Demand for Money, Interest Rates and Income Taxation [*]

Introduction

One of the central problems of modern monetary theory, and perhaps *the* central problem, is the determination of how much money people will choose to hold under alternative situations. Much of the recent literature dealing with the determinants of the demand for money has followed the Keynesian lead in assuming that the role of interest has something to do with it. There has thus been a good deal of discussion concerning the choice of the relevant rate (or rates) to be used [see, for example, Meltzer, 1963]. The proper choice of such a rate (or rates) is important in the empirical evaluation of the interest elasticity of the demand for money. It is generally assumed that the demand for money is inversely related to the relevant rate of interest. The quantitative estimation of the elasticity is left to the empirical work to determine.

Of course, if, as Friedman seems to imply [Friedman, 1956], the interest elasticity of the demand for money, under normal circumstances, is very low or even zero, then, it does not make much difference which rate of return, on assets other than money, is chosen. In such case the basic influence on the demand for money will be income, and the long-run change in income velocity may be attributed to the "luxury" nature of the commodity called money [Friedman, 1959]. However, if, as the "Keynesians" maintain, the rate of interest is an important explanatory variable of the demand for money (or income velocity), then, it is important to choose a rate which, in fact, reflects the net returns from holding assets other than money. This will be particularly so when the

empirical model is trying to find historical relationships for periods which may extend over long periods of time.

This paper will maintain that the empirical work that has tried to establish a relationship between the demand for money and the rate of interest has not used a truly relevant rate. It will show that, when the proper modifications are made, there appears to be a somewhat higher statistical relationship between the variables; consequently, the interest elasticity of the demand for money becomes greater.

The approach that will be followed is similar to the one used by Latané in his two well-known articles dealing with the topic [Latané, 1954, 1960]. The paper will consist of three sections. The first will discuss the general hypothesis to be tested empirically. The second will present the data needed for its testing. The third will present the empirical results and draw some conclusions. The whole testing will be done within the context of the United States for which country the data are available.

I. Demand for Money and Income Taxation

When it is argued that the demand for money on the part of economic units is affected by the rate of interest, it should be obvious that the rate that is relevant to them is the one reflecting the *net* rather than the gross yield. It is then strange to realize that, to my knowledge, there has been no reference in the literature to the fact that the rate of return which affects the economic unit is the after-tax rather than the market rate. No theoretical study seems to have specifically discussed this aspect and I was not able to find any empirical study that has taken account of the tax factor.[1] Friedman, for example, when in his basic article on the demand for money gets to the point of aggregating the individuals' preferences, writes that: " the result, in principle depends on the distribution of the units by the several variables. This raises no serious problem about P, r_b, and r_e for these can be taken the same

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[1] One reference to taxes is found in [Duesenberry, 1963] but it relates to the effect of taxes on the cash flow of corporations rather than on rates of return. Recently, I have seen a reference to a book by Giuseppe Campa entitled *Imposte, Domanda di Moneta e Saggio di Interesse* (Milano: Giuffré, 1967). From the title of this book, I would guess that it bears on the subject under discussion. Unfortunately, I have not had an opportunity to see the book itself so that I am unable to comment on it.

for all ... " [Friedman, 1956, p. 14]. This, however, is not true if a *progressive* income tax is in existence since the rate of return on bonds, r_b, and on equities, r_e, will be different among taxpayers depending on their marginal tax rate which obviously depends on their position on the income distribution.

The income tax, especially if progressive, may be expected to influence the choice of the assets in the balance-sheet equilibrium of economic units; thus, a realistic model must take this factor into account. The equilibrium which can be expected to emerge *cum* income tax is likely to differ from the one that would result *sine* income tax.

The reason for this is that the utility derived from keeping one's wealth in the form of money (defined here as currency plus demand deposits) is not subject to the tax: on the other hand the yields from the other assets are subject to a tax with marginal rates which at times in the United States have exceeded 90 per cent. A 90 per cent marginal tax rate means that the net yield that is received by the economic units in the top income brackets is only 10 per cent of the market rate; this is hardly an effect that can, or should, be ignored. Thus, it is obvious that, *ceteris paribus*, the imposition of an income tax will make money more attractive to hold relatively to other assets. That is, it ought to lead to a portfolio with a greater share of money than it would have contained had there been no income taxes. *Ceteris paribus,* it should, thus, be associated with a decrease in velocity.[2]

The size distribution of money holdings is reported to be very uneven in the United States. [See Latané, 1960]. If, as it is very likely, there is a substantial rank correlation, at least for the household sector, between money holdings and levels of income, the marginal income tax rates for the owners of some of these large balances must be relatively large. Thus, the difference between market and after-tax rates of return on various assets must be quite substantial. If, then, the demand for money is sensitive to changes in the relative rates of return, the income tax factor ought to be taken into consideration since it can be expected to play a significant role.

