"THE CHICAGO TRADITION" AND THE EMPIRICAL RELEVANCE OF THE MODERN QUANTITY THEORY OF MONEY

By YOSHINORI SHIMIZU*

I. *Two Approaches of the Classical Quantity Theory*

When we talk about the classical quantity theory of money, I. Fischer is the economist most closely associated with the approach of the famous "equation of exchange" $M_s V_t = PT$ (1). In accordance with commonly held view, Fischer supposed V_t and T to be constant thus converting the "equation of exchange" into the "quantity theory of money" which is a theory of the determination of the price level $M_s \bar{V}_t = P\bar{T}$ (2). However, he didn't believe in the constancy of the velocity in a literal sense. According to Pesek[1], Fischer thought the velocity to depend on several factors such as; $V = g\left(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, \frac{Y_c}{p}, n, p, s, v, x, y, z\right)$ (3) where Y_c=current income, n=per capita trade, p=use of check, s=frequency of receipts and of disbursements, v=regularity of receipts and disoursements, x=correspondence beweent times and amounts of receipts and disbursements, y=density of population, and z=rapidity of transportation. It means that Fischer expected proportionality between money and prices only in the special case of a purely monetary disturbance that leaves the equilibrium values of the real variables in (3) unchanged. Fischer's approach postulates that the demand for money arises as a result of an individual's need to trade with one another. It links the demand for money to the volume of trade existing in an economy at any time, and hence leads directly to a theory of the demand for money.

On the other hand, the "Cambridge" approach by Marshall and Pigou questioned what would determine the amount of money as individual would wish to hold. The emphasis is on the choice-making behavior of individuals. This approach is much more akin to an application of the general theory of demand to a particular problem than it is to a special theory of the demand for money. As far as the Cambridge approach is concerned, the principal determinants of peoples' "taste" for holding money is the fact that it is a convenient asset to have, being universally acceptable in exchange for goods and services. The more transactions an individual has to undertake the more cash he will want to hold. To this extent the approach is similar to Fischer's, but the emphasis is on *want* to hold, rather than *have to* hold. This is the basic difference between the Cambridge approach and the Fischer's framework.

Pigou simplified their model by assuming that the level of wealth, the volume of transactions and the level of income would be in stable proportions to one another over a short period. Then, other things being equal, the demand for money in nominal terms would be

* Lecturer (*Kōshi*) of Money and Banking.

[1] See B. P. Pesek [7].

proportional to the nominal level of income. $M_d=kPY$ (4) combined with an equilibrium condition $M_d=M_s$ (5), $M_s=kPY$ (6), hence, $M_s\frac{1}{k}=M_sV=PY$ (7). Here V represents the income velocity rather than the transaction velocity V_t.

What Fischer required to be constant, the institutional framework determining the technical nature of the transaction making process, might reasonably be expected not to change perceptively over short periods. Hence, his approach might be regarded as a means of providing a theory of the money that implied a constant velocity of circulation in the short run. Not so with the Cambridge economists whose emphasis was on the rate of interest and expectations, for these are the variables that one might expect to vary significantly over very short periods. The Cambridge approach called for an analysis of the variables involved before stating a formal theory of the money market based on the approach. Fischer proposed a hypothesis to the effect that the rate of interest had no significant effect on the demand for money, but one could not derive such a definite proposition from the work of the Cambridge school. Their contribution to monetary theory was precisely to call attention to the fact that such variables as the rate of interest might be important determinants of the demand for money. In this direction, two developments have been made, one was the Keynesian monetary theory and the other was the modern quantity theory.

The important implication of Keynesian theory is that the relationship between the demand for money and the rate of interest will be unstable over time, shifting around as what is regarded as a "normal" level for the rate-of-interest changes, so that the effectiveness of monetary policy and fiscal policy alike is impossible to assess on the basis of a model that treats this relationship as a stable one. Keynes turned his attention to the analysis of the motives for money holding. On the other hand, Friedman, taking for granted the fact that people do hold money carefully analyzed the factors that determine *how much* money people will want to hold under various circumstances.

