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The Financial Instability Hypothesis, Disaggregated Finance and the Structure of Econometric Models

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The Financial Instability Hypothesis, Disaggregated Finance and the Structure of Econometric Models

by

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Guide to Charts 1-6.

Chart 1:		fixed investment/cash flow
Chart 2:	III:	corporate liabilities/cash flow
	IV:	corporate liabilities/demand deposits
Chart 3:	I:	household liabilities/disposable income
	III:	household liabilities/demand deposits
Chart 5:	II:	no default risk assets/total financial assets of commercial banks
	IV:	total assets at risk/total financial assets of commercial banks
Chart 6:	V:	loans/deposits
	VI:	bought funds/total liabilities

I. Introduction

The financial instability hypothesis has a long and respectable lineage, both in economic theory and as a guide to economic policy. The work and teachings of pre-Keynesian economists, such as I. Fisher [ ] and H. Simons [ ] underscored debt-deflation aspects of the post-crisis behavior of the economy. If one looks at Keynes' "General Theory..." [ ] from the perspective of the circumstances that ruled at the time it was produced then an interpretation which emphasizes the cyclical and instability aspects of the argument gains force. The claims of The General Theory to being general rests upon such a cyclical cum financial instability interpretation, as it then becomes a theory of various alternative states of the economy and the transition amongst these states.

The financial instability hypothesis does not produce theorems about the behavior of an abstract economy, rather it deals with the behavior of a specific capitalist economy with definite institutional characteristics. In as much as abstract economic theory leads to propositions about the existence and stability of equilibrium, the observed and acknowledged instability of "real" economies is often imputed to institutional characteristics that are deemed to be non-essential. Thus recognition of financial instability as a fact of life has led to economic policy proposals which center around the design of institutions. The policy controversies dealing with the design and operations of the monetary and banking systems of the United States, that have occurred regularly since the founding of the Republic, have revolved around the belief that the precise institutional flaw that leads to financial instability can be discovered and corrected.

The theoretical problem is whether one or more financial systems for a capitalist economy exist that are adequately responsive to the financial needs of economic growth and which are not conducive to fueling speculative booms, generating financial crises, and triggering debt-deflations. If such financial systems exist the policy problem can be defined: design and operate such a financial system.

However, there is no proof that such financial systems exist. In fact, the main body of economic theory has not even addressed itself directly to this problem.[1] There have been many attempts to design such a financial system, the Federal Reserve System, the various 100% money schemes, and the doctrines of monetarism are various examples, but these are exercises without any rigorous theoretical underpinnings.

Keynesian policy ideas can be interpreted as an attempt to finesse this problem. Keynes essentially accepted the flaws in capitalism as being unavoidable, and designed policy instruments to make the consequences of the flaws less than disastrous.

For a while, in the post-war period, it seemed as if the standard Keynesian policy prescriptions - together with the post-war maze of institutions - had succeeded in eliminating financial instability from the American economy. However, the crunch of 1966, the squeeze of 1969-70 and the international monetary crisis of 1971 are "bits" of evidence that indicate that financial instability is still with us.

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[1] F.H. Hahn [ ]

There are three aspects to this paper, theory, facts and a critique of existing econometric models. In the theory the Financial Instability hypothesis will be defined and its relation to an emphasis upon disaggregated finance will be taken up. The "facts" will take the form of a presentation of how financial interrelations in the economy have changed over the postwar period, so that the financial environment within which the economy operates is significantly different in 1972 than it was in the immediate postwar period. In the light of the theory and the facts, criteria for the adequacy of an econometric model are advanced. One set of criteria deals with the financial-real system attributes that need to be specified; the second deals with the financial variables that are introduced, and the precise way in which they are used.

The following points are made in this paper:

1. Financial instability is a fact of life.

2. The theory of financial instability leads to an emphasis upon disaggregated finance, in particular upon the detail of asset and liability structures.

3. It is evident that the financial environment within which the economy functions has undergone striking changes over the postwar period.

4. The existing set of econometric models -- at least the sample examined -- seems to be blissfully unaware of these phenomena.

A purpose of this paper is to set the stage for an attempt to do better. First we need to identify the gaps in our existing formulations of macro-econometric models. This is done in Section V below. Then we have to combine our theory, facts, and our knowledge of the gaps in order to construct a more adequate macro-econometric model. This is our research program.

II. The Financial Instability Hypothesis and Disaggregated Finance.

Perhaps as good a description as any of what the financial instability hypothesis is about is the statement by Irving Fisher in 1933:

> "There may be an equilibrium, which, though stable, is so delicately poised that, after departure from it beyond certain limits, instability ensues, just as at first a stick may bend under strain, ready at all times to bend back, until a certain point is reached, when it breaks. This simile probably applies when a debtor goes "broke" or when the breaking of many debtors constitutes a "crash", after which there is no coming back to the original equilibrium."[2]

First of all, the financial instability hypothesis implies that financial changes can occur which in a significant sense alter the equilibrium of the economy. We note that Fisher refers to "an equilibrium..." rather than "the equilibrium," i.e. there is not a unique equilibrium, for any set of endowments, production techniques, and preference systems among consumption flows there exists a number of possible equilibria. Furthermore, which of these potential equilibria "rules" at any time is determined by financial characteristics.

In order to finesse quibbles as to the meaning of equilibrium, let us talk in terms of different modes of operation of the economy. Each mode of operation has "financial" as well as income, employment, price, and allocational characteristics. Even though financed instruments are more fungible than durable capital equipment, it is nevertheless true that each mode of operation leaves a characteristic financial legacy. This largely endogenously determined financial legacy acts as a predetermined constraint upon future behavior.

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[2] I. Fisher [ ], p. 239.

Each mode of operation of the economy is transitory. The characteristics of each income determining and financing processes sow the seeds of its own, albeit temporarily, "destruction."

The way in which "control" over positions in real capital assets is financed by business corporations is of primary importance in the financial relations of a corporate-capitalist economy. Real capital yields a cash flow: gross profits after taxes is a readily available cash flow concept in the flow of funds accounts for the non-financial corporate sector (a concept inclusive of corporate interest payments would be more suitable for the type of analysis we undertake). The liability structure "partitions" this cash flow amongst claimants. The liability structure can require cash payments in excess of cash receipts over a period. In such cases the debtor will need to raise cash either by running down "liquid" assets or by refinancing the position. We are familar with this behavior for Treasury operations. After recent corporate difficulties it is evident that analogous situations arise for non-financial corporations.

The fundamental speculation in a capitalist economy, where debts exist, centers around the liability structure of real asset holders. By speculation is meant the taking of a position in the face of situation where the probability distribution confronting the decision maker is not only not known but in principle not knowable.

We start from an economy with a cyclical past. Don't ask us how the economy got into this predicament. We are interested in evolution, not the creation. We assume the economy is now operating in a full employment growth

mode with essentially stable prices. Initially the liability structures of corporations, the asset structures of banks, the mix of assets and liabilities in household portfolios are selected with the past cyclical performance in mind. Similarly the past cyclical performance of the economy affects the liquidity premiums attached to short term, marketable, and default free financial instruments.[3]

Let us assume success is prolonged. The cash flows from operations grow, the cash requirements of the liability structure are easily handled, and loans from banks are easily repayed. For banks, households and corporations the desired cash and marketable security "reserves", and the cash flow coverage of liabilities, based upon cyclical anticipations, turn out to have been excessive. Desired asset and liability structures change as a result of this "learning."

As a result of the success of the economy, cash flows being earned by real assets do not dip due to recessions and the numerators in the present value formulations are on the average greater than anticipated. As a result, the present value of the items in the stock of the real assets in the economy rises.

The above sketches developments which make an increase in the pace of investment profitable. Simultaneously, the excess liquidity in firms, households, and financial institutions, newly found as a result of the revaluation of expectations, are a source of financing. As the near past cyclical experience receeds in time, the subjective value placed upon holding liquid assets

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[3]Keynes [ ], Chapter 17.

in portfolios decreases and the desired ratio of debt to equity financing of positions in real assets by corporations and of loans to deposits for banks increases. That is an investment boom financed at least in part by a speculation against cash and liquid assets will take place. In quantity theoretic terms, velocity increases. This speculation increases the fragility of the financial system, in the sense that the size of the income shortfall or of the portfolio re-evaluation that can cause serious difficulties decreases.

It is not necessary or possible to go into greater detail here; it is sufficient to note that stable growth in the context of a complex financial system and a memory of an unstable past is in and of itself destabilizing. The fundamental instability of a capitalist economy is that it tends to transform equilibrium growth into explosive growth: this explosive growth takes the forms of an accelerating pace of investment, an increased ratio of investment to income, and an increase in the ratio of investment that is debt financed.

An important aspect of a speculative boom is the refinancing of positions in the inherited capital stock. In this way the financial structure for all of capital, rather than only the financial structures for current investment, is brought into conformity with the new view as to what is desirable. With this refinancing, cash flow commitments due to liabilities will rise relative to income generated cash flows.

The "crash" of which Fisher wrote occurs when a not unusual event takes place within the context of a taut, illiquid liability structure of firms and financial institutions. The speculative demand for money of which Keynes

wrote is perhaps best interpreted as the liability structure that is considered compatible with the ownership of particular types of real and financial assets. Debt-deflation takes place when the desired structure of financial assets and liabilities contains a smaller ratio of cash flow commitments to cash receipts and a higher ratio of protected assets to liabilities than the initial inherited portfolios.

The debt-deflation of which Fisher wrote leads to a writing down of cash flow commitments. When and if all debts are finally written off by bankruptcy, cash flow commitments are nil. This, in principle, is the ultimate end of a debt-deflation process. However, even in 1933 government intervention stopped short of creating an all equity world. However, the combination of the stagnation of the 1930's and the war of the 1940's left the economy with a very robust financial situation. Debts relative to income and protected assets were very small indeed.

The period between 1946 and 1966 is unique historically in that no meaningful financial traumas took place over that time. The crunch of 1966, the liquidity squeeze and the Penn-Central crisis of 1970, and the flight from the dollar in 1971 are three incidents of financial instability over a five year period. It is evident that the growth cum-mild cycles of the first two postwar decades transformed the very robust financial system of the postwar period into a rather fragile system.

In the light of the above considerations it is evident that any model, theoretical or empirical, that is consistent with the financial instability hypothesis, will need to disaggregate finance. The disaggregation should be

carried at least to the extent that the liability structure and the structure of financial assets for the major final demand sectors, corporations and households, are explicitly considered.

Once a "rest of the world" sector is added, the economy can be considered as a "closed set of books", in which all financial liabilities of any sectors show up as assets in either the same or another sector. Inasmuch as the proximate holders of financial assets and the issuers of financial liabilities are often financial institutions, the sectoral breakdown will have to explicitly allow for the existence of financial institutions -- both banks and non-bank financial institutions.

The linkages amongst the sectors will consist not only of interest rates, which enter as a price variable in the supply and demand equations for instruments and which parcel the stock of instruments among the various holders, but also flow and balance sheet relations. The flow relations are of two kinds. One flow reflects the contract terms in financial instruments. The debtor is committed to make the contractual payment to the holder of debt instruments. The other flow relation is that spending is financed by income and financial instruments and that "spending" will take place both on income account and to acquire financial instruments. In particular, new financial instruments are brought into being as debt-financed spending by private as well as government sectors takes place.

From the fact that debt financing by both government and private sectors requires that the debt instruments find their way in some set of portfolios,

it follows that the full (systemic) implications of any debt-financed expenditures cannot be evaluated until allowance is made for the explicit consequences in various financial markets. Once this is done the differential consequences of alternative financing techniques for spending by other sectors can be investigated.

