Transactions Demand for Money: An Adaptation to Less Developed Countries

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I. Introduction

The intent of this paper is primarily pedagogic. The inventory-theoretic approach of Baumol-Tobin type has a strong explanatory virtue for transactions demand for money.[1] Highlighted in this approach is the substitution between money and bonds, with the latter deemed as the closest substitute for the former. To students born and bred in less developed countries where the bonds markets are extremely thin, however, the line of explanation following this approach sounds rather alien and hollow. This is because they find it hard to swallow bonds to which they are most likely total strangers being regarded as the nearest asset to money whereas no mention is made of some other assets which they accept as money substitutes in their everyday life.

An economist's reasoning is to be firmly grounded on the institutional arrangements of an economy where he is expected to play a role as an analytical observer. Direct borrowing from the stock of received theories developed in other countries should be discouraged. The effectiveness of economics education could be greatly enhanced if students would feel the textbook and their everyday worlds are not wildly ajar. A process of adaptation to local socio-economic milieu is critical if unhappy obscurantist indoctrination that otherwise would be inevitable is to be avoided.

The structure of this paper is framed in the context of a stage of Korean economy that has been phased out by and large at the time of writing. But the heuristic value of this paper will be evident to

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1 See Baumol (1952).

many economists in less developed countries.

II. The Model

Suppose a typical less developed economy where about one half of the total number of economic agents are rural-based and the other half urban-based. Apparently the explanation of transactions demand for money may as well be divided into two parts, each accounting for one segment of the economy.

1. *Rural Sector*

This sector is assumed to consist solely of subsistence farmers. Other populace in this sector such as rural artisans are assumed away for the sake of simplicity. Let us take one individual farmer-household for a close look. It is assumed that our representative farmer's earnings accrue in the form of a single agricultural product (rice, for example) at the same harvest time every year. A large portion of his earnings is devoted to his own consumption. The remainder constitutes his marketable surplus (let us call it s) which he sells in exchange for cash. Later on he spends money on goods that he cannot and had better not produce by himself. We also assume that he does not save at all and that his everyday expenditure is spread evenly over the entire period. When he is in short of cash, he takes his day off the field and carries his rice by himself or by employing porters to a distant market place where his commodity fetches a better price than at his home village. Therefore his selling operation incurs transaction costs in the form of (i) his foregone wage and (ii) wages paid to porters which increase with the volume of his load. It is assumed that both his own wage (w) and a porter's wage [c, wage paid per unit quantity ("gama" or "jigae", for example)] of rice are customarily paid in rice. Again for brevity's sake, the purchasing operation of our representative farmer is assumed to be conducted right at his home village with visiting and resident vendors. Hence, little transaction cost is involved in his buying operation. Then, the total cost of transactions (k) which can be expressed in physical units of rice will be simply as follows:

(1) $k = w + c.m$

where m is the volume of one-time sale.

By dint of his perennial experience that the price of rice falls sharply at the time of harvest after reaching its high immediately beforehand,[2] our representative farmer is assumed to form an expectation of seasonal variation in rice price and attempt to hold his stock

2 See Johson (1967). *The Fluctuation of Rice Price Before and After Harvest in Korea* (1959-1973).

rice as long as possible. We assume that the price of rice increases at a uniform rate throughout the year until the next harvest when it plummets. On the other hand, while he maintains his rice stock the storage cost accrues to him, through, among other things, the deteriorating quality of rice and the decreasing quantity of inventory caused by the attack of rats and vermins. The net effect of two divergent forces throughout the year may be called the net variation in rice price (v).

