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A MODEL OF INTERRELATED DEMAND FOR ASSETS BY HOUSEHOLDS*

BY PAUL WACHTEL

The interrelated model, a multi-asset generalization of the partial adjustment model, is derived within a cost-minimization framework. It is applied to durable goods, liquid assets, consumer credit holdings, and consumption, an asset with a depreciation ratio of one. The model is estimated with quarterly data for the 1953–1967 period and provides estimates of equilibrium income, interest rate, and rental price elasticities. Distributed lag patterns and the effect of disequilibrium in money balances on household behavior are examined.

Although consumer demand theory always emphasizes the relationships among assets, econometric studies are frequently restricted to a single asset. In this paper a model that emphasizes the joint determination of household demand for assets is suggested and estimated.[1] The model is a generalization of the partial adjustment model for stocks of goods and is applied here to a group of closely related assets and consumption demand.

The interrelated demand model provides the usual estimates of price and income elasticities, but also sheds light on several other aspects of household behavior. In particular the model will help determine whether disequilibria in asset holdings are related, the extent of price effects on other assets, and the speed of asset adjustments to equilibrium. Of particular interest is the role of money, since the effect of changes in money balances held by households on their expenditures is not fully understood. By considering consumption goods as assets, the intra-portfolio adjustments can be compared with the income allocation decisions made by the household.

There are several reasons why net investment does not bring stocks to their current equilibrium instantaneously: First, there are increasing pecuniary and nonpecuniary costs to changing the level of assets held, as well as to being out of equilibrium, in terms of foregone earnings or the additional cost of alternative resource uses. Secondly, changing asset levels involves information costs about markets as well as transactions and search costs. These are very common in the case of imperfect second-hand markets for consumer durables. Also, in the capital investment literature it is common to cite delivery and putting-in-place lags; these may also occur in the household sector where immediate delivery may only be available at higher costs. Finally, lagged adjustments by households can be expected because of habit persistence. The consumer may have a distaste for change that causes him to delay the adjustment to income and price changes.

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[1] For similar applications see Nadiri and Rosen [7], Brainard and Tobin [1], and Motley [6].

The model generalizes the familiar partial-adjustment model by including cross-adjustment effects. That is, disequilibrium in one sector affects the adjustments being made simultaneously in other sectors. These interrelationships are not unexpected in the household sector where, for example, an increase in tangible asset holding is necessarily accompanied by a decline in liquid balances or an increase in liabilities.

At a given level of wealth, portfolio equilibrium requires shifting of assets because of rate of return changes. In addition, the desired level of wealth holding changes continuously. Thus, the household sector is simultaneously making decisions on two levels: the allocation of income and the allocation of wealth. Most econometric models of the household sector concentrate on the former, while portfolio models concentrate on the latter. However, the decision processes are not independent; the model used here is a suggested synthesis of approaches. The importance of such a synthesis should be obvious to anyone who suggests that the household sector responds to changes in its money balances.

THE MODEL

The model is derived by minimizing a quadratic cost function.[2] The derivation is based on a two asset example, but can be readily generalized. The household incurs costs in adjusting its level of asset holding (X_1 and X_2) to the desired or target levels (X_1^* and X_2^*) as shown by (1).

$$\begin{aligned} C_t = {} & \alpha_1(X_{1t}^* - X_{1t})^2 + \alpha_2(X_{1t} - X_{1t-1})^2 + \alpha_3(X_{2t}^* - X_{2t})^2 + \alpha_4(X_{2t} - X_{2t-1})^2 \\ & + \alpha_5(X_{1t} - X_{1t-1})(X_{2t}^* - X_{2t-1}) + \alpha_6(X_{1t}^* - X_{1t-1})(X_{2t} - X_{2t-1}). \end{aligned} \tag{1}$$

The cost of disequilibrium coefficients (α_1 and α_3) and the cost of asset change coefficients (α_2 and α_4) are positive. The coefficients of the interaction terms, which are the product of net investment in one asset and disequilibrium in the other, can be of either sign. The quadratic form is chosen because it implies increasing costs of disequilibrium and of asset change. However, it also implies symmetry between investment and disinvestment, which may not be desirable.