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[2] One could also add that high marginal tax rates are likely to encourage tax evasion. To the extent that cash is more difficult to trace than other assets, the demand for cash would consequently increase. This factor, however, is probably not too important although, of course, its magnitude cannot be estimated.

While the hypothesis presented above provides a fairly good explanation of the behavior of economic units that are lenders, a few additional comments are in order for the units that are borrowers, including most corporations. If these units are corporations, or if they are households which itemize their tax returns — that is, if they do not use the standard deduction — they have the option of treating the interest payment as a cost and can thus deduct it from their taxable income. Given the level of income, the higher are the tax rates, the more attractive borrowing becomes, since the interest costs are shared with the tax authorities. This may have several consequences. First, it may lead to smaller cash holdings on hand since the attractive option of borrowing is always there and thus the need to hold cash decreases. Secondly, it may, on the other hand, increase the demand for the Keynesian " finance " since the net cost of holding borrowed funds is now lower due to the high marginal tax rates. In other words, the borroweres may become less careful as to when to borrow and may anticipate some borrowing. Thirdly, over a period of time, it is likely that the range of financial assets that may compete with money in satisfying the liquidity needs of the economic units increases. Fourthly, there will be a demand for money necessitated by the recurrent repayments of the debts. All of these alternatives are possible; but it is not clear to what an extent they may change the results that one would expect from the basic hypothesis presented above.

The Federal income tax was introduced in the United States in 1913. After 1913, the nominal rates were generally increased reaching extremely high levels during and immediately after World War II. If the demand for money is in fact interest elastic, an increase in tax rates, by reducing the *net* yield on assets other than money, would lead, *ceteris paribus,* to an increase in the demand for money over that period and, thus, to a decrease in its velocity. This is reported to have happened historically [Friedman, 1959; Klein and Kosobud, 1961]. Thus the tax factor becomes a candidate in supplying an explanation or at least part of one for this phenomenon.[3]

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[3] Professor Friedman attributes this trend to the " luxury " nature of money, Latané to the fall in the market rates of interest.

Not only tax rates but also the methods of tax payment ought to be considered in an empirical investigation of the factors that affect the demand for money. Between 1913, when the U.S. income tax was introduced, and 1942 there was no withholding at the source of the tax payment. Rather, federal income taxes were paid in quarterly instalments in the year that followed the receipt of income. Thus, it was necessary for the taxpayers to make provision for the money needed to meet the tax obligation when the time came.

In 1943, the law was changed to reflect the principle that taxes ought to be paid at the same time when the income is earned. Thus for wages and salaries the method of withholding at the source was introduced according to which taxes on these incomes are withheld by the employers. For other incomes there are quarterly instalments based on an estimate of the tax due and paid during the same year when the income is received. The net effect of these changes should be to reduce the demand for money. In fact while up to 1942 receivers of incomes from wages and salaries had to set aside money for the payment of the tax — or at least had to invest in assets which could be safely, cheaply and quickly converted into cash — after 1942 this was no longer necessary. In conclusion it can by maintained that, *ceteris paribus,* the demand for money should have decreased after 1942.[4]

To test the hypothesis introduced in this section it is necessary to rerum some money demand equations taking into account the tax level as well as the method of tax payment. The latter will be taken into account by the use of a dummy variable which separates the 1913-42 period from the following period when the withholding method was in effect. The tax level can be taken into account either through the adjustment of the yield on assets or through the use of an additional variable to reflect the tax rates. The results are shown with both of these alternatives.

In the following section, I will outline the data used since some of them are not easily available. The period covered in the testing is 1914-1966. 1914 was chosen as the initial year because it was the first year during which the income tax was in effect and also

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[4] W. J. Baumol's model, outlined in " The Transactions Demand for Cash - An Inventory Theoretic Approach ", *Quarterly Journal of Economics,* 66, November 1952, provides a convenient framework to understand this change in the demand for money due to the timing of payments.

because it becomes much more difficult to get the needed series beyond that period. 1966 was chosen as the terminal year because it was the last year for which the basic data needed for the introduction of the tax variable were available.

II. Presentation of Data

Table 1 gives the data that will be used to test the influence of the tax factor on the demand for money.

M_1 is currency held by the public plus demand deposits at commercial banks. For the 1914-58 period, these data were taken from Milton Friedman and Anna J. Schwartz, *Monetary Statistics of the United States* (New York: National Bureau of Economic Research, 1970, Table 1). For the 1959-66 period the data in our table are very slightly different from those in Friedman and Schwartz; for these years the source was the Board of Governors of the Federal Reserve System. In both cases the data refer to December of each year and are seasonally adjusted.