II. *The Chicago Tradition*

Friedman begins "The Quantity Theory of Money—A Restatement" with the explanation that "Chicago was one of the few academic centers at which the quantity theory continued to be a central and vigorous part of the oral tradition . . . . the purpose (of this introduction) is to set down a particular "model" of a quantity theory in an attempt to convey the flavor of the oral tradition. . . ."

In his words the basic features of the quantity theory are as follows;

1. The quantity theory is in the first instance a theory of the demand for money. It is not a theory of output or of money income, or of the price level. Any statement about these variables required combining the quantity theory with some specifications about the conditions of supply of money and perhaps about other variables as well.
2. To the ultimate wealth-owning units in the economy, money is one kind of asset, one way of holding wealth.
3. The analysis of the demand for money on the part of the ultimate wealth-owning units in the society can be made formally identical with that of the demand for a consumption service. As in the usual theory of consumer choice, the demand for money (or any

other particular asset) depends on three major sets of factors: (a) the total wealth to be held in various forms—the analogue of the budget restraint; (b) the price of and return on this form of wealth and alternative forms; (c) the tastes and preferences of the wealth-owing units.

From these and other considerations Friedman arrives at a demand function for money of the form $M=g\left(P, r_b, r_e, \frac{1}{P}\frac{dP}{dt}, \omega, Y; u\right)$ (8) where M is the nominal quantity of money; P, the price level; r_b, the interest rate on bonds; r_e, the interest rate on equities; $\frac{1}{P}\frac{dP}{dt}$, the rate of change of prices, hence the negative of the rate of return on money balances; ω, the ratio of nonhuman to human wealth; Y, money income; u, the variables that can be expected to affect tastes and preferences. Friedman then makes the familiar assumption that this function is homogeneous of the first degree in P and Y, and hence rewrites it as $\frac{M}{P}=f\left(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, \omega, \frac{Y}{P}; u\right)$ (9). Alternatively, dividing (8) by Y, he obtains $Y=v\left(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, \omega, \frac{Y}{P}; u\right)M$ (10). "In this form the equation is in the usual quantity theory form, where v is income velocity."

What is "the Chicago tradition" which exists behind this simplified model? Why is it "the *oral* tradition"? Before examining these basic features, we should first examine the meaning of the demand for *money*, i.e., the distinction between money and credit. The interest rate is not the price of money. The interest rate is the price of credit. The price level or the inverse of the price level is the price of money. What is to be expected from the general price theory is what the quantity theory says; namely, that a rapid increase in the quantity of money means an increase in the price of goods and services, and that a decrease in the quantity of money means a decrease in the price of goods and services. It might be identified with the classical quantity theory. Also in this direct form, the quantity theory is an application of the general price theory.

Another and more relevant meaning of the price of money is the price of holding wealth as a form of money. This price of the cost of holding money is measured by the rates of return on alternative assets. According to usual price theory,[2] the cost of any productive service to use A is the maximum amount it would produce elsewhere. The forgone alternative is the cost. The alternative uses of a resource depend upon the use for which the cost is reckoned:

i) The cost of an acre of land to the wheat-growing industry is the amount it would yield in non-agricultural uses (residences, parks and so on).

ii) The cost of an acre of land to the wheat-growing industry is the amount it would yield in other agricultural crops (oats, corn and so on).

iii) The cost of an acre of land to wheat farmer X is the amount the land could yield to other wheat farmers, as well as all non-wheat uses.

If all land were homogeneous in all relevant respects obviously all three of these alternative costs would be the same under competition. But if the land is not homogeneous, it is not necessary that these alternative costs be equal.

[2] See G. J. Stigler [9], ch. 6.

This theory of cost and production is directly applicable to the analysis of the demand for money. In this case a resource is identified with wealth and the alternative uses are the alternative forms of holding wealth. The alternative forms of holding wealth depend upon the form for which the cost is being reckoned:

i) The cost of holding a unit of wealth in a liquid asset of money is the amount the wealth could yield in other liquid forms (bonds, securities).

ii) The cost of holding a unit of wealth in a financial asset of money is the amount it could yield in other financial asset forms (equities).

iii) The cost of holding a unit of wealth in money which is simply one way of holding wealth is the amount it could yield in other alternative form including financial and real assets.

