COWLES FOUNDATION FOR RESEARCH IN ECONOMICS

AT YALE UNIVERSITY

Box 2125, Yale Station
New Haven, Connecticut 06520

COWLES FOUNDATION DISCUSSION PAPER NO. 548

A MODEL OF U.S. FINANCIAL AND NONFINANCIAL ECONOMIC BEHAVIOR

by

DAVID BACKUS (QUEENS UNIVERSITY)

WILLIAM C. BRAINARD (YALE UNIVERSITY)

GARY SMITH (UNIVERSITY OF HOUSTON)

JAMES TOBIN (YALE UNIVERSITY)

A MODEL OF U.S. FINANCIAL AND NONFINANCIAL ECONOMIC BEHAVIOR

BY

DAVID BACKUS (QUEENS UNIVERSITY)

WILLIAM C. BRAINARD (YALE UNIVERSITY)

GARY SMITH (UNIVERSITY OF HOUSTON)

JAMES TOBIN (YALE UNIVERSITY)

This research was undertaken by NSF Grant APR76-13448 and continuing SRI Sub-contract No. 14225.

1. INTRODUCTION

At the beginning of this or any calendar quarter, economic agents in the United States--households, business firms, financial institutions, governments--held certain measurable quantities of a variety of assets, financial and real. The great bulk of financial assets were the debts of other resident agents; some were debts of foreigners. The bulk of real assets were land and reproducible consumers' or producers' durable goods located within the country. We also owned real properties abroad, just as foreigners owned some here. These asset and debt positions were the cumulative results of past saving and investment, past portfolio behavior, and past capital gains and losses, realized or unrealized.

During the current quarter, these balance sheets will change. Households will be deciding how much to add to their wealth and in what form. Businesses will be deciding how much real capital to accumulate and how to finance their investments. Governments will be running and financing budget surpluses or deficits; in this particular quarter no doubt they will be on balance in deficit and will have to issue new interest-bearing debts or new monetary liabilities. Probably they will issue some of each. The country's net position vis-a-vis the rest of the world will decline by the deficit in the external current account. This deficit too will have its financial counterparts. At the same time, all these agents, and foreigners as well, will be reshuffling their initial balance sheets. The transactions and revaluations resulting from portfolio shifts are indistinguishable from those connected with saving and accumulation. At the end of the quarter, there will be new balance sheets, to be adjusted again in the next quarter.

During each quarter the new asset stocks desired by some agents are somehow reconciled to new supplies offered by others. The process is closely linked to economic activity--production, consumption, employment, inflation--during the quarter. The links go in both directions. Current incomes help to determine household saving, business saving and investment, government deficits, and the current account deficit. Simultaneously, commodity prices, foreign exchange rates, interest rates, and asset revaluations influence consumer spending, domestic capital accumulation, and net foreign investment. Thus the mechanisms that maintain balance of asset demands and supplies are intertwined with those that balance flows of commodities and labor.

Several kinds of government policies affect the real and financial outcomes. Budget policies determine government purchases of goods and services, transfer payments, and taxes. In addition to their direct effects on commodity markets, these policies help to determine the government deficit and the new supplies of government liabilities. Financial and monetary policies determine how the deficit is financed, in particular by what combination of monetary issue and non-monetary debt. In addition, the government may refinance its existing debt, and in particular the central bank may change the monetary issue by open market operations in outstanding government securities. Other relevant government policies are less aggregative and more structural;

reserve requirements on banks and other financial institutions; regulation of interest rates on central bank or government assets or liabilities, and on intermediary liabilities to the public; specific taxes or tax credits, for example with respect to investments, depreciation, capital gains and losses, property incomes.

Expectations about next quarter and many future quarters affect the current saving, investment, and portfolio behavior of economic agents. The relevant variables include commodity prices, asset prices, business profits, unemployment, government policies--any variables on which the outcomes of intertemporal decisions depend. Expectations, and the confidence with which they are held, vary among agents. In some degree, they are formed by previous experience; in some degree they depend on current economic performance.

The horizons relevant to current economic behavior differ markedly among households and among business firms. At one extreme are immortal institutions like Harvard and Yale, whose current expenditures are the outcome of calculations of indefinitely sustainable consumption, whose future receipts are so fungible forward and backward in time that it is only their present value that matters. At the other extreme are households, often poor or young or both, and businesses, often new or small or both, without cashable assets or lines of credit. Their current expenditures for goods and services, consumption or investment, are constrained by their cash receipts in the same quarter. There are many intermediate cases, including consumers whose horizons range from a few years to a lifetime. But the presence of both wealth-constrained and liquidity-constrained agents is a fact of considerable economic significance. Expectations, particularly those concerned with a long future, are more important for those for whom liquidity is not a binding constraint. Liquidity-bound consumers and businesses will spend all their disposable resources over a few quarters anyway. Thus we should not be surprised if both permanent income and current cash income are important for aggregate consumption, and for its response to temporary tax reductions and transfers. Likewise we should not be surprised if current cash flow, as well as long-run calculation of profitability, affects business investment.

Our objective is to model the process of asset accumulation and economic activity just sketched, and to estimate models of this type for the United States. With such an empirical model, government policies, structural changes, institutional innovations, and demographic or technological trends can be simulated to estimate shorter- and longer-run consequences. Emphasis on financial markets and institutions permits systematic examination of financial policies and innovations, and of the financial consequences of other policies and developments. Consistent tracking of asset stocks is necessary to answer questions about the long-run impacts of short-run cyclical fluctuations and stabilization policies on capital accumulation.

Here is a sample of questions which the projected model is designed to address:

Effects of government budget deficits and debt: Do they crowd out or crowd in private capital formation? How does the answer to this question depend on the length of time allowed for the economy to adapt, on the degree of slack in resource utilization, and on the mixture of monetary and non-monetary financing of the deficit? How do debt management and monetary policies, changing the relative supplies of government bonds of long maturity, government obligations of short maturity, and base money, affect the structure of interest rates and the paths of economic activity and prices? Has the historical decline, over the last three decades, in federal debt relative to private debt and equity raised or lowered the cost of capital for real investment? What would happen if this trend continued? How does social security affect private saving and capital formation?

Effects of regulations and innovations on financial intermediation: Structural innovation in financial institutions has proceeded rapidly in recent years, in part causing and in part caused by changes in government regulations. Their macroeconomic effects, as well as their consequences for financial variables, are the subject of considerable interest and conjecture. Further changes are in prospect. What are the effects of raising or lifting deposit rate ceilings? What happens when savings deposits, money market funds, overnight loans, and credit or overdraft lines become better and better substitutes for checking accounts?

A model suited to answer questions like these needs certain features that standard macro-econometric models usually do not have. These include:

(i) disaggregation of assets and agents. Obviously it is difficult to investigate the effects of regulations of financial institutions and assets--interest rate ceilings, quantitative restrictions, reserve requirements, etc.--unless the specific institutions and assets are distinctly recognized in the model.

(ii) an explicit supply/demand modeling of asset markets and yield structures. As a rule, empirical models rely on historically estimated chains of relationships of yields--by maturity, risk class, and other differentiations--to determine yield structures. That procedure forecloses any possibility of altering rate relationships by changes in relative asset supplies.

2. THE FRAMEWORK FOR ACCOUNTING AND ANALYSIS

The accounting framework is simple. Consider a matrix of which rows (i) represent assets or commodities (e.g., currency, government bonds, equities, consumption goods, labor services...), while columns (j) represent economic sectors (e.g., households, commercial banks, nonfinancial businesses, governments, rest of the world...). An entry x_{ij} then represents the net purchases--a negative entry means net sales--of the item during a particular quarter, or any time period. If the matrix is a complete closed system, each row and each column must sum to zero. A row accounts for all sectors' sales and purchases of a particular item, and they must balance. A column accounts for a single sector's purchases and sales of all items, and these also must balance. This format can accommodate any desired degree of disaggregation, varying the numbers of sectors and items. Table 1 is illustrative.

The accounting framework comes to life as an economic model when the entries x_{ij}, at least some of them, become variables to be explained by the behavior of the sector. The rows, at least some of them, are then interpreted as markets, and the zero sums of these equations become conditions determining the values of some variables rather than merely <u>ex post</u> accounting identities. In general, a matrix of N rows will provide $N-1$ independent equations and permit their simultaneous solution for $N-1$ variables. These are the within-period endogenous variables of the model. If the period is a quarter, each of these variables is assumed to take on one and only one value each quarter, a value that is determined during that quarter.

The equation system describes these within-period endogenous variables as functions of (1) predetermined endogenous variables, state variables whose values for this period were fixed prior to the current period, whose values for next period will depend on this period's outcomes; (2) exogenous variables, whose values do not depend systematically on the outcomes of the system in either the current period or previous periods: these include (a) settings of policy instruments, (b) non-policy variables whose values, like those of policy instruments,

TABLE I. Theoretical Model, Uses - Sources of Funds

	A Households	F Financial Intermediaries	J Nonfinancial Business	Government		Within- Period Endogenous Variable
1. H Base Money	$PA^H(\cdot) - H^A_{-1}$	$+\rho D + (1-\rho)Df^H(\cdot) - H^F_{-1}$		$-\gamma_H(P(G-T) + bB_{-1}) - Z_H$	= 0	Y or P
2. D Deposits	$PA^D(\cdot) - D_{-1}$	$-(D - D_{-1})$				D
3. B Gov. Bonds	$PA^B(\cdot) - P_B B^A_{-1}$	$+(1-\rho)Df^B(\cdot) - P_B B^F_{-1}$		$-\gamma_B(P(G-T) + bB_{-1}) - Z_B$	= 0	r_B
4. E Equity	$PA^E(\cdot) - P_E E^A_{-1}$	$-(PF^E(\cdot) - P^F_E E^F_{-1})$	$-(PJ^E(\cdot) - P^J_E E^J_{-1})$		= 0	r_E
5. L Loans	$PA^L(\cdot) - L^A_{-1}$	$+PF^E + (1-\rho)Df^L(\cdot) - L^F_{-1}$	$-(PJ^L(\cdot) - L^J_{-1})$		= 0	r_L
6. IS Equation	-Saving $-P\sum_S A^S + \sum_S P_S S^A_{-1}$	0 0	+Net Investment $+PI(q_K, K_{-1}) - Pq_K \delta K_{-1}$	+Gov. Deficit $+P(G-T) + bB_{-1}$	= 0 = 0	
7. Interest & Dividends	$-R_{E_{-1}} PE^A_{-1} - r_{L_{-1}} PL^A_{-1} - bB^A_{-1}$ $(= -RPK_{-1} - bB^A_{-1})$	$+R_{E_{-1}} PE^F_{-1} - r_{L_{-1}} PL^F_{-1}$ $+bB^F_{-1}$	$+RPK_{-1}$	$+bB_{-1}$	= 0	
8. Taxes & Transfers	PT			-PT	= 0	
9. Labor	-Nw		+Nw		= 0	
10. Goods	PC		P(-Y+I)	+PG	= 0	
Sum 1 to 6 = Sum (1 to 5) + (7 to 10) =	0	0	0	0	= 0	

must be known or assumed, and (c) random shocks drawn from probability distributions whose parameters must be assumed or estimated.

The most important predetermined endogenous variables, in our applications, are stocks of financial and real assets. The single-period model determines the increment to each stock, and thus fixes its new value for the next period. The stock-flow identities are auxiliary equations needed to track the economy from period to period. A long-run equilibrium is one in which stocks are in some sense stationary, i.e., their dollar values are all constant from period to period or are all growing by the same percentage.

Other variables might be treated as predetermined endogenous, if it were thought that their proximate determinants were all lagged by one period or more. For example, it might be convenient and reasonable to regard wages and prices as dependent on employment and output last period but not on contemporaneous measures of economic activity.

3. A THEORETICAL MODEL

Later in this paper we explain how we try to build an empirical model of the U.S. economy in the spirit of the previous section. But the architectural design may be clearer if we set it forth formally in a condensed and simplified theoretical model.

Imagine that there are four sectors: Households, Financial Intermediaries, Businesses, and Government; five assets: High-powered Money (currency and bank reserves), Bank Deposits, Government Bonds, Business Equity, and Business Loans; and one commodity.

This model is summarized in Table I. The four sectors define the columns. The first five rows refer to assets[1] available in this economy. The sixth row is the negative of the sum of the first five; thus over these six rows each column sums to zero. The sixth row is actually the well-known IS equation. It says:

- Household Saving + Business Investment
 + Government Deficit = 0.

The remaining rows are simply auxiliary accounts. They add nothing to the formal analysis. They also sum to the IS equation of row six. Indeed the final row, the tenth, is simply the national product equation, an alternative version of "IS" .

All the entries in Table I are purchases or sales during a discrete period of time, say a quarter or a year. The subscript -1 denotes variables predetermined at the end of the previous period, the subscript +1 the expected values of variables next period. Otherwise the variables are those of the current period. All the cell entries are in current dollars.

