The Integrated Financial and Real System of National Accounts for the United States: Does It Presage the Financial Crisis?[*]

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Abstract: The initial implementation of the System of National Accounts (1993) for the United States by the Bureau of Economic Analysis and the Federal Reserve Board has two significant advantages for economists. First, the SNA are organized according to sectors of the economy defined by economic agents: firms, financial institutions, consumers, governments and the rest of the world. Second, the accounts integrate real and financial information, so that one can track not only production of, income from, and use of output, but also net lending, net borrowing, and net worth by sector. We exploit these two features in the SNA accounts to examine US economic history leading up to the financial crisis of 2007 and recession of 2008. First, the SNA data show recent increases in leverage in the household sector. We track the household shift to a net lending position through the capital and current accounts of the household sector and then the other SNA sectors. Second, in the financial businesses sector, the accounts largely miss the rise in exposure to the US housing market as well as the critical factors that significantly spread and amplified the housing-market related changes throughout the financial system and the real economy. Finally we present three ways in which SNA-type accounts could be improved to presage a similar future crisis.

Information on the US economy is contained in disparate sources that, while generally congruent, in places track differently-defined sectors, omit sectors of interest, or are not fully consistent with one another. In this paper, we discuss and analyze an innovative set of macroeconomic accounts for the United States that integrate financial and real data from these distinct sources using the System of National Accounts (SNA; 1993), a framework for macroeconomic accounts constructed by a number of national and international statistical agencies around the world.[1] The US implementation of the SNA, the results of a joint research project of Bureau of Economic Analysis (BEA) and Federal Reserve Board (FRB) staff, is constructed primarily from both the National Income and Product Accounts (NIPA), which measure the production of, use of, and income generated by newly produced goods and services, and the Flow of Funds Accounts (FFA), which measure net flows and balances of financial assets.[2] The structure of these accounts differs radically (and initially, confusingly) from the organization of both the NIPA and FFA.

We illustrate the organization and use of the SNA by studying US economic history leading up to the financial crisis of 2007 and severe recession of 2008. First, we track the secular and recent changes in household saving, financial investment and real investment through the capital and current accounts of both the household sector and the other SNA sectors. We find that the SNA data show recent increases in leverage in the household sector financed primarily with mortgages and through borrowing from the rest of the world.

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[1] Commission of the European Communities, International Monetary Fund, Organization for Economic Co-Operation and Development, United Nations, and the World Bank (1993).

[2] See Albert M. Teplin, Rochelle Antoniewicz, Susan Hume McIntosh, Michael G. Palumbo, Genevieve Solomon, Charles Ian Mead, Karin Moses, and Brent Moulton (2006).

Second, we show that the SNA data on the financial sector largely misses both the rise in exposure to the housing market and increases in leverage, balance sheet complexity, maturity mismatch, and counterparty risk-taking— four factors that we see as critical in amplifying and spreading the housing market shock through the financial and real economy. Thus we conclude that the SNA data alone do not presage the severity of the current financial crisis. We end the paper by suggesting three modifications to line and sectoral aggregation to increase the usefulness of SNA-type data for indicating vulnerability to potential future similar crises.

I. The organization of the System of National Accounts

Compared to the existing macroeconomic accounts data, the US SNA data have two main advantages. First, the SNA contain a full set of macroeconomic information broken down by sectors of the economy that are economic units of interest: Households (including nonprofit organizations that serve households), Nonfinancial noncorporate business (sole proprietorships and limited partnerships), Nonfinancial corporate business, Financial business, Federal government, State and local government, and Rest of the world (foreign governments and businesses that engage in trade or financial transactions with domestic counterparts). In contrast, in the NIPA's familiar $C+I+G+NX$ organization, consumption and government spending cover economic units of interest, but investment does not – it is a grouping based on activity. For example, household consumption of housing services is in C but household investment in housing structures appears in I.