Solving the first order conditions for a minimum of (1) with respect to X_{1t} and X_{2t} yields the interrelated model (2):

$$\begin{aligned} X_{1t} - X_{1t-1} &= \frac{\alpha_1}{\alpha_1 + \alpha_2}(X_{1t}^* - X_{1t-1}) - \frac{\alpha_6}{2\alpha_1 + 2\alpha_2}(X_{2t}^* - X_{2t-1}) \\ X_{2t} - X_{2t-1} &= \frac{-\alpha_5}{2\alpha_3 + 2\alpha_4}(X_{1t}^* - X_{1t-1}) + \frac{\alpha_3}{\alpha_3 + \alpha_4}(X_{2t}^* - X_{2t-1}). \end{aligned} \tag{2}$$

The model can be rewritten in matrix form as (3), where $[X_t]$ is a vector of assets, B the matrix of adjustment coefficients, $[U_t]$ an error term, and the desired asset

[2] Eisner and Strotz [2] used this procedure to derive the partial adjustment model. See also Zellner [8] and Lucas [5].

levels are given by $[X_t^*] = A[Z_t]$, where $[Z_t]$ is the vector of arguments of the long-run target demand functions and A a coefficient matrix.

$$[X_t] = A[Z_t] + (I - B)[X_{t-1}] + [U_t]. \tag{3}$$

The matrix of adjustment coefficients, B, is derived from the cost coefficients in (2). Therefore, it is expected that the own adjustment coefficients (the diagonal elements of B) will be between 0 and 1, depending on the speed of adjustment. The coefficients can also be interpreted as a measure of the relationship between assets in the short run. A negative cross adjustment coefficient indicates that an excess demand[3] for that asset leads to a decline in holdings of the other asset. The relationships need not be symmetric because assets differ in their liquidity. For example, it may well be expected that an excess demand for durables leads to the spending of money balances, but it would be most surprising to find that households build up their money balances by liquidating durable stocks.

The system of difference equations (3) can be solved for the equilibrium (4)

$$[\bar{X}] = B^{-1}A[\bar{Z}] \tag{4}$$

by putting $[X_t] = [X_{t-1}]$. The impact coefficients and the effects on stocks in succeeding quarters are given by the coefficients of the matrices A, $(I - B)A$, $(I - B)^2A$ . . . the sum of these lagged effects will be the equilibrium solution if the modulus of the characteristic roots of the $(I - B)$ matrix is less than one in absolute value: the larger the roots, the longer it takes the system to approach equilibrium. The lag patterns are not restricted to be geometrically declining, as can be shown by rewriting (3) with the lag operator (L) and solving for the reduced form (5). Each equation of the reduced form

$$[X] = (I - (I - B)L)^{-1}A[Z] \tag{5}$$

is a rational distributed lag in the particular asset, in which the order of the lag is determined by the number of assets.

Similar models have been derived by Lucas [5] and have been used by Brainard and Tobin [1] in simulations. Lucas maximizes utility subject to adjustment costs and investment constraints in order to derive an interrelated model where the matrix of adjustment coefficients is a function of the discount rate. The Brainard and Tobin model includes balance sheet constraints which can be simply included in the present model by minimizing the cost function, (1), subject to the constraint that $X_{1t} + X_{2t} = X_{1t}^* + X_{2t}^*$. This has been done by the author in a paper appearing in the *Proceedings of the Journal of Finance*, 1972.

Estimates of the Model

The model is estimated with four components: durable goods (automobiles, furniture, appliances, etc.), liquid assets (the broadly defined money stock), consumer credit (loans to finance durables purchases) and consumption (expenditures on nondurables and services, including imputations, plus depreciation on durables, interest payments and transfers abroad). The assumption made to

[3] Excess demand indicates that desired holdings exceed actual.

include consumption in the asset model is that the expenditure flow is gross investment in a stock which depreciates entirely in one quarter. The asset data are from the Flow of Funds of the Federal Reserve except for the durables stocks which were constructed by the author (see Juster and Wachtel [4]). All assets are in real (1958) prices per household. The equations are estimated for quarterly observations, 1953–1967.