Households. The functions $A^S(\cdot)$ $(S = H, D, B, E, L)$ tell the real amounts of asset S desired at the end of the period. The corresponding nominal quantity is PA^S . From this is subtracted $P_S S^A_{-1}$, the dollar value of households' initial holdings of the asset at current period asset prices P_S . The difference is specific saving in the asset S , and the sum of the five items is total household saving in current dollars. The functions $A^S(\cdot)$ will all contain the same arguments. These will include:

(1) the vector of real yields r_S on the five assets, taking account of expectations of capital gain or loss,

(2) the predetermined asset holdings,

(3) some set or combination (like disposable income) of the items determining net receipts in rows 7-9 and the expectations of these items.

As the sum of specific saving functions, total household saving will depend on the same list of variables.

In the bottom rows the income account is given. The convention is that business produces the entire real gross national product Y , retains I for replacement and net investment, and sells C+G to other sectors. The real earnings RK_{-1} , net of depreciation, are distributed in dividends (R_E per equity share) and in loan interest, and Nw/P is paid to households for labor. Note that R_E includes only earnings on equity distributed as dividends or retained, whereas r_E --the yield relevant for portfolio and saving decisions-- includes expected capital gains or losses as well.

Similarly, the income payment from government bonds in row 7 is simply the coupon, while the yield r_B relevant for portfolio and saving decisions depends also on expectations of bond prices and commodity prices.

$$\frac{P_B}{P}(1 + r_B) = \frac{b + P_{B_{+1}}}{P_{+1}} = \frac{b + P_{B_{+1}}}{P(1 + \pi_{+1})} . \qquad (1)$$

If P_B is expected to remain unchanged, it will be equal to

$$\frac{b}{r_B + \pi_{+1} + \pi_{+1}r_B} \approx \frac{b}{r_B + \pi_{+1}} .$$

Financial Intermediaries. The column in Table I exemplifies a number of the problems in modeling such institutions. In a practical model there would be several such columns. Here banks are taken to be representative financial intermediaries. They receive deposits and equity investments from the public, make loans to business, hold some government bonds, and hold some reserves in base money. The balance sheet in current dollars is: Equity $(P_E^F E^F)$ + Deposits (D) = Loans (L^F) + Bonds $(P_B B^F)$ + Reserves (H^F) . Here it is assumed, in conformity with U.S. institutions, that the nominal interest rate on deposits is legally fixed; indeed it is taken to be zero, though it could be any other number. At this rate, banks would gladly accept more deposits but are not permitted to bid for them. Therefore the quantity of deposits D is simply PA^D , the quantity the public desires at existing rates. Required reserves are a prior claim of ρD and the disposable deposits $(1-\rho)D$ are a (negative) prior claim, distributed among loans, government bonds, and net free reserves in the fractions f^L , f^B , and

f^H , which identically sum to 1. These fractions are functions of the rates r_L and r_B , the reserve requirement ρ , and the central bank's discount rate. In Table I it is assumed that the loan interest rate r_L adjusts to clear the market. Another, and perhaps more realistic possibility in some past periods, is that banks regard business loans as a prior claim on their disposable funds and meet these demands at the prevailing rate, only later adjusting this rate in the direction that brings loan demand closer to the banks' desired supply. This latter assumption is used below in our empirical model.

Bank equity is taken in row 4 to be a perfect substitute for equity in nonfinancial business, a questionable simplification that could be avoided by further disaggregation of assets. The item in row 7 simply says that all real interest earnings are distributed as dividends to banks' shareowners.

Nonfinancial business. The balance sheet, in current dollars, is Equity $(P_E^J E^J)$ + Loans (L^J) = Capital $(q_K PK)$. Business holdings of financial assets, including money, are ignored. Loans are for one period, are denominated in dollars, and bear a nominal interest rate $r_L + \pi_{+1}$.

The business sector's desired increase in equity liability to shareowners during the period is $PJ^E - P_E^J E_{-1}^J$. Increases in equity occur either by issue of shares or by retention of earnings; retained earnings are considered as dividends paid matched by sales of shares. Businesses desired increase in loan liability is $PJ^L - L_{-1}^J$. Loans are representative of several kinds of debt that would be distinguished in a more complete model for empirical application. Both are expressed in current prices. These two items must sum to $PJ^K - Pq_K K_{-1}$, which is equal to net investment $Pq_K \Delta K$. The necessary real gross investment I is $q_K(\Delta K + \delta K_{-1})$. The sector has two decisions, investment and financial structure. The latter could be further analyzed into two sub-choices: how to finance its new investment, as between loans and equity, and whether and how to refinance its initial capital stock.

Because of the balance sheet identity P_E and Pq_K are not independent:

$$P_E = \frac{Pq_K K_{-1} - L_{-1}}{E^J_{-1}} . \tag{2}$$

They are positively related by the leverage factor K_{-1}/E^J_{-1}. We can also use the balance sheet to show the relation of ΔE to ΔK and ΔL:

$$\left.\begin{aligned} P_E \Delta E^J &= Pq_K \Delta K - \Delta L \\ \Delta E^J &= \frac{Pq_K \Delta K - \Delta L}{P^E} = \frac{Pq_K \Delta K - \Delta L}{Pq_K K_{-1} - L_{-1}} \cdot E^J_{-1} \end{aligned}\right\} \tag{3}$$

This equation tells how to track the quantity E^J, whether new shares are issued or earnings are retained, whether retained earnings are invested or used to repay debt, and so on.

Equity owners will receive in aggregate real dividends of $R_{E_{+1}}$ per share, equal to $R_{+1}K - r_L L/P$. But r_E, the real one-period return on equity at market price, also depends on what happens to equity prices relative to commodity prices:

$$1 + r_E = \frac{R_{+1}K - r_L L/P + (P_{E_{+1}}/P_{+1})E}{(P_E/P)E}$$

$$= \frac{R_{+1}K - r_L L/P}{q_K K - L/P} + \frac{P_{E_{+1}}/P_{+1}}{P_E/P} \, . \tag{4}$$

Thus

$$q_K = \frac{R_{+1}}{r_E + v} + \frac{L}{PK}\left(1 - \frac{r_L}{r_E + v}\right) \tag{5}$$

where $v = 1 - (P_{E_{+1}}/P_{+1})/(P_E/P)$. Here v is less than zero if equity prices are expected to rise faster than commodity prices and is greater than zero if they are expected to rise more slowly. Normally v is negative, approximately equal to $-(\ell/1-\ell)\rho$, where ℓ is the debt-to-capital ratio, and ρ is the rate of commodity inflation. Equation (5) connects q_K to r_E and r_L and to expected earnings of capital R . As shown in Table I, q_K in turn is a major determinant of business investment, for reasons the authors have argued elsewhere [16], [15]. Given investment, the business sector will choose financing by reference to the real rates r_E and r_L .

Government. The government purchases goods in real amount G , collects taxes T in real terms, and pays interest on its bonds of bB_{-1}/P in real terms. The bonds are consols paying \$b every period. The budget deficit in dollars $PG - PT + bB_{-1}$ is financed in fraction γ_B by selling bonds at their current market price P_B and in fraction γ_H by printing high-powered money. ($\gamma_H + \gamma_B = 1$.) In addition, the government may engage in open market operations, selling bonds in amount $\$Z_B$ for money in amount $-\$Z_H$ ($Z_B + Z_H = 0$) . Taxes are net of transfers and may be modeled as endogenous, dependent on incomes, production, consumption, and other current variables. Thus the policy instruments of government are G , the parameters of T , γ_H , and Z_H . In addition, the central bank can change the reserve requirement ρ and its discount rate.

The model presented in Table I does not do justice to taxation. If taxes apply to rates of return, variation of tax rates will affect the portfolio, saving, and investment behavior central to the model. These substitution effects are additional to the permanent or transitory disposable income effects of changes in taxes or transfers, which are essentially lump-sum changes so long as labor supply is not modeled as sensitive to after-tax wages.

The one-period model. The model of Table I has five independent equations, most conveniently and symmetrically the first five rows. Asset prices appearing in the five equations can be expressed in terms of real interest rates by using the auxiliary formulas (1) and (4). These equations will determine five within-period endogenous variables. Several choices are possible, among them:

(1) A Keynesian model (r_E, r_L, r_B, D, Y)

(2) A classical model (r_E, r_L, r_B, D, P)

(3) A Phillips model (r_E, r_L, r_B, D, Y, P) , adding a within-period relationship of P and Y .

In addition to parameters of government policy, variables exogenous for the one-period solution would include expectations of future commodity and asset prices or of their rates of change.

The comparative statics of solutions to models of this type are qualitatively quite robust. The standard "IS/LM" conclusions for fiscal and monetary effects on Y and/or P apply [14]. The one-period solutions change over time as asset stocks change. They can be tracked in principle, and in practice with numerical parameter values, but the dynamics are usually analytically intractable.

4. THE EMPIRICAL MODEL: BALANCE EQUATIONS AND ENDOGENOUS VARIABLES

The model we are currently trying to estimate and simulate has the general structure of the theoretical model just reviewed, but is more disaggregated. Its coverage is shown in Table II, which follows the same format as Table I. We have aggregated the Flow of Funds data compiled by the Federal Reserve Board into the first fourteen rows of Table II. The flows comprise the bulk of financial saving, lending, and borrowing, and they augment the stocks of financial assets and liabilities. Capital gains and losses--in practice estimated primarily for equity--are also shown in rows 7 and 13. They account for the difference between the increase of net worth (row 12) and the amount of "net financial saving" (row 14).

"Net financial investment" represents the algebraic sum of the previous rows. It is in principle the IS row, as in Table I. As in that table, this row could also be reached

TABLE II. Empirical Model: Uses - Sources of Funds

1977 Flows at Annual Rates (End-of-Year Stocks)

	Households	Commercial Banking	Savings Institutions	Insurance & Pension Funds	Miscellaneous Intermediaries	Businesses	Federal Government	State & Local Governments	Rest of the World	Discrepancies	Sum	Within-Period Endogenous Variable
1. Currency & Reserves	8.3* (89.9)	3.3† (40.5)					-11.6 (-130.4)				= 0	Y or P
2. Demand Deposits	11.3 (114.6)	-23.2 (-276.4)	0.8 (4.7)	0.8 (7.7)	0.2 (5.9)	1.3 (74.5)	4.4 (7.0)	0.9 (14.1)	1.9 (18.4)	1.6 (29.6)	= 0	demand deposits at Commercial Banks
3. Time Deposits at Commercial Banks	39.2 (428.8)	-42.6 (-473.3)					0.1 (0.9)	4.2 (41.6)	1.4 (11.4)	-2.4 (-9.4)	= 0	time deposits at Commercial Banks
4. Time Deposits at Savings Institutions	69.1 (563.0)		-69.1 (-563.0)								= 0	time deposits at Savings Institutions
5. Shorts	13.1 (52.9)	-28.7‡ (-40.6)	3.9 (29.0)	5.2 (20.3)	-7.2 (-32.5)	-3.3 (45.2)	-18.0 (-193.1)	15.4 (51.9)	17.4 (57.9)	2.4 (9.4)	= 0	short rate
6. Longs	5.9 (193.0)	13.1 (205.5)	5.0 (67.0)	52.8 (382.2)	-9.3 (-35.9)	-24.6 (-302.2)	-51.6 (-327.3)	-12.5 (-215.7)	21.2 (33.4)		= 0	long rate
7. §Equity: Purchases	33.5	-0.6	0.4	-8.9	-2.5	-28.7			7.0		= 0	equity rate
Equity: Capital Gains**	-82.8 (777.0)	-4.8 (-57.5)	-0.0 (4.8)	-4.6 (137.7)	-0.2 (-8.7)	102.3 (-593.0)			-10.2 (39.7)			
8. Nonmarketables	51.5 (726.7)			-40.1 (588.7)			-11.4 (-138.1)				= 0	Household nonmarketables
9. Mortgages	-82.4 (-568.9)	27.7 (179.0)	62.0 (462.3)	6.1 (108.1)	-0.9 (15.1)	-37.0 (-349.6)	23.9 (139.5)	0.6 (14.7)			= 0	mortgage rate
10. Loans	-49.8 (-368.1)	47.9 (426.1)	5.6 (44.4)	3.7 (46.8)	20.6 (78.4)	-26.8 (-208.4)	5.1 (76.2)	-1.2 (-21.2)	-1.8 (-38.7)	-3.4 (-35.4)	= 0	loans at Commercial Banks
11. Miscellaneous	6.6 (52.6)	7.9 (-3.3)	-3.9 (-9.4)	-14.9 (-114.0)	-0.7 (-22.2)	20.8 (158.8)	4.7 (67.6)	1.1 (10.6)	-25.3 (-121.4)	3.7 (-19.3)	= 0	[exogenous]
12. Financial Net Worth	23.6 (2061.5)	0.0 (0.0)	4.6 (39.9)	0.0 (0.0)	0.0 (0.0)	4.1 (-1474.7)	-54.3 (-497.7)	8.5 (-104.2)	11.7 (0.3)	1.8 (-25.1)	= 0	
13. - Capital Gains	82.8	4.8	0.0	4.6	0.2	-102.3	0.1	0.0	10.2	-0.4	= 0	
14. - Net Financial Saving	106.4	4.8	4.6	4.6	0.2	-98.2	-54.2	8.5	21.9	1.4	= 0	
15. - Discrepancy	-30.1			-8.8		30.4	2.8	7.9	-1.0	-1.4	= 0	
16. - Investment Less Saving	-76.3			-5.4		67.8	51.4	-16.4	-20.9	0.0	= 0	
17. Interest, Dividends, & Retained Earnings	-194.0			0.0		176.9	29.1	-6.5	-5.5		= 0	
Interest & Dividends	-156.2			0.0		139.1	29.1	-6.5	-5.5		= 0	
Retained Earnings (net of depreciation)**	-37.8			0.0		37.8	----	----	----		= 0	
18. Taxes & Transfers	79.1			12.9		313.1	-201.7	-199.1	-4.2		= 0	
Taxes	287.1			12.9		303.4	-374.5	-228.8	----		= 0	
Transfers	-207.9			----		9.6	172.7	29.7	-4.2		= 0	
19. Labor	-1196.3			----		988.4	66.4	141.5	----		= 0	
20. Goods & Services	1288.6			6.2		-1679.2 +209.6 †	78.6	107.4	-11.1		= 0	
21. Miscellaneous	-53.7			-24.5		59.0	79.0	-59.8	----		= 0	
Sum (1 ~ 11) + 13 + 15 + Sum(17 ~ 21) = 12 + 13 + 15 + 16 = 0	0	+0		+0	+0	+0	+0	+0	+0		= 0	

Sources and Notes attached.