Second, the US SNA integrates financial and real information. For each of a set of consistently-defined sectors, the SNA follows: a current account that tracks the flows of production/income and consumption; a capital account that tracks saving and capital formation; a

financial account that tracks net acquisition of financial assets and net incurrence of debts; a revaluation account that tracks gains and losses on tangible and financial assets; and a balance sheet account that tracks the stocks of tangible assets, financial assets, and liabilities. In the current NIPA and FFA for example, only a sophisticated user investing a significant amount of time could navigate the published tables to produce estimates of net lending and borrowing across the major sectors of the economy.

To illustrate the SNA structure, consider the evolution of a sector's net worth. For any sector, change in net worth is the sum of revaluation of existing stocks of real and financial assets, other volume changes (which includes durables goods), net lending, and net capital formation (the sum of these last two is also net saving plus capital transfers). Each period, each sector's combined sources of funds must equal its combined uses of funds. Sources of funds include current disposable income and borrowing from others sector; uses of funds include current spending (outside of investment), investment, and the acquisition of financial assets.

A novel aspect of the SNA integration is net lending and borrowing, which for each sector of the economy is in both the capital account and the financial account. In the NIPA-based capital account, a sector's net lending or borrowing position is defined as the difference between its net saving—disposable income less current spending—and its net investment (gross purchases of physical capital less depreciation). Sectors that invest on net more than they save out of current income are net borrowers. In the FFA-based financial account, a sector's net lending or borrowing position is defined as the difference between its net acquisition of financial assets and its net incurrence of debt.
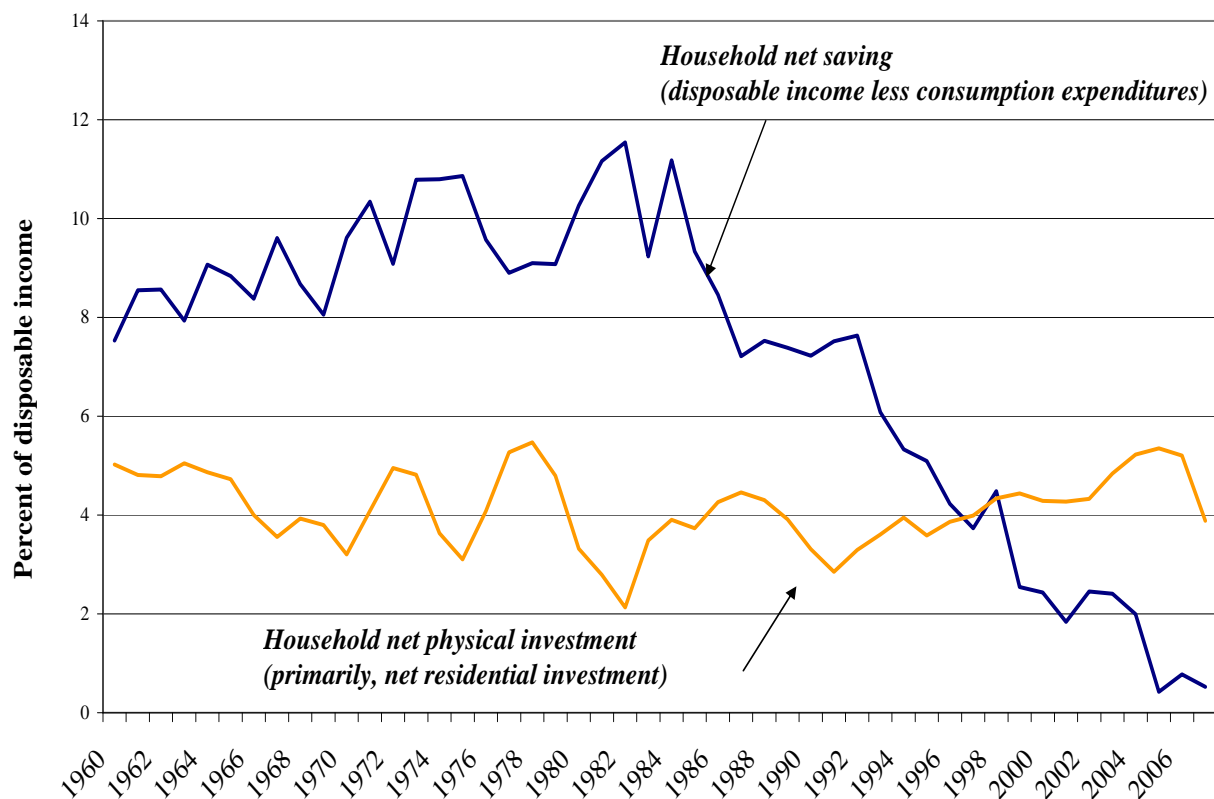
FIGURE 1. HOUSEHOLD SECTOR NET LENDING OR BORROWING
IN THE SNA CAPITAL ACCOUNT

