.(12)

That is, the price expectations of money demanders might be influenced not only by experienced rates of inflation but significantly also by other observations regarding, for example, the behavior of the nominal money supply, of governmental budgetary deficits or of money-wage adjustments and foreign exchange rates. Thus the investigation of price expectation behavior in Korea remains to be studied more extensively. At present we interpret our estimate of the adaptation coefficient to imply that money demanders do not depend heavily on recently experienced inflation rates.

Under this limited interpretation of the adaptation coefficient for price expection, let us examine the inflation-rate elasticities of money demand, which are summarized in Table 3. The relative magnitudes of inflation-rate elasticties of demand for three alternative forms of money are consistent with our conjectures in Section 2 of Chapter II, except that, contrary to our expectation, the inflation-rate elasticity of currency demand is greater, in absolute value, than that of demand for demand deposits.(13)

Our expectation in Section II was that the inflation-rate elasticity of demand deposit holeings is greater (in absolute value) than that of currency demand since demand deposit holdings are likely to be associated with longer payment periods than currency demand. Our observation, which is opposed to this expectation, indicates again that there is a dichotomy between the bank-using money demanders and the money demanders beyond the access to banking services, as discussed in the

(12) A relevant remark was made by Diz· "The results of these regressions for two subperiods of approximately equal length showed a tendency for the 'best' values of δ [the adaptation coefficient for price expectation] to be lower during the second than during the first subperiod since the variability of the rates of inflation was greater during the second subperiod than the value of δ may inversely respond to changes in the variance of inflation." (Diz, "Money and Prices," p. 100.)

(13) Since, however, the coefficients for p^e in the demand equations for currency and demand deposits are −.094 and −.081, respectively, and their standard errors are .009 and .035, respectively (see Section 3 of Chapter III), it appears that the difference between the absolute values of the two coefficients is statistically insignificant.

preceding subsection. The reaction in currency demand by the money demanders without access to banking services to the changes in infiation rate appears to be very strong.

It is noteworthy that a decrease in the expected inflation rate not only increases the total volume of real money holdings, but also changes its allocation in the alternative forms of money in favor of time and savings deposits. The implication of this observation for development policy will be discussed in the next subsection.

To compare our observations with those made of other countries, Table 4 summarizes several estimates made in seven studies of the holding-cost elasticities of money demand.

Estimates by Deaver of expected-inflation-rate elasticities of money demand in Chile are surprisingly lower(in absolute value) than ours, but the relative magnitudes between the elasticities of M1 and time deposite

Table 3. Holding-cost Elasticities of Money Demand: Other Countries

	N/P	D/P	T/P
Chile[a]		−.05*	−.29
Argentina[b]	−.680～−.954	−9.111～−3.423	−6.013～−2.538
India[c]	−1.364	−.584	N.A.
47 countries[d]		−2.48*	N.A.
United States[e]	.088[f]	−.104	−2.820
United States[g]	−.07	−.11	−1.62
United States[h]	−.364	−.352	−.374

N.A.=Not available.

*The elasticity of demand for (N+D)/P.

[a] With respect to the expected inflation rate, 1932—55 covered, Deaver, "Chilean Inflation," p.41.

[b] The numbers are the coefficients for the current rate of inflation in each money demand equation, 1938-62 covered, Diz, "Money and Price," p. 104.

[c] With respect to the Treasury bill rate, 1949-66 covered, Gupta, "Demand for Money," pp. 164-65.

[d] The number is the coefficient for the current rate of inflation in the currency/demand-deposit ratio equation, 1952-61 covered, Perlman, "International Differencess," p 327.

[e] With respect to the Treasury bill rate for D/P, and with respect to the yield on long-term U.S. government bonds for T/P, 1953-64 covered, Teigen, "Aggregate Quarterly," p. 212.

[f] The elasticity of N/D with respect to the Treasury bill rate.

[g] With respect to the Treasury bill rate for N/P and D/P, and with respect to the yield on long-term U S. government bonds for T/P, 1950-63 covered, Goldfeld, "*Commercial Bank*," p. 160.