TABLE II (continued)

Sources: Flow-of-Funds and National Income and Product Accounts.

Notes:

*Currency held by the nonbank public has been allocated entirely to households.

†Bank reserves include required reserves of 3.8 (40.9) and net free reserves of -0.5 (-0.4).

‡Bank holdings of shorts include assets of -4.5 (65.5) and liabilities of -24.3 (-106.1).

§The equity liabilities of commercial banks, insurance and pension funds, and miscellaneous financial intermediaries are taken to be equal to the financial net worth reported by these institutions.

||Purchases of goods and services by business are that sector's gross physical investment.

**Retained earnings of businesses (37.8) are treated as issues of equity to households. They are consequently included in business (-) and household (+) savings.

by summing nonfinancial receipts and outlays. These entries are in rows 17 through 21, and their sum is in row 16 as "investment less saving." In principle, this is the same as row 14 with sign reversed. In fact there are statistical discrepancies, shown in row 15.

As in Table I, business retained earnings, net of depreciation, are imputed to shareowners, mainly households, as if they were dividends. They are shown separately in row 17. This means that "investment less saving" of Business is just net investment, as it should be in the IS equation. The retention of earnings also appears in other columns, mainly Households, as saving. Correspondingly, above line 15, retention of earnings is an issue of equity by business and a purchase of equity by households and other shareowners.

In Table II we show only one commodity row and one labor row. Thus the "real" side of the economy is disaggregated less than the financial side, a reversal of the usual emphasis in macro-econometric models. Work in process, however, is intended to disaggregate commodity and labor markets further. The commodity row of Table II attributes all gross production to the business sector. That sector keeps part of it, for gross fixed investment and inventory accumulation, and sells the rest to the other sectors. In the labor row, Households supply worker-hours to the other sectors.

The first 10 rows of Table II, plus the "IS" row 16, provide eleven equations of a model similar to the theoretical model described in the previous section. (Rows 12 and 13 are memoranda concerning the previous rows, but provide no independent information. Row 11--"miscellaneous"--can be taken as exogenous.)

There will be ten within-period endogenous variables. One choice of this list, not the only possible one, is given in the final column of the table. Each variable appears in the row with which it is most naturally associated--even though in principle all variables are involved simultaneously in the clearing of each market. Thus market-determined rates of return or asset prices are associated with the assets to which they refer. For some rows, quantities rather than prices are assumed to make the within-period adjustments. This occurs for financial assets on which interest rates are legally regulated (deposits) or are institutionally slow to adjust (bank loans).

The markets corresponding to the rows always "clear" _ex post_; actual transactions net to zero. But we distinguish between transactions realized _ex post_ and transactions desired _ex ante_ at the prevailing values of the within-period endogenous variables--prices, interest rates, incomes, etc. In some markets, those which we will label "cleared," these variables adjust so that realized and desired transactions coincide. In "noncleared" markets, some agents will be unable fully to execute desired transactions. (Smith and Brainard [19] discuss the modeling and estimation of rationed markets.)

In Table II demand deposits are identified as a noncleared market. With the nominal interest rate on deposits restricted by law, banks generally stand willing to accept more deposits than are offered. Likewise the rates of returns on savings accounts are exogenously restricted by rate ceilings; in these markets too the institutions generally accept all deposits. However, there have been some periods of time when the ceilings were not effective and these markets were cleared by the deposit rates. Nonmarketable securities are similarly modeled. They are principally insurance and pension reserves and savings bonds available on tap from the federal Treasury. Thus in the short run the government's issues adjust to other sectors' demands.

Bank loans to business are also treated as an "uncleared" market. This is appropriate for most of the sample period to which a model may be fitted, although it seems less realistic today. Here the reason was not legal regulation but the behavior of the banking industry. In the short run, banks had explicit or implicit credit line commitments to their business customers, which they felt compelled to honor at going rates. Subsequently, if meeting these demands leads to more lending than the banks desire, the loan rate was increased. Or it was lowered if banks found themselves with too few loans. This adjustment of the loan rate, an administered price, we model as taking place between periods. The loan rate is another predetermined endogenous variable, and its adjustment is another transitional equation.

Going below row 16, we are implicitly treating the markets for labor and commodities as noncleared. Wages are determined by Phillips curve equations describing the sticky period-to-period adjustment for wages to labor market disequilibria. The labor market is "cleared" by workers' accepting what jobs are offered. Commodity transactions are also demand-determined within any period. Commodity transactions are also demand-determined within any period. Between periods prices move to keep up with normal unit labor costs, but with some sensitivity to demand pressures in the previous period.

An alternative formulation for any or all of these three noncleared markets would make both quantities and prices endogenous within a period. For example, the wage adjustment could depend in part on the contemporaneous excess supply, while the adjustment would not be sufficient to clear the market. The Phillips curve would then be another equation in the one-period model. In the extreme "classical" regime, markets would be cleared by flexible money wages and prices; therefore price P would replace output Y as an endogenous variable.

Rows 17, 18, and 21, which complete the accounts, are not really markets, and there are no prices that naturally correspond to the items. In the case of private transfers, households' receipts are taken to adjust passively to other sectors' outlays. In the case of taxes net of government transfers, transactions depend on the tax code and on existing laws defining entitlements to transfers. Given the legislation determining sectors' net tax liabilities, we can regard the row as determining the government's net receipts. Dividends and interest payments reflect predetermined asset positions and contractual obligations. Since these positions balance out, the payments and receipts based on them automatically sum to zero.

5. THE EMPIRICAL MODEL: SECTORS AND THEIR BEHAVIOR

Columns refer to sectors. In this dimension, too, the model builder has discretion, within data limitations, about the degree of disaggregation. For each sector, the column entries sum to zero, as in Table II.

In Table II four financial sectors are distinguished, in keeping with our emphasis on financial disaggregation. Indeed further disaggregation would be desirable. For example, for purposes of modeling monetary policy, the behavioral differences between money market banks and other commercial banks are important.

The key nonfinancial sectors are those for households, business, and federal government. With respect to households, there are several possible directions of useful disaggregation. One would be to segregate the entities like personal trusts and nonprofit organizations now lumped together with families and individual consumers. Another would be to make distinctions by age or other demographic characteristics. The split that we regard as most important, for reasons argued above, is between liquidity-constrained and wealth-constrained households. We are trying to implement this distinction empirically, in ways described elsewhere [12].

In the case of nonfinancial business, separate columns for corporate and noncorporate business would be desirable for some purposes. Corporations are the originators of equities and other financial claims for which market valuations are available. Another direction of disaggregation, columns for different industries, would be associated with addition of rows for different commodities.

For these sectors, financial institutions, households, and business, the column entries are to be explained by behavioral equations. The federal government column is partially exogenous, so far as purchases, transfer rules, tax functions, monetary policies, and debt issues are concerned. Budget outcomes are endogenous because realized outlays and revenues depend not only on policies but also on economic performance during the period. Other sectors--state and local governments and rest of world--should be similarly modeled. At the current stage of the model under construction, these three sectors are lumped together as a completely exogenous column. For example, federal bonds, state and local bonds and foreign bonds enter simply as exogenously supplied long-term marketable bonds.

Behavioral equations for financial institutions, households, and business follow general principles familiar from previous papers by the authors. For each sector we identify those "prior claims" that the sector takes as exogenous for the period. This quantity constrains its decisions about other entries in the column. It consists of items which are predetermined by earlier decisions or by inherited stocks--e.g. interest receipts or payments--or by the decisive side of noncleared markets--e.g. deposits as seen from banks' standpoint. Subject to the budget constraint imposed by these prior claims, a sector is imagined to formulate long-run target asset and wealth positions, based on current and expected interest rates, incomes, and other relevant variables. Actual positions are then adjusted towards these targets. Transitory factors, like windfall gains and losses, will also influence these adjustments.

In relating sectoral portfolio choices to asset yields, our general presumption is that our broad asset categories are gross substitutes. That is, an increase in an asset's yield increases the demand for the asset itself and decreases demand for others individually and collectively. In estimations our priors conform to this presumption, but the final estimates are not constrained to do so.

In some cases it is convenient to imagine agents who make decisions sequentially or hierarchically. The substantive content of a hierarchical approach is that simplifying restrictions are placed on the explanatory variables. In principle, every entry in a column should depend on the same list of explanatory variables. In a hierarchical model a sequence of simplified decisions are specified. For example, the consumption-saving decision might be assumed not to depend upon the fine detail of asset yields and inherited holdings which influence portfolio decisions, but on an average yield and on total initial wealth. The portfolio allocation might then be based upon asset yields, inherited holdings and available saving, but not on some of the separate factors (such as income expectations, relative commodity prices, and demographic detail) which motivated that saving. Although theory tells us that separations of this type are legitimate only under rather strong assumptions, there is often a compelling need for plausible rough approximations in empirical work. In the current version of the model households have been depicted as first allocating income between consumption and saving and then making an independent allocation of the saving among the several assets. Similarly business firms have been described as making production and investment decisions separately from financing decisions. The Purvis-Smith discussion [7], [8] is concerned with the gains and costs of a hierarchical approach. The Backus-Purvis paper [1] espouses and implements an integrated model of household expenditure and financial decisions, which will be used in later versions of the empirical model.

6. SPECIFICATION AND ESTIMATION OF ASSET DEMAND EQUATIONS

At the first stage in developing the empirical model described above we have focused our attention on the financial markets corresponding to the first ten rows of Table II. Understanding the behavior of these markets is crucial to understanding the response of the economy to policy actions and various shocks which impinge directly on financial sectors. A distinctive feature of the financial block of the model is that separate supply and demand equations are specified for a relatively large number of assets rather than relying on explicit aggregation or rate structure equations to reduce the dimensionality of the model. Such simplifying assumptions and restrictions are probably harmless for some purposes, but they beg many of the questions we would like to address. For example, with a term structure equation the ability of monetary and fiscal authorities permanently to alter the relative rates of return among financial and physical assets is ruled out a priori.

Similarly, debt accumulation for capital formation--crowding out or crowding in--and financial innovations or changes in regulations have consequences that depend crucially on the quantitative magnitudes of the substitution relationships among assets.

In this section we describe the specification and estimation of the asset demand and supply equations for Households, Commercial Banks, Savings Institutions, and Insurance and Pension Funds. These estimated equations will, in principle, allow us to simulate the response of financial variables--rates and quantities--to changes in exogenous supplies of and demands for assets of the other sectors--government, rest of the world, and business.

Asset demand specification. Although the various sectors demand and supply different assets, liabilities, and commodities, we have assumed that the equations which describe sectoral behavior have the same general form. Each sector's assets have been divided into two groups according to whether or not the items are directly controlled by the sector. This division differs from sector to sector, and in the short and long runs.

In the case of financial intermediaries--Commercial Banks, Savings Institutions, and Insurance and Pension Funds--the controlled flows reflect portfolio decisions about the allocation of a predetermined aggregate of prior claims. In particular a typical intermediary is constrained by:

$$\sum_{i=1}^{n} a_i = W = NW - \sum_{i=1}^{n} R_i ,$$

where the a_i are directly controlled financial items constrained to be equal to total disposable assets (W) equal to net worth minus prior claims R_i . (Predetermined liabilities, e.g. bank deposits, are a negative prior claim.)