The data for gross national product (GNP) were obtained from the *Economic Report of the President* and from U. S. Department of Commerce, *Long Term Economic Growth, 1860-1965* (Washington: U. S. Government Printing Office, 1966), pp. 166-167. They are shown at current prices.

The rate of interest, r, used is the annual yield on long-term prime corporate bonds. For the 1914-19 period the source is *Durand Basic Yields of Corporate Bonds* as reported in Sidney Homer, *A History of Interest Rates* (New Brunswick: Rutgers University Press, 1963), p. 341. For the period after 1919, it is Moody's Aaa. These data are available from *Moody's Bond Survey* and from *Moody's Industrial Manual*.

The data for the average tax rates on interest incomes, t, were obtained, for the 1914-1958 period, from Appendix B of Colin Wright's study "Saving and the Rate of Interest", published in Arnold C. Harberger and Martin J. Bailey, eds., *The Taxation of Income from Capital* (Washington: The Brookings Institution, 1969). This series was extended after 1958 by the author using Wright's method.

Wright's method, which requires a lot of tedious calculations, can be described very briefly. Let B indicate total interest income

Year	M_1 ($ Bil.)	GNP ($ Bil.)	$\frac{GNP}{M_1}=V$	r	t	R = r-r.t
1914	11.8	38.6	3.27	4.11	0.0179	4.04
1915	13.6	40.0	2.94	4.18	0.0179	4.11
1916	15.8	48.3	3.06	4.10	0.0317	3.97
1917	18.5	60.4	3.26	4.41	0.1147	3.90
1918	21.0	76.4	3.64	4.82	0.2143	3.79
1919	23.7	84.0	3.54	5.44	0.1819	4.45
1920	23.4	91.5	3.91	6.12	0.1423	5.25
1921	20.9	69.6	3.33	5.97	0.1116	5.30
1922	23.1	74.1	3.21	5.10	0.1165	4.51
1923	23.2	85.1	3.67	5.12	0.1016	4.60
1924	24.6	84.7	3.44	5.00	0.0743	4.63
1925	26.3	93.1	3.54	4.88	0.0749	4.52
1926	25.7	97.0	3.77	4.73	0.0792	4.36
1927	26.0	94.9	3.65	4.57	0.1417	3.93
1928	26.7	97.0	3.63	4.55	0.0919	4.14
1929	26.7	103.1	3.86	4.73	0.0969	4.28
1930	25.3	90.4	3.57	4.55	0.0793	4.47
1931	22.3	75.8	3.40	4.58	0.0719	4.25
1932	20.8	58.0	2.79	5.01	0.1440	4.29
1933	20.2	55.6	2.75	4.49	0.1424	3.85
1934	23.3	65.1	2.79	4.00	0.1551	3.38
1935	27.6	72.2	2.62	3.60	0.1630	3.01
1936	31.4	82.5	2.63	3.24	0.1760	2.67
1937	29.6	90.4	3.05	3.26	0.1725	2.70
1938	32.4	84.7	2.61	3.19	0.1443	2.73
1939	36.8	90.5	2.46	3.01	0.1527	2.55
1940	42.9	99.7	2.32	2.84	0.1679	2.36
1941	49.0	124.5	2.54	2.77	0.2471	2.09
1942	63.3	157.9	2.49	2.83	0.3472	1.85
1943	80.5	191.6	2.38	2.73	0.3663	1.73
1944	91.3	210.1	2.30	2.72	0.4359	1.53
1945	103.0	211.9	2.06	2.62	0.4464	1.45
1946	108.4	208.5	1.92	2.53	0.4339	1.43
1947	113.1	231.1	2.04	2.61	0.4308	1.49
1948	111.5	257.6	2.31	2.82	0.3711	1.77
1949	111.2	256.5	2.31	2.66	0.3487	1.73
1950	116.2	284.8	2.45	2.62	0.3740	1.64
1951	122.7	328.4	2.68	2.86	0.3495	1.86
1952	127.4	345.5	2.71	2.96	0.3155	2.03
1953	128.8	364.6	2.83	3.20	0.3710	2.01
1954	132.3	364.8	2.76	2.90	0.3473	1.89
1955	135.2	398.0	2.94	3.06	0.3532	1.98
1956	136.9	419.2	3.06	3.36	0.3566	2.16
1957	135.9	441.1	3.25	3.89	0.3364	2.58
1958	141.1	447.3	3.17	3.79	0.3334	2.53
1959	142.6	483.7	3.39	4.38	0.3478	2.86
1960	141.7	503.7	3.55	4.41	0.3622	2.81
1961	146.0	520.1	3.56	4.35	0.3175	2.97
1962	148.1	560.3	3.78	4.33	0.3043	3.31
1963	153.6	590.5	3.84	4.26	0.2998	2.98
1964	160.5	632.4	3.94	4.40	0.2771	3.18
1965	168.0	684.9	4.08	4.49	0.2648	3.30
1966	171.7	749.9	4.37	5.13	0.2667	3.76