II. The household sector of the SNA and the prelude to the financial crisis

In this section, we document the evidence of rising household leverage in the SNA. First,

Figure 1 shows the well-known fact that after having fluctuated in the neighborhood of 10

percent from the early 1960s through the recession of 1982, the household saving rate has

declined to near zero.[3] Second, and more interesting, net physical investment by the US

household sector did not decline along with saving. In fact, in the recent boom years of the

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[3] Annual data from 1960 through 2007 are available at:
http://www.bea.gov/national/nipaweb/Ni_FedBeaSna/Index.asp and are updated by BEA and FRB staff after each
quarter's publication of the Flow of Funds Accounts. We use data available as of the December 11, 2008, release of
the Flow of Funds Accounts of the United States.

housing market (2002 through 2006), households' net investment in tangible assets, mainly net residential investment, actually increased from 4 percent of disposable income to about 5½ percent in 2006.

Third, consequently, and most importantly, after having providing funding to other sectors on net, at an average annual rate of around four to five percent of disposable income from 1960 to 1990, households started borrowing on net in 1996 (Figure 2). Net borrowing reached 5 percent of disposable income in 2005 and 2006.

What sort of debt increased so dramatically over the past decade? The household balance sheet shows a large acceleration in net mortgage debt, which rose steadily over the forty years from 1960 to 2000, cumulating to 40 percent of disposable income (from 0.31 to 0.70), then