Among these, the quantity theory is based on the third and the broadest definition which is the meaning of the second basic feature pointed out by Friedman. Conversely, Keynesian theory depends on the first or second definition. If all wealth were homogeneous in all relevant respects, all three of these costs would be the same under competition and could be represented by a single variable. However, all wealth can never be homogeneous since the marginal utility of wealth is different for each individual. In (8)–(9) these are denoted by r_b, r_e, $\frac{1}{P}\frac{dP}{dP}$ which correspond the definitions of alternative forms i), ii) and iii) respectively. This is the meaning of the basic feature 3 (b).

Since r_b and r_e are nominal rates, r_b and r_e rise when $\frac{1}{P}\frac{dP}{dP}>0$. Thus the distinction between nominal and real magnitudes are crucial for the introduction of the rate of return on real assets $\left(\frac{1}{P}\frac{dP}{dt}\right)$. The failure to take explicit account of the divergence between nominal and real magnitudes means to ignore the variable $\frac{1}{P}\frac{dP}{dt}$, which is equivalent in turn to ignoring real assets as an alternative form of holding wealth. What is important is not the level of prices but their rate of change. Hence, the basic feature 2 and the distinction between nominal and real magnitudes are closely connected.

The above argument shows an aspect of the fact that the quantity theory results from the application of the general price theory to monetary problems. The price theory itself is already well known. What is important is the application of it to the analysis of monetary problems which is expressed as the third basic feature of the quantity theory. In other words, "the Chicago tradition" denotes an attitude in solving several problems through the application of price theory or supply and demand analysis. The tradition itself does not have any systematic statement and appears only in applied forms. Thus, the tradition itself has to be "the oral tradition." This tradition is best represented by G.S. Becker as follows; "The perhaps presumptuous title of *Economic Theory* is used instead of a title like *Micro Theory* or *Price Theory* because of my belief that there is only one kind of economic theory, not separate theories for micro problems, macro problems, nonmarket decisions, and so on."[3]; "Although often called partial-equilibrium analysis, a more accurate name for the supply-demand ap-

[3] See G. S. Becker [1], p. viii.

proach would be "practical general equilibrium analysis."[4]

Since the essence of "the Chicago tradition" is the application of the demand and supply analysis, the quantity theory itself is nothing but a framework of the analysis. Though the modern quantity theory is more developed than the classical quantity theory in the sense that it includes the classical one as a part of it, the variation of the velocity might or might not be important depending on the periods and objectives of the analyses. Thus an empirical analysis plays an critical role in drawing conclusions about the real world. This is the reason why monetarists seem to put emphasis on empirical studies rather than sophistications of their theory. In this sense, the quantity theory is Chicago's oral tradition and the policy conclusion is mainly based on the results of their empirical researches. Hence, in Friedman's own words "the Chicago tradition was not a rigid system, an unchangeable orthodoxy, but a way of looking at things."[5]

III. *Empirical Analysis of the Velocity Function*

As noted above, the crucial difference between Keynesian theory and the quantity theory exists in the scope of alternative assets of money and the stability of the demand for money function. The scope of alternative assets is wider in the quantity theory because it takes account of the substitutability of money with real assets, represented by the variable $\frac{1}{P}\frac{dP}{dt}$. In empirical studies, however, this important variable has not been introduced explicitly. If the variable $\frac{1}{P}\frac{dP}{dt}$ is not significant, the substitution should be understood to occur only among financial assets and the theoretical consideration of real aseets has no practical meaning. In that case, the actual difference between the two approaches is merely reduced to the difference in the magnitude of the income or interest elasticities. In order to examine the empirical relevance of important characteristics of the quantity theory noted in the above section, we have to measure the possible substitutability between money and real assets.

Here, we encounter a serious problem since due to the Fischer effect the expected rate of inflation which represents the return on real assets is implicitly involved in the level of market interest rates. Therefore, the inclusion of the expected rate of inflation to the explanatory variables in addition to market interest rates introduces the problem of multicollinearity. In what way, then, should we measure the substitutability between money and real assets? One indirect way is to examine the substitutability of money with a representative kind of real asset instead of real assets in general. What kind of real asset is suitable as a representative real asset? Fortunately for the study, in Japan people have taken it for granted that land is a very profitable form of holding real wealth. It is well known, for example, that during the period of excess money supply prior to the rapid inflation of 1973–4, firms with excess money stock rushed out to buy land, and created a situation which led to the subsequent period of enormous inflation. In fact, the rate of increase in land price in Japan

[4] See G. S. Becker [1], p. 5.