The balance sheet relations relate to the double double-entry characteristic of a transaction involving assets. A sale of financial instruments from one unit to another requires two entries in two balance sheets. All financial transactions require an offsetting transaction in the initial balance sheet, and the instruments involved both have to go to some balance sheet or have to come from some balance sheet.

The cash payments embodied in financial contracts are of special importance in determining the behavior of corporations and households. The contracts outstanding at any time, which embody commitments made in past financing decisions, absorb corporate income (gross profits after taxes), and household income (personal disposable income).

Once financial instruments are recognized as setting up cash flows, then it is necessary to combine and not to consolidate unit balance sheets in aggregating to sectoral balance sheets.

We can note in passing that the disaggregation of finance is necessary for consistency as well as completeness, even if the model is not designed to explore implications of the financial instability hypothesis. Unless the financing constraint is recognized as holding for all sectors, the full

consequences of a debt spending act cannot be known. Furthermore, by explicitly considering the relevant set of balance sheets, assumed behavior may require implicit behavioral patterns for neglected sectors that are difficult to rationalize.[4]

Thus, while the full force of the explicit recognition of financial variables other than a few broad aggregates is achieved only within the context of models consistent with the financial instability hypothesis, the disaggregation of finance will lead to increased power and precision in models that are based upon static or standard growth paradigms.

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[4]Brainard-Tobin [ ].

III. The Evolution of the Financial Structure in the Post-War Period.

It is readily apparent that the financial structure, as measured by the financial assets and the liabilities extant in the economy, was quite different in 1971 than in 1946. For many elements of the financial structure the changes exhibited a steady trend over the period as a whole; for other dimensions the rate of change accelerated toward the end of this period; and for still others a "break" in the trend occurred in the 1960's.

The first twenty years of the post-war period, 1945-1965, was characterized by the absence of any significant financial disturbance in the United States. In the six years, 1966 through 1971, three significant financial disturbances have taken place: the crunch of 1966, the liquidity squeeze of 1969-1970, and the dollar crisis in 1971.

It is hypothesized that these disturbances took place in the period after 1966 because the evolution of the financial arrangements and the financial structure of the economy over the prior twenty year period had transformed a robust financial structure into a fragile one. As a result, changes in cash flows and financial market conditions, due to either income generating, financial, market, or economic policy developments, which in prior robust circumstances would not have led to financial market instability, induced financial market developments in the fragile situation which apparently threatened to have serious repercussions.

Of course no great debt deflation process was triggered by these disturbances in the 1966-1971 period. The combination of the large size of the government relative to Gross National Product - which is both an income

generating and a financial market stabilizer - and the rather prompt intervention by the Federal Reserve System, acting as a lender of last resort, when the mini crises threatened, was successful in turning aside the threat of financial deflation.

"Liabilities" are used by firms, households and banks to finance control over, or position in, assets. Any liability can be interpreted as setting up a time series of cash payments: dated, demand, and contingent. The cash to meet these commitments can come from four sources: cash receipts due to participation in income production (wages and gross profits after taxes), the sale of assets, borrowing, and the running down of cash on hand. The cash flow as stated in liabilities is both a repayment of principal as well as the payment of interest.

Thus the relation between cash flow payments because of liabilities and the cash flow receipts due to participation in income production on the one hand and the cash flow payments because of liabilities and the cash flow receipts that can be "easily" or "readily" generated by dealing in financial assets, selling out positions or borrowing, are measures of the vulnerability of the economy to financial shocks. An index of robustness or fragility can in principle be constructed out of such measures; we do not attempt to do this Rather we look at selected financial ratios for selected sectors.

A. Non-Financial Corporate Business

The non-financial corporate business sector is of central importance to any cyclical-financial view of the economy because this is the primary investing sector and the sector that holds the privately owned stock of productive assets. Thus corporate finance is one starting place for monetary theory.

The liabilities of the corporate sector are a measure, albeit a crude one, of cash flow commitments. The crudity is obvious, for the shorter the term to maturity and the higher the interest rate, the greater the cash flow requirements per dollar of liabilities outstanding. Data on cash flow commitments due to liabilities is lacking. Once the validity of the cash flow approach to the analysis of financial interrelations is demonstrated in theory and by our crude empirical work, it is to be hoped that the flow of funds accounts will be modified into a sectoral cash flow accounting system. Meanwhile, we will use the available data on the liabilities extant as a substitute for the unmeasured cash flow commitments.

Before the balance sheet-income and balance sheet structure relations are taken up, we will examine one purely income, or flow account relation which measures a financial impact of the ongoing income generating process. This measure is the relation between corporate gross investment and internal funds. Internal funds are, in this case, gross profits after taxes.

As is evident in Chart 1 and Table 1 Column I, aside from the immediate postwar years, when firms were in a position to finance fixed investment by running down cash, and the most recent years, the ratio of non-financial corporate business investment to cash flows in the form of gross profits after taxes cycled between about 1.125 and .9. Beginning with 1966 corporations began to run deficits at an accelerating clip. Investments so outran internal funds than by 1970 fixed investment was some 135% of cash flows. Even the relatively stagnant year of 1971 was characterized by investment running at 125% of internal funds. Thus, in the second half of the 1960's, the financing of new investment required a sharp rise in corporate debts or new issues of equities.

From 1950 to 1961 the ratio of total corporate liabilities to cash flows (Column III Table 1, Line III Chart 2) remained within the relatively small range of 6.3 and 7.6, with a rough tendency to approximate 7.0. In the period from 1962 to 1967 this ratio dipped to as low as 6.1. The range over this period was 6.1,to 6.7. With 1967 as 6.7, the ratio of liabilities to cash flows virtually exploded over the recent past reaching 9.5 in 1970. As a result of the 13.5% improvement in corporate gross profits in 1971, this ratio dipped to 8.9. If we recognize that, following the early 60's, there was a run up of interest rates and tendency to shorten the term of liabilities, then the rise in the ratio of corporate cash payments due to debts to cash receipts from income generation in the years 1965 to 1971 was greater than the 56% indicated in the data.

Thus this evidence indicates no significant change took place in the burden of debt relative to income between 1950 and 1961. Over the period 1962-1966 this debt burden may actually have become lighter. However, beginning in 1967 the liability-cash flow ratio increased radically. The rise in the ratio of investment to cash flow is one causal factor, but it is not sufficient to explain the change. Another factor was the conglomerate movement.

This rise in the ratio of liabilities to cash flows, combined with our knowledge about the shortening of the term to maturity of many liabilities, leads us to conjecture that by 1971 the dependence of non-financial corporations upon refinancing (i.e. the issuance of new debt to meet financial commitments on outstanding debt) was much greater than in the early 1960's.

Thus the data on liabilities relative to cash flows indicates that in the 1970's the corporate sectors well being is much more heavily dependent upon financial market conditions than in earlier epochs.

The "cash flow" data we are using do not reflect the impact of higher interest rates upon cash flows. It would be desirable to have available a "cash flow" concept that measures gross capital income net of taxes, i.e. inclusive of interest payments. The following illustrative table indicates how these relations are affected by the available measurements. A 50% rise in the rate of interest, from 5% to 7.5%, with an initial 6 to 1 liability cash flow relation leads to an 8% increase in the liabilities-cash flow ratio.

	Interest Rates			
	5%	7 1/2%	5%	7 1/2%
A. Liabilities	60	60	100	100
B. Gross Cash Flow (including interest)	15	15	17	17
C. Interest	3	4.5	5	7.5
D. Capital Consumption Allowance	8	8	8	8
E. Taxes	2	1.25	2	.75
F. Net Profits after Taxes (B-C-D-E)	2	1.25	2	.75
G. Gross Profits after Taxes (D + F)	10	9.25	10	8.75
H. Liabilities : Gross Profits after Taxes	6	6.50	10	11.40

The same change with an initial 10 to 1 liabilities cash flow ratio leads to a 14% increase in the ratio. In a sense,,rising interest rates, as a warning signal of incipient financial difficulties, are in the nature of a self fulfilling prophecy. (Note that a 9% interest rate would lead to zero net profits with a 10/1 ratio whereas it would take a 15% interest rate to achieve zero net profits with a 6/1 ratio). Furthermore, to the extent that high and rising interest rates feed back upon investment activity, the resultant decline in income will adversely affect gross cash flows due to income.

There has been a well nigh uninterrupted trend increasing the ratio of liabilities to demand deposits over the postwar period (Chart 2, Line IV); furthermore there is some evidence that an acceleration took place in the second half of the period. Between 1946 and 1958 this ratio increased from 4.3 to 7.1 - a 65% increase. Between 1958 and 1970 this ratio increased by 135%. This

apparent acceleration in the rate of increase of this ratio reflects the more precise cash management policies of corporations, as well as the incremental indebtedness due to the conglomerate movement that culminated in the squeeze of 1970.

Corporate liabilities increased to $600 billion in 1971 from $84 billion in 1946, a ratio in excess of 7. Corporate Demand Deposits increased to $38 billion in 1971 from $20 billion in 1946, a ratio of 1.9. In contrast, the total demand deposits outstanding increased by a factor of 2.25 while G.N.P. increased by a factor of 5 over this same period. Thus while a measure of income velocity increased by a factor of 2.25, the corporate debt velocity increased by a factor in excess of 3.5. The simple, say naive, measures of velocity can miss what is happening by a wide margin, if financial relations are an important determinant of what makes the economy run.

Beginning in 1960 the wholesale negotiable certificates of deposit became an important asset in corporate portfolios. Being a liability of commercial banks, these instruments can be considered as being protected by the Federal Reserve System. Thus the ratio of Total Liabilities to Protected Assets (the sum of Demand Deposits, Government Debt, State and Municipal Debt, and Corporate time deposits) may be a better indicator of the corporate sector liquidity position than the liabilities - demand deposit ratio (Chart 2, Line V).

This ratio grew at a modest steady rate from the 2.51 of 1945 to 5.0 in 1963. Beginning in 1963, the rate of increase of this ratio increased, so that by 1970 it was 10.3. In the first period the ratio grew at an average rate of about 4% per year; in the second period the rate of growth of this ratio was in excess of 10% per year.

Further evidence of the changed financial position of corporations is found in the ratio of assets at risk to total financial assets. In 1946, 50% of the corporate sector's financial assets were at risk; i.e., there was some possibility of default. In 1970, 84% of the corporate sector's financial assets were at risk (Table 1, Column II).

Thus by the middle 60's the corporate sector's financial situation was radically different than in the immediate post war-period. A modest fall in corporate gross profits, or even an increased awareness that such a fall might take place, could lead to an attempt to decrease the burden of debt by using cash flows to reduce debt, to acquire cash, or to acquire protected assets. Such an effort, if essayed in a large scale, could, by way of decreased investment, lead to a cummulative decline in income.

Following the liquidity squeeze of 1970, the corporate sector engaged in a rather massive refinancing of short term debt by new bond issues as well as new equity issues. In 1971 new share issues amounted to 17% of the total of new issues and internal cash flow, a much higher ratio than in any other year of the post-war period. Such debt refinancing, by stretching the term of debts, reduced the cash flow commitments even as they left the balance sheet value of liabilities unchanged. Equity financing designed to restructure liabilities acted as a depressant on equity prices with repercussions upon the pace of consumer spending and investment.