Sources: See Text

as reported in the annual issues of the U. S. Treasury Department, Internal Revenue Service, *Statistics of Income*. Let bi indicate the amount of interest income in the ith class. Let $Wi = \dfrac{bi}{B} =$ proportion of total interest income contained in the ith income class. Let ti indicate the marginal tax rate in the ith income class. Then the average tax rate applicable to interest income is

$$t = \sum_{i=1}^{n} Witi.$$

III. Empirical Results and Conclusions

As a first step, a Latané-type of relationship was tested using the unadjusted rate of interest shown in the table [Latané, 1954 and 1960]. In this the velocity of money $(V = GNP/Mi)$ is made a dependent variable while the rate of interest r is the independent variable. The equation obtained for the 1914-1966 period was:

(1) $V = 1.03457 + 0.521561r$ $R^2 = 0.7267$
            $(0.18048)^*\ (0.044783)^*$

The equation shows that the interest rate, by itself, "explains" statistically more than 72 per cent of the total variation. The star indicates significance at the one per cent level. It should be emphasized that the relationship shown in equation (1) refers to the whole 1914-1966 period, *with no years excluded*. Thus both depression and war years are included. A scatter diagram indicated that the relationship would improve if the "abnormal" years — 1921, 1932, 1933, 1945, 1946 and 1947 — were excluded. This exclusion could not be justified on any valid ground so that it was decided to include the whole period.[5]

As a test of the capacity of taxation to affect the velocity of money I correlated, next, the velocity of money with t, that is

[5] The use of logarithms brought about a marginal increase in the R^2 in equation (1) but provided no improvement in the other relationships.

with the average tax rate applicable to interest income. As it was argued in the first section, a high tax rate would, *ceteris paribus*, induce larger money holdings since the utility derived from holding money is not taxed while the yield derived from holding bonds is taxed. Thus, if the dependent variable is velocity, one would expect a negative sign for t. The equation for the 1914-1966 period was:

(2) $V = 3.57480 - 2.21978t$ $R^2 = 0.1889$
            $(0.16856)^*\ (0.64413)^*$

Equation (2) shows that velocity and tax rate are statistically related; the tax rate, by itself, "explains" 19 per cent of the total variation. Although this is only about one fifth of the total, the negative sign is as expected and the statistical significance is at better than the one per cent level.

The next step was to rerun the Latané-type of equation with the addition of the tax factor. This, as it was argued, includes not only the tax rate, t, but also the dummy variable, d, to account for the change in method of payment that took place in 1943. As it was indicated above, the tax level can be taken into account either through the adjustment of the yield on bonds, in order to net out the effect of taxes, or through the use of an additional variable to reflect the tax rates. In the first case, the tax variable does not enter directly but it is used to obtain a net-of-tax average rate of interest R (which is shown in the table). In the second case the tax variable t is entered directly in the equation.

The equations so obtained are shown below:

(3) $V = 0.8785 + 0.6024\ R + 0.7278d$ $R^2 = 0.8454$
        $(0.28023)^*\ (0.06321)^*\ (0.12792)^*$

(4) $V = 1.0054 + 0.53121r - 1.77137t + 0.67059d$ $R^2 = 0.8020$
        $(0.30095)^*\ (0.05206)^*\ (0.80835)^*\ (0.17662)^*$

These are our basic equation. They show that the addition of the tax factor makes a rather appreciable difference. We are now capable of explaining statistically between 80 and 85 per cent of the

total variation on the part of the velocity of money. Once again the signs are the right ones and the coefficients are significant at the one per cent level. Given the length of the period covered, and given the fact that no " exceptional " year was left out as it is often done in this type of analysis, these are indeed good results which can be helpful in guiding economic policy.

In summary this paper has attempted to show through the empirical testing of a simple hypothesis that the basic " Keynesian " relationship that attempts to make the change in the demand for money a function of the rate of interest can easily be improved upon. In particular, as a contribution to the limited area of economics that analizes the relationship between monetary and fiscal policy, it has been shown that the income tax has, in the case of the United States, played a not too insignificant role in the determination of the demand for money. The rather obvious policy implication of the analysis is that, assuming that everything else remains the same, the monetary authority ought to increase the supply of money whenever an income tax is introduced or whenever the rates of this tax are increased. Obviously, the opposite should be done whenever the rates of this tax are reduced.

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