Each equation of the reduced form is estimated by GLS with the additional assumption that its residual follows a pattern of first order serial correlation. Although the cross-equation covariances of residuals are likely to be nonzero, least squares provides efficient unbiased estimates when the independent variables are the same in each equation. This is the case, since the variables determining each desired demand, and the lagged variables enter each equation.

The elements of $[Z]$ are the determinants of desired demand. For durable goods the relevant price is the rental price (RD) or implicit value of the services of the good. It is defined as the opportunity cost of holding one's assets in durable goods: that is, the rate of return on alternative assets (RL) plus the rate of depreciation (δ), less the rate of capital gain (G), all valued at the relative price of the investment good (P), as shown in (6). The rate of capital gain is assumed to be zero in defining the rental price variable.

$$RD = P(RL + \delta - G) \tag{6}$$

The rate of return to financial assets and liabilities is the interest rate. The interest rate represents the opportunity cost of holding cash, the return to savings, and the cost of borrowing. Ideally, separate interest rates for the return to liquid assets and the costs of consumer credit should be included in the model. Neither series is readily available in quarterly time series, and both would be highly collinear in any case. Therefore, the bond rate is used to represent net interest rate effects. The appropriate form of the interest rate is the real rate rather than the nominal rate. An estimate of the rate of inflation based on a ten quarter weighted average of past rates of change in consumer prices is subtracted from the nominal rate.

Application of the Permanent Income Hypothesis suggests that both permanent and transitory income should enter the asset demand functions. If consumption is a constant proportion of permanent income, then savings is the remaining portion plus transitory income. Therefore the demand for any component of savings is a function of both transitory (YT) and permanent income (YP). The asset demand coefficients of permanent and transitory income will differ by the marginal propensity to consume out of permanent income as well as by the differential influence on the particular savings component.[4] Transitory or unexpected income is undoubtedly held in the form of money balances before the household readjusts its expenditure flows. Thus, the effect of transitory income should be felt through the effect of unexpected liquid asset holdings ("excess supply" of money) on expenditures. This may not be the case if the household makes its adjustments in less than one quarter. A trend variable (N) is also included in the

[4] Permanent income is estimated by applying the adaptive expectations model to quarterly postwar data with a trend correction. See Juster and Wachtel [4] for the data.

regression to allow for possible shifts in the utilization of assets or institutional and structural changes in demand.

The desired stock functions for the four asset model can be written as:

$$X_i^* = a_{0i} + a_{1i}YP + a_{2i}YT + a_{3i}RD + a_{4i}RL + a_{5i}N + U_i \qquad i = S, A, L, V.$$

The variables are defined in the glossary that follows Table 1. Own and other asset prices, as well as income and trend variables, appear in each function. It is expected that all permanent and transitory income coefficients are positive (i.e., a_{1i} and $a_{2i} > 0$, for all i). The expected own price effects are:

$$a_{3S} \text{ and } a_{4V} < 0 \quad \text{and} \quad a_{4L} > 0.$$

Since consumer credit and durable stocks are complementary assets, it is expected that:

$$a_{3V} \quad \text{and} \quad a_{4S} < 0.$$

The signs of the other price effects are not clear, *a priori*. The coefficients of the asset demand functions should not be confused with the regression coefficients of the model which are functions of both these coefficients and the adjustment coefficients.

Regression coefficients for the model are shown in Table 1, with the t-ratios in parentheses. At the bottom, the estimated coefficient of serial correlation is given along with the standard error of the equation. Two tests for serial correlation are given: the standard Durbin–Watson Statistic (DW) and a new Durbin statistic (D).[5]

The lower part of the table presents the equilibrium stock solutions for each asset along with the stock elasticity evaluated at the mean. Finally, the cumulative effects at the end of one year as a proportion of the total effects are shown. The effect after one year is the sum of the respective elements of the first four matrices of lag effects. The table includes a statistic labelled γ, the equilibrium rate of growth. It is the long-run trend effect and is defined as a percent of the mean level of asset holdings for the sample period. It is included because the interpretation of elasticities is complicated by collinearity of most variables with the trend term. Hence, regression coefficients are partial effects net of the trend influence. The total effect includes the trend influence which will be important when the equilibrium growth rate is large relative to the actual growth rate.