B. Households

Households are both the largest demand sector in determining income and the major owner of many classes of financial assets. Household demand is

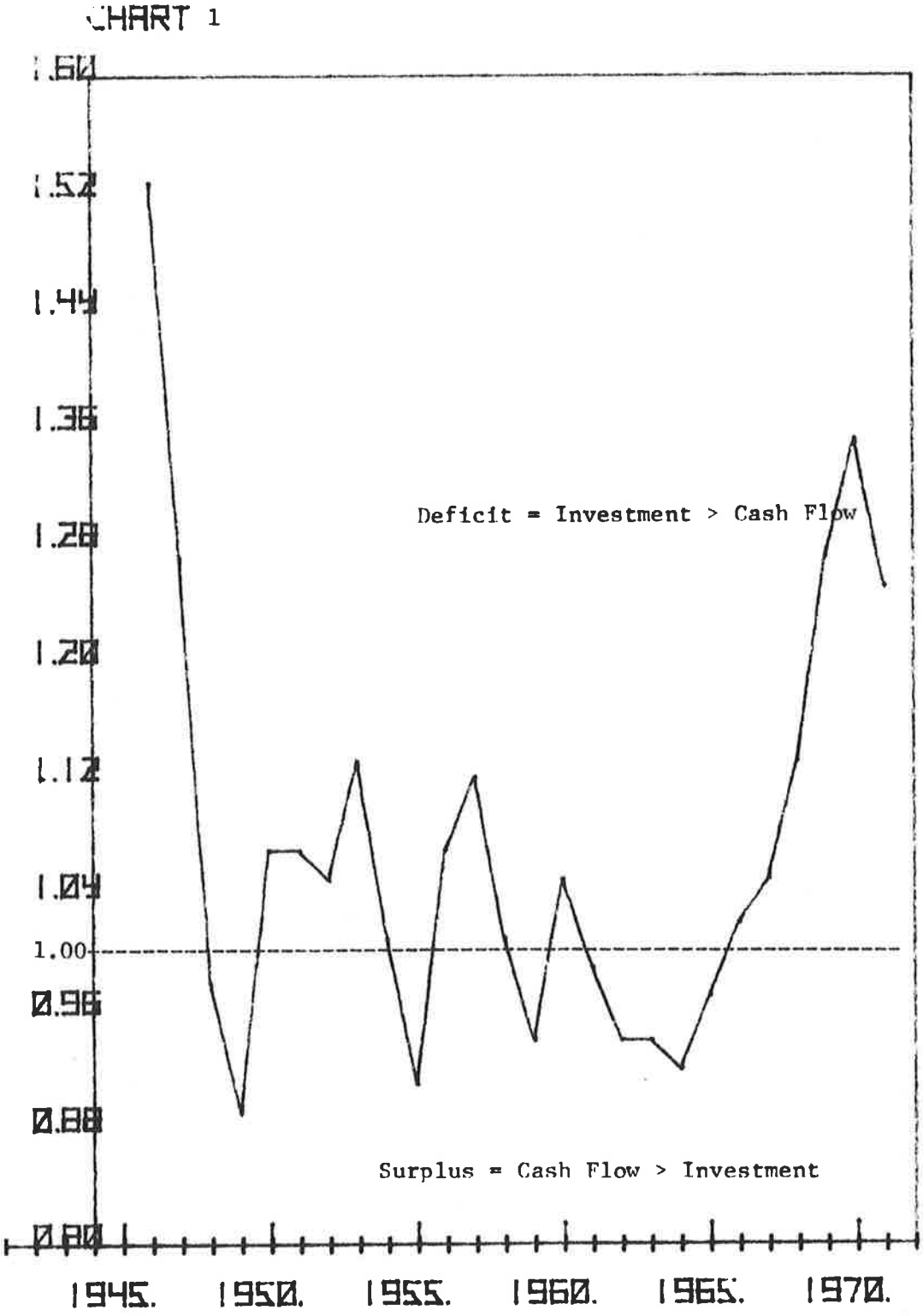
Table 1.
Post-War Evolution of the Finances of Non-Financial Corporate Business.
Computed Measures of Liquidity and Financial Insolvency Risk.
1946-1971
Year End Outstandings and Annual Flows.

Year	I	II	III	IV	V
1945	NA	.437	NA	NA	1.942
1946	1.527	.501	10.751	4.258	2.516
1947	1.270	.538	7.790	4.522	2.812
1948	.98	.557	5.766	4.861	2.998
1949	.89	.543	5.584	4.600	2.749
1950	1.07	.572	7.196	5.257	2.979
1951	1.07	.580	7.393	5.623	3.217
1952	1.05	.603	7.237	5.695	3.370
1953	1.13	.598	7.592	5.986	3.417
1954	1.01	.614	7.014	5.725	3.466
1955	.91	.625	6.303	6.224	3.527
1956	1.07	.669	6.855	6.781	4.187
1957	1.12	.683	6.757	7.057	4.427
1958	1.01	.689	7.369	7.164	4.441
1959	.94	.684	6.725	7.988	4.375
1960	1.05	.722	7.170	8.931	5.102
1961	.99	.724	7.086	9.057	4.917
1962	.94	.728	6.481	9.600	5.076
1963	.94	.731	6.445	9.904	5.039
1964	.92	.751	6.154	10.775	5.606
1965	.97	.763	6.106	11.848	6.097
1966	1.02	.788	6.271	13.008	7.076
1967	1.05	.798	6.674	13.455	7.507
1968	1.13	.806	7.521	14.501	8.026
1969	1.27	.829	8.549	15.591	9.368
1970	1.35	.840	9.491	16.659	10.280
1971	1.25	.824	8.948	15.751	9.636

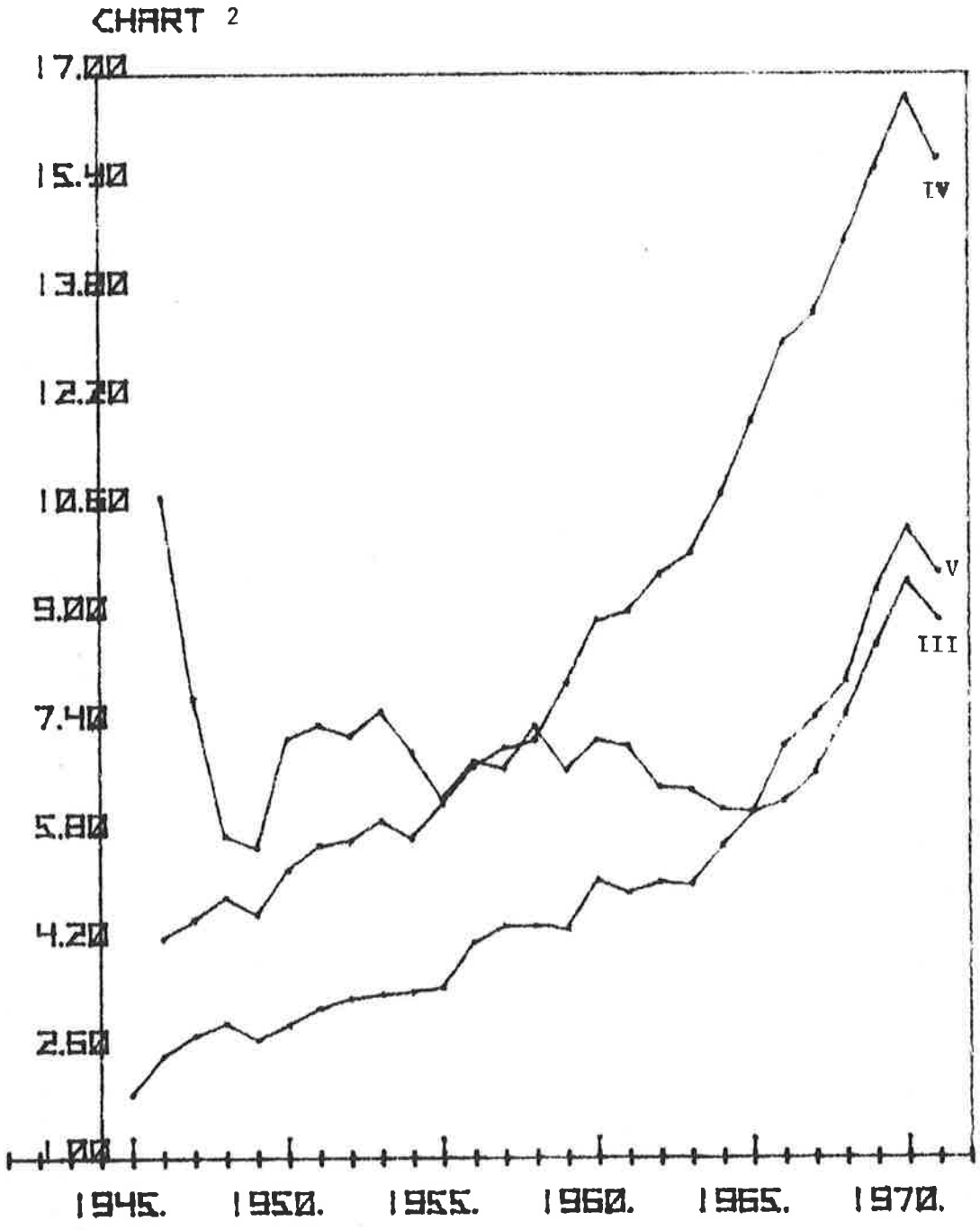
I = Fixed Investment : Cash Flow
II = Financial Assets at Risk : Total Financial Assets
III = Total Liabilities : Cash Flow
IV = Total Liabilities : Demand Deposits
V = Total Liabilities : Protected Assets

Source: Underlying data is from Flow of Funds Accounts: Financial Assets and Liabilities Outstanding 1945-1971 (June 1972) and Flow of Funds Accounts: Annual Flows 1946-1971 (August 1972); Division of Research and Statistics Board of Governors of The Federal Reserve System

Chart 1.
Fixed Investment : Cash Flow
Non-Financial Corporate Business
1946-1971



Liabilities as a Ratio to Cash Flows,
Demand Deposits and Protected Assets
Non-Financial Corporate Business
1946-1971.



III = Total Liabilities : Cash Flow
IV = Total Liabilities : Demand Deposits
V = Total Liabilities : Protected Assets

financed by income (measured by the cash flow item, consumers disposable income), by debts, and by the sale of, or running down of, assets. Households spend on current consumption, commitments embodied in their financial liabilities, and current assets. Thus the ratio of liabilities to personal disposable income and the ratio of household liabilities to household financial assets of various kinds are measures of the constraints imposed by financial considerations upon current household behavior with respect to both current purchases of goods and services and transactions in financial instruments. These same ratios measure the vulnerability of household demand to financial shocks and the vulnerability of financial markets to shocks starting from shortfalls of household income or changed household views about desirable asset and liability structures.

Households as owners of financial assets have a choice between holding equities and debts [debts include money, deposits, corporate debt and government (state and local as well as national) debt]. The value of equities relative to total financial assets in household portfolios not only reflects household's view of the future of the economy, but also measures the sensitivity of household's wealth to the revaluation of prospects that occur upon stock markets from time to time. Inasmuch as the stock market is the volatile element in the determination of the market value of capital equipment collected in firms, stock market valuation can be a significant variable in an investment demand relation which specifies the investment process as one in which the price of the stock of capital assets has a major impact upon the demand for the output component, investment.

Stock market valuation may also appear as a variable in the consumption function, measuring wealth or permanent income as a determinant of consumers' demand.

Liabilities relative to disposable income showed a well nigh steady growth between the years 1946 and 1964-65; this ratio went from .24 in 1946 to .74 in 1965. Since 1965 this ratio has fallen back somewhat from the 1965 peak, but has remained at or above .7 (Table 2 Column I, Chart 3 line I).

Liabilities relative to various classes of fixed "value" financial assets showed an upward trend in the first part of the post war period. This was followed by "relative stability." Between 1945 and 1966 the liability-money (i.e. liability-demand deposits) ratio increased from .6 to 4.0; this represents an enormous increase in the implicit transaction velocity of money.