[h] With respect to the weighted average of yields on private securities for N/P and D/P, and with respect to the Treasury bill rate for T/P; 1948-62 covered; F. deLeeuw, "A Model of Financial Behavior," in *The Brookings Quarterly Econometric Model of the United States*, ed. J S Duesenberry, et al. (Chicago: Rand McNally & Company, 1965), p 493.

are consistent with ours.[14] Although Diz did not present the relevant elasticities, his results show a reaction of currency demand to the expected inflation rate that is lower than the reaction to demand deposits; in fact the reaction is insignificant. His results also show that time and savings deposits exhibits a much greater reaction to the expected inflation rate than demand deposits does.[15]

It is interesting to note that the oaservation by Perlman in his cross-section study of forty-seven countries is rather consistent with our observation. He found a significant negative relation between the currency/demand deposits ratio and the inflation rate, though there was no indication that currency demand had, in absolute value, a larger inflation-rate elasticity than demand deposits. Perlman attributed this result to "the fact that with higher expected rate of inflation the interest yield on deposits is adjusted to some extent to the expected rate of inflation and that, therefore, the price effect of inflation is smaller for deposits than for currency.[16]

This explanation cannot be applied to the Korean case, since, as indicated earlier, the interest rates on demand deposits have been essentially unchanged during the period under study. Of course, we cannot apply our explanation in terms of the dichotomy of money demanders to Perlman's highly aggregative study.

For the United States, the rate of inflation has not been observed as a significant determinant of money demand, for which two major explanations have been offered. One is that "the American price level has never changed rapidly enough for the effects of this variable [inflation rate] to become large enough to be measurable."[17] This essentially empirical explanation seems to be supported by some recent theoretical arguments. For example, Fried has demonstrated, in his neoclassical one-sector growth model incorporporating the transactions demand for money, that "the elasticity of money demand with respect to the expected rate of inflation

(14) Deaver, "Chilean Inflation."
(15) Diz, "Money and Prices."
(16) Perlman, "International Differences," p. 327.
(17) D.E.W. Laidler, *The Demand for Money Theories and Evidence* (Scranta, Pa.· International Textbook Company, 1969), p. 91.

is an increasing function of that rate."[18]

The other explanation is that price expectations might enter the money demand function via the interest rate on financial assets. This explanation is plausible since it has been recognized since Irving Fisher that expectations of changes in the price level influence the market rates of interest and since "there is a lot of evidence from observations in the securities market that the public tends to respond rather quickly to changes in the expected rate of inflation."[19]

In this respect, it would be of interest te compare our estimates of expected-inflation-rate elasticity with the interest-rate elasticiities estimated from the U.S. data. Comparing the results from the three U.S. studies summarized in Table 4 with our results, our expected-inflation-rate elasticities appear to be, in absolute value, greater than the U.S. market-rate-of-interest elasticities of money demand. Although deLeeuw shows little differences among the three forms of money, Teigen, Goldfeld and our study show that the demand for time and savings deposits exhibits the strongest reaction to changes in the holding cost of money.

Among the studies of underdeveloped economies, Gupta claims to have found that the demand for money in India is interest elastic, and his results show that the interest-rate elasticity of demand for currency is usually higher than that for demand deposits. (See Table 4 above.) However, the significance of his results, based on the use of Treasury bill rates as a proxy for the market rates of interest, is doubtful, since in India practically no Treasury bills are held outside the monetary authorities and the banking system.[20]

Indeed, it is very difficult in most underdeveloped economies to find a good proxy for the market rates of interest. As indicated in Section II, the development of organized securities markets is very primitive and limited in size, so the yields formulated there could hardly be considered to have a significant relationship with the general public's money demand

(18) J. Fried, "Money, Exchange and Growth," *Western Economic Journal* 11(September 1973) 299.

(19) H.G. Johnson, *Macroeconomics and Monetary Theory*(Chicago, Aldine Publishing Co., 1972), p. 127.

(20) V.G. Pendharker, "The Demand for Money in India A Comment," *Journal of Development Studies* 7 (January 1971): 201.

behavior.