<figure>

Net lending position: Household saving exceeds investment

Net borrowing position: Household saving falls short of investment
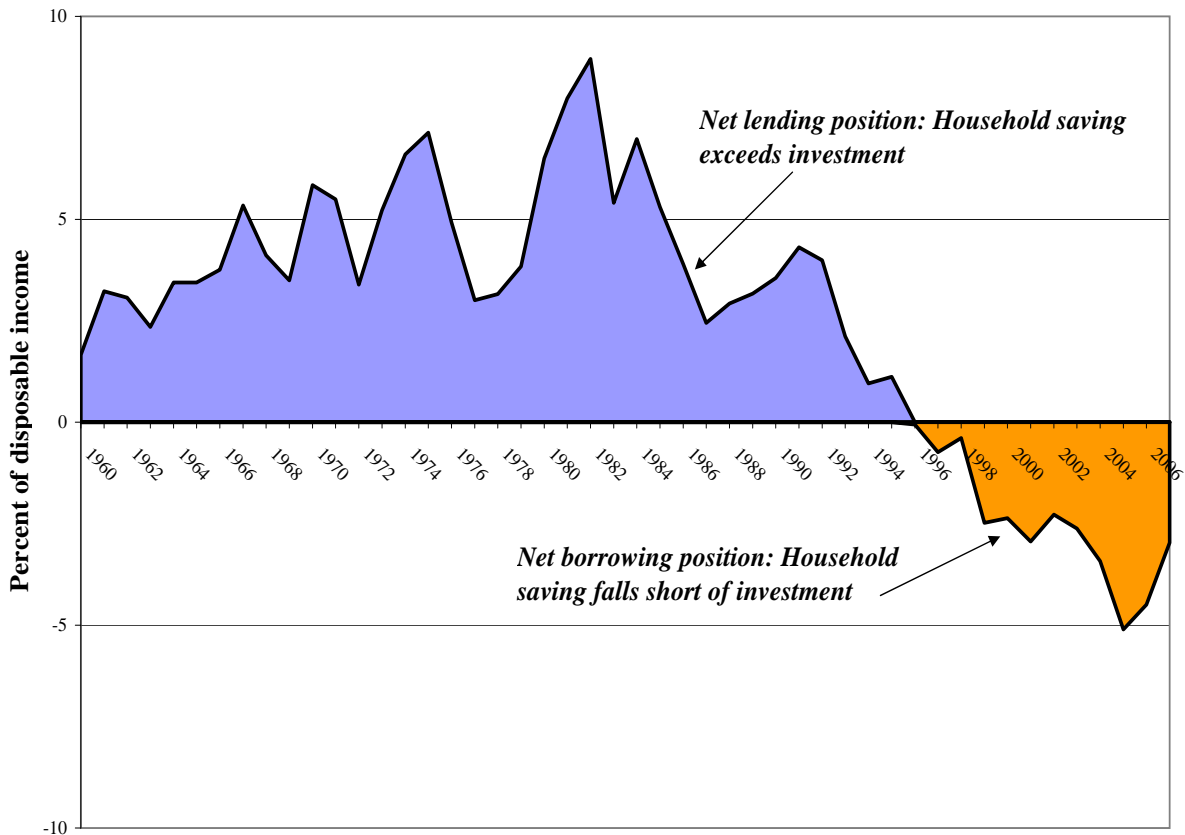
FIGURE 2. NET LENDING (+) OR BORROWING (-) BY US HOUSEHOLDS
IN THE SNA CAPITAL ACCOUNT

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climbed another forty percent of disposable income over only seven years from 2000 to 2007 (to 1.09).

We do not however observe in the SNA the significant increase in highly-leveraged home purchases that raised the exposure of the financial sector to house price risk. In the SNA, the aggregate home loan-to-value ratio rose little, yet we know from other sources that a significant fraction of mortgages were extended with little payment and so with exceptionally high leverage.

In sum then, we observe in the SNA data a significant rise in balance sheet leverage by the household sector that, at least in hindsight, signals an increased exposure of consumer demand to decreases in asset values. But we do not observe the extent to which a subset of highly-leveraged homes/mortgages moved housing risk from the homeowner to the lender.
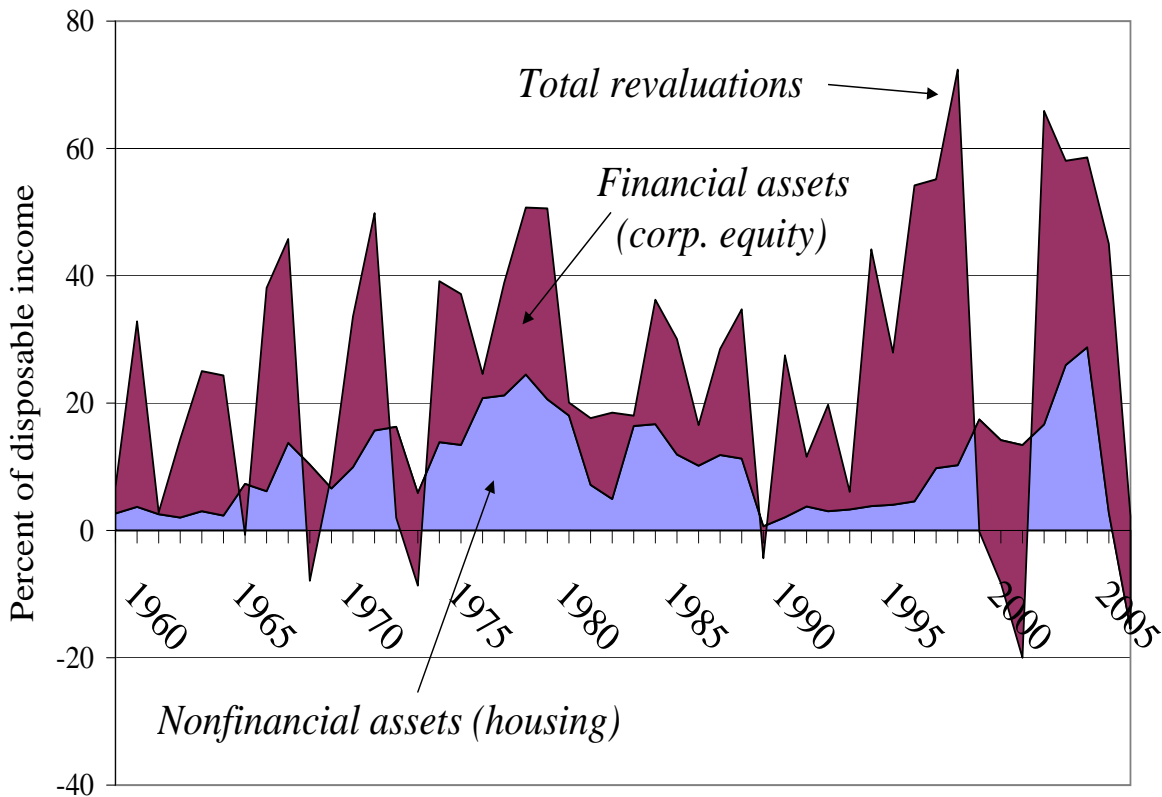
FIGURE 3. REVALUATIONS OF HOUSEHOLD ASSETS