The stock elasticities are often small in magnitude. However, a small effect on stocks held does not imply a small effect on current flows because the acceleration principle applies. For example, the equilibrium elasticity of liquid asset holdings with respect to interest rates is less than 0.10 and the impact effect is of about the same magnitude. Since the mean quarterly flow of savings in the form of liquid assets is less than 2 percent of the stock, a 0.10 percent change in stock in one quarter requires a change in the flow of 50 percent. Thus a small equilibrium elasticity can imply potentially large effects on the flows. Of course, the actual change in the flow will also depend on the lagged effects of previous interest rate changes and the adjustment pattern. The immediate effect of a rise in interest rates on the flow will be partly offset by negative lagged influences because the interest rate effects on liquid assets tend to overshoot equilibrium by a large amount.

[5] J. Durbin, "Testing for Social Correlation in Least Squares Regression when some of the Regressors are Lagged Dependent Variables," *Econometrica*, Volume 38, May 1970, pp. 410–421.

An excess demand for durables leads to a building up of liquid asset stocks by the household while an excess demand for liquid assets has no effect on durables. Both effects are in accord with *a priori* expectations. Households build up liquid asset holdings in anticipation of future expenditures for durable goods. Similarly, durable goods are fixed assets which can only be liquidated at fairly high cost and therefore it is not expected that durables would be sold to reach a desired liquidity position.

The most interesting set of adjustment coefficients in Table 1 is found in the liquid assets equation because of the pivotal transactions role of money. A planned increase in durables stock has a positive effect on money holdings while a planned increase in consumption expenditures has a negative effect. The household accumulates liquid balances in anticipation of making investments in durables, but adjusts its consumption flow immediately to the new planned level by reducing money holdings as needed.

On the surface, the use of a lag model is somewhat tenuous with regard to consumption goods. There is little reason to expect increasing costs due to physical delays in adjusting consumption flows. The estimates of the model concur because the own lag coefficient is near zero. In addition, the substitution effects with the other assets are all positive but very small.

Since the rental price includes an interest rate component, a total interest rate effect may be a better measure. The total effect derived from (6) is given by:

$$\frac{dX_i^*}{d(RL)} = a_{3i}\frac{d(RD)}{d(RL)} + a_{4i} = a_{3i}P + a_{4i}$$

where P is the relative price of durables. The partial interest rate effects imply an offsetting change in the relative price or the depreciation rate.

The total interest elasticity on loans is -0.02 which is in accord with earlier expectations. The impact effect, however, is positive which may be due to increasing prices which lead to increased borrowing as protection against inflation and this price effect enters the real interest rate with a negative sign. The total interest effect on durables is small and zero on consumption. On impact both the partial and total interest rate effects in the liquid asset equation are positive. The equilibrium total interest elasticity on liquid asset holding is -0.09, the expected negative effect. This suggests that an increase in the real rate of return leads to an immediate shift into liquid assets, but only on a temporary basis, as liquid assets are largely for transactions. The rental price elasticity of durables demand is -0.56 and the adjustment is about one-fourth completed at the end of one year. The rental price elasticity on consumer credit is almost as large.

