CONFIDENTIAL - FOMC CLASS III

BOARD OF GOVERNORS
OF THE
FEDERAL RESERVE SYSTEM

Office Correspondence

Date September 16, 1988

To Federal Open Market Committee

Subject: Effects of Interest Rate Changes on Household Cash Flows

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MJP

In response to questions raised by several members of the Committee, the Board staff has put together the attached discussion of how changing interest rates might, on net, affect the cash flows of households. A summary of the main conclusions may be found on the first two pages of the paper.

September 16, 1988

INTEREST RATES AND HOUSEHOLD CASH FLOW*

The rise in interest rates during recent months has prompted questions about the accompanying effects on the cash flow of households. This concern has been heightened by the increased prevalence of adjustable-rate mortgage lending, including home equity lines of credit.

This paper analyzes the effects of changes in market interest rates on household cash flow, examining effects on both interest income and interest expense. In addition, the implications for debt servicing and consumption are discussed. The conclusions of the analysis are:

> Interest-paying assets held by households exceed, in the aggregate, the volume of their consumer and home mortgage debt. Throughout the post-WWII period the household sector has lent more funds to businesses and governments than it has borrowed from these sectors.
>
> Because the household sector is a net lender, its interest income exceeds its interest expense, in most recent years by a margin of 25 to 50 percent.
>
> Interest income has, historically, been more responsive to changes in market interest rates than has interest expense. Currently about $1.2 to $1.5 trillion of household interest-paying assets would be expected to adjust within one year of a change in market interest rates.
>
> Interest expense on the main elements of household debt--home mortgages plus consumer credit--has become more responsive to market rates in the past five years, owing primarily to the growth of adjustable-rate mortgages and home equity lines of credit, which together now account for approximately 25 percent of all home mortgage debt. Despite this development and the short maturities on many consumer loans, interest payable on only about one-third ($900 billion) of the current stock of household debt will change within one year of a change in market interest rates.

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Based on the above findings, the household sector's interest income, net of interest expense, would be expected to increase in both the short run and the long run in response to a rise in market interest rates, all else equal.

Households with debt typically have the income and assets to service that debt. However, most ARM debtors have few rate-sensitive asset holdings that could generate increased interest income to offset a rise in interest expense.

Despite the positive effect of a rise in interest rates on nominal cash flow of households, consumer spending is likely to decline as higher rates reduce the value of assets and damp aggregate economic activity by raising financing costs.

The remaining sections of this memo explain these findings.

I. The Household Sector as Net Lender

The financial assets of households substantially exceed their liabilities (table 1).[1] Excluding equity in noncorporate business, household financial assets totaled $9.1 trillion at the end of 1987. Of these financial assets, we estimate that about $4 to $4-1/4 trillion are interest-earning in the sense of yielding interest payments to households in the current year. Currency and some checkable deposits do not provide any monetary return, and holdings of corporate equities provide dividends rather than interest. Such assets as pension fund reserves do not yield a currently available return to households.

As to the liabilities of the household sector, debt totals nearly $3 trillion. Of the total, $1.8 trillion is home mortgage debt

1. The household sector as defined in the Flow of Funds Accounts includes nonprofit institutions and foundations as well as true households. Perhaps 10 to 15 percent of the financial assets of the sector and 5 to 10 percent of the debt arise from these nonpersonal entities. Household debt in this analysis is defined as home mortgage debt and consumer credit, which at the end of 1988 accounted for 88 percent of total debt of the household sector.

and $700 billion is consumer debt. (Much of the remaining volume of liabilities is actually attributable to tax-exempt and nonprofit organizations included in the household sector.)

Thus, the stock of interest-paying assets held by households exceeds their stock of interest-bearing liabilities by roughly 50 percent. According to the Flow of Funds Accounts, these assets have exceeded liabilities in each of the past twenty-five years; that is, throughout the period the household sector has been a net lender to businesses and governments.

Reflecting this excess of interest-paying assets over liabilities, interest income of households exceeds their interest expense (table 2). According to Commerce Department figures, monetary interest received by households was $313 billion in 1987[2] and interest paid was $254 billion, of which $161 billion was mortgage interest on owner-occupied houses. Throughout the post-WWII period, interest income of households has exceeded expense by a margin that has ranged from 10 to 50 percent; in recent years the margin has fluctuated between 25 and 50 percent.