We have separated the portfolio decision into two parts: determination of a long-run desired portfolio and short-run adjustment to that portfolio. Each sector's long-run portfolio allocation is assumed to depend upon such variables as rates of return, income, and the expected quantity of disposable assets:

$$\frac{a^*}{W^e} = Ax .$$

a^* is an n-dimensional vector of desired holdings; W^e is expected disposable assets; x is a k-dimensional vector of explanatory variables, with $x_1 = 1$; and A is the $n \times k$ matrix of long-run coefficients. If desired demands are required to satisfy the balance sheet identity then

$$1 = \sum a_i^*/W^e = \sum_{i=1}^{n} A_{i1} + \sum_{j=2}^{k} (\sum_{i=1}^{n} A_{ij})x_j$$

can hold for all values of x_j if and only if

$$\sum_{i=1}^{n} A_{i1} = 1$$

$$\sum_{i=1}^{n} A_{ij} = 0 \ , \quad j = 2, \ldots, k \ .$$

That is, an increase in disposable assets must be held somewhere, and a change in any proportion must be at the expense of the remaining proportions.

It is assumed that the short-run asset demand functions take the familiar partial-adjustment form. However, our specification differs in two respects from the type frequently assumed. First, the adjustment of any particular asset depends, in principle, on a complete description of the short-run disequilibrium. For example, the speed with which a discrepancy between desired and actual holdings of bonds is eliminated depends upon whether the bond disequilibrium is the counterpart of a discrepancy between desired and actual holdings of cash, or desired and actual mortgages. Second, consistency requires that the variables which give rise to partial adjustment in the demand for one asset must give rise to offsetting adjustments in the demand for other assets, given the constraint on disposable assets. Thus the equations are of the form:

$$\Delta a = \underset{n\times n}{E} [a^{*} - a_{-1}] + \underset{n\times p}{F} (S - S^{e}) + \underset{n\times q}{G} z \qquad (7)$$

where the z are q explanatory variables that are thought to influence adjustment behavior directly and the $S_i - S_i^e$ are the sources of unanticipated changes in disposable assets (such as unplanned saving or unexpected capital gains) with $\sum(S_i - S_i^e) = W - W^e$.

The E_{ij} can be interpreted as the partial effects on holdings of the i^{th} asset of a unit increase in $W^e - W_{-1}$ (and $W - W_{-1}$) which the sector desires to hold as the j^{th} asset. The E_{ij} will sum across equations to one. F_{ij} is the partial effect on holdings of the i^{th} asset of a unit increase in $S_j - S_j^e$ with $W^e - W_{-1}$ constant and $W - W^e$ increasing by one unit. The F_{ij} will therefore sum across equations to one. Finally, the G_{ij} will sum to zero since $W - W_{-1}$ is held constant.

Savings institutions. Tables III to V contain the structural equations and coefficient estimates for the three financial intermediaries. The specification of Savings institutions in Table III, essentially the same as Smith and Brainard [11], is typical. Disposable assets are the sum of time and saving deposits, FHLB borrowing, equity holdings (a small, exogenous number), and net worth. Long-run demands depend on the logs of various interest rates. The equity rate is the rate of discount on earnings implicit in observed market values of equity.[2]

In the spirit of the illustrative theoretical model of Table I, the interest rates should be one-period yields. For long bonds, a one-period rate would allow for capital gains or losses due to expected changes in bond prices. In fact, we do not attempt to estimate directly short-term rates on long-maturity securities. Instead, our regressions include as

TABLE IIIA. Savings Institutions: Short-Run Estimates

Dependent Variable		Interest Rate Responses						
		1	D66	ln(RSHORT)	ln(RLONG)	ln(RMORT)	ln(RLOAN)	$\ln\left(\frac{RE}{RSHORT}\right)$
$\frac{\Delta DDC}{W^e}$	prior	none	0.0000	-0.0153	0.0090	-0.0150	-0.0017	0.0006
	OLS	0.3298	0.0064	-0.0023	-0.0133	0.0060	-0.0003	-0.0091*
	mixed	0.1897	0.0091	-0.0001	-0.0146	0.0096	0.0016	0.0013
$\frac{\Delta SHORT}{W^e}$	prior	none	0.0000	0.0195	-0.0030	-0.0450	-0.0127	0.0126
	OLS	0.8347*	-0.0044	0.0018	0.0204*	-0.0244*	0.0005	0.0020
	mixed	0.3190	-0.0068	0.0066	-0.0023	0.0176	-0.0016	0.0024
$\frac{\Delta LONG}{W^e}$	prior	none	0.0000	-0.0042	0.0840	-0.0900	-0.0010	-0.0068
	OLS	0.5124*	-0.0086*	-0.0008	0.0089	-0.0017	-0.0004	-0.0007
	mixed	0.2796	-0.0118	-0.0049	0.0175	-0.0168	-0.0016	-0.0046
$\frac{\Delta MORT}{W^e}$	prior	none	0.0000	0.0000	-0.0900	0.1500	-0.0025	-0.0065
	OLS	-0.8077*	0.0037	-0.0003	-0.0120	0.0110	0.0003	0.0058
	mixed	0.2056	0.0042	-0.0006	-0.0015	-0.0185	-0.0002	0.0002
$\frac{\Delta LOAN}{W^e}$	prior	none	0.0000	0.0000	0.0000	0.0000	0.0180	0.0000
	OLS	0.1308	0.0029	0.0015	-0.0041	0.0091	-0.0002	0.0020
	mixed	0.0060	0.0053	-0.0009	0.0010	0.0080	0.0019	0.0007

Dependent Variable		Adjustment Coefficients						
		$\frac{\phi DDC}{W^e}$	$\frac{\phi SHORT}{W^e}$	$\frac{\phi LONG}{W^e}$	$\frac{\phi MORT}{W^e}$	$\frac{\phi LOAN}{W^e}$	$\frac{\Delta FHLB}{W^e}$	$\frac{W-W^e-\Delta FHLB}{W^e}$
$\frac{\Delta DDC}{W^e}$	prior	1.0000	0.1500	0.1500	0.1000	0.0500	0.1000	0.3000
	OLS	0.8786*	0.4381*	0.2165	0.3157	0.3971	0.3122*	0.1338*
	mixed	0.8555	0.2781	0.1342	0.1721	0.3449	0.1586	0.1484
$\frac{\Delta SHORT}{W^e}$	prior	0.0000	0.8500	0.2500	0.2000	0.0500	0.1000	0.4000
	OLS	0.7305*	1.3936*	0.6625	0.8659*	0.5843*	-0.0669	0.3480*
	mixed	0.1050	0.7493	0.3379	0.3606	0.3382	0.0350	0.4163
$\frac{\Delta LONG}{W^e}$	prior	0.0000	0.0000	0.6000	0.2000	0.0000	0.0000	0.0000
	OLS	0.3422	0.2800	0.7921*	0.5135*	0.5441*	-0.0447	0.3080*
	mixed	0.1300	-0.0055	0.5356	0.2680	0.0464	-0.0029	0.0764
$\frac{\Delta MORT}{W^e}$	prior	0.0000	0.0000	0.0000	0.5000	0.0000	0.8000	0.3000
	OLS	-0.9826*	-1.1207*	-0.8119*	-0.8411*	-0.7805*	0.7401*	0.1905*
	mixed	0.0137	-0.0061	-0.0018	0.1832	0.0465	0.8070	0.3445
$\frac{\Delta LOAN}{W^e}$	prior	0.0000	0.0000	0.0000	0.0000	0.9000	0.0000	0.0000
	OLS	0.0313	0.0089	0.1407	0.1459	0.2551*	0.0593*	0.0278
	mixed	0.0128	-0.0158	-0.0059	0.0160	0.2240	0.0022	0.0144

TABLE IIIB. Savings Institutions: Long-Run Estimates

Dependent Variable		1	D66	ln(RSHORT)	ln(RLONG)	ln(RMORT)	ln(RLOAN)	$\ln \frac{RE}{RSHORT}$
$\frac{\Delta DDC}{W^e}$	prior	none	none	-0.0180	0.0000	0.0000	0.0000	0.0000
	OLS	0.1143	0.0071	-0.0087	-0.0298	0.0060	0.0002	-0.0125
$\frac{\Delta SHORT}{W^e}$	prior	none	none	0.0250	-0.0200	-0.0500	-0.0150	0.0200
	OLS	-0.2675	-0.0202	0.0083	0.0702	-0.0372	-0.0026	-0.0221
$\frac{\Delta LONG}{W^e}$	prior	none	none	-0.0070	0.2000	-0.2500	0.0000	-0.0070
	OLS	-0.1185	-0.0443	-0.0029	0.0701	-0.0383	-0.0028	-0.0260
$\frac{\Delta MORT}{W^e}$	prior	none	none	0.0000	-0.1800	0.3000	-0.0050	-0.0130
	OLS	1.6312	0.0512	-0.0122	-0.1332	0.0279	0.0098	0.0841
$\frac{\Delta LOAN}{W^e}$	prior	none	none	0.0000	0.0000	0.0000	0.0200	0.0000
	OLS	-0.3594	0.0063	0.0154	0.0227	0.0416	-0.0047	-0.0235

Notes:
1. $\Delta X \equiv X - X_{-1}$, $\phi X \equiv X^* - X_{-1}$ (the actual regressor is X_{-1}) .
2. Sample period: 1954.1 to 1978.3 excluding 1966.1 (98 observations).
3. $D66 = \begin{cases} 1 & \text{before 1966} \\ 0 & \text{1966 and after} \end{cases}$
4. Data excludes Mutual Savings Banks prior to 1966.
5. Asterisk (*) indicates t-statistic greater than 2.0 in absolute value.

TABLE IVA. Insurance and Pension Funds: Short-Run Estimates

Dependent Variable		Interest Rate Responses					
		1	ln(RSHORT)	ln(RLONG)	ln(REQUITY)	ln(RMORT)	$\ln\left(\frac{RE}{RSHORT}\right)$
$\frac{\Delta DDC}{W^e}$	prior	none	-0.0135	0.1000	-0.0300	-0.0450	0.0000
	OLS	0.0736	-0.0003	-0.0035	0.0005	0.0032	0.0001
	mixed	0.0368	-0.0012	-0.0025	0.0000	0.0008	-0.0003
$\frac{\Delta SHORT}{W^e}$	prior	none	0.0170	0.1000	-0.0300	-0.0450	-0.0140
	OLS	0.1400	0.0018	0.0067	-0.0014	-0.0045	0.0034
	mixed	0.2255	0.0037	-0.0083	-0.0020	0.0125	0.0029
$\frac{\Delta LONG}{W^e}$	prior	none	-0.0035	0.4600	-0.1050	-0.2400	0.0140
	OLS	0.5490*	-0.0023	0.0107	0.0001	-0.0095	-0.0022
	mixed	0.6648	-0.0025	0.0114	0.0025	-0.0069	-0.0007
$\frac{\Delta(EQUITY-CGEQ)}{W^e}$	prior	none	0.0000	-0.2000	0.2250	-0.0750	0.0000
	OLS	0.0866	-0.0039*	0.0012	0.0005	0.0055	-0.0014
	mixed	0.0212	-0.0002	-0.0031	-0.0012	0.0032	-0.0004
$\frac{\Delta MORT}{W^e}$	prior	none	0.0000	-0.4600	-0.0600	0.4050	0.0000
	OLS	0.1508*	0.0048*	-0.0152*	0.0003	0.0054	0.0002
	mixed	0.0516	0.0003	0.0035	0.0008	-0.0097	-0.0014

Dependent Variable		Adjustment Coefficients					
		$\frac{\phi DDC}{W^e}$	$\frac{\phi SHORT}{W^e}$	$\frac{\phi LONG}{W^e}$	$\frac{\phi EQUITY}{W^e}$	$\frac{\phi MORT}{W^e}$	$\frac{W-W^e-CGEQ}{W^e}$
$\frac{\Delta DDC}{W^e}$	prior	1.0000	0.1000	0.1000	0.0000	0.0000	0.2000
	OLS	0.2103*	0.0316	0.0792	0.0768	0.0611	0.0678
	mixed	0.5130	0.1036	0.0124	0.0344	0.0425	0.0219
$\frac{\Delta SHORT}{W^e}$	prior	0.0000	0.9000	0.2000	0.1000	0.1000	0.2000
	OLS	0.1854	0.4971*	0.1156	0.1483	0.1780*	0.1402
	mixed	0.3001	0.7860	0.2079	0.2362	0.2816	0.2408
$\frac{\Delta LONG}{W^e}$	prior	0.0000	0.0000	0.7000	0.3000	0.2000	0.4000
	OLS	0.5463*	0.2797	0.5361*	0.5587*	0.5738*	0.5433*
	mixed	0.0624	0.0335	0.7317	0.6912	0.6102	0.6741
$\frac{\Delta(EQUITY-CGEQ)}{W^e}$	prior	0.0000	0.0000	0.0000	0.5000	0.0000	0.1000
	OLS	-0.1331	0.0851	0.1280	0.0592	0.0428	0.1069
	mixed	0.0643	0.0371	0.0215	-0.0054	0.0148	0.0363
$\frac{\Delta MORT}{W^e}$	prior	0.0000	0.0000	0.0000	0.1000	0.7000	0.1000
	OLS	0.1912*	0.1066	0.1410*	0.1470*	0.1443*	0.1418*
	mixed	0.0602	0.0398	0.0265	0.0436	0.0509	0.0269

TABLE IVB. Insurance and Pension Funds: Long-Run Estimates

Dependent Variable		1	ln(RSHORT)	ln(RLONG)	ln(REQUITY)	ln(RMORT)	$\ln\left(\frac{RE}{RSHORT}\right)$
DDC	prior	none	-0.0150	0.0000	0.0000	0.0000	0.0000
W^e	OLS	-0.2987	-0.1906	0.5855	-0.0065	-0.2162	-0.0081
SHORT	prior	none	0.0200	0.0000	0.0000	0.0000	0.0200
W^e	OLS	0.0592	0.0416	-0.1210	-0.0006	0.0540	0.0107
LONG	prior	none	-0.0050	1.0000	-0.3000	-0.4500	-0.0200
W^e	OLS	-2.0151	-1.6227	4.9084	-0.0583	-1.7768	-0.1078
EQUITY	prior	none	0.0000	-0.4000	0.4500	-0.1500	0.0000
W^e	OLS	6.0750	3.7498	-11.6946	0.1630	4.4129	0.2250
MORT	prior	none	0.0000	-0.6000	-0.1500	0.6000	0.0000
W^e	OLS	-2.8204	-1.9781	6.3217	-0.0975	-2.4740	-0.1198

Notes: 1. $\Delta X \equiv X - X_{-1}$, $\phi X \equiv X^* - X_{-1}$ (the actual regressor is $-X_{-1}$).