A better understanding would have been useful, because, while the scale of the recent declines in home prices and equity are historically large, they are not unprecedented and revaluations often lead to changes in household net worth that dwarf those due to non-secular changes in household saving. As Figure 3 (previous page) shows, fully offsetting the accounting effects of revaluation would require, in some years, household saving on the order of plus 20 percent or minus 60 percent of disposable income.

Using the SNA capital account, Table 1 reports which sectors lent funds to the household sector. Note that, except for statistical discrepancies, net lending and borrowing across all sectors

Table 1. SNA Net Lending and Borrowing in the United States, by Sector and Decade: 1960 through 2007

	SNA Capital Account Net lending (+) or borrowing (-) by sector	1960s	1970s	1980s	1990s	2000s
1	All U.S. sectors	9	-41	-139	-197	**-472**
2	Households	74	146	213	54	**-251**
3	Nonfinancial noncorporate business	-48	-73	-83	-41	**-71**
4	Nonfinancial corporations	-4	-49	-16	-22	**20**
5	Financial businesses	18	27	-1	14	**110**
6	Federal government	-13	-84	-239	-169	**-201**
7	Municipal governments	-18	-5	-10	-34	**-75**
8	Rest of the world	-18	-8	103	116	**526**
9	Statistical discrepancy	9	51	35	82	-56
	SNA Financial Account Net lending (+) or borrowing (-) by sector	1960s	1970s	1980s	1990s	2000s
1	All U.S. sectors	9	-46	-140	-26	**-572**
2	Households	127	217	329	153	**-311**
3	Nonfinancial noncorporate business	-48	-73	-83	-41	**-71**
4	Nonfinancial corporations	-48	-114	-123	11	**44**
5	Financial businesses	13	8	7	25	**19**
6	Federal government	-13	-89	-266	-189	**-227**
7	Municipal governments	-18	3	-6	12	**-28**
8	Rest of the world	-13	-8	86	124	**543**

Note: Data taken from Table S.2, "Selected Aggregates for Total U.S. Economy and Sectors" (lines 34-50).

sum to zero each period. In the 1960s and 1970s, the two nonfinancial business sectors, the two government sectors, and the rest of the world were consistently net borrowers, meaning their rates of investment almost always exceeded their rates of saving. The household and the financial business sectors served as the net lenders to all the other sectors. In the 1980s and 1990s, the primary change was to net lending by foreign institutions.