[5] See M. Friedman [2], p. 3.

has consistently been much higher than the rate of inflation.

Therefore, in the following empirical analysis we assume land as the representative real asset in Japan. In order both to avoid the above mentioned multicollinearity and to concentrate our attention on the substitutability of money with land, we use the rate of increase in relative land price as the expected rate of return on land holding, namely, the rate of change in (land price index / WPI). One point which should be noted here is that the critical variable $\frac{1}{P}\frac{dP}{dt}$ stands for expected rate of price increase in real assets and does not include the prices of services which cannot be substituted for money as a form of holding wealth. In empirical studies, therefore, we have to use the WPI rather than the CPI or the implicit deflator. Since the point of our analysis is to measure the substitutability of money with real assets, we aggregate equity and bond as financial assets and use a single variable as the expected rate of return on financial assets.

In the empirical examination of this relationship we use the velocity function: $Y/M=v\left(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, \omega, \frac{Y}{P}; u\right)$ (11). In this formulation, we can avoid seasonal variations of the quarterly data. The fitted regression equation is

$$\log v=\alpha+\beta_1 \log y+\beta_2 \log (P_L/\dot{\text{WPI}})+\beta_3 \log r+\varepsilon \tag{12}$$

where y is the real GNP, P_L; land price index; r, average contracted interest rates on loans an discounts of all banks. As noted above $(P_L/\dot{\text{WPI}})$ is the proxy variable for $\left(\frac{1}{P}\frac{dP}{dt}\right)$. β_1 and β_3 show the income elasticity and the interest elasticity of the velocity, respectively. The expected values are $\beta_1 \lesseqgtr 0$ as $\eta_{M\cdot y} \gtreqless 1$, where $\eta_{M\cdot y}$ denotes the income elasticity of the demand for money, $\beta_2>0$ and $\beta_3>0$. The period of the analysis is 18 years, using the quarterly data from the first quarter of 1956 to the fourth quarter of 1973.

The results are as follows:

Regression I

$$\log v=13.2763-0.1689^* \log y+0.0444^* \log (P_L/\dot{\text{WPI}})+0.2009 \log r$$
$$(-8.37) \qquad (3.88) \qquad (1.02)$$
$$\bar{R}_2=0.848 \quad D-W=0.322 \quad F=132.7$$

Regression II

$$\log v=23.5779-0.1856^* \log y+0.0485^* \log (P_L/\dot{\text{WPI}})$$
$$(-15.78) \qquad (4.54)$$
$$\bar{R}_2=0.848 \quad \text{D}-\text{W}=0.329 \quad F=198.42$$