The transient response of each asset to a change in permanent income are shown in Chart 1. Cumulative response patterns which lead to the equilibrium effects can be obtained by adding up successive values on the diagrams. The patterns are consistent with expectations. The stock of durables and consumer credit adjust fairly slowly, while consumption adjustments are virtually instantaneous and liquid assets adjustments are virtually complete at the end of one year. There is a lag of one quarter before the peak consumer credit effect is reached; the largest effect for all other assets is in the quarter of impact. All assets approach the equilibrium values monotonically, except liquid assets which overshoot equilibrium

TABLE 1

FOUR ASSET INTERRELATED MODEL, 1953–1967

	S		A		L		V	
	Regression Coefficients and t-Ratios in Parentheses							
YP	0.0389	(1.1)	0.0947	(4.5)	0.3412	(2.3)	0.0064	(0.2)
YT	0.0683	(2.6)	0.0701	(4.0)	0.3387	(2.9)	0.1018	(4.3)
RD	−6.704	(1.3)	0.8327	(0.2)	−140.2	(5.7)	−3.095	(0.7)
RL	14.04	(2.4)	−1.549	(0.3)	90.58	(3.4)	5.367	(1.0)
N	−1.202	(1.4)	2.304	(4.2)	21.86	(5.7)	1.507	(1.7)
S_{-1}	0.9050	(21.3)	0.0552	(2.1)	−0.3364	(1.8)	−0.0308	(0.7)
A_{-1}	0.0152	(0.2)	−0.0575	(1.1)	0.4964	(1.6)	0.0096	(0.2)
L_{-1}	0.0023	(0.1)	0.0151	(1.2)	0.6276	(7.1)	0.0085	(0.5)
V_{-1}	0.1568	(2.2)	0.0577	(1.3)	−0.7584	(2.4)	0.8883	(12.8)
ρ	0.54		0.34		0.47		0.65	
S.E.	7.17		5.31		33.60		6.20	
DW	1.99		1.95		1.86		2.07	
D	0.04		0.21		0.07		−0.32	
	Equilibrium Coefficients and Elasticities in Parentheses							
YP	0.4422	(0.75)	0.1223	(0.55)	0.6840	(1.03)	−0.0021	(0.0)
RD	−108.1	(−0.56)	−9.478	(−0.14)	−254.6	(−1.17)	−18.09	(−0.36)
RL	166.8	(0.11)	8.971	(0.02)	85.53	(0.05)	9.343	(0.02)
RT	62.29	(0.04)	−0.192	(0.0)	−160.6	(−0.09)	−8.146	(−0.02)
γ	1.04%		1.00%		2.49%		5.03%	
	Proportion of Equilibrium Effect at End of One Year							
YP	0.34		0.88		1.15		−1.43	
RD	0.26		0.51		1.17		0.79	
RL	0.32		0.43		1.96		2.01	
RT	0.44		4.14		0.75		−0.61	
	Characteristic Roots of Adjustment Matrix							
	$0.8862 \pm 0.0795i$, 0.6604, −0.0694							

GLOSSARY OF SYMBOLS USED IN TABLE 1

Four assets of model:

- *S* = Real per household stock of durable goods at end of quarter
- *A* = Real per household consumption expenditures during quarter
- *L* = Real per household liquid asset holdings at end of quarter
- *V* = Real per household consumer credit liabilities outstanding at end of quarter

Explanatory variables:

- *YP* = Real per household permanent income
- *YT* = Real per household transitory income
- *RD* = Real rental price of durables
- *RL* = Real corporate bond rate
- *N* = Linear trend

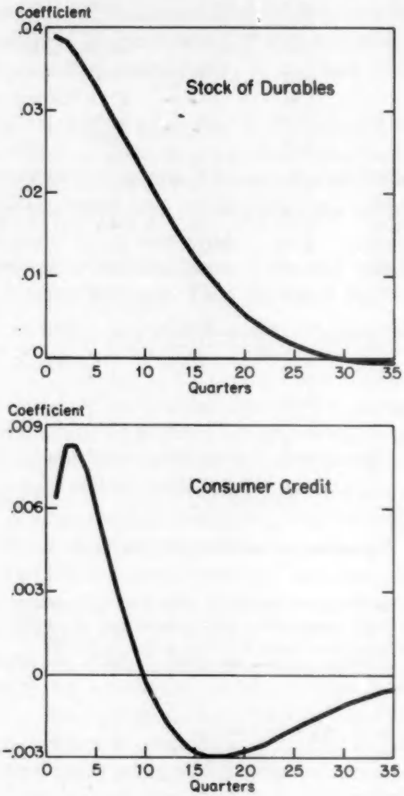
Regression statistics:

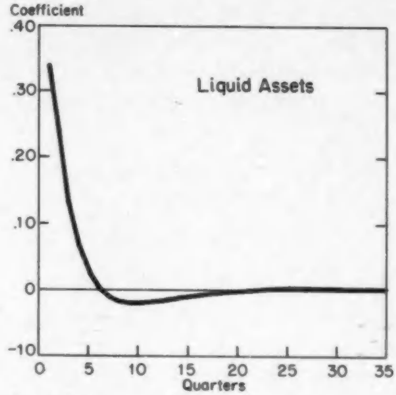
- ρ = Coefficient of serial correlation
- *S.E.* = Standard error of estimate in real dollars per household
- DW = Durbin–Watson statistic
- D = Durbin statistic

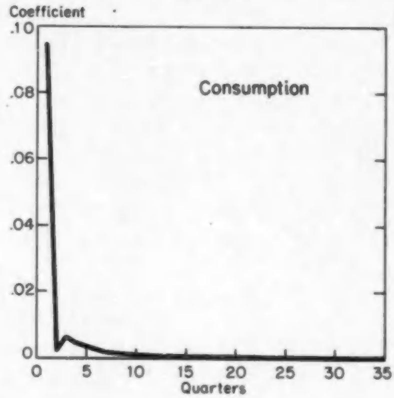
Others:

- γ = Equilibrium growth rate (see text)
- *RT* = Total interest rate effect (see text)

CHART 1
DISTRIBUTED LAG PATTERN OF PERMANENT INCOME




Coefficient
.40
.30
.20
.10
0
-10
0 5 10 15 20 25 30 35
Quarters
Liquid Assets


Coefficient
.10
.08
.06
.04
.02
0
0 5 10 15 20 25 30 35
Quarters
Consumption

after a year. The long-run income elasticities are about unity for liquid assets, 0.75 for durables, zero for consumer credit (which is largely determined by a strong trend effect), and about one-half for consumption expenditures. The approaches to equilibrium for other explanatory variables are similar but not necessarily the same.

The trend term in each equation makes the interpretation of the elasticities difficult, particularly the income elasticity. A more "traditional" estimate of the marginal propensity to consume or invest in an asset can be derived by combining effects from the net income coefficient and the trend. By assuming that the trend coefficient is entirely an income effect and by postulating a simple form to the relationship between income and trend, a total income effect can be derived. Income can be written in terms of its variation around a trend growth line:

$$Y = Y_0 e^{\alpha N} \phi$$

where α is the growth rate, N is the time trend, and ϕ is the random component. Solving for N and substituting in the asset demand equation yields a total income effect on asset demand of:

$$a_{1i} Y + a_{5i} \frac{(\ln Y - \ln Y_0 - \ln \phi)}{\alpha}.$$

Assuming the deviation from trend (ϕ) to be independent of income we find a total marginal propensity to invest of:

$$a_{1i} + \frac{a_{5i}}{\alpha Y}.$$

The short run marginal propensity to consume (at annual rates) defined in this way is 0.9192. The total long run permanent income elasticity of consumption demand is 1.03 and of durables demand 1.23. The procedure is not applied to the other assets where the trend is more likely to be a valid proxy for omitted variables.

In order to apply the model to the overall behavior of the household sector, consumption was treated as an asset with a depreciation ratio of one. If some consumption goods are really "durable," the true depreciation ratio is less than one and the model is misspecified. If this is the case, the marginal propensity to consume is underestimated. In any case, it is of interest to examine a three asset interrelated model which excludes consumption. Results are shown in Table 2.

The specification of desired demand is unchanged except that disposable income ($YD = YP + YT$) is used as a single income variable. The lag coefficients are virtually unchanged except that the lagged stock of durables appears with a small but significant coefficient in the consumer credit equation. With the exception of some insignificant coefficients in the consumer credit equation, all variables have the same short and long run effects as in the four asset model. The interrelated model exhibits a great deal of stability under changes in specification.