In the 2000s, however, as household switched from being the largest lending sector to the largest borrowing sector, a large inflow of foreign (financial) capital provided the lion's share of net lending, complemented by new lending by nonfinancial corporations.

In sum, leading up to the financial crisis, housing revaluations and net housing investment were large by historical standards but neither was unprecedented in magnitude. The SNA emphasize that what was unprecedented was the household sector's dramatic shift from funding the investment of other sectors to borrowing from them, primarily in the form of mortgages.

III. The financial sector of the SNA and the prelude to the financial crisis

In this section, we show why the SNA data, although helpful for many macroeconomic analyses, did not convey the substantial vulnerabilities that accumulated in the financial system during the 2000's and that turned a housing correction into a financial crisis and deep recession.

The financial market crisis began in 2007 when recent vintages of securitized mortgages began to default at elevated rates and house prices decelerated nationally and actually fell (in nominal terms) in some local markets. Mortgage-related assets lost significant value, and fewer institutions were willing to hold or buy these securities as they were significantly downgraded and their complexity hindered valuations. Financial institutions with significant exposure to mortgage-related assets lost capital, questions about the solvency of specific companies arose,

and a range of financial institutions became vulnerable to—and experienced—a withdrawal of short-term funding leading some into insolvency. As the crisis has progressed, house prices have continued to fall and the US is, as we write, mired in a deep recession.

Thus, the origin of the crisis in the financial sector was exposure to real estate and mortgage credit, but the core losses were exacerbated by four factors: high leverage (which amplifies the effect of price movements on balance sheets and can lead to margin calls that require unwinding positions pushing prices lower and making losses greater still), maturity mismatch (which leads to increased debt payments when credit becomes expensive, reducing liquid assets further and leading in some cases to insolvency), complexity of assets and the balance sheet (which impedes fundamentally solvent institutions from communicating their positions so as to continue accessing credit), and reliance on business models with significant exposure to any counterparty risk (creates the risk of a sort of bank run, whereby the suspicion of insolvency by a firm's counterparties reduces its ability to conduct business and possibly leads to insolvency).[4]

Why do the SNA data not show the increase in the exposure of the financial sector to house price risk? The main answer is aggregation across asset classes. The SNA do not distinguish among different types of corporate bonds or commercial paper. Structured financial products—such as collateralized debt obligations, asset-backed securities, non-agency mortgage-backed securities, and certain types of asset-backed commercial paper (namely, structured investment vehicles and securities arbitrage programs)—carried more risk and exposure than traditional corporate bonds. While the SNA does show assets that consist of long-term loans (line 102 in the financial sector accounts), which are primarily mortgages, securitization conveys sizable

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[4] We do not consider other possible contributing factors that are less amenable to measurement, such as inaccurate judgments about risk and expected returns, herd mentality, and mismanaged conflicts in interest.

exposures to residential mortgages through the "corporate bond" holdings in the SNA presentation. In the SNA data, exposure to long-term loans (mortgages) actually declines as a fraction of total assets for the financial business sector from 1990 on.

Turning to the propagating factors, the SNA does not display an increase in leverage of the financial sector for two reasons. First, aggregation across the sector hides leverage of commercial and investment banks. Balance sheet leverage in the aggregate financial sector—as measured, for example, by the ratio of asset values to equity capital—is an amalgam of institutions that employ very little leverage—such as mutual funds, pension funds, money market funds, and insurance companies (and that, together, account for a substantial amount of security holdings)—and others that employ significant leverage—such as broker/dealers, commercial banks and saving institutions, and government-sponsored enterprises (Fannie Mae, Freddie Mac, and the Federal Home Loan Banks). According to Tobias Adrian and Hyun Song Shin (2008), during the credit boom of the mid-2000s, balance sheet leverage increased among the primary dealers and major investment banks while leverage decreased among commercial banks. Moreover, some large commercial banks and bank holding companies—particularly those with significant broker/dealer functions—increased their balance sheet leverage, even as the (sub)sector as a whole generally did not. Although effective leverage in critical financial institutions increased substantially during the mid-2000s, the SNA aggregate data for the financial sector show just a slightly faster increase in liabilities than assets, implying only a small increase in leverage.