More relevant rates of interest might be those formulated in the unorganized money market, for which no statistical data are reported. In this study, however, any significant relevance of the unorganized-market rates of interest for money demand behavior by our household-firms was denied for *a priori* reasons. (See Section 1 of Chapter II.) At present, there is no way to confirm or reject this hypothesis. The high explanatory power of the inflation rate in money demand functions does not mean that market rates of interest for money demand in Korea are insignificant or irrelevant. Thus the relevance of market rates of interest for money demand behavior in Korea, as in many other underdeveloped countries, remains unsolved in spite of the statement by Laidler that "of all the issues in monetary economics, this [the importance of interest rates in money demand] is the one that appears to have been settled most decisively."(21)

3. Money as a Means of Accumulation

The evidence which confirms our hypothesis that the demand for money depends, above all, on expected income and the inflation rate has been analyzed in the preceding two subsections. The analysis revealed that money, especially bank deposits, is used as one of major means of accumulation for future-period transactions. This finding is related to our third hypothesis about money demand, i.e., the hypothesis that money demand is positively related with the rate of return to investments (z). It should be recalled from Section II, however, that under this basic hypothesis the individual relationship between z and each alternative form of money was left to be empirically determined.

As shown in Section III, the empirical confirmation of this hypothesis is less straightforward than the two hypotheses discussed in the preceding subsections. The rate of return to investment (z), for which the ratio of consumer goods price to producer goods price was used as a proxy, was statistically insignificant (with a negative sign) in the currency demand function (Eq. 1a); appeared to have little relation to the demand for demand deposits (Eq. 2a); and was significant with a positive sign only in the demand function for time and savings deposits (Eq. 3). These

(21) Laidler, *Demand for Money*, p. 97.

imperfect statistical results may be related to the imperfection of our proxy for z. Since the ratio of consumer to producer goods prices is not a perfect proxy for z, our empirical results cannot be given conclusive interpretations.

Given the imperfection of the proxy, however, a tentative explanation of the empirical results may be attempted. The negative relationship between z and currency demand in Eq.(1a) may be interpreted to indicate that there is a shift, in reaction to a rise in z, from currency demand, which was associated with shorter payment periods in our money demand hypothesis, to time and savings deposit holdings, which were associated with longer payment periods and which are found empirically to have a significant positive relationship with z.

The shift, however, is possble only for those household-firms that have access to banking services. As indicated earlier, banking services are unavailable to many farm household-firms in Korea, and banking habits are not developed. Therefore, these money holders may simply accumlate their currency holdings. which is almost their only form of money accumulation. Thus, the statistical insignificance of the negative coefficient for z in currency demand equation (Eq. 1a) might reflect the combined results of both the shift of currency demand to bank deposits by the bank-using individuals and mere currency accumulation by those without banking serices. Here we see more evidence, though tentative, for the dichotomy of money demand behavior in Korea.

Regarding demand deposit holdings, Eq. (2a) shows that there is neither a shift from demand deposits to other forms of money nor an increase in the demand for demand deposits in reaction to a rise in z. All in all, time and savings deposits are empirically found to show a significant positive response to changes in z, given the imperfection of our proxy for z.

The increase in the demand for time and savings deposits in response to a rise in z appears to be not merely the result of shifts from currency holdings, since the coefficient for z in time and savings deposit demand equation (Eq.3) is larger, in absolute value, than that in currency demand equation (Eq. 1a). Moreover, the following estimation of the demand function for total money (M2) shows a net positive response of money

demand to a rise in our proxy for z. The mean elasticity of the demand for total money with respect to z is .7[22]; the mean elasticity with respect to the expected rate of inflation is −1.4; and that with respect to the current rate of inflation is −.07:

$$\text{(2SLS)}\quad ln\frac{N+D+T}{P} = \underset{(-2.695)}{-8.972} + \underset{(.874)}{.069}DM1^* + \underset{(.966)}{.083}DM2^* + \underset{(1.307)}{.107}DM3^*$$
$$+ \underset{(6.169)}{1.924}ln(Y/P)^e - \underset{(-5.068)}{.177}p^e + \underset{(1.652)}{.0072}z^*$$
$$\text{s.e.} = .242 \qquad G = 24$$

For a given rise in the rate of return on investments, how much a household-firm would increase its holdings of time and savings deposits depends, above all, on its expected real income and cost of deposit holding. For a given level of expected income, the lower the real cost of holding deposits, the larger the increase in holdings of time and savings deposits in response to the given rise in the rate of return on investments, and thus the higher the rate of investments in a certain period.