It is assumed, as is usual in the inventory-theoretic approach, that our representative farmer's cash holding is exhausted just before the harvest and therefore he revamps his purse at the very time of harvest. Since m is sold initially out of s, his average stock of rice

2) The Fluctuation of Rice Price Before and After Harvest in Korea (1959—1973)

Year	Annual Index No. of Rice Price (1970=100)	Month of Rice Price High	Low	Rate of Change (%) From High to Low Month
1959	18.36	August	December	−32.44
1960	21.85	August	November	−35.04
1961	27.80	September	January (1962)	−31.89
1962	29.40	August	November	−31.89
1963	47.30	July	November	−6.30
1964	60.40	July	December	−59.94
1965	54.70	September	January (1966)	−27.29
1966	57.50	September	January (1967)	−19.16
1967	64.50	August	December	−33.06
1968	73.10	October	December	−13.74
1969	83.90	September	December	−2.50
1970	100.0	September	December	−12.00
1971	124.9	September	December	+1.85
1972	158.3	August	November	−7.16
1973	169.0	August	December	−5.45

Note: (1) As the harvest time differs, the highest-and lowest-priced months shifts year by year.
(2) As the Rice Price Support Program was introduced in the later years (especially beginning 1972), the amplitude of fluctuation was reduced.

over the entire year is $(s-m)/2$. His total expected capital gains is $v.(s-m)/2$. On the other hand his total cost is composed of two parts, fixed cost $(w.n)$ and variable cost $(c.s)$, where n is the number of rice-selling transactions which in turn can be expressed by the marketable rice surplus over the one-time selling volume of rice (that is s/m).

Then our representative farmer's problem is reduced to a maximization problem of the net gains (E) or the difference between his total capital gains and total cost with the one-time selling volume as his decision variable:

(2) Maximize $E=v.(s-m)/2-(w.s/m+c.s)$

The optimizing rule is given by the first order condition of (2):

(3) $dE/dm=v/2+w.s/m^2=0$

The optimum one-time selling volume of rice (m^*) is:

(4) $m^* = \sqrt{2w \cdot s/v}$

The optimum lot-size of his rice-selling transaction is directly related to his marketable surplus (s) and his foregone wage rate (w) while it is inversely related to the net variation in price of his crop (v). It should be noted that s and m (hence m*) are hitherto expressed in terms of physical units. The market value of m adds to cash holding. The optimum average cash holding (M*) is given by the market value of m*/2. Therefore as in the original Baumol model, the income (or marketable surplus to be exact) elasticity of demand for money is+½. The price variation elasticity of demand for money is−½. In passing, it should be added that the market value of m* increases steadily throughout the year and consequently the rice-selling transaction occurs at increasingly distant intervals.

Another point worth our remark is that v may or may not be influenced by actual or expected rate of inflation in the general price level. If it is, the case is doubly strengthened for including inflation rate in the specification of demand for money equation since the assets demand for money which is to be explained separately may also require inflation rate as one of its explanatory variables. In any case, the net variation in agricultural price should be included in the specification of transactions demand for money as a separate independent variable.

In general we may write the rural demand for transactions balances as follows:

(5) $rM^d = rM^d\,(\overset{+}{S}, \overset{-}{v}, \overset{+}{w})$:

2. *Urban Sector*

Income (Y) accrues to our representative urban worker-household monthly in cash. It is assumed that his expenditure stream is evenly spread over the entire month and that our representative urban worker saves nothing. It is also assumed that commercial banks pay interest on time and savings accounts only if deposits stay with them for more than one month period. But the ubiquitous unorganized money markets (the UMMs hereafter)[3] offer him interest for less-than-one-month loans and the interest rate is much higher than the rate in the organized money market (the OMM).

In investing into or withdrawing from the UMMs. he has to pay a fixed cost (F, for his opportunity cost of time and labour, say his shoe-soles) as well as charges increasing with the volume of

3 See Kim, Pyung Joo (1976) and Park, Yung Chul (1976) for the unorganized money markets in Korea.

transaction (let k be cost per unit of transaction). Let x be the fraction of his income Y which he lends and r be interest rate per month in the UMMs.