Second, leverage is difficult to observe because risk is difficult to observe. The distinction between collateral and a risky investment is in the eye of the beholder. As in most macro-financial accounts produced around the world, the SNA reports lending and borrowing between

sectors using broad categories of credit instruments—instruments that embed different degrees of credit risk and implicit leverage. For example, for mortgage assets, underwriting became more lenient (no money down, no documentation of income/assets, etc) which exposed investors to unprecedented losses. Although the SNA data show the exceptional growth of mortgages in real time, they did not convey the increased possibility of the magnitude of the losses we have seen.

In terms of our second propagating factor, maturity mismatch built up substantially during the credit boom in a manner that the aggregated data in the SNA do not reveal. As emphasized by David Bowman and Daniel Covitz (2008) and by Markus K. Brunnermeier (2008), in the 2000's, financial engineering allowed a range of financial institutions, hedge funds, and money
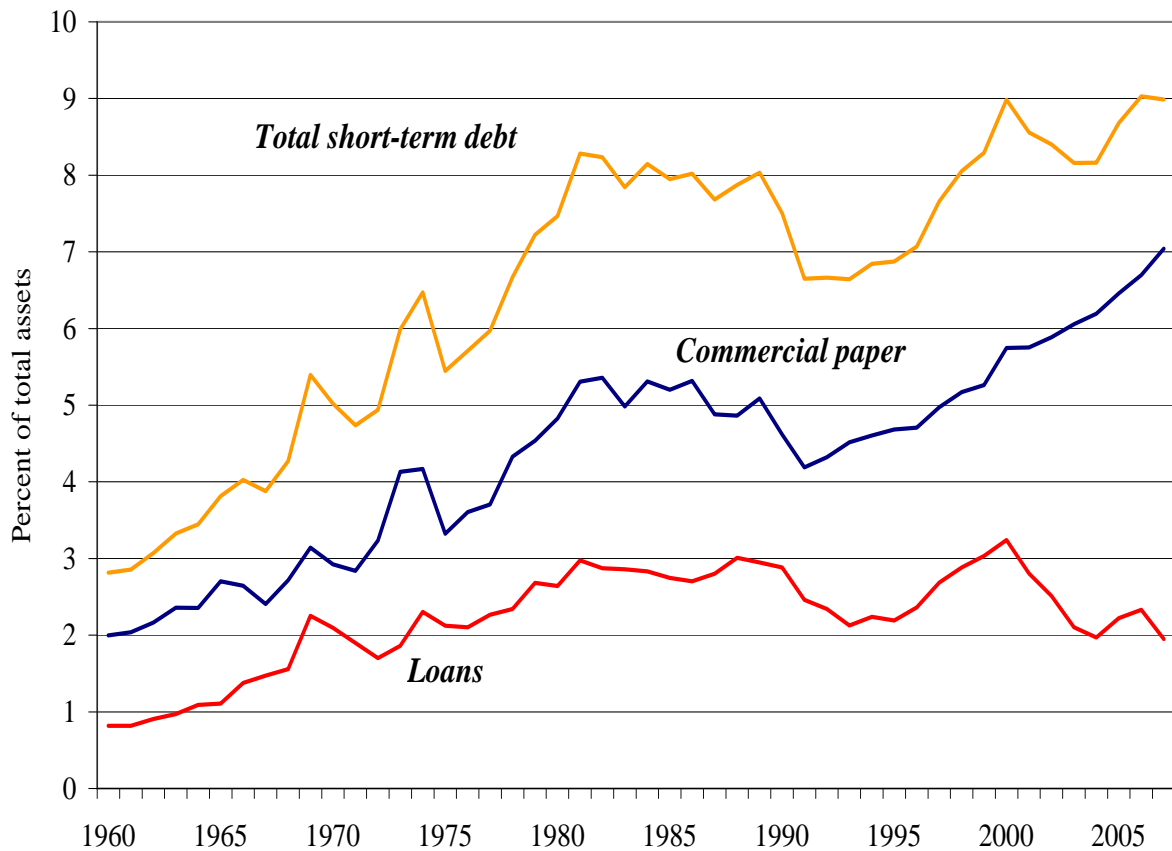
FIGURE 4. SHORT-TERM DEBT OF THE SNA FINANCIAL SECTOR