II. Sensitivity of Interest Income to Changes in Interest Rates

The interest-earning components of household assets vary considerably in their responsiveness to market interest rates. Yields

2. The Commerce Department also imputes interest earnings to individuals that are disregarded here. Commerce treats financial institutions as true intermediaries, and thus attributes all of the net interest earned by institutions to persons. The amount can be thought of as the value of services received by depositors from financial institutions in lieu of monetary interest payments.

on money market mutual funds are quite responsive to current market rates, while rates on NOW accounts, MMDAs, and savings deposits move quite sluggishly. For example, three-month Treasury bill rates increased by about 115 basis points between late May and the end of August, but rates on savings deposits were flat and rates on MMDAs rose about 20 basis points. Rates on new small time deposits move much more closely with market rates, though the rate sensitivity of existing accounts depends on how quickly they mature and can be reinvested. Call Report data for year-end 1987 indicate that about half of small time deposits at banks and thrifts combined have remaining maturities of six months or less; three-quarters reprice within one year. As for large time deposits, about two-thirds of these accounts at banks mature in three months, and 80 percent mature within six months.

Little is known about the maturity distribution of household holdings of government securities; presumably most carry maturities of more than a year, which is the case for the entire stock of U.S. Treasury securities. Most corporate bonds and tax-exempt securities held by households are fixed rate and presumably have relatively long maturities.

Assuming that three-quarters of small time deposits ($750 billion) and the bulk of large time deposits are interest sensitive, along with all money market mutual funds and small portions of government securities and some other categories, it would appear that, roughly speaking, earnings on about $1.2 to $1.5 trillion of household

assets vary with market interest rates, in the sense that these assets reprice within a year.

Model-Based Estimates

Additional insights into the responsiveness of household interest income to changes in market interest rates come from econometric models.

Consider first the Board's money market model. Many of the interest-bearing assets of the household sector are components of M2. The money market model contains an estimated rate-setting equation for each component of M2 that yields an explicit return. Each own rate is assumed to have an equilibrium value that is a linear function of the federal funds rate. An error correction specification is used to model the dynamic adjustment to equilibrium. Some equations are estimated over very limited sample periods.

Table 3 shows the simulated average responses of own rates on principal M2 components to a sustained 100 basis-point increase in the federal funds rate. Yields on new small time deposits[3] and money market mutual funds, which are estimated to be very flexible, increase almost as much as the funds rate, rising about 90 basis points the first year and an additional 10 basis points the second year. The response of the MMDA own rate is somewhat slower, but nevertheless substantial over the period of a year. The rates paid on saving deposits and other checkable deposits are estimated to respond very sluggishly to movements

3. The model estimate refers to newly opened six-month accounts. Interest rates on the existing stock of small time deposits would adjust more slowly, as these accounts matured.

in the funds rate, with both rising only 20 basis points the first year and another 10 basis points the second year.

As an alternative approach, estimates can be made of the responsiveness of interest income from the entire stock of household interest-bearing assets. A rate of return on this stock can be computed by dividing interest receipts by the stock.[4] This rate of return, not surprisingly, has moved with the general level of interest rates over the past 35 years (chart). The rate of return responds to both current and lagged values of interest rates, and also reflects portfolio shifts among the various components of the stock. A simple model suggests that during this period a 100 basis-point change in one-year Treasury yields in a year has been accompanied by roughly a 25 basis-point change in the rate of return on the stock of interest-bearing assets in that same year and an additional 15 basis-point change in the next year. Because deposit rates were regulated for part of this period, the current responsiveness may be greater, but econometric evidence is inconclusive.

III. Sensitivity of Interest Expense to Changes in Interest Rates

Recent media attention has focused on the effects of rising interest rates on households' interest expenses. The continuing prevalence in recent years of adjustable-rate loans among new conventional mortgages and the growing popularity of home equity lines of credit have increased the proportion of home mortgage debt that is

4. Interest-paying assets are defined in this exercise to include household sector holdings of small time and savings accounts, money market funds, large time deposits, and all credit market instruments, including government and private securities.

adjustable rate. Most consumer credit continues to be fixed rate, but the shorter maturities on these loans mean that much of this debt reprices quickly.

Regarding mortgages, we estimate that close to 25 percent of all home mortgage debt outstanding now carries