Since 1966 this ratio has remained in a 3.7 to 3.9 range (Table 2, Column IV). This increase in the "money" velocity was partially offset by a strong increase in household holdings of deposits other than demand deposits. The liability-deposit ratio increased from .32 in 1945 to a peak of .96 in 1960. Thus while the liability-money ratio increased by a factor of 6 2/3 from the end of the war to its postwar peak, the liability-deposit ratio only increased by a factor of 3.0 (Table 2, Column V, Chart 3, line III).

The liability-deposit ratio has trended downward since 1960. This ratio reached .83 in 1971 which reflected a sharp drop from the 1969 level of .93. Similarly, the liability-deposit ratio dropped from .93 in 1966 to .88 in 1968. We might conjecture that the two domestic mini-crises of the post-war period induced a run down of liabilities and a run-up of deposits by households (Chart 3, line III).

Similarly, the liability-protected asset ratio trended upwards at a steady pace until 1961. Sincle 1961 this ratio has remained rather stable in the .74 to .77 range.

On the asset composition side, the major asset composition category is the breakdown between debts and equities. Inasmuch as new issues of equities were rather small potatoes throughout most of the post-war period - the exception being the most recent years - the major determinant of changes in the numerator of this ratio are the changes in the valuation placed upon equities on stock markets. Thus changes in this ratio measure either changes in accepted portfolio risks or changes in the anticipations that rule at any time. As is evident from Column VI in Table 2 and from Chart 4, there was an upward trend in this ratio from the end of the war through 1960. Since then the obvious trend has disappeared, to be replaced by a cycle around a value of about .42.

In all of the household measures there is evidence that a change in the mode of operation of household finances occurred sometime in the early 1960's. The first postwar phase saw strong trends in the ratio of household liabilities to both disposable personal income and to money holdings. About 1965 or 1966 this trend was apparently broken to be replaced by a "plateau."

The rapid increase in savings deposits in the early 1960's meant that the liabilities-deposit ratio peaked before the liabilities-money and liabilities-personal disposable income ratio. However, as was discovered in the crunch of 1960, such savings deposits can be sensitive to interest rates and induce instability in the sectors holding such deposits.

In addition to the change in the behavior of the liabilities-disposable personal income and the liabilities-asset category ratios in the 1960 to 1965 period, the ratio of equity values to the value of total financial assets exhibits a consistent trend in the period until 1960, after which it has cycled without any trend. Thus the argument can be made that financial relations imposed tightening constraints upon households until 1960 or 1965 after which the financial relations seem to "plateau."

Two bits of information have to be added to the above. The run up of interest rates after the early 1960's has meant that the cash flow commitments embodied in liabilities, as well as the cash flow receipts embodied in assets, increased per dollar of assets. Furthermore, the crunch of 1966 and the squeeze of 1969 may have had some affect in stabilizing desired liability-income and liability-liquid asset or money ratio.

As is evident from Chart 4, the corporate stock-total financial asset ratio has cycled around no readily apparent trend in the years since 1961. This ratio peaked at .449 in 1965, had a trough of .405 in 1966, peaked once again at .458 in 1968 and had a trough of .392 in 1970. The peak trough amplitude was .044 in the first "cycle," and .066 in the second; about 10% and 15% of the mean value. This "one shot" evidence of increasing relative swings in the value placed upon equities may be evidence that in the relatively more taut financial system that now rules the stock market is given to swings characterized by increasing amplitude. If true this means that the "burdens" placed upon stabilization policy are now quite different from those that ruled earlier in the post-war period.

The evidence on household finances is consistent with the view that households commodity and asset demand acted as a stimulant to or driving force for the economy in the period from the end of the war to the early 1960's. Beginning early in the 1960's households many have become more of a "reacting" rather than an "initiating" sector in determining changes in income.

C. Commercial Banking

Commercial Banking underwent radical changes in the post-war period. The ratio of cash and short-term treasury securities to total financial assets has fallen drastically, as has the ratio of protected assets (i.e. government securities plus cash) to total financial assets. As a result assets at risk as a ratio to total assets has risen drastically. These developments are evident in Table 3, Columns I, II, and IV, and Charts 5 and 6.

The "banking process" in the postwar period has had two dominant aspects; one being an increase in total bank assets, the second being a substitution of "loans" for no default assets. As is evident (Table 3, Column IV, Chart 5 line IV) assets at risk as a ratio to total assets rose steadily from a level .30 in 1947 to .64 in 1966. In the years 1965-1971 this ratio has remained in the .62 to .66 range.

The conventional criteria of the loan deposit-ratio has of course followed a trend similar to that for assets at risk relative to total assets. The aggregate loan-deposit ratio exceeded .61 in 1969, which is in sharp contrast to the .20 ratio of 1946 (Chart 6, Line V).

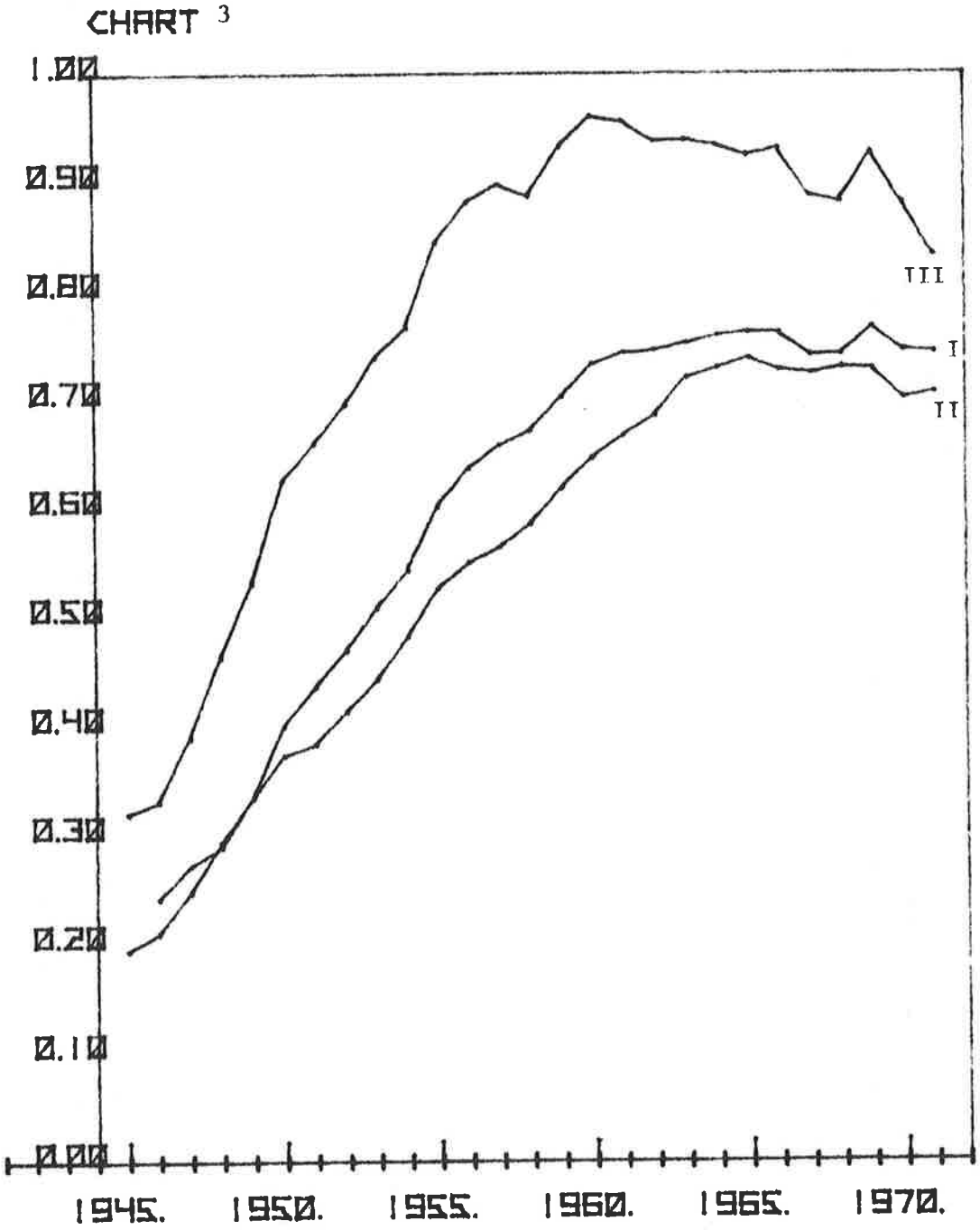
Table 2
Post-War Evolution
of the Finances of Households.
Computed Measures of Liquidity and Insolvency Risks.
1946-1971

Year	I	II	III	IV	V	VI
1945	NA	.092	.321	.605	.195	.299
1946	.242	.102	.332	.642	.211	.272
1947	.273	.119	.390	.787	.248	.261
1948	.290	.139	.464	.978	.294	.254
1949	.335	.153	.531	1.164	.335	.265
1950	.374	.173	.625	1.370	.401	.299
1951	.384	.179	.660	1.458	.436	.322
1952	.414	.190	.696	1.596	.470	.327
1953	.443	.209	.739	1.777	.509	.304
1954	.482	.198	.766	1.923	.543	.375
1955	.526	.205	.844	2.217	.601	.405
1956	.550	.214	.882	2.411	.637	.405
1957	.564	.235	.898	2.652	.658	.361
1958	.585	.212	.887	2.742	.671	.426
1959	.618	.221	.932	2.983	.702	.426
1960	.646	.234	.960	3.220	.732	.409
1961	.667	.219	.956	3.352	.743	.451
1962	.685	.243	.938	3.562	.745	.403
1963	.720	.240	.939	3.737	.752	.424
1964	.729	.237	.934	3.872	.759	.438
1965	.738	.235	.925	3.868	.762	.449
1966	.727	.253	.931	4.006	.761	.405
1967	.724	.232	.888	3.801	.741	.443
1968	.729	.226	.882	3.691	.741	.458
1969	.728	.247	.927	3.837	.766	.415
1970	.701	.249	.881	3.824	.745	.392
1971	.706	.242	.833	3.897	.743	.405

I = Liabilities : Disposable Personal Income
II = Liabilities : Financial Assets
III = Liabilities : Deposits
IV = Liabilities : Money
V = Liabilities : Protected Assets
VI = Corporate Stock : Total Financial Assets