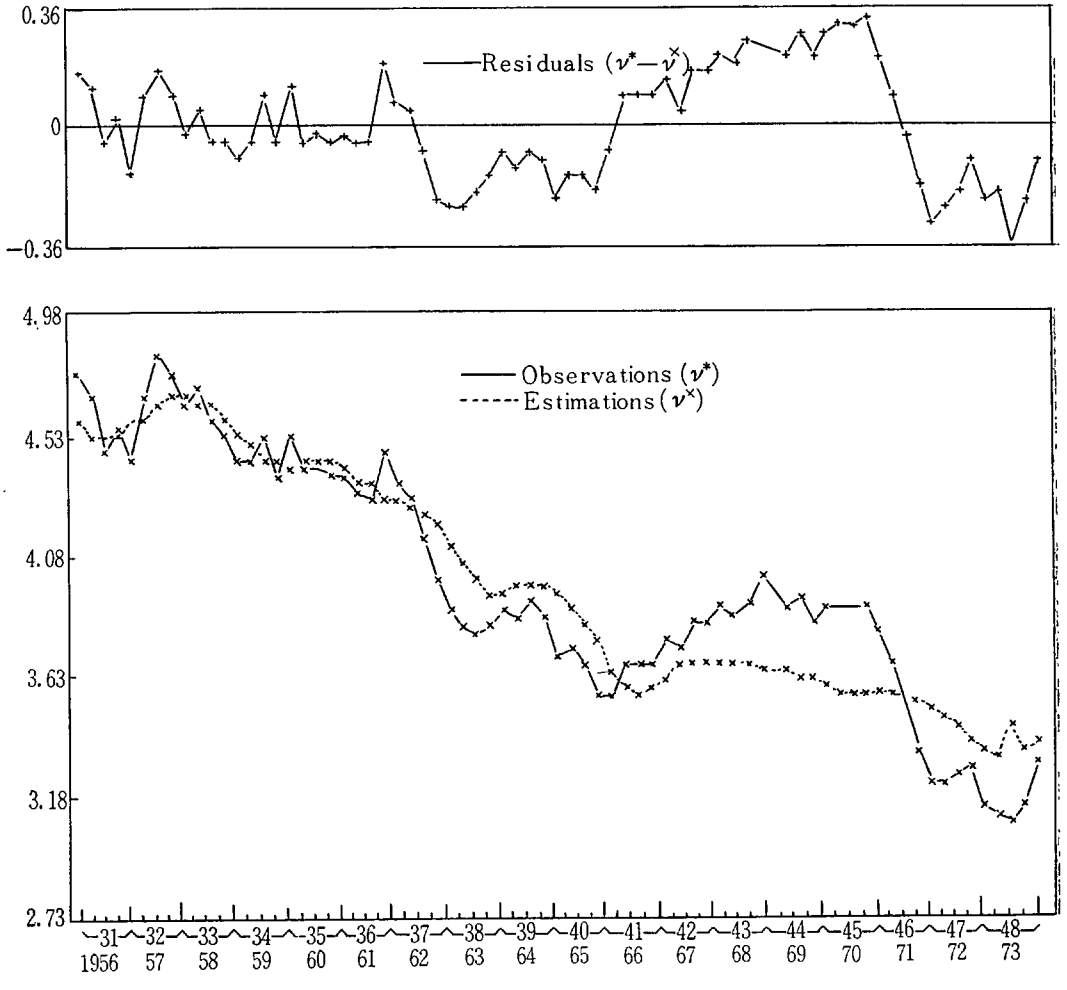
*: significant at the 5% level, ( ): t-value.

β_1 is negative and highly significant, indicating that the velocity falls by 0.169% for a 1% increase in real GNP. If the real GNP rises 7% per annum, the velocity falls by 1.183% each year. This implies that money is a luxury and that the income elasticity of money is a little more than unity, which coincides exactly with Friedman's result. β_2 is positive and also significant at the 5% level as expected. The velocity rises by 0.044% for a 1% increase in $(P_L/\dot{\text{WPI}})$. If this variable rises about 20% per annum which is not unusual in Japan, the effect of the rise in GNP would be completely offset. Significance of this coefficient implies a considerable substitutability between money and land as a representative real asset. β_3 is positive

as expected but not significant at the 5% level. In order to say something about this variable, we have to examine the relationship using definitions of money or interest rates other than those we employed here. Regression II is a similar regression excluding the insignificant interest rate variable. This result is essentially identical with that of Regression I except that, as expected, the value of β_1 and β_2 and each t- value is higher than in Regression I.

The residuals ($v^*-v^\times$) in Fig. 1 indicate divergences between Peoples' desired velocity $v^\times$ and the actual velocity v^* which realize *ex post* in relation to the actual supply of money. Therefore, a period of positive residuals (1966–70) should be understood as a period of "deficient liquidity" during which time the actual money supply is less than desired, while a period of negative residuals (1972–73) denotes a period of "excess liquidity" in which the actual money supply is greater than desired. These behavior of residuals had important

FIG. 1



effects on the rates of inflation in subsequent periods with time lags of one or two years. During 1966–72, the WPI had been relatively stable and especially during Jan. 1971–Aug. 1972 when the rate of increase in the WPI had been negative. On the other hand, during 1973–74 we experienced an enormous rate of inflation.

According to the above examination, we could conclude tentatively that money and real assets are considerably substitutable and hence the expected rate of inflation would be an important variable in the demand for money function. Thus, we might be able to find a stable demand function for money in Japan by carefully choosing explanatory variables or data which might be used to predict the movement of the price level and to guide the policy of money supply.

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