2. Sample period: 1954.1 to 1978.3 (99 observations).

3. Asterisk (*) indicates t-statistic greater than 2.0 in absolute value.

TABLE VA. Commercial Banking: Short-Run Estimates (Loan Disequilibrium)

Dependent Variable		Interest Rate Responses							
		1	ln(RDISC)	ln(RSHORT)	ln(RLONG)	ln(RMORT)	ln(RLOAN)	$\ln\left(\frac{RE}{RSHORT}\right)$	$\frac{(1-k)DD_{-1}}{W^e}$
$\frac{\Delta EXRES}{W^e}$	prior	none	0.0010	-0.0010	0.0000	0.0000	0.0000	0.0000	0.0000
	OLS	0.0155	-0.0002	-0.0000	0.0002	-0.0018	0.0010	0.0003	0.0074*
$\frac{\Delta BORRES}{W^e}$	prior	none	0.0050	-0.0050	0.0000	0.0000	0.0000	0.0000	0.0000
	OLS	0.0291	0.0027	-0.0052*	0.0039	-0.0005	-0.0011	-0.0023	-0.0019
$\frac{\Delta ASHORT}{W^e}$	prior	none	-0.0030	0.0257	-0.0915	-0.0442	0.1017	0.0600	0.0583
	OLS	-0.1140	-0.0384*	0.0281*	0.0507	-0.0281	-0.0128	-0.0183	0.1925*
$\frac{\Delta LSHORT}{W^e}$	prior	none	-0.0030	0.0624	-0.0625	-0.0157	0.0213	0.0288	0.0616
	OLS	1.0949*	0.0263	-0.0208	0.0450	-0.0475	-0.0004	0.0083	-0.0306
$\frac{\Delta LONG}{W^e}$	prior	none	0.0000	-0.0737	0.2230	-0.0525	-0.0535	-0.0756	-0.0965
	OLS	-0.0084	0.0081	-0.0087	-0.0787*	0.0774*	0.0104	0.0007	-0.0895
$\frac{\Delta MORT}{W^e}$	prior	none	0.0000	-0.0084	-0.0690	0.1125	-0.0695	-0.0132	-0.0235
	OLS	-0.0171	0.0015	0.0067	-0.0211*	0.0005	0.0029	0.0113*	-0.0778*

Dependent Variable		Adjustment Coefficients								
		$\frac{\phi EXRES}{W^e}$	$\frac{\phi BORRES}{W^e}$	$\frac{\phi ASHORT}{W^e}$	$\frac{\phi LSHORT}{W^e}$	$\frac{\phi LONG}{W^e}$	$\frac{\phi MORT}{W^e}$	$\frac{\phi LOAN}{W^e}$	$\frac{W-W^e}{W^e}$	$\frac{-\Delta LOAN}{W^e}$
$\frac{\Delta EXRES}{W^e}$	prior	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	OLS	1.0052*	0.0245	0.0161	0.0155	0.0155	0.0074	0.0190*	0.0082*	0.0102*
$\frac{\Delta BORRES}{W^e}$	prior	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	OLS	-0.6252	0.8870*	0.0448*	0.0161	0.0293	-0.0108	0.0399	0.0232*	0.0441*
$\frac{\Delta ASHORT}{W^e}$	prior	0.0000	0.0000	0.8500	0.1500	0.1750	0.1750	0.4700	0.4400	0.4500
	OLS	-0.1926	1.0625	0.3355	-0.0623	-0.1119	-0.6726*	0.1480	0.5510*	0.4064*
$\frac{\Delta LSHORT}{W^e}$	prior	0.0000	0.0000	0.1500	0.8500	0.0850	0.0850	0.1900	0.1800	0.1500
	OLS	-1.6275	2.6691*	0.8511*	1.1047*	1.0899*	1.2343*	1.0865*	0.3538*	0.5818*
$\frac{\Delta LONG}{W^e}$	prior	0.0000	0.0000	0.0000	0.0000	0.7300	0.1300	0.2800	0.2600	0.3000
	OLS	-0.3970	-3.5115*	-0.1707	-0.0095	0.1187	0.4714	-0.2416	0.0879	-0.0122
$\frac{\Delta MORT}{W^e}$	prior	0.0000	0.0000	0.0000	0.0000	0.0100	0.6100	0.0600	0.1200	0.1000
	OLS	2.8375*	-0.1318	-0.0769	-0.0645	-0.1415*	-0.0297	-0.0518	-0.0241	-0.0303

TABLE VA. Commercial Banking: Short-Run Estimates (Loan Disequilibrium)

Dependent Variable		Interest Rate Responses							
		1	ln(RDISC)	ln(RSHORT)	ln(RLONG)	ln(RMORT)	ln(RLOAN)	$\ln\left(\frac{RE}{RSHORT}\right)$	$\frac{(1-k)DD_{-1}}{W^e}$
$\Delta EXRES / W^e$	prior	none	0.0010	-0.0010	0.0000	0.0000	0.0000	0.0000	0.0000
	OLS	0.0155	-0.0002	-0.0000	0.0002	-0.0018	0.0010	0.0003	0.0074*
$\Delta BORRES / W^e$	prior	none	0.0050	-0.0050	0.0000	0.0000	0.0000	0.0000	0.0000
	OLS	0.0291	0.0027	-0.0052*	0.0039	-0.0005	-0.0011	-0.0023	-0.0019
$\Delta ASHORT / W^e$	prior	none	-0.0030	0.0257	-0.0915	-0.0442	0.1017	0.0600	0.0583
	OLS	-0.1140	-0.0384*	0.0281*	0.0507	-0.0281	-0.0128	-0.0183	0.1925*
$\Delta LSHORT / W^e$	prior	none	-0.0030	0.0624	-0.0625	-0.0157	0.0213	0.0288	0.0616
	OLS	1.0949*	0.0263	-0.0208	0.0450	-0.0475	-0.0004	0.0083	-0.0306
$\Delta LONG / W^e$	prior	none	0.0000	-0.0737	0.2230	-0.0525	-0.0535	-0.0756	-0.0965
	OLS	-0.0084	0.0081	-0.0087	-0.0787*	0.0774*	0.0104	0.0007	-0.0895
$\Delta MORT / W^e$	prior	none	0.0000	-0.0084	-0.0690	0.1125	-0.0695	-0.0132	-0.0235
	OLS	-0.0171	0.0015	0.0067	-0.0211*	0.0005	0.0029	0.0113*	-0.0778*

Dependent Variable		Adjustment Coefficients								
		$\frac{\phi EXRES}{W^e}$	$\frac{\phi BORRES}{W^e}$	$\frac{\phi ASHORT}{W^e}$	$\frac{\phi LSHORT}{W^e}$	$\frac{\phi LONG}{W^e}$	$\frac{\phi MORT}{W^e}$	$\frac{\phi LOAN}{W^e}$	$\frac{W-W^e}{W^e}$	$\frac{-\Delta LOAN}{W^e}$
$\Delta EXRES / W^e$	prior	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	OLS	1.0052*	0.0245	0.0161	0.0155	0.0155	0.0074	0.0190*	0.0082*	0.0102*
$\Delta BORRES / W^e$	prior	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	OLS	-0.6252	0.8870*	0.0448*	0.0161	0.0293	-0.0108	0.0399	0.0232*	0.0441*
$\Delta ASHORT / W^e$	prior	0.0000	0.0000	0.8500	0.1500	0.1750	0.1750	0.4700	0.4400	0.4500
	OLS	-0.1926	1.0625	0.3355	-0.0623	-0.1119	-0.6726*	0.1480	0.5510*	0.4064*
$\Delta LSHORT / W^e$	prior	0.0000	0.0000	0.1500	0.8500	0.0850	0.0850	0.1900	0.1800	0.1500
	OLS	-1.6275	2.6691*	0.8511*	1.1047*	1.0899*	1.2343*	1.0865*	0.3538*	0.5818*
$\Delta LONG / W^e$	prior	0.0000	0.0000	0.0000	0.0000	0.7300	0.1300	0.2800	0.2600	0.3000
	OLS	-0.3970	-3.5115*	-0.1707	-0.0095	0.1187	0.4714	-0.2416	0.0879	-0.0122
$\Delta MORT / W^e$	prior	0.0000	0.0000	0.0000	0.0000	0.0100	0.6100	0.0600	0.1200	0.1000
	OLS	2.8375*	-0.1318	-0.0769	-0.0645	-0.1415*	-0.0297	-0.0518	-0.0241	-0.0303

TABLE VB. Commercial Banking: Long-Run Estimates

Dependent Variable		1	ln(RDISC)	ln(RSHORT)	ln(RLONG)	ln(RMORT)	ln(RLOAN)	$\ln\left(\frac{RE}{RSHORT}\right)$	$\frac{(1-k)DD_{-1}}{W^e}$
EXRES	prior	none	0.0010	-0.0010	0.0000	0.0000	0.0000	0.0000	0.0000
W^e	OLS	0.0043	0.0004	-0.0012	-0.0020	-0.0005	0.0016	0.0008	-0.0002
BORRES	prior	none	0.0050	-0.0050	0.0000	0.0000	0.0000	0.0000	0.0000
W^e	OLS	0.0465	0.0106	-0.0216	0.0007	-0.0086	0.0076	0.0052	-0.0569
ASHORT	prior	none	-0.0030	0.0500	-0.0500	0.0000	-0.0250	0.0900	0.1200
W^e	OLS	0.4821	-0.0267	-0.0262	-0.2992	0.2519	0.0300	0.0076	-0.5986
LSHORT	prior	none	-0.0030	0.0800	-0.0500	0.0000	-0.0250	0.0300	0.0800
W^e	OLS	2.0134	0.2738	-0.8218	0.3601	-0.8261	0.4352	0.3544	-1.8700
LONG	prior	none	0.0000	-0.0900	0.4000	-0.0500	-0.2000	-0.1000	-0.1000
W^e	OLS	-0.6660	-0.0459	0.0622	0.1374	0.0983	-0.0726	-0.1581	1.2565
MORT	prior	none	0.0000	-0.0100	-0.1000	0.2000	-0.1500	-0.0200	-0.0300
W^e	OLS	0.1743	-0.0033	0.1271	-0.2643	0.2629	-0.0584	-0.0113	-0.3534
LOAN	prior	none	0.0000	-0.0240	-0.2000	-0.1500	0.4000	0.0000	-0.0700
W^e	OLS	-1.0546	-0.2089	0.6816	0.0673	0.2220	-0.3433	-0.1987	1.6227

Notes: 1. $\Delta X \equiv X - X_{-1}$, $\phi X \equiv X^* - X_{-1}$ (the actual regressor is $-X_{-1}$).