managers to earn high returns (until the crisis) by borrowing short at low interest rates and lending long at higher rates. But firms that rely on short-term debt for funding long-term assets are vulnerable to runs: a withdrawal of short-term funding can cause bankruptcy of an otherwise solvent institution. During the credit boom many leveraged firms (broker/dealers and subsidiary broker/dealers of major commercial banks) took on *extremely* mismatched maturity structures; they relied on (then) inexpensive overnight debt (such as repurchase agreements) to fund investments in long-term assets (such as asset-backed commercial paper conduits).

The SNA aggregation across institution types and asset classes largely masks the rise in reliance on short-term funding. The SNA do measure net short term borrowing, but these data show only a long-term trend: net liabilities that are short–term debt rise from 2 percent of total assets for the sector in 1960 to about 7 percent in 2007 (Figure 4). There is also a trend increase rather than an acceleration in commercial paper obligations relative to total assets (Figure 4).

Aggregation to the broad sectoral level and to broad asset classes also masks changes in the third important propagating factor: balance sheet complexity. However, we suspect that such information probably was not needed from the government -- the complexity was largely known. That is, it seems likely that everyone knew that Bear Stearns and Lehman Brothers were complex institutions, but potentially everyone did not appreciated how this complexity could contribute to making these institutions insolvent in the face of large but indeterminate losses.

Finally, in terms of counterparty risk, sectoral aggregation masks the increased reliance on counterparty exposure that made the financial system vulnerable to the fear that any bank might enter bankruptcy. Gross counterparty exposure is netted out by aggregation.

IV. Conclusion and suggestions for modifying the SNA

The credit boom in the US economy left a pronounced footprint in the household sector of the SNA. Households moved from significant net lending to significant net borrowing over 25 years, and, in the past decade, increased housing investment and increased net mortgage debt at an unprecedented rate. What cannot be gleaned from the SNA is the extent to which mortgage risk rose disproportionately more than leverage due to looser underwriting.

In the SNA financial business sector, building exposure to real estate and institutional vulnerabilities were even less visible for three reasons: the financial sector covered by the SNA is too broad, aggregate information in the SNA masks substantial heterogeneity among firms and households, and the SNA presentation does not differentiate among similar debt instruments with different risk characteristics. What improvements can be made?

First, while it seems unrealistic to ask that national accounts measure the riskiness of assets, more detailed classification of assets would be useful, such as classifying different types of mortgage assets. It also seems feasible to separate out structured financial products.

Second, the SNA definition of the financial sector can be improved. When a mutual fund or hedge fund purchases a security, that security should appear on the household balance sheet not the balance sheet of the financial sector. Only firms that provide a significant level of financial intermediation and are not simply conduits for households should be in the financial sector.

Third, it would be extremely useful to further divide those institutions in the financial sector that provide significant intermediation into those that can use leverage and those that cannot. For example, insurance companies and pension funds would then not be aggregated with investment banks and broker dealers. Such a division into two sectors seems both feasible and useful despite institutions which blur this distinction, such as entities like AIG and products like

credit default swaps.

Ultimately, because average net positions mask changes in the tails of the distribution, analysts will need to augment aggregate data in the macroeconomic accounts with information about the extent of extreme leverage, extreme lack of diversification, or more generally statistics about the extent to which a significant fraction of a sector may have large exposures.

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