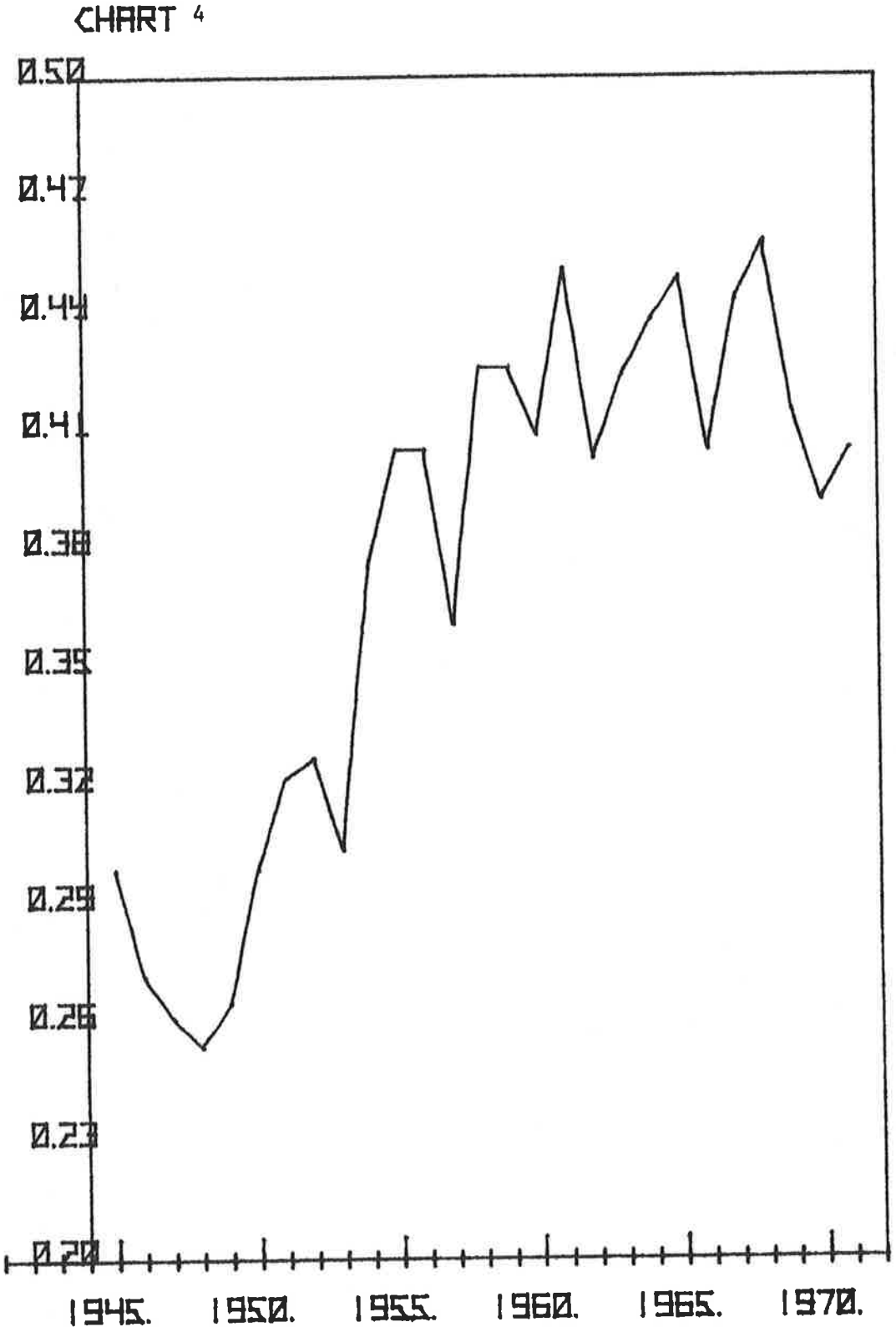
Source: Underlying data is from the Flow of Funds Accounts: Financial Assets and Liabilities Outstanding 1945-1971 (June 1972) Division of Research and Statistics, Board of Governors of the Federal Reserve System

Liabilities : Disposable Demand Income,
Deposits and Protected Assets
Households
1945-1971



I = Liabilities : Disposable Personal Income
II = Liabilities : Financial Assets
III = Liabilities : Deposits

Value of Corporate Stock : Value of Financial Assets
Households.
1945-1971



Much has been made of the development of liability management banking. Liability management banking consists of the use of liabilities other than demand and savings deposits as sources of funds. In part it reflects the running down of bank holdings of treasury bills and other easily marketable assets, so that borrowing from the Federal Funds market, from abroad, or from large holders of cash by way of certificates of deposit becomes the favored position making technique.

We label the non-deposit source of funds along with large denomination Certificates of Deposit "bought funds." In the early post-war years such funds consisted of less than 5% of bank liabilities; in 1969 bought funds were 19% of total liabilities. As is evident from Chart 6, line VI bought funds as a percentage of total liabilities grew at a slow rate from the mid forties until about 1960. From 1960 through 1969 such funds grew at a somewhat more rapid relative rate. In 1970 and 1971, the ratio of bought funds to total liabilities was somewhat below the 1969 peak.

From the perspective of what happened to commercial bank assets and liabilities over the post-war period, it is doubtful if the relation that existed during the post-war period to date between changes in bank credit to the private sectors (i.e. loans) and the growth of bank reserves can be extrapolated into the future. Of course with high and rising interest rates banks will continue to exhibit ingenuity in creating new liabilities to supplement the funds made available by reserve base growth. However, unless the Federal Reserve protects the banks against run offs of these assets by adopting a more liberal discount policy, the possibility of serious repercussions from runs on banks increases as they resort to more "fanciful" liabilities to acquire funds.

Table 3
Post-War Evolution of Commercial Banking.
Computed Measures of Liquidity and Solvency Risks.
1946-1971
Year End Outstandings.

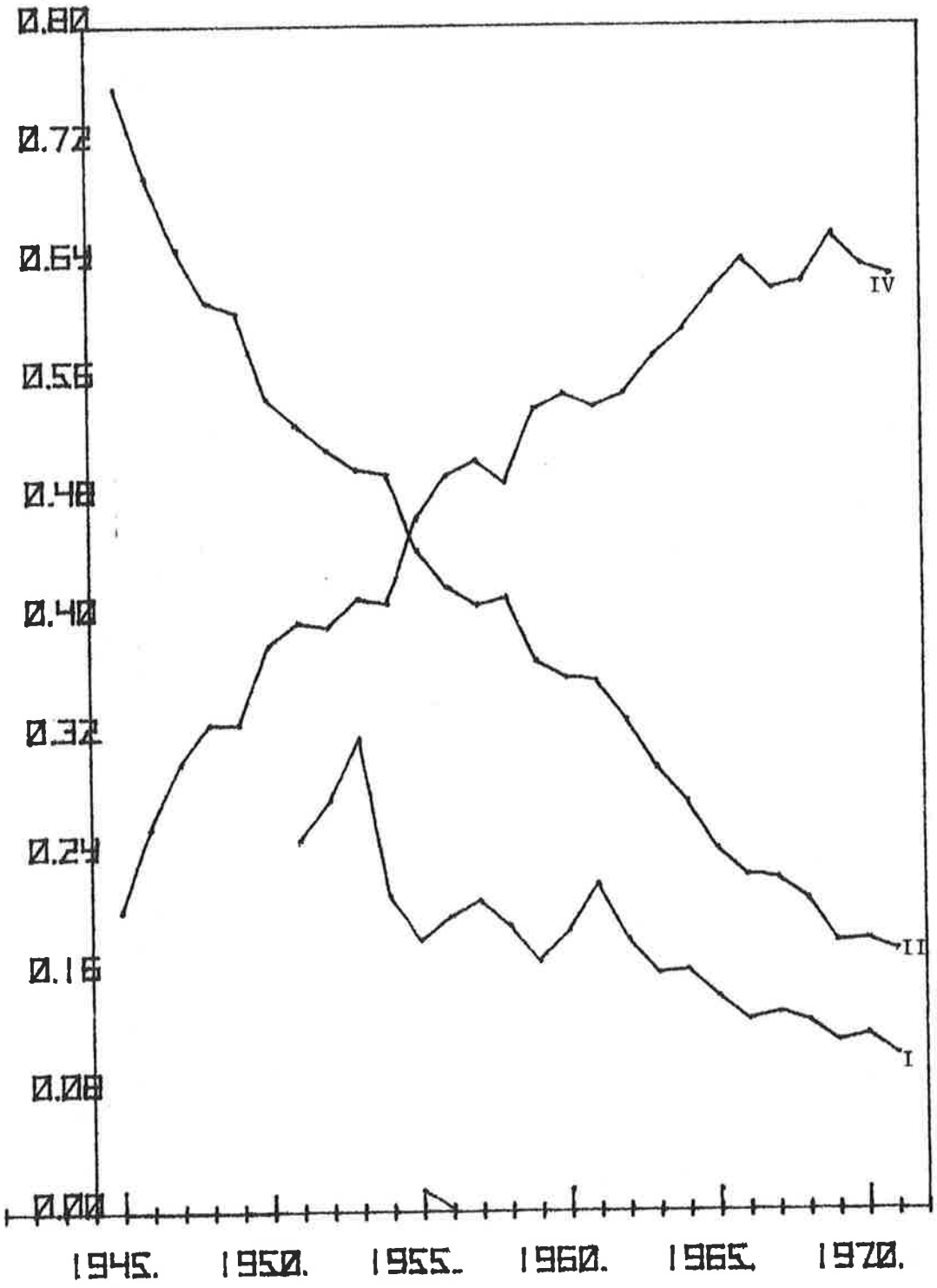
Year	I	II	III	IV	V	VI
1945	NA	.759	.797	.203	.160	.021
1946	NA	.699	.741	.259	.197	.018
1947	NA	.650	.698	.302	.229	.022
1948	NA	.614	.672	.329	.246	.026
1949	NA	.607	.671	.329	.242	.031
1950	NA	.549	.618	.382	.284	.036
1951	.251	.531	.603	.397	.311	.039
1952	.278	.514	.588	.394	.312	.040
1953	.319	.500	.587	.413	.330	.041
1954	.214	.497	.590	.410	.322	.043
1955	.183	.446	.533	.467	.382	.047
1956	.199	.421	.504	.496	.413	.056
1957	.210	.409	.494	.506	.423	.058
1958	.193	.414	.509	.491	.403	.057
1959	.169	.371	.459	.541	.455	.060
1960	.189	.360	.449	.551	.470	.069
1961	.221	.358	.457	.543	.467	.082
1962	.184	.332	.449	.551	.466	.088
1963	.161	.300	.424	.576	.484	.104
1964	.163	.277	.406	.594	.503	.116
1965	.145	.245	.380	.620	.529	.130
1966	.129	.227	.363	.642	.556	.140
1967	.134	.225	.378	.622	.532	.148
1968	.128	.211	.373	.627	.540	.163
1969	.114	.182	.342	.658	.606	.186
1970	.119	.183	.362	.638	.561	.183
1971	.105	.176	.369	.631	.539	.179

I = No Default and No Market Risk Assets : Total Financial Assets
II = No Default Risk Assets : Total Financial Assets
III = Total Protected and Semi-Protected Assets : Total Financial Assets
IV = Total Assets at Risk : Total Financial Assets
V = Loans : Deposits
VI = Bought Funds : Total Liabilities