2. Sample period: 1963.1 to 1978.3 (63 observations).

3. Asterisk (*) indicates t-statistic greater than 2.0 in absolute value.

TABLE VIA. Households: Short-Run Estimates

Dependent Variable		Interest Rate Responses										
		1	ln(RTDB)	ln(RTDS)	ln(RSHORT)	ln(RLONG)	ln(REQUITY)	ln(RMORT)	ln(RLOAN)	$\ln\left(\frac{RE}{RSHORT}\right)$	$\left(\frac{\dot{P}}{P}\right)^e$	$\frac{\sqrt{Y}}{W^e}$
$\frac{\Delta DDC}{W^e}$	prior	none	-0.0200	-0.0200	-0.0040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.6000
	OLS	0.1659*	-0.0201*	0.0063	0.0043	-0.0095	-0.0003	0.0295*	-0.0053	0.0048	0.0002	5.8456*
	mixed	0.2947	-0.0224	0.0117	0.0022	-0.0086	-0.0008	0.0085	-0.0028	0.0007	0.0009	1.4387
$\frac{\Delta TDB}{W^e}$	prior	none	0.1767	-0.1382	-0.0045	0.0020	-0.0900	-0.0115	0.0095	0.0150	0.0000	-0.7850
	OLS	0.0142	0.0141*	0.0092	-0.0007	0.0018	0.0018*	-0.0143	0.0011	-0.0004	0.0003	-1.3460*
	mixed	0.1229	0.0089	0.0364	-0.0007	-0.0086	0.0033	0.0024	-0.0026	0.0006	0.0007	-0.2757
$\frac{\Delta TDS}{W^e}$	prior	none	-0.1382	0.1767	-0.0078	0.0100	-0.1475	0.0105	-0.0105	0.0150	0.0000	-0.5000
	OLS	-0.0438	0.0027	0.0087	0.0020	-0.0026	-0.0005	-0.0004	-0.0136*	0.0012	-0.0001	-0.2972
	mixed	0.0894	0.0015	0.0221	-0.0007	-0.0027	0.0014	0.0061	-0.0083	0.0017	-0.0004	0.2399
$\frac{\Delta SHORT}{W^e}$	prior	none	-0.0085	-0.0085	0.0200	-0.0100	-0.0200	-0.0040	-0.0040	0.0250	0.0000	-0.1600
	OLS	0.2582*	0.0019	-0.0021	0.0018	-0.0051	0.0004	0.0057	0.0109*	-0.0006	-0.0003	1.0537
	mixed	0.1168	0.0012	-0.0281	0.0076	-0.0038	-0.0025	-0.0017	0.0079	0.0047	-0.0007	-0.5397
$\frac{\Delta LONG}{W^e}$	prior	none	-0.0080	-0.0080	-0.0015	0.0830	-0.0525	-0.0145	-0.0145	-0.0475	0.0000	-0.0700
	OLS	0.0179	-0.0055	-0.0127	-0.0037	0.0138	-0.0001	-0.0054	0.0035	-0.0018	-0.0002	-1.2089
	mixed	0.1126	0.0062	-0.0181	-0.0043	0.0171	0.0017	-0.0062	0.0030	-0.0058	-0.0002	-0.2738
$\frac{\Delta EQUITY\text{-}CGEQ}{W^e}$	prior	none	0.0000	0.0000	-0.0025	-0.0800	0.2650	-0.0220	-0.0220	0.0000	0.0000	-0.0500
	OLS	0.0770*	0.0011	-0.0030	-0.0011	0.0076*	0.0002	-0.0071*	-0.0007	0.0003	0.0001	-0.3860
	mixed	0.0947	0.0022	-0.0033	0.0005	0.0038	-0.0002	-0.0093	-0.0011	0.0005	0.0001	-0.1231
$\frac{\Delta NONMKT\text{-}CGNON}{W^e}$	prior	none	0.0000	0.0000	0.0000	0.0000	0.0750	-0.0100	-0.0100	0.0000	0.0000	0.0000
	OLS	-0.0230	-0.0039	-0.0024	0.0014	-0.0030	-0.0007	-0.0004	-0.0007	0.0014	0.0000	-0.4794
	mixed	0.0321	0.0029	-0.0017	-0.0007	-0.0047	0.0008	0.0068	-0.0018	0.0001	0.0002	-0.0867
$\frac{\Delta MORT}{W^e}$	prior	none	0.0000	0.0000	0.0000	0.0000	-0.0550	0.0690	-0.0150	0.0000	0.0000	0.0000
	OLS	0.0471*	-0.0007	0.0038	-0.0008	0.0033	-0.0004	-0.0091*	0.0028*	0.0001	0.0001	-0.9970*
	mixed	-0.0011	0.0024	-0.0039	-0.0022	0.0027	0.0000	-0.0005	0.0043	-0.0002	-0.0001	-0.1038
$\frac{\Delta LOAN}{W^e}$	prior	none	-0.0020	-0.0020	0.0003	-0.0050	0.0250	-0.0175	0.0665	-0.0075	0.0000	-0.0350
	OLS	0.4865*	0.0104*	-0.0078	-0.0033	-0.0063	-0.0005	0.0015	0.0019	-0.0050*	-0.0001	-2.1848*
	mixed	0.1380	-0.0030	-0.0152	-0.0017	0.0047	-0.0036	-0.0062	0.0013	-0.0022	-0.0004	-0.2758

TABLE VI-A., continued

Dependent Variable		Adjustment Coefficients									
		ϕDDC / W^e	ϕTDB / W^e	ϕTDS / W^e	ϕSHORT / W^e	ϕLONG / W^e	ϕEQUITY / W^e	ϕNONMKT / W^e	ϕMORT / W^e	LOAN / W^e	$W-W^e$-CGEQ-CGNON / W^e
ΔDDC / W^e	prior	0.9000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.2500
	OLS	1.1300*	0.0465	-0.0362	0.2831*	0.2440*	0.1909*	0.2342*	-0.1022	0.4735*	0.1962*
	mixed	0.9201	0.2329	0.3299	0.2308	0.2191	0.2860	0.1856	0.2856	0.2427	0.2888
ΔTDB / W^e	prior	0.0500	0.8000	0.1000	0.0500	0.1000	0.0500	0.0500	0.0000	0.1000	0.1200
	OLS	-0.1580*	0.1060	0.0767	0.0122	-0.0274	0.0383	-0.0848	-0.0110	-0.0264	0.0276
	mixed	0.0316	0.3246	0.2379	0.1133	0.1485	0.1887	0.0922	0.1577	0.1335	0.1870
ΔTDS / W^e	prior	0.0500	0.1000	0.8000	0.0500	0.1000	0.0000	0.1000	0.1000	0.0000	0.1700
	OLS	-0.1670*	-0.1074*	0.0174	-0.1133*	-0.1908*	-0.0532	0.0129	-0.0111	-0.0013	-0.0473
	mixed	0.0235	0.1120	0.1726	0.1005	0.1296	0.1191	0.1380	0.1593	0.1065	0.1232
ΔSHORT / W^e	prior	0.0000	0.0000	0.0000	0.7000	0.1000	0.1000	0.0000	0.1000	0.1000	0.0800
	OLS	0.1861*	0.3349*	0.0497	0.4995*	0.3906*	0.2658*	0.3733*	0.1935	0.2195*	0.2828*
	mixed	0.0079	0.0593	0.0409	0.3982	0.1249	0.0891	0.1175	0.1539	0.1122	0.0865
ΔLONG / W^e	prior	0.0000	0.0000	0.0000	0.0500	0.5000	0.1000	0.0000	0.0000	0.0000	0.0300
	OLS	-0.1248	-0.0077	0.0090	-0.0718	0.1184	-0.0018	-0.0053	0.0813	-0.0687	-0.0095
	mixed	0.0040	0.0572	0.0403	0.0800	0.2404	0.1106	0.0738	0.0307	0.0199	0.0955
ΔEQUITY-CGEQ / W^e	prior	0.0000	0.0000	0.0000	0.0000	0.0000	0.5010	0.1000	0.0000	0.0000	0.1500
	OLS	-0.0157	0.1820*	0.0411	0.0493	0.0860*	0.0720*	0.0752*	0.0636*	0.0963*	0.0666*
	mixed	0.0028	0.0403	0.0297	0.0058	0.0039	0.0747	0.1201	0.0320	0.0162	0.0711
ΔNONMKT-CGNON / W^e	prior	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.1000	0.0000	0.0000	0.1500
	OLS	-0.0157	0.1820*	0.0411	0.0493	0.0860*	0.0720*	0.0752*	0.0636*	0.0963*	0.0666*
	mixed	0.0018	0.0389	0.0310	-0.0011	0.0053	0.0377	0.0385	0.0423	0.0423	0.0422
ΔMORT / W^e	prior	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.1000	0.0500
	OLS	0.0303	-0.0115	0.3385*	0.0039	0.0268	0.0499*	-0.0571*	0.2801*	-0.1485*	0.0413*
	mixed	0.0077	0.0623	0.0560	-0.0196	0.0151	0.0048	-0.0055	0.0233	0.0695	0.0082
ΔLOAN / W^e	prior	0.0000	0.0000	0.0000	0.0500	0.1000	0.1500	0.1500	0.2000	0.6000	0.1000
	OLS	0.1231	0.5986*	0.5514*	0.4302*	0.4509*	0.4745*	0.5056*	0.5261*	0.5534*	0.4785*
	mixed	0.0005	0.0725	0.0617	0.0921	0.1132	0.0893	0.2398	0.1150	0.2708	0.0975

TABLE VI-B. Households: Long-Run Estimates

Dependent Variable		1	ln(RTDB)	ln(RTDS)	ln(RSHORT)	ln(RLONG)	ln(REQUITY)	ln(RMORT)	ln(RLOAN)	$\ln\left(\frac{RE}{RSHORT}\right)$	$\left(\frac{\dot{p}}{p}\right)^e$	$\frac{\sqrt{Y}}{W^e}$
$\frac{DDC}{W^e}$	prior	none	-0.0250	-0.0250	-0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.00
	OLS	-1.0630	-0.0312	1.0983	0.0729	1.9618	0.1108	-1.6634	-0.9775	0.4169	0.0083	98.32
$\frac{TDB}{W^e}$	prior	none	0.2500	-0.2000	-0.0050	-0.0100	-0.1000	0.0000	0.0000	0.0250	0.0000	-1.00
	OLS	-3.3552	0.0080	3.4397	0.2100	6.1785	0.3550	-5.2952	-3.0534	1.2850	0.0273	293.40
$\frac{TDS}{W^e}$	prior	none	-0.2000	0.2500	-0.0100	-0.0100	-0.1500	0.0000	0.0000	0.0250	0.0000	-0.60
	OLS	-4.7424	0.0555	4.7771	0.2824	8.2979	0.4912	-7.0642	-4.1929	1.7137	0.0345	399.27
$\frac{SHORT}{W^e}$	prior	none	-0.0100	-0.0100	0.0300	-0.0200	-0.0500	-0.0100	-0.0100	0.0500	0.0000	-0.20
	OLS	2.8961	0.0330	-3.0621	-0.1795	-5.5802	-0.3186	4.7331	2.7907	-1.1490	-0.0232	-258.03
$\frac{LONG}{W^e}$	prior	none	0.0150	-0.0150	-0.0050	0.2000	-0.2000	-0.0200	-0.0200	-0.1000	0.0000	-0.10
	OLS	-0.9319	-0.0130	0.8919	0.0338	1.7010	0.1005	- .3866	-0.7982	0.3237	0.0060	78.67
$\frac{(EQUITY-CGEQ)}{W^e}$	prior	none	0.0000	0.0000	-0.0050	-0.1600	0.5000	-0.0400	-0.0400	0.0000	0.0000	-0.10
	OLS	3.4009	0.0398	-2.4356	-0.1381	-4.4074	-0.2436	3.6738	2.1716	-0.9005	-0.0175	-224.27
$\frac{(NONMKT-CGNON)}{W^e}$	prior	none	0.0000	0.0000	0.0000	0.0000	0.1500	-0.0200	-0.0200	0.0000	0.0000	0.00
	OLS	-6.8426	-0.0098	7.1121	0.4450	12.5590	0.7276	-10.6665	-6.3405	2.6126	0.0505	604.65
$\frac{MORT}{W^e}$	prior	none	0.0000	0.0000	0.0000	0.0000	-0.1000	0.1500	-0.0600	0.0000	0.0000	0.00
	OLS	6.5981	-0.0770	-6.6427	-0.4014	-11.5652	-0.6890	9.8517	5.8362	-2.3961	-0.0481	-556.43
$\frac{LOAN}{W^e}$	prior	none	0.0000	0.0000	0.0000	0.0000	-0.0500	-0.0600	0.1500	0.0000	0.0000	0.00
	OLS	5.0402	-0.0054	-5.1787	-0.3251	-9.1457	-0.5340	7.8178	4.5640	-1.9064	-0.0381	-435.60

NOTES: 1. $\Delta X \equiv X - X_{-1}$, $\phi X \equiv X^* - X_{-1}$ (the actual regressor is $-X_{-1}$).

2. Sample period: 1954.1 to 1978.3 (99 observations).

3. Asterisk (*) indicates t-statistic greater than 2.0 in absolute value.

RLONG the yield to maturity, and we try to capture interest rate expectations by an additional variable. The variable $\ln(RE/RSHORT)$ -- RE is the 91-day treasury bill rate expected next quarter, from the Goldsmith-Nagan survey [4]--is intended to capture the effect of an expected change in the short rate. For given current short and long rates, an increase in the expected future short rate presumably implies a lower expected one-period return from holding longs. For investors with short horizons this would be associated with an increase in the demand for shorts, and a decrease in demand for longs (and other assets with distant maturities) as indicated by the prior means in the table. Nominal rates are used for all of the financial sectors on the grounds that these institutions are dealing entirely in nominally-dominated claims, and that real income effects of inflation are negligible.

Savings institutions, like all other sectors except commercial banks, are assumed always to be on their demand curves. Their effective demands are identical with short-run notional demands--however, because of costs of adjustment, short and long run notional demands differ. Discrepancies between actual and long-run desired asset holdings are eliminated by a general partial adjustment mechanism. Expected disposable assets for each sector is an adaptive process with an estimated geometric rate of growth appended:

$$WE = (1+g)(\delta W_{-1} + (1-\delta)WE_{-1}) ,$$

where g is the growth rate and δ is a weighting parameter set arbitrarily at .75. For savings institutions unexpected funds have two components: changes in FHLB borrowing and unexpected inflows from other sources, primarily deposits. Each component is allocated separately in the short-run so that thrifts can react differently to changes in deposit liabilities and FHLB advances.