Then one month consists of two subperiods: (1-x) of a month when expenditure is reimbursed out of his initial cash income and x of a month-the remainder of the month-when expenditure is financed out of withdrawn loans from the UMM. Now we can borrow Harry G. Johnson's extension of the Baumol-Tobin model.[4]

Net yield in the first $(1-x)$ fraction of a month is:

$$(6)\quad E_1 = x.Y\ (1-x)r - (F + k.x.Y)$$

Gross yield in the remaining x fraction of a month is $(x.Y-M)\frac{x \cdot r}{2}$, where M is the size of loan withdrawals. Cost is $F.n + k.x.Y = \frac{F \cdot x \cdot Y}{M + k \cdot x \cdot Y}$ Where n is the number of transactions which can be expressed as x.Y/M. Thus the net yield in this subperiod is:

$$(7)\quad E_2 = \frac{(x \cdot Y - M)x \cdot r}{2} - \left(\frac{F \cdot x \cdot Y}{M} + k \cdot x \cdot Y\right)$$

Solving (7) for the optimum size of loan withdrawal, we obtain:

$$(8)\quad M^* = \sqrt{\frac{2F \cdot Y}{r}}$$

Substitute (8) into (7) and we get:

$$(9)\quad E_2^* = x \cdot Y\ \left(\frac{x \cdot r}{2} - k\right) - 2x\sqrt{\frac{F \cdot Y \cdot r}{2}}$$

This is net yield in the x subperiod, given the optimum size of loan withdrawal. Net yield of the entire month (E) is the sum of $E_1 + E_2^*$.

$$(10)\quad E = [x \cdot Y\ (1-x)r - F - k \cdot x \cdot Y] + [x \cdot Y\left(\frac{x \cdot r}{2} - k\right) - 2x\sqrt{\frac{F \cdot Y \cdot r}{2}}]$$

From this the optimum value of decision variable x is derived:

$$(11)\quad x^* = 1 - \frac{2k}{r} - \sqrt{\frac{2F}{Y \cdot r}}$$

Our representative urban worker as a maximizer of net yield

4 See Harry G. Johnson (1967).

will invest x.Y in the UMM and will withdraw M* out of it at one time at the evenly spaced intervals.

The optimum average cash holdings for the entire month (M**) is the weighted average of cash holdings in the initial period $\frac{(1-x^*)Y}{2}$ and cash holding in the remaining period (M*/2), weights being the respective fractions of the month.

$$(12)\quad M^{**}=(1-x^*)\ (1-x^*)\ \frac{Y}{2}+x^*\cdot\frac{M^*}{2}$$

$$=\frac{2k^2Y}{r^2}+(1+\frac{2k}{r})$$

Optimum average transactions balance of the urban sector varies inversely with interest rate in the UMM, and directly with income and transaction cost.

In general from, the urban demand for transactions balances may be written as follows:

$$(13)\quad uM^d=uM^d(\overset{+}{Y},\ \overset{-}{r},\ \overset{+}{k},\ \overset{+}{F})$$

Summing over the rural and urban sectors, the overall demand for transactions balances may be written as follows:

$$(14)\quad M^d=M^d(\overset{+}{Y},\overset{+}{S},\overset{-}{r},\overset{-}{v},\overset{+}{w},\overset{+}{k},\overset{+}{F})$$

In the explanation of assets demand for money, the crucial point will be the substitution between money (defined as the sum of currency in circulation and demand deposits, therefore with zero yield). time and savings deposits (with its interest, ro), loans in the UMMs (with loan yield, ru) and real assets (with capital gains, Pe). Therefore we may write the overall demand for money in a general form as follows:

$$(15)\quad M^d=M^d\ (Y,S,ru,ro,\dot{p}_e,v,w,k,F)$$

III. Summary and Conclusion

It is shown above that the explanation of transactions demand for money can be cast neatly in the socio-economic milieu of less developed countries within the conventional framework of Baumol-Tobin type of inventory-theoretic model. The primal difference lies in which asset is regarded as the closest substitute for money.

Instead of bonds, agricultural product in the rural sector and the unorganized money market loan in the urban sector may be adopted with benefit in terms of enhanced understanding among economics students of less developed countries.

Empirical studies on this line adumbrated in this paper can be under-taken when statistical data of money holdings are available separately for the rural and urban sectors.

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