Of course, the household-firm has an option in choosing a means of accumulation. It would perfer to accumulate real commodities if the overall transaction costs involved in commodity accumulation is lower than those involved in money accumulation. For an individual household-fiirm this option does not make any significant difference in the rate of investment to be realized. For the society as a whole, however, whether individuals accumulate their abstained consumption in the form of real commodities or monetary assets makes an important difference. Money accumulation (expecially in time and savings deposits) can be pooled to finance investments by other individual; thus the rate of investment in society as a whole could rise before the accumulating individuals can realize their desired increase in investment. This is not the case if the individuals' accumulation takes place in the form of real commodities. Thus, a monetary policy which succeds in reducing the holding cost of money can increase the rate of investment at both the levels of individuals and the society as a whole.

(22) This elasticity was obtained by the coefficient for z (.0072) times the mean value of z (99.414).

V. Conclusion

Despite several deficiencies of the study, especially those related with the estimation of expected inflation rate (p^e) and the proxy for the rate of return to investments (z), our investigation has produced several important findings.

Above all, our observations confirm the significance of what we have labelled the "accumulaion" aspect of money demand by the household-firm, which is assumed to be the representative money holder in Korea. As its desired investments and durable consumer expenditures increase, the household-firm accumulates money holdings because its current income is too small to finance the increase in these expenditures and because it must rely mainly on self-finance. This hypothesis is empirically confirmed by the relative magnitudes of income and inflation-rate elasticities among the different forms of money and by the relationship between the demand for each form of money and our proxy for z.

Prevailing asset preference approaches should explain the differences in income and inflation-rate elasticities among different forms of money in terms of preferences or tastes of money demanders. These approaches would state that the income and/or inflation-rate elasticities of demand for currency can be different from those for bank deposits—just as the income and/or price elasticities of demand for the apple can be different from those for the orange. We feel that our explanation, in terms of the accumulation aspect of money demand is more informative and better reflects the unique property of money than an explanation in terms of preferences or tastes.

The economic conditions underlying our money demand hypothesis appear not to be unique to Korea but, rather, to apply generally to many other underdeveloped economies. Therefore, we feel that an extension of our hypothesis to these other countries would be worthwhile in future studies.

The investigation of the accumlation aspect of money demand also reveals evidence suggesting consistently the existence of a dichotomy in money demand behavior between the bank-using money demanders and the money demanders without access to banking services.

Although our evidence suggests a tendency toward currency accumulation on the part of the latter group, they are also likely to depend more heavily on money substitutes (real commodities) for the accumulation of transaction balances than the bank-using money demanders. The present study could not identify these money substitutes, possibly because we used the aggregate data of currency holdings.

Although information concerning the regional money stock is very difficult to obtain, a separate study of money demand behavior in regions beyond access to banking services would significantly improve our understanding of the nature of money demand. Since in these regions the "unorganized" money markets are likely to prevail, a comparative study of financial behavior in these regions and the bank-using areas would reveal another aspect of the dualism of the Korean financial economy.

Our estimation of the price expectation behavior of Korean money holders reveals that they do not depend entirely on recently experienced inflation rates but look for more extensive evidence on which to base their expectations. Therefore, it would be erroneous to conclude from the observed insignificance of current or shortly lagged rates of inflation in money demand functions that the expected inflation rate is not a significant determinant of money demand.

The present study did not attempt to investigate factors other than experienced inflation rates that influence the price expectations of Korean money demanders. In view of our evidence indicating the importance of these other factors, an extensive study of price expectation behavior in Korea would improve our understanding of money demand in this country.

APPENDIX: GLOSSARY

This glossary explains the notations used in the text, describes the data used in the estimation, and presents their sources.