Insurance and pension funds. The specification of Insurance and Pension Funds parallels that of savings institutions. Prior claims are life insurance and pension reserves, policy and other loans, and net worth and miscellaneous. Equity holdings are a major part of this sector's portfolio (approximately 30% in 1971) and (unrealized) capital gains are a substantial fraction of changes in the value of equity held. We have made the arbitrary decision that these gains do not lead (for one period) to revisions in the demands for other assets, but are kept in equity. Hence in the short-run tables, capital gains are netted out of disposable assets and the dependent variable for equity is net of (unrealized) capital gains.

Commercial banks. The long-run demand equations for commercial banks are of the same general form as for the other financial intermediaries. However, in the short run banks can be off their notional demands. Banks are assumed to accommodate loan demand within the period, and to respond subsequently to an excess of loans in their portfolios by raising the loan rate. This accommodation implies that their effective demands for other assets will also differ from notional demands. The specification in the short-run tables for banks is derived as follows:

Partition the short-run notional flow demands as

$$\begin{pmatrix} \Delta a_1^n \\ \Delta a_2^n \end{pmatrix} = \begin{pmatrix} E_1 \\ E_2 \end{pmatrix}(a^* - a_{-1}) + \begin{pmatrix} F_1 \\ F_2 \end{pmatrix}(S - S^e)$$

The subscript 2 refers to loans. (Thus E_2 , for example, is an n-dimensional row vector.) Let the effective demands be

$$\begin{pmatrix} \Delta a_1 \\ \Delta a_2 \end{pmatrix} = \begin{pmatrix} \Delta a_1^n \\ \Delta a_2^n \end{pmatrix} + \begin{pmatrix} \theta_1 \\ \theta_2 \end{pmatrix}(\Delta\bar{a}_2 - \Delta a_2^n)$$

$\Delta\bar{a}_2$ is the exogenous flow supply of loans; a fraction θ_2 of the difference between the supply and the notional demand is met by banks with spillovers, represented by the vector θ_1 , into banks' demands for other assets. The θ_j sum to zero or, equivalently, the elements of θ_1 sums to $-\theta_2$. (To see this, note that $(\Delta\bar{a}_2 - \Delta a_2^n)$ is simply a z variable in equation (7).) Manipulation yields

$$\begin{aligned}\Delta a_1 &= E_1(a^* - a_{-1}) + F_1(S - S^e) + \theta_1\Delta\bar{a}_2 \\ &\quad - \theta_1[E_2(a^* - a_{-1}) + F_2(S - S^e)] \\ &= [E_1 - \theta_1 E_2](a^* - a_{-1}) + [F_1 - \theta_1 F_2](S - S^e) + \theta_1\Delta\bar{a}_2\end{aligned}$$

and

$$\Delta a_2 = (1 - \theta_2)E_2(a^* - a_{-1}) + (1 - \theta_2)F_2(S - S^e) + \Delta\bar{a}_2 \ .$$

For estimation the model is underidentified without further restrictions on, or information about, θ_2 :

$$\Delta a_1 = \left[E_1 - \frac{\theta_1}{\theta_2}E_2\right](a^* - a_{-1}) + \left[F_1 - \frac{\theta_1}{\theta_2}F_2\right](S - S^e) + \frac{\theta_1}{\theta_2}\Delta a_2 \; .$$

It is easiest to interpret the disequilibrium short-run equations for Commercial Banks by assuming $\theta_2 = 1$. Then loans vary with other sector's demands for them, and the coefficients indicate how the remainder of the portfolio adjusts to accommodate loan demand. The interest rate responses and adjustment coefficients in a given row are now the sum of a variable's effect on the asset in question and a (negative) fraction $(-\theta_{ij})$ of the loan discrepancy.

Households. The household sector (Table VI) plays a central role in the model both because of the quantitative importance of its expenditures on current output and because of the magnitudes of its holdings of various assets and liabilities. The constraint on demands, W , is net worth. Households are the dominant demanders of equity, of the liabilities of intermediaries, and of the supply of mortgage credit. They are also important in the markets for short- and long-term securities and loans.

As discussed above, our intention in later versions of the model is to integrate consumption and portfolio behavior, but here we follow more conventional practice in separating the two decisions. Table VI gives the short- and long-run asset and liability demand equations. They are similar to those of other sectors with the following exceptions. The equations include a transaction variables Y^{α}/W^{e} . (Y is personal income, inclusive of taxes, and α is a parameter to be estimated.) The likelihood function for α for the complete system of equations, calculated at intervals of .2, had a sharply-defined maximum at $\alpha = .5$ --a square-root rule of sorts. Nominal interest rates are used in the regressions. But the equations also include the Juster/Survey Research Center [13, Table 19B] price expectations variable. Our prior means were constructed by assuming that the effect of an increase in expected inflation accompanied by equal increases in market-determined nominal interest rates decreases the demand for demand deposits and currency, with the effect distributed across other assets.

Estimates. An important difference between this study and previous work is our explicit use of subjective prior information in the estimation. Most model-builders mine the data[3] in search of plausible estimates. We hope to profit from direct use of the same vague information that leads investigators, *ex post*, to view some estimates as plausible and others unacceptable. In particular, we have used the Theil-Goldberger mixed estimation technique to combine our prior beliefs with the data. This involves specifying prior means and a variance-covariance structure for the structural coefficients.[4]

Our prior means, which are reported together with OLS estimates in Tables III to VI, are highly subjective, but we expect most economists will find them qualitatively plausible. The long-run coefficients reflect our belief that most pairs of assets are gross substitutes: stock demands depend positively on own rates and negatively on other rates. Own elasticities generally are in the range of 1 to 3 in absolute value. There is rough symmetry motivated by the idea that equal increases in all rates should not have large effects on demands. The adjustment matrix has diagonal elements between 0 and 1 with liquid assets adjusting more quickly than illiquid ones. Unexpected funds are allocated relatively more heavily into demand deposits and shorts than into other assets.

Unconstrained OLS results testify to the difficulty of obtaining significant and/or sensible coefficient estimates in models of this type. Fewer than half of the short-run rate responses and approximately half of the adjustment coefficients are significant, and there are a larger number of estimates quantitatively, if not significantly, far from the priors. Many are of the "wrong" sign, and some significantly so. Although these results are typical of what one gets from time series data, they do not provide a sensible basis for simulation. Many of the policy experiments which we anticipate simulating with the model depend critically on estimates of the supply and demand equations including their cross-elasticities, and it would be difficult to have much confidence in results which incorporate so many anomalies.

In previous work by Smith-Brainard [2] and Backus-Purvis [1] the use of prior information removed virtually all of the "peculiar" estimates in the adjustment matrix which occurred with OLS but was less successful in eliminating "wrong" signs on interest rates in the short- and long-run demand equations. Mixed estimation of the Savings, Insurance, and Household sectors repeats this experience.

As shown in Tables III, IV and VI, the use of prior information substantially "improved" the estimates of the adjustment coefficients. Perhaps the most dramatic change relates to Savings Institutions short-run demand for mortgages. According to the OLS estimates, an increase in the desired holdings of mortgages accompanied by an equal increase in disposable funds results in a decrease in mortgage demand, and increases in the desired holdings of other assets (accompanied by increases in disposable funds) lead to large sales of mortgages and purchases of assets not themselves desired. The mixed estimation virtually eliminates this anomaly. A number of other anomalous features of the OLS adjustment matrix are eliminated by using the mixed estimation procedure and approximately 3/4 of the adjustment coefficients are substantially changed in the direction of the priors. The mixed estimates of the rate coefficients, taken as a group, do not appear qualitatively superior to the OLS estimates. For both estimation procedures most of the own coefficients are of the "correct" sign, but from a third to a half of the cross-elasticities are of the "wrong" sign.

These results suggest that there are problems with our behavioral or statistical specifications. There are several possible statistical reasons for these problems: (1) we devoted little attention to the intertemporal structure of errors. The partial adjustment specification involves a large number of parameters which may compensate for the lack of a more flexible error structure. But to the extent that it does, the estimates of those parameters will conflict with our prior views of plausible speeds of adjustment and cross effects. (2) We have not dealt with the estimation problems created by the simultaneity of the system. (3) In order to keep the prototype model simple we have aggregated several sectors where we know (for example in the Savings and Insurance and Pension sectors) that sub-sectors differ significantly in behavior. The simulations of the model below provide clues to a number of features of our behavioral specification which may be causing difficulty.

7. SIMULATION OF THE FINANCIAL BLOCK

Simulation of the model and its subsectors using pure priors for the coefficients serves several purposes. First, simulation provides a direct test of the consistency of the system's specification. Although the qualitative nature of the equilibria of models like this can be derived analytically, the dynamics are intractible. Even if each individual sector behaves sensibly, the system as a whole may not. Second, simulation reveals non-obvious qualitative implications of the coefficient priors and market specification for the response of the endogenous variables to policies or other shocks. In some cases there may be prior information about system-wide "multipliers." Discrepancies between such priors and the simulated multipliers would suggest reexamination of the specifications of individual sectors. Ideally any prior information about reduced form behavior would be used symmetrically with prior information about structural coefficients in the estimation itself. In any case, simulation provides a way of investigating the implications of the priors for the response of the system to various shocks and policy experiments for which there is no direct historical experience.

In this section we report results of simulating the financial block. The adjustment of financial variables required to satisfy asset demand and supply equations described in Table II is described, taking as predetermined the level of output, prices, and the capital stock, and taking the financial behavior of businesses, rest of the world, and government to be exogenous.

Although simulations of the financial block alone do not test a number of the distinctive features of the model, those that relate to the endogeneity of capital stock and government debt, understanding the behavior of the financial sector is a step toward understanding the complete model.

Simulation of the financial block did not reveal any outright inconsistencies of specification, but it did reveal a number of features of our specification with which we are not content. No doubt we will find others. Among the difficulties are the following:

(1) Capital gains are volatile and tend to induce large fluctuations in asset demands and rates. In the prototype model capital gains in equity are, in the first instance, held in equity, adjustment starting one period later. The intent was to implement the empirical evidence that capital gains and losses have relatively small effects on the demands for other assets in the short run. What the specification actually did, however, was simply postpone the strong effects of gains or losses for one quarter. We have now smoothed changes in q and therefore, capital gains in equity.

(2) Another specification "error" which seems to be creating difficulties in the simulations is the assumption that banks fully accommodate loan demands. Perhaps because of the large variations in household loan demand resulting from the treatment of capital gains, loan demand is highly volatile and forces substantial and unrealistic reallocation of bank portfolios. One possible solution is to allow some adjustment of the loan

rate within the period, as may be anyway more realistic in recent years. Another is to assume some rationing of credit.

(3) A third feature of the specification with which we are not completely happy is our assumption of partial adjustment. Slow adjustment of quantities forces large fluctuations in the endogenous interest rates to clear markets when there are exogenous shocks to quantities supplied. In the case of demand deposits and currency, which serve as buffers or "temporary abodes of purchasing power," the partial adjustment assumption seems particularly inappropriate.

Simulation results. Tables VII to XII report a variety of simulations illustrating some of the experiments we wish to explore. The first two simulations illustrate the response of the system to two standard tools of monetary policy: open market operations and changes in reserve requirements. Although there are fluctuations reflecting the aforementioned treatment of capital gains, the simulations are qualitatively in accord with usual presumptions. Increasing reserves or decreasing reserve requirements decreases all interest rates. Changes in the short and long rates are almost equal; the simulations assume that future expected short rates move with the current short rates. The mortgage rate moves more than these two rates, reflecting substantial responses by banks and other financial intermediaries. Moreover, the mortgage market is assumed to be cleared by the mortgage rate, with no rationing. Perhaps the mortgage market should be treated similarly to the loan market. The equity rate moves somewhat less than other rates,

TABLE VII. Open Market Operation

$1 Billion Purchase of Short-Term Securities

Yr.	Qtr.	Differences from Base Simulation			
		RSHORT	RLONG	REQUITY	RMORT
1971	1	-0.521	-0.210	-0.189	-0.276
1971	2	-0.379	-0.181	-0.069	-0.229
1971	3	-0.348	-0.184	0.022	-0.203
1971	4	-0.328	-0.287	-0.236	-0.359
1972	1	-0.304	-0.215	-0.085	-0.273
1972	2	-0.116	-0.144	0.067	-0.159
1972	3	-0.371	-0.342	-0.290	-0.435
1972	4	-0.315	-0.266	-0.097	-0.326
Average of Last 3 Qtrs.		-0.267	-0.251	-0.107	-0.307

Yr.	Qtr.	Demand Deposits at Commercial Banks
1971	1	3.024
1971	2	4.271
1971	3	5.057
1971	4	1.965
1972	1	3.883
1972	2	5.505
1972	3	1.118
1972	4	3.847
Average of Last 3 Qtrs.		3.490

Note: Rates are annual percentages. Stocks are in billions of dollars.