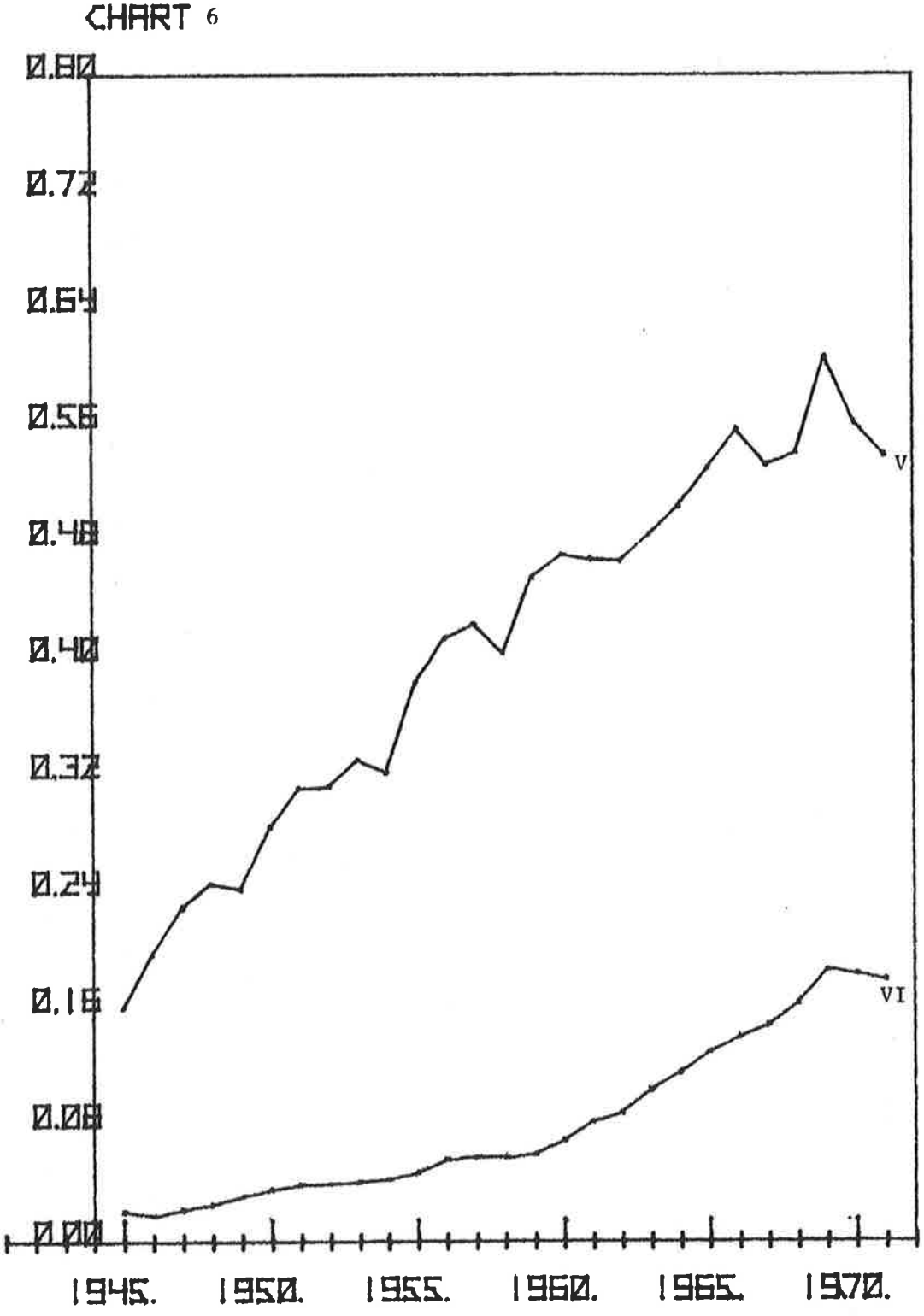
Source: Underlying data is from the Flow of Funds Accounts: Financial Assets and Liabilities Outstanding 1945-1971 (June 1972) Division of Research and Statistics, Board of Governors of The Federal Reserve System

Ratios of Selected Assets to Total Financial Assets
Commercial Banks
1946-1971

CHART 5



Loans-Deposits and Bought Funds-Total Liabilities Ratios
Commercial Banks
1946-1971



D.

Only three sectors have been examined in this exercise. Attention should also be given, in a more complete analysis, to the evolving picture of non-bank financial institutions; furthermore, the rest of the world should be incorporated as a financial sector.

The dollar crisis of 1971 fits into a cash flow financial instability format quite naturally. The financing of long term U.S. Corporate investment abroad, particularly in the 1960's, was accompanied by short term borrowings abroad. The short term borrowings took the form of the rest of the world acquiring dollar deposits and short term dollar assets. The basic "income" cash flow which made this balance sheet position viable was a strong U.S. surplus in the balance of trade. As soon as the U.S. balance of trade surplus was attenuated, the balance sheet structure, by which short term liabilities financed positions in long term assets, was no longer viable. The chronic sickness of the dollar, culminating in the events of August 1971, resulted.

If we look at the corporate and the household financial pictures together, we note that in the early part of the period, say to 1965, the household liabilities to cash flow ratio increased while the corporate ratio may even have trended downward slightly. In the years since 1965 the household ratio may have trended downward, while the corporate ratio increased by a significant margin. As we look to the future, the current "initial conditions" for both sectors reflects a much higher liability-cash flow ratio than ruled in the late 1940's - early 1950's.

The liability-demand deposits ratio increased by a factor of more than 4 for corporations and by a factor well in excess of 6 for households. There has been a strong trend in this ratio for both sectors in the period.

Meanwhile, the banking sector has shown a strong trend (until perhaps around 1965) in substituting assets at risk for protected assets. It also has shown considerable ingenuity in devising ways to "buy funds." There is little question but that banking in the 1970's is quite a different business than banking in the early 1950's.

Thus the financial structure is much more closely articulated in 1970 than in the immediate post-war period. More units are financing their positions in assets with liabilities that are short relative to their available cash flows, bank liabilities to a considerable extent reflect funds that could quite readily leave the banking system (i.e. lead to a substantial reserve absorption as the "asset holders" require payment in "demand deposits"), increased ratios of income receipts are committed to servicing liabilities.

Given the importance of both private investment and consumer discretionary spending in aggregate demand and the sensitivity of such spending to views as to how the financial system operates, the increased commitment of cash flows and the greater liability money ratio indicates that the economy is now much more sensitive to the manner in which the purely financial system operates than was true earlier in our post-war experience.

IV. The Specification of Financial Interrelations in Macro-Econometric Models

The financial instability hypothesis, together with the evidence that has been presented on the changing structure of financial relations, indicates that the current set of macro-econometric models define financial variables too narrowly and misspecify how financial variables enter into economic relations. Currently, interest rates, usually narrowly conceived of as market variables which determine either or both of intertemporal choices in consumption and relative factor prices in production, are the pre-eminent, if not the sole, financial variable that enters both the purely financial and the real sectors. Some models allow for wealth effects in consumption. In these cases interest rates may have two roles, also entering the model as a determinant of some wealth variables.

In none of the existing models with which we are familiar does the current impact of past financing decisions, which are embodied in the cash flow commitments as stated in liabilities, affect current behavior. In none of the existing models we discuss are the financing repercussions of sectoral liability emissions introduced in a consistent way as linking the various sector's financing decisions. None of the models embody constraints that reflect an awareness of the interdependence of balance sheets.

A current decision by a firm to invest in real capital assets is affected by existing financial commitments. An investment decision involves a weighing of the expected cash flow receipts that this real investment, when combined with the firm's other real assets, will generate, the cash flows the internal funds would have generated in alternative uses, and the total cash flow

commitments due to the liabilities issued to finance title to the capital assets. Symmetrically, household decisions to purchase consumer durables are affected by their outstanding cash flow commitments. Bankers - and other financial intermediaries - are juggling cash payment commitments and cash receipts. The entire potentially destabilizing dependence upon selling assets or borrowing in financial markets to make position can only be caught in a structure which recognizes the importance of cash flows. Thus in an econometric model which is based upon a recognition that financial instability exists, finance needs to be disaggregated, so that liability structures and financial intermediaries are introduced. Furthermore, cash flows, both as current commitments and as a future consequence of current decisions, need to be considered as behavior determining variables.

Thus there are dual stock-flow relations affecting the determination of spending. One, familiar in literature, centers around the difference between a desired and an actual capital stock and the time consuming process of equating the actual with the desired. The second, novel to the literature, centers around the difference between the desired and the actual liability structure, with their implied cash flows. Whereas capital stock disequilibrium involves relatively stable technological factors, financial disequilibrium depends upon potentially unstable portfolio preferences.

It is important to develop measures of the cash flow commitments embodied in the stock of financial instruments outstanding. Given the often fungible nature of financial commitments, it is true that when financial markets are functioning well, refinancing possibilities can ease the burdens of cash flow

commitments. However, this implies that units which depend upon refinancing are doubly vulnerable; they depend not only on the normal functioning of markets in which production decisions are made but also upon the normal functioning of those financial markets in which they borrow and sell assets.

To be consistent with the arguments advanced the financial modeling within an econometric model will need to specify:

(A) how both currently determined and predetermined financial variables that appear in real sector expenditure equations are determined, and how real sector variables appear in the equations that determine financial variables.

(B) how spending and financing decisions are interdependent. Not only must the cash flows due to past financing decisions be integrated into the explanation of current spending and financing decisions, but the necessity for sectoral surpluses to be placed and for sectoral deficits to be financed must be built into the model.

(C) how the financial instrument markets are interdependent because of various balance sheet constraints. Not only must each sector's balance sheet balance, but in a financially closed economy every financial liability is a financial asset someplace.

(D) how the instruments of monetary and fiscal policy affect financial variables.

Thus the links between financial and real variables that need to be included are both more numerous and more complicated than those that the current generation of macro-econometric models specify. As will be made evident in section V, the current generation of macro-econometric models is hierarchical in concept in that the real sector defines the variables that the financial sector need determine. Our concept avoids this real sector dominance and defines financial variables - such as cash flows due to financial assets - to which real sector behavior must accomodate.

In the light of the implications of the financial instability hypothesis and the logical need to disaggregate finance the following channels or linkages between and amongst financial and real variables need to be considered in constructing an econometric model:

(1) The use of the interest rate as a determinant of the "choice of technique." Is the choice of the capital intensity in production dependent upon interest rates?

(2) The use of the "interest rate" as a determinant of the phasing of consumption over a planning horizon. Does the "interest rate" appear as a variable in the savings or consumption equations?

(3) The use of a "relative price" variable as a determinant of expenditures on capital goods. A "relative price" refers to the value of a physical asset in the secondary or asset market relative to the cost of producing a new unit. This may be proxied by the valuation of the capital stock in the equity market relative to the cost of producing a new unit of capital. In housing, the price of a unit in the existing stock of houses relative to the

cost of producing a new unit of housing is the relative price variables which is directly affected by financial variables.

(4) The use of the real value of net wealth of the household sector as a determinant of consumption expenditures. The value of real net wealth can change via accumulation, via change in the price of consumer goods, and via changes in value financial instruments. Changes in interest rates affect the market value of fixed coupon variable price bonds and equities held by households. Changes in the money supply and the supply of government bonds may directly alter the value of households net wealth.

(5) The use of liquid assets as a determinant of consumption expenditures.

(6) The use of variables to capture the influence of credit rationing. If non-price rationing takes place, or if there are many "dimensions" to a financing contract, interest rates will not fully capture the influence of financing on expenditure decisions.

(7) The use of the outstanding stock of financial instruments as a determinant of cash flows to and from spending and financing units. This channel operates both through the evolution of financial structures in response to the dominant deficit and surplus sectors during a particular mode of operation of the economy and the effect of changing financial market conditions upon financing terms.

(8) The use of financing constraints as a determinant of the behavior of both real demand and financial markets. Any unit (or sectoral) deficit must be financed and this implies that the supply of financial instruments

increases and every surplus must be placed which affects the demand for financial instruments. Because of diverse asset preferences of suppliers and demanders of instruments this phenomenon gives rise to financial intermediation.

(9) The use of the refinancing of asset positions during a speculative boom and the refinancing of liability structure during a debt-deflation as a determinant of changes in cash flow commitments as well as a determinant of private demand. Booms, corporate takeovers, mergers and debt-deflation processes involve a restructuring of cash flow commitments due to financial instruments without any corresponding change in the ability of the real output producing relations to generate cash flows.

Thus we have two sets of standards for examining econometric models which help us determine their adequacy: what the model needs to specify and whether the linkages that are specified between the real and the financial variables fully reflect the financial influences. Both relate to the question of whether the model is sufficiently well specified to capture the behavioral attributes which relate to financial instability.

There are seven econometric models which we will subject to the test of adequacy. These models are:

(1) The Michigan Model (M): Saul H. Hymans and Harold T. Shapiro "Current Version of the RSQE (DHL-III) Quarterly Econometric Model of the U.S. Economy," Research Seminar in Quantitative Economics, University of Michigan, February 1972.

(2) The Department of Commerce Model (C): Maurice Liebenberg, Albert A. Hirsch, and Joel Popkin. "A Quarterly Econometric Model of the United States: A Progress Report", Survey of Current Business. May 1966.