In denoting a variable, the higher case letter is used mainly for a quantity variable in a nominal terms and its real vale is denoted by dividing the nominal term by its relevant deflator. The lower case letters refer largely to ratios, rates of change, rates of interest, etc.

The definition of a notation is given under the item (1), and items(2) and (3) are description and source of the data, respectively.

*indicates an exogenous variable and + a policy variable in the context of the whole structural model presented in the author's doctoral dissertation.

BOK and ESY are the abbreviations for the Bank of Korea and *Economic Statistics Yearbook*, respectively.

C/*P*: (1) Real private consumption expenditiures

(2) The annual series from GNP accounts is interpolated by the weighted average of quarterly consumption expenditures per farm household and urban household deflated, respectively, by the prices paid for household goods by farm households and the Seoul consumer prices. The averaging weights are determined by the number of farm and urban households.

(3) Annual series: BOK, ESY, "Expenditures on Gross National Product"

Consumption expenditures by farm households: Economic Planning Board of Korea, Statistical Yearbook, "Farm Household Survey"

Consumption expenditures by urban households: Economic Planning Board of Korea, *op. cit.*, "Urban Household Survey"

Prices paid for household goods by farm households: Economic Planning Board of Korea, *op. cit.*, "Farm Household Survey"

Seoul consumer price index: BOK, ESY, "Seoul Consumer Price Indexes"

Number of farm households: BOK, ESY, "Number of Farm Households and Cultivated Area"

Number of urban households: Economic Planning Board of Korea, *op. cit.*, "Urban Household Survey"

D: (1) Demand deposits at commercial banks

(2) The end-of-quarter sum of "checking," "passbook," "savings," "temporary," "credit control" and "public" deposits at the Bank of Korea, "deposit money banks" and the Korea Development Bank.

(3) BOK, ESY, "Money Supply and Principal Factors Affecting It"

*DM1, DM2, DM3: Seasonal dummy variables for the first, second, and third quarters, respectively

*DMT1: (1) Dummy variable fo the increase in rates of interest on time and savings deposits

(2)=1 for 1961.3 and 1965.4; = 0 for other quarters

*DMT2: (1) Dummy variable for the decrease in rates of interest on time and savings deposits

(2)=1 for 1959.3, 1968.4, 1969.2, 1971.3, 1972.1, 1972.3 and 1972.4; =0 for other quarters

N: (1) Currency held by the nonbank public

(2) Currency in circulation (outside the banks)

(3) BOK, ESY, "Money Supply and Principal Factors Affecting It"

P: (1) Domestic price level

(2) Wholesale price index

(3) BOK, ESY, "Wholesale Price Indexes for Major Commodity Groups"

T: (1) Time and savings deposits at commercial banks

(2) Sum of "time," "new household,""notice,""installment savings," "savings association," "mutual installments," "household installments," "new farmer's," "deferred," and "tax savings association" deposits at deposit money banks and the Korea Development Bank

(3) BOK, ESY, "Time and Savings Deposits at Deposit Money Banks" and "Major Account of the Development Bank"

Y/P: (1) Real income

(2) =C/P+I/P+G/P+xX/P

C/P and I/P were explained above.

G/P: The annual series of general government consumption expenditures from the GNP accounts is interpolated by the quarterly series of government expenditures deflated by the wholesale price index.

xX/P: The annual series of sum of exports of goods and services and net fator income from the rest of the world in the GNP accounts is interpolated by the quarterly proportions of exports.

xM/P: The annual series of imports of goods and services in the GNP accounts is interpolated by the quarterly proportions of imports.

e: (1) Superscripted to dencte to expected value of the corresponding variable

p: (1) Rate of change in the price level

(2) Rate of change in the end-of-quarter wholesale price indexes at

annual rate

(3) BOK, ESY, "Wholesale Price Indexes for Major Commodity Groups"

t: (1) Superscripted to denote quarterly time period

z: (1) Rate of return to investment

(2) Ratio of consumer goods' wholesale price to producer goods' wholesale price

(3) BOK, ESY, "Wholesale Price Indexes for Major Commodity Groups"

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