TABLE VIII. Reserve Requirements

Increase of .01 in Required Reserve Ratio on Demand Deposits

Yr.	Qtr.	Differences from Base Simulation: RSHORT	RLONG	REQUITY	RMORT
1971	1	0.778	0.278	0.245	0.368
1971	2	0.574	0.266	0.113	0.342
1971	3	0.637	0.317	0.018	0.363
1971	4	0.479	0.413	0.304	0.516
1972	1	0.499	0.352	0.147	0.449
1972	2	0.297	0.288	-0.006	0.346
1972	3	0.526	0.499	0.359	0.633
1972	4	0.543	0.449	0.176	0.556
Average of Last 3 Qtrs.		0.455	0.412	0.176	0.512

Yr.	Qtr.	Excess Reserves	Borrowed Reserves	Demand Deposits at Commercial Banks	Time Deposits at Commercial Banks
1971	1	-0.091	0.455	-3.733	-5.449
1971	2	-0.067	0.297	-5.411	-6.803
1971	3	-0.051	0.195	-6.802	-8.543
1971	4	-0.097	0.405	-2.997	-10.849
1972	1	-0.067	0.256	-5.394	-10.325
1972	2	-0.043	0.127	-7.163	-10.849
1972	3	-0.102	0.414	-2.307	-12.870
1972	4	-0.081	0.314	-5.614	-12.528
Average of Last 3 Qtrs.		-0.075	0.285	-5.028	-12.082

Note: Rates are annual percentages. Stocks are in billions of dollars.

TABLE IX. Operation Twist

$1 Billion Purchase of LONGS, Sale of SHORTS

Yr.	Qtr.	Differences from Base Simulation RSHORT	RLONG	REQUITY	RMORT
1971	1	0.004	-0.025	-0.020	-0.028
1971	2	0.025	-0.011	0.002	-0.009
1971	3	0.043	-0.013	0.002	-0.009
1971	4	0.001	-0.022	-0.019	-0.025
1972	1	0.024	-0.012	-0.001	-0.011
1972	2	0.035	-0.010	0.005	-0.007
1972	3	-0.001	-0.024	-0.021	-0.028
1972	4	0.019	-0.015	-0.002	-0.014
Average of Last 3 Qtrs.		0.018	-0.016	-0.006	-0.016

Yr.	Qtr.	Demand Deposits at Commercial Banks
1971	1	-0.015
1971	2	0.128
1971	3	0.136
1971	4	-0.109
1972	1	0.092
1972	2	0.154
1972	3	-0.134
1972	4	0.077
Average of Last 3 Qtrs.		0.032

Note: Rates are annual percentages. Stocks are in billions of dollars.

TABLE X. Freddie Mac

$1 Billion Purchase of Mortgages, Sale of LONGS

Yr.	Qtr.	Differences from Base Simulation: RSHORT	RLONG	REQUITY	RMORT
1971	1	0.005	0.012	0.007	-0.007
1971	2	-0.006	0.002	-0.004	-0.014
1971	3	-0.004	0.004	-0.001	-0.013
1971	4	0.003	0.006	0.004	-0.005
1972	1	-0.005	0.002	-0.003	-0.013
1972	2	-0.002	0.003	-0.000	-0.011
1972	3	0.002	0.005	0.003	-0.006
1972	4	-0.003	0.002	-0.003	-0.011
Average of Last 3 Qtrs.		-0.001	+0.004	0.000	- .009

Yr.	Qtr.	Demand Deposits at Commercial Banks	Mortgage Liability of Households
1971	1	0.056	0.151
1971	2	-0.039	0.175
1971	3	-0.014	0.199
1971	4	0.043	0.228
1972	1	-0.032	0.234
1972	2	-0.008	0.237
1972	3	0.033	0.249
1972	4	-0.030	0.244
Average of Last 3 Qtrs.		-0.002	0.243

Note: Rates are annual percentages. Stocks are in billions of dollars.

TABLE XI. Stock Market Intervention

$1 Billion Purchase of Equity, Sale of SHORTS

Yr.	Qtr.	Difference from Base Simulation: RSHORT	RLONG	REQUITY	RMORT
1971	1	0.017	-0.005	-0.023	-0.012
1971	2	0.029	-0.002	-0.001	-0.005
1971	3	0.055	-0.002	0.004	-0.001
1971	4	0.002	-0.016	-0.023	-0.022
1972	1	0.028	-0.005	-0.004	-0.007
1972	2	0.047	0.001	0.008	0.003
1972	3	-0.000	-0.019	-0.025	-0.025
1972	4	0.021	-0.008	-0.005	-0.010
Average of Last 3 Qtrs.		0.003	-0.009	-0.007	-0.011

Yr.	Qtr.	Demand Deposits at Commercial Banks
1971	1	0.065
1971	2	0.125
1971	3	0.160
1971	4	-0.138
1972	1	0.080
1972	2	0.197
1972	3	-0.172
1972	4	0.054
Average of Last 3 Qtrs.		0.026

Note: Rates are annual percentages. Stocks are in billions of dollars.

TABLE XII. Regulation Q Ceilings on Deposit Rates

25 Basis Point Increase at Both Commercial Banks and Savings Institutions

		Differences from Base Simulation			
Yr.	Qtr.	RSHORT	RLONG	REQUITY	RMORT
1971	1	-0.069	-0.018	-0.018	-0.036
1971	2	-0.077	-0.048	-0.035	-0.082
1971	3	-0.069	-0.060	-0.012	-0.094
1971	4	-0.030	-0.063	-0.039	-0.091
1972	1	-0.049	-0.069	-0.038	-0.108
1972	2	-0.002	-0.055	-0.006	-0.089
1972	3	-0.043	-0.087	-0.060	-0.126
1972	4	0.011	-0.061	-0.020	-0.095
Average of Last 3 Qtrs.		-0.011	-0.068	-0.029	-0.103
Yr.	Qtr.	Demand Deposits at Commercial Banks	Time Deposits at Commercial Banks	Time Deposits at Savings Institutions	Mortgage Liability of Households
1971	1	-1.579	3.729	1.922	0.327
1971	2	-2.266	5.440	2.598	0.926
1971	3	-2.248	6.455	3.184	1.855
1971	4	-2.692	6.572	3.413	2.233
1972	1	-2.576	7.007	3.728	2.571
1972	2	-2.490	7.615	3.830	3.113
1972	3	-3.128	7.769	3.953	3.140
1972	4	-3.023	7.516	3.670	3.148
Average of Last 3 Qtrs.		-2.880	7.633	3.818	3.134

Note: Rates are annual percentages. Stocks are in billions of dollars.

reflecting the less than perfect substitutes assumption of asset demands.

Simulations (not shown) of the effect of open market operations in long term securities and changes in reserve requirements on time deposits look very similar to those shown in Tables VII and VIII. Together these results suggest that the (similar) effects of these actions on the excess demand for unborrowed reserves dominate their differences in other markets.

Tables IX, X, and XI report the consequences of changing the relative supplies of various assets. For these experiments, most individuals' "reduced form" priors are probably less certain than for open market operations. As can be seen in Table IX, debt management is far from impotent, even though switching longs for shorts has a much smaller effect than switching either one for high-powered money. A one-billion dollar shift from short to long debt (about one-third of one percent of government debt in 1971) decreases the long-short rate differential by about three and a half basis points. The effect is remarkably close to previous estimates.[5]

The effect of the recent meteoric rise of mortgage-backed bonds can be analyzed in a manner similar to debt management. In the model, the growth of such bonds appears as an increase in mortgage assets and long liabilities of federal agencies. In Table X, a simulated issue of an additional one-billion dollars of longs and purchase of mortgages results in a .2 billion dollar increase in mortgage credit granted to households; i.e., there is substantial slippage between the agency actions and households.[6] The rate differential created by such a transaction is small.

An important difference between this model and most other financial models is that capital is not perfectly substitutable for interest-paying financial assets. As a consequence, the magnitude of the effect of conventional monetary policy is only partially, and imperfectly, captured in the response of market rates on government securities. The substantial differences in the quantitative response of the required rate on capital and these rates can be seen in the simulations reported above.

The imperfect substitutability of bonds and capital also means that increases in the quantity of government debt may decrease rather than increase the required rate of return on capital. There may be crowding in rather than crowding out. In the complete model, the consequences of government deficits for supplies of government debt and crowding out will be reckoned automatically. The effect of such changes in relative supplies can be inferred from a simulation of the financial block by an "open market operation" involving government debt and equity. Indeed, such open market operations could conceivably be used as an instrument of monetary policy. Table XI illustrates a one-billion dollar shift from shorts to equity. The equity rate decreases but the impact is damped by the concurrent increase in q which increases the supply of capital at market prices.

An important policy question for which there is no easy answer is the effect of changes in deposit ceiling rates on market interest rates, the cost of capital, and the degree of intermediation. Table XII considers the effect of increase in the ceiling rates on deposits at both Commercial Banks and Savings Institutions. For such a change there is a substantial reduction in demand deposits and an increase in time and savings accounts. As can be seen from the table, such an increase is "expansionary" in that it lowers the rates on various assets, particularly mortgages.

The effects of increasing the ceiling rate at one or the other of the two types of intermediary separately can easily be simulated. Our priors imply a high degree of substitution between deposits, and either of these changes results in a substantial shift from one intermediary to the other. Increases in the ceiling rate on bank time deposits is contractionary, reflecting the absorption of reserves by reserve requirements on their deposits, whereas the increase in the rates at thrift institutions is expansionary.

8. CONCLUSION

It is our hope that with some improvement of the specification and the use of a somewhat more sensible error structure it will be possible to obtain estimates in rough accord with our priors and which also result in credible simulations. We also suspect, however, that it will be difficult to distinguish on the basis of sample fits our model from other models, for example those that assume perfect substitutes. Such discrimination may require the use of information about structural parameters from other sources: cross section studies, other time series studies on different data, and studies of particular markets, like Friedman's on corporate bonds [3].

FOOTNOTES

[1] Throughout, the term "assets" is used for both assets and liabilities. The latter are defined as negative assets.

[2] Calculations are described in Smith [8]. Our figures are based on more recent data.

[3] We do not intend this as a derogatory term. As Leamer [5] points out, data-mining suggests purposeful search. Fishing, by contrast, has implications of unstructured activity.

[4] Brainard and Smith [2] have developed a tractable procedure for computing the prior covariance matrix for a complete system of asset demands. The covariance matrices actually used in estimation are available on request.

[5] Compare the results surveyed by Nordhaus and Wallich [6]. (Table II)

[6] One could reasonably argue that the major effect of these programs comes not from the shift in relative supplies, but rather from the increased liquidity of the secondary market for mortgages.

REFERENCES

[1] Backus, David and Purvis, Douglas, "An Integrated Model of Household Flow-of-Funds Allocations," March 1978; revised February 1979, Mimeo.

[2] Brainard, William and Smith, Gary, "The Systematic Specification of a Full Prior Covariance Matrix," Mimeo, 1979.

[3] Friedman, Benjamin, "Financial Flow Variables and the Short-Run Determination of Long-Term Interest Rates," Journal of Political Economy, Vol. 85, 1977, pp. 661-689.

[4] Goldsmith-Nagan, Bond and Money Market Letter, various issues, Washington, D. C.

[5] Leamer, Edward, Specification Searches, New York: John Wiley & Sons, 1978.

[6] Nordhaus, William and Wallich, Henry, "Alternatives for Debt Management," in Issues in Federal Debt Management, Federal Reserve Bank of Boston, 1973, Table II.

[7] Purvis, Douglas, "Dynamic Models of Portfolio Behavior: More on Pitfalls in Financial Model Building," American Economic Review, 68:3, June 1978, pp. 403-09.

[8] Smith, Gary, "An Intrinsic Value Estimate of the Yield on Corporate Stock," Mimeo, 1978.

[9] Smith, Gary, "Dynamic Models of Portfolio Behavior: Comment on Purvis," American Economic Review, 68:3, June 1978, pp. 410-16.

[10] Smith, Gary and Brainard, William, "Disequilibrium Models for Financial Institutions," Mimeo., 1974.

[11] Smith, Gary and Brainard, William, "The Value of A Priori Information in Estimating a Financial Model," Journal of Finance, 31, December 1976, pp. 1299-1322.

[12] Smith, Gary and Kowalewski, Kim, "The Spending Behavior of Wealth and Liquidity-Constrained Consumers," Cowles Foundation Discussion Paper 536.

[13] Survey Research Center, "Survey of Consumer Attitudes: Tables and Charts," February 1979, Table 19B.

[14] Tobin, James and Buiter, Willem, "Fiscal and Monetary Policies, Capital Formation, and Economic Activity," Cowles Foundation Discussion Paper No. 512; forthcoming in: The Government and Capital Formation, George von Furstenberg, ed..

REFERENCES

[15] Tobin, James, "A General Equilibrium Approach to Monetary Theory," Journal of Money, Credit and Banking, Feb. 1969, pp. 15-29.

[16] Tobin, James and Brainard, William, "Pitfalls in Financial Model Building," American Economic Review, May 1968, pp. 99-122.