The lag patterns can be analyzed by comparing the impact coefficients with the equilibrium effects, and by examining the proportion of the long-run effect occurring four quarters after impact. Durables respond smoothly to changes in any exogenous variable with about one-half the total effect occurring by the end of one year. For liquid assets, both income and interest rate effects overshoot equilibrium by the end of the first year. This is consistent with the idea that liquid assets are held for transactions purposes. Households hold more than the equilibrium amount in anticipation of expenditures. For consumer credit, the rental

TABLE 2

THREE ASSET INTERRELATED MODEL

	S		L		V	
	Regression Coefficients and t-Ratios in Parentheses					
YD	0.0563	(3.1)	0.3257	(3.8)	0.0675	(4.3)
RL	14.84	(2.7)	105.9	(4.1)	5.701	(1.1)
RD	−6.671	(1.3)	−147.4	(6.1)	−3.779	(0.9)
N	−0.9127	(1.2)	21.41	(6.3)	2.917	(2.8)
S_{-1}	0.8892	(32.1)	−0.2075	(1.8)	−0.1011	(2.6)
L_{-1}	−0.0041	(0.3)	0.6394	(8.7)	−0.0067	(0.4)
V_{-1}	0.1518	(2.1)	−0.7054	(2.2)	0.8257	(10.5)
ρ	0.58		0.47		0.82	
$S.E.$	7.05		33.76		6.20	
DW	2.00		1.92		2.06	
	Equilibrium Coefficients and Elasticities in Parentheses					
YD	0.5449	(0.93)	0.6780	(0.99)	0.0451	(0.28)
RL	90.27	(0.06)	186.6	(0.11)	−26.83	(−0.06)
RD	−31.65	(−0.16)	−369.3	(−1.65)	10.87	(0.20)
γ	0.40%		6.84%		4.00%	
	Proportion of Equilibrium Effect at End of One Year					
YD	0.42		1.29		3.69	
RL	0.57		1.29		−0.26	
RD	0.69		0.92		−0.39	
	Characteristic Roots of Adjustment Matrix					
	0.8428 ± 0.1114i, 0.6688					

price and interest rate effects have different signs of impact than in the long-run. The positive short-run, or impact, interest rate effects are difficult to explain except as a consequence of the shifting of assets into durables leading to additional borrowing.

The equilibrium growth rate is not an important determinant of the equilibrium stock of durables, but it approaches the actual growth rate for consumer credit and liquid assets. For the 1953–1967 period, the compound growth rate in credit liabilities is 4.74 percent and for liquid assets it is 4.24 percent. The trend variable can also be considered to be a proxy for wealth. Such an interpretation suggests that consumer credit, and to a lesser extent, liquid assets are wealth-superior goods. Increased wealth leads to more borrowing in order to reallocate the time stream of consumption. The wealth effects on durable assets and on consumption are considerably smaller.

There are many studies of the demand for money in the econometric literature, but only a handful deal with the household sector. For example, Hamburger [3] reports an equilibrium *nominal* interest rate elasticity of −0.10 for liquid assets. However, the total equilibrium *real* interest rate elasticity implied in Table 2 is −0.10. An interrelated model estimated by Motley [6] has liquid asset elasticities of −0.14 with respect to interest rates and 1.40 with respect to income.[6]

[6] These results are weighted averages of Motley's money and savings deposit results.

Conclusions

Recent applications of the interrelated demand model indicate that it is a promising way of integrating portfolio decisions into an econometric model. Even this narrow application demonstrates that single equation stock adjustment models do not adequately explain household behavior. Much work remains, however, before models of this sort can be incorporated in larger econometric models of the economy. For the household sector, the largest drawback at this time is the inadequacy of aggregate portfolio data. A large, persistent and inexplicable discrepancy between Flow of Funds and National Income calculations of personal saving limits the usefulness of the former in model building. In addition, the model should be extended to include all the components of wealth. In these results, housing assets and equities are notably absent because of the difficulty in explaining accrued capital gains on these assets.

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