(3) The Wharton Model (W67): Michael K. Evans and Lawrence R. Klein, The Wharton Econometric Forecasting Model, Philadelphia: University of Pennsylvania, Wharton School, 1967.

(4) The Wharton Model (W72): Michael D. McCarthy, The Wharton Quarterly Econometric Forecasting Model Mark III, Philadelphia, University of Pennsylvania, Wharton School, 1972.

(5) The Brookings Model (B): G. Fromm and P.J. Taubman, Policy Simulations with an Econometric Model, Washington, D.C.: The Brookings Institution, 1968.

(6) The Federal Reserve-MIT Model (FRB-MIT): Frank de Leeuw and Edward M. Gramlich, "The Federal Reserve-MIT Econometric Model", Federal Reserve Bulletin, January, 1968.

(7) The FRB-MIT-Penn Model (FMP) "FRB-MIT-Penn Model Coding", version 4.3, March 25, 1970, revised August 24, 1970, Mimeo.

V. A Survey of the Financial Sectors of Seven Econometric Models.

This section takes up two topics. The first is an exposition of the way in which financial variables and markets are treated in the seven models. The second is an evaluation of the adequacy of the way in which finance is treated in these models, using standards derived from the financial instability hypothesis and the need to disaggregate finance.

We are restricting our current survey to the financial sectors of complete econometric models. Interesting and important work on modeling financial markets in "isolation" is not reviewed in this exercise.

A. The Treatment of Financial Variables

The philosophy underlying the treatment of financial variables and financial sector modeling in complete econometric models is: "Broadly speaking, the purpose of the financial sector is to determine the financial variables that, according to the model, affect directly the various components of aggregate demand."[1] That is, the financial markets are analyzed because financial variables are "sprinkled" in the equations of the real sector. The modeling of financial relations is done in two stages. In the "first stage" a "basic" interest rate - short term in all but one case - is determined in a market which equates the supply and demand for an exogenous monetary aggregate.

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[1] "A Survey of the Financial Sector of the MIT-FRB Model", Supplementary Paper VIII of the MIT-FRB Model Project, MIT).

Once this basic short term interest rate is determined, the interest rates needed for the real sector are determined by means of term and risk structure equations.

Table 1 lists the financial variables which appear in the real sector expenditure equations in the seven econometric models we examine. Each model includes at least one long-term interest rate in the real sector. The corporate bond rate appears in five of the seven models (all but B and C). The mortgage rate appears in three models (C, FRB-MIT, FMP), the long-term government bond rate in one (B), and municipal bond rate in one (FMP). Five of the models include a short-term interest rate in the real sector equations. In three of these, the rate is the commercial paper rate. Three models include liquid asset variables; in two of these cases the liquid assets variable is the broad money supply (W72, B) and in the other case it is the broad money supply, savings deposits and savings and loan shares (C). One model (FMP) includes net worth of the household sector. Both the FRB-MIT and FMP models include the dividend price ratio as an argument in real sector equations.

Two Models (W67 and W72) introduce a dummy variable to allow for the credit market affects of regulation W. The FMP Model includes variables reflecting the availability of mortgage financing by financial institutions.

In Table V-2 the various expenditure equations which might appear in an econometric model (not all appear in each model) are listed and the explicitly financial variables that appear in each equation in each model are listed.

Table V-1
Financial Variables in Real Sector
Expenditure Equations

	M	C	W67	W72	B	FRB-MIT	FMP
1. long-term interest rates	RCB	RM	RCB	RCB	RGL	RM RCB	RM RCB RMUN
2. short-term interest rates	RCP		RCP	RCP	RTB	RTB	
3. liquid assets		L		M2	M2		
4. wealth							W
5. dividend price ratio						DPR	DPR
6. credit dummy variable			Cr	Cr			
7. mortgage flows							MF

L = liquid assets held by households (currency + demand and bank savings deposits + savings and loan shares.)
M_2= currency + demand deposits + time deposits
M_2* = currency + demand deposits + time deposits - certificates of deposit
Cr = dummy variable to account for affects of regulation W
RCB = corporate bond rate
RM = mortgage rate
RTB = Treasury bill rate
RCP = commercial paper rate
DPR = dividend price ratio
W = net worth of household sector
MF = availability of mortgage financing by financial institutions

Table V-2
Financial Variables in Real Sector
Expenditure Equations

Expenditure functions	M	C	W67	W72	B	FRB-MIT	FMP
CON							W
CONA						RCB	
CONO						RCB	
EC							
ECNS				M2	M2	RCB	
ECN							
ECS							
ECD							RCB
ECDA			Cr	Cr			
				M2			
				RCB/RCP			
ECDO		L		M2			
HS	RCB-RCP	RM			RTB	RM	RM
							RCB
							MF
EH			RCB-RCP	RCB-RCP			
EI					RTB		
EPDS	RCB		RCB	RCB	RGL		
			RCB-RCP				
OPD						RCB	RCB
						RDP	RDP
EPD							
EPS						RCB	RCB
						RDP	RDP
EGS							
EGSC						RCB	RCB
							RMUN
EGSO						RCB	
EGSW						RCB	
EGSP						RCB	

Expenditure Categories:

CON = consumption (expenditures on nondurables and services plus consumption of services of durables).

CONA = consumption of services of autos

CONO = consumption of services of durables other than autos

EC = total consumer expenditures

ECNS = consumer expenditures on nondurables and services

ECN = consumer expenditures on nondurables

ECS = consumer expenditures on services

ECD = consumer expenditures on durables

ECDA = consumer expenditures on autos

ECDO = consumer expenditures on durables other than autos

HS = housing starts

EH = expenditures on residential construction

EI = inventory investment

EPDS = expenditures on producers' durables and structures

OPD = orders of producers' durables

EPD = expenditures on producers' durables

EPS = expenditures on producers' structures

EGS = state and local government expenditures on goods and services

EGSC = construction expenditures by S & L government

EGSO = other expenditures on goods and services by S & L government

EGSW = employee compensation by S & L government

EGSP = transfer payments by S & L government

Note that predominantly the financial variable is an "interest rate". The credit proxy appears in two models (W67 and W72) and then only in the equation for auto expenditures. M_2 appears in two models, W72 and B; it appears in both models in the equation for consumer demand for non-durables and services. M_2 also appears in W72's equations for automobile demand and durables other than autos. W appears in the FMP Model only.

It is evident from Table V-2 that interest rates appear in the housing sector of each model; either in one or both of the housing starts and the housing expenditures equation. It is also true that interest rates appear extensively in the FRB-MIT and FMP models, and hardly at all in the M and L models.

It is worth noting that only in the W72 and FMP Models do more than one non-interest rate financial variable appear in the expenditure equations.

The first stage in financial modeling in these models is to determine a basic short-term interest rate. This basic short-term interest rate is determined by either a financial reduced form equation such as equation (V-1) or a system of structural equations such as (V-2) through (V-6).

(V-1) $RTB = F(RU, RDIS, DDG, y, \ldots)$

(V-2) $RU = rr_d DDP + rr_t TD + RF + rr_d DDG$

(V-3) $DDP = f_1(RTB, y, RTD, \ldots)$

(V-4) $TD = f_2(RTB, RTD, y, \ldots)$

(V-5) $RTD = f_3(RTB, \ldots)$

(V-6) $RF = f_4(RTB, RDIS, DDP + DDG + TD, \ldots)$

Where RU = unborrowed reserves, RTB = Treasury bill rate, RDIS = discount rate, DDG = government demand deposits at commercial banks, y = income, rr_d = required reserve ratio against demand deposits, rr_t = required reserve ratio against time deposits, DDP = privately held demand deposits, TD = time deposits, RF = free reserves, RTD = rate on time deposits.

In principle, every reduced form equation such as (V-1) can be derived from equations V-2 through V-6; however, the models which work with reduced form equations do not specify the underlying structural equations.

This first stage embodies the commercial banking process in that it links a bank reserve variable and interest rates.

M, C, and W67 estimate financial reduced form equations to determine the basic short-term interest rate (RTB in M, RCP in C and W67). The exogenous monetary aggregate is unborrowed reserves in M, the ratio of excess reserves to total reserves in C, and the ratio of free reserves to required reserves in W67.

The financial reduced form in M differs somewhat from the equations in C and W67. The M equation reflects a loanable funds approach to interest rate determination: its arguments are supplies (unborrowed reserves, corporate cash flows, federal surplus) and demands (fixed business investment, residential construction, and inventory investment) for loanable funds.

The financial reduced form in C and W67, as well as the four structural models, reflect a liquidity preference approach. The determinants of the short-term interest rate are the supply and demand for the exogenous monetary aggregate or, alternatively, the supply and demand for money.

W72, B, FRB-MIT, and FMP all use a structural approach to determine their basic interest rate. The structure includes equations for the demand for demand deposits (V-3), demand for time deposits (V-4), a rate setting equation for the interest rate on time deposits (V-5), and a demand equation for free reserves (V-6).

The second stage in the financial modeling of econometric models is to go from the basic interest rate determined in the bank related markets to the financial variables that appear in the expenditure models. The standard technique is to derive the required interest rates by term and risk class structure equations. These structure equations are in the nature of reduced forms, and they often are "good fits" rather than the embodiment of any explicit theory.

Each of the seven models has a term structure equation such as equation V-7 relating the corporate bond rate to the basic short-term rate.

In five of the models (all but W67 and B) there is at least one interest rate in addition to the basic short-term rate and the long-term rate determined via the term structure equation in a real sector expenditure equation. The additional interest rate(s) are determined by risk structure equations such as (V-7) - (V-9). For example, RTB is the basic short-term rate in the financial sector of both M and W72, but it is **RCP** which appears in the expenditure sector. A Treasury bill and commercial paper have similar maturities but different risks of default; the two rates have similar time patterns but RCP is always greater than RTB. We refer to equations such as (V-7) as risk structure equations, as they determine the relation between interest rates of different risks.

In C, FRB-MIT and FMP a risk structure equation, such as (V-9), is used to determine the mortgage rate from the corporate bond rate (the basic long-term rate) which is determined by a term and risk structure equation such as (V-8).

(V-7) $RCP = f_6(RTB)$

(V-8) $RCB = f_5(RTB)$

(V-9) $RM = f_7(RCB)$

Table V-3 summarizes the structure of the financial sector in the seven econometric models. The exogenous monetary aggregate, the basic short-term rate, other short-term rates determined via risk structure equations, the basic long-term rate determined via a term structure equation, and other long-term rates determined via risk structure equations are identified.

There is great variability in the size of the financial sectors in the seven models. W67 has two estimated equations in the financial sector; M has three, C four and B six. FRB-MIT has eleven, W72 twelve, and FMP thirty-three.

Number of Estimated Equations

M - 3
C - 4
W67 - 2
W72 - 12
B - 6
FRB-MIT - 11
FMP - 33

In the two models with the smallest financial sectors, -- M, W67 -- there are no structural equations in the financial sector. The financial sector consists of a reduced form to determine the basic short-term rate, a term structure equation, and a risk structure equation. The most important

Table V-3
Structure of the Financial Sectors of the
Seven Econometric Models

	M	C	W67	W72	B	FRB-MIT	FMP
exogenous monetary aggregate	RU	E/R	R_f/R_r	RU	RU	RU	RU
basic ST rate	RTB	RCP	RCP	RTB	RTB*	RTB	RTB
other ST rates in exp. eqs.	RCP	-	-	RCP	-		-
LT rate via TS equations	RCB	RCB	RCB	RCB	RGL*	RCB	RCB
other LT rates in exp. eqs.	-	RM	-	-	-	RM	RM RMUN

*In the B model, the long-term rate appears in the money demand equation and the short-term rate in the free reserves equation; the long and short term rates are determined simultaneously rather than sequentially in the financial sector.

determinant of the number of estimated equations in the financial sector is whether the basic short-term rate is determined via a financial reduced form or via a system of structural equations. Among the models with structural equations in the financial sector, the FMP Model is about three times the size of FRB-MIT and W72. The larger size of the FMP model is due to its inclusion of supply and demand equations for several liquid assets (savings deposits at mutual savings banks, savings and loan shares, and deposits with life insurance companies) and of equations for the supply of mortgage financing by the savings institutions supplying those liquid assets.

B. The adequacy of financial modeling in econometric models.

Two sets of "criteria" for financial modeling were developed in Section IV; the first set dealt with the required specifications and the second with the linkages.

1. The Required Specifications

The basic formulation of these models is to specify real sector equations and then use these equations to determine the output required from the financial markets. Thus, the first specification, that the financial variable in the real sector equations need to be determined, is satisfied. The flaw in these models centers around the adequacy of the formulations of consumer demand for durables and housing that ignore inherited consumer debt as well as the formulations of investment demand that ignore liability structures.

The models neither recognize that predetermined cash flows due to the financial structure exist, nor that current investment in excess of current income requires sectoral deficit financing.

The financial sectors in the seven econometric models are concerned with the role of portfolio behavior by the non-financial and commercial banking sectors in determining interest rates rather than with the effect upon aggregate demand and sectoral balance sheets of the external financing of the expenditures of the non-financial sector.

A principal short coming of the financial sectors is their failure to recognize the essential interdependence between expenditures and financing: the financial sector is where that portion of current expenditures not covered by current cash inflows due to income is financed - either by the liquidation of existing assets or the emission of new liabilities.

If the expenditure equation for the jth sector is written as

$$(V\text{-}10) \quad E_j = E_j(R_j, r_j, NW_j),$$

where R_j is the receipts of the jth sector on income account (including transfers), r_j is the vector of interest rates at which the sector can borrow and lend, and NW_j is the sector's net worth, then the final demand of the jth sector is determined. However, Equation V-10 does not say anything about the way in which E_j is financed. This sectoral final demand must be financed by some combination of receipts during the period, liquidation of assets held at the beginning of the period, or the emission of new liabilities.

The financing should be specified rather than "implied". In this way the explicit repercussions of financing activity on balance sheets and on the markets for other financial instruments can be investigated. The effects of today's spending by a sector, other sectors' spending, and future spending decisions can be captured only if the affected balance sheets and financial markets are specified.

The impact of the financing decision for a government deficit upon financial markets has been modelled in works other than those under consideration. Christ [ ] [ ] has noted the implications of the government budget restraint. The government (like any other sector) must finance its final demand (government expenditures) by a combination of current receipts (tax revenues) and emissions of new liabilities (money or bonds). The particular financing decision has important implications for the impact of government expenditures on the variables the government is attempting to influence. If the government finances its expenditures out of current receipts, there is no direct impact on financial markets. There will still be the indirect effect on financial markets as real sector variables which appear in the portfolio relations in the financial sector change. If the government finances its expenditures by emitting liabilities there will be a direct effect on financial markets. The precise nature of the financial market impact of a government program depends on how the expenditures are financed.

A similar logic applies to the deficits of households and corporations. The fact that both spending and financing decisions of these sectors are endogenous complicates the task of modelling their behavior.

Thus there should be a "financing constraint" for each sector. The financing constraint requires that any expenditures not financed by current receipts be financed by reductions in asset holdings or emissions of new liabilities. We can write this requirement as

$$(V\text{-}11) \quad E_j = R_j + \Sigma \Delta A_{ij} + \Sigma \Delta L_{kj}$$

where ΔA_{ij} is the change in the value of the jth sectors holding of the ith asset and ΔL_{kj} is the change in the outstanding value of the jth sector's kth liability.

The asset demand and liability supply equations of the model affect the determination of both final demand and the precise way in which the realized excess of expenditures over receipts is financed. Thus the asset demand and and liability supply equations cannot be isolated from the expenditure equations; rather they interact. A complete set of structural equations for any sector must include the expenditure decision as well as the financing and portfolio composition decision.

None of the models deal explicitly with the full set of liabilities and financial assets in the economy. Brainard and Tobin "argue for the importance of explicit recognition of the essential interdependences of markets in theoretical and empirical specifications of financial models. Failure to respect some elementary interrelationships - for example, those enforced by balance sheet identities - can result in inadvertent but serious errors of econometric inference and of policy." [, p. 99]

A sector's balance sheet identity can be written as

$$(V\text{-}12) \quad NW_j = \Sigma A_{ij} - \Sigma L_{kj}$$

where NW_j is the net wealth of the jth sector, A_{ij} is the value of the jth sectors holdings of the ith asset, and L_{kj} is the value of the kth liability of the jth sector. The balance sheet identity gives us the proximate allocations of a sector's net worth among the various assets it holds and liabilities it has emitted. It implies that one of the sector's asset demand or liability supply functions is redundant, and it implicity imposes restrictions on the coefficients of the asset demand and liability supply functions. Balance sheet identities are not included in any of the seven econometric models and indeed there are few theoretical models that explicitly include them.[1]

However, even though none of the models are complete in terms of assets and liabilities, these models do introduce particular asset demands and supplies. There are no asset demand or liability supply equations for any sector in M or W67. There is a demand for liquid assets equation in C but no equations for the supply of liquid assets.

The remaining four models have at least one portfolio relation for the non-financial private sector and one for the commercial banking sector. In B, there are demand equations for demand deposits and time deposits; and there is a demand equation for free reserves (implicitly a supply equation for

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[1]Exceptions are Foley and Sidrauski [ ] and Meyer [ ].

time deposits). The W72, FRB-MIT, and FMP models include the following additional equations: demand for currency, a demand for commercial loans (a private sector liability supply equation) and one setting the commercial loan rate (implicitly a supply of commercial loans equation (i.e., an asset demand by the commercial banking sector).

The FMP model includes, in addition, a demand for certificates of deposit equation and a rate setting equation for CD's; demand equations for savings and loan shares, deposits at mutual savings banks, and life insurance deposits and a rate setting equation for each of the life insurance policy loans, saving and loan shares, and deposits at mutual savings banks. In addition, the FMP model includes equations determining mortgage commitments by mutual savings banks, life insurance companies, savings and loan associations, and commercial banks. In this model mortgage commitment variables appear as arguments in the housing starts equation.

The asset demand equations in the W72, B, and FRB-MIT models are part of the money supply sector. In these models the financial sector can be interpreted as an expanded LM curve -- there are equations for the demand for money and an implicit money supply equation.

The extension of the financial sector in the FMP model reflects the attempt to explain the crucial role of financial flows in the housing market. This requires modelling of the supply and demand for mutual savings banks deposits, life insurance deposits, and savings and loan shares.

All of the models are interested in exploring the conditional impact of economic policy. To this end they all specify channels for both monetary and fiscal policy. Only in theoretical models which explicitly introduce the

instruments used in the financing of government expenditures is it possible to capture the conditions determining the full impact of fiscal policy upon financial markets and thus the financial as well as the income impact of fiscal policy. Inasmuch as none of the econometric models we are considering do this, we can place our emphasis upon how monetary policy is modeled.

In Table V-4 the actual (Z) and the potential (X) policy variables in the seven models are exhibited. The major policy variables in the models as now structured fall into two classes: a measure of reserves and various direct controls such as the required reserves ratios, and rate ceilings. Four models use the discount rate as an exogenous policy variable.

None of the policy linkages reflect the instruments used by governments and private sectors to finance activities.

2. The Linkages between Financial and Real Variables

In our theoretical argument some nine linkages between the real and financial sectors were identified. We can now examine our seven models to determine which of these linkages have been used. Our comments will of necessity be brief.

(1) The first linkage is the interest rate as a determinant of the choice of technique. For this linkage to be operative, it is necessary to start with a model in which the interest rate-wage rate relation determines a desired capital intensity. In four of the models (B, W72, FRB-MIT, and FMP) the business fixed investment equations are derived from a Jorgenson type model of optimal capital accumulation where the interest rate enters as a determinant of the "user cost of capital." In two other models (M and W67) a long-term

Table V-4
Policy Instruments and Potential Policy Instruments in the Financial Sectors of the Seven Econometric Models

	M	C	W67	W72	B	FRB-MIT	FMP
money supply				X	X	X	X
monetary base							
unborrowed base							
unborrowed reserves	Z			Z	Z	Z	Z
total reserves							
free reserves				X	X	X	X
free reserves ratio			Z				
excess reserves							
excess reserves ratio		Z					
Treasury bill rate	X			X	X	X	X
commercial paper rate	X	X	X			X	X
Discount rate		Z	Z			Z	Z
TD rate ceiling					Z	Z	Z
CD rate ceiling							Z
supply of govt bonds							
maturity structure					Z		
Treasury deposits					Z	Z	Z
reserve req-DD				Z	Z	Z	Z
reserve req-TD				Z	Z	Z	Z

interest rate also appears in the business fixed investment equations although these equations are esentially ad hoc. Thus only the C Model ignores this linkage.

(2) A second role for the interest rate is the consumption or saving equations. This linkage appears in only the FRB-MIT and FMP Models.

(3) The relative price channel is included in the specification of the housing sector in the FRB-MIT and FMP Models. The mortgage rate affects the demand for the stock of houses and thus the price of the existing stock relative to the cost of constructing a new unit of housing. Construction costs appear as an argument in the housing starts equation. The role of changes in equity prices in the investment decision is recognized in the FRB-MIT and FMP Models by including the dividend price ratio as a determinant of the cost of capital.

(4) Only the FMP Model includes a wealth effect in the consumption sector. The interest induced wealth effect and the wealth effect via accumulation are included in the specification of the wealth variable but there are no direct wealth effects due to changes in the supply of government bonds or money.

(5) Liquid asset variables appear in the consumption equations of the C, W67 and B Models.

(6) Five models attempt to capture the influence of non-price rationing. The M, W67 and W72 Models use either the difference between or the ratio of long and short term interest rates as a measure of credit rationing in the housing starts or residential construction equations. The FMP Model includes a measure of both the availability as well as cost of mortgage financing in its housing sector.

(7) None of the seven models allow for the influence of cash flow commitments on spending decisions.

(8) None of the models allow for the impact on financial markets of surpluses and deficits in the various sectors of the economy.

The M Model includes the surplus or deficit of the federal government in its financial reduced form. The C Model does not include any variable influenced by real sector spending in its financial reduced form. The other models capture the influence of the real sector spending decisions on financial markets through expenditure variables in portfolio equations or in financial reduced forms. None of the models explicitly allows for the direct impact on financial markets of an increase in the supply of government bonds to finance deficits although the financial reduced form of the M model does this indirectly by including the government surplus as an argument. None of the models require sectoral expenditures in excess of sectoral receipts to be financed in external markets.

(9) No model allows for the essential speculative element in the financing of positions in the stock of asset prices. This channel, which reflects variations in asset preferences in response to past performance of the economy, is a channel by which cash flow commitments (Channel 7 above) can change independently of new investment activity.

VI. Conclusions

(1) The financial instability hypothesis leads to the view that a disaggregated financial structure which emphasizes the cash flow commitments in liabilities is an important factor determining system behavior.

(2) The financial picture for the American economy has changed markedly over the post-war period.

(3) Existing econometric models barely have scratched the surface in interpreting financial factors as meaningful system determinants.

(4) The path for research is to construct econometric models which explicitly incorporate cash flow commitments and speculative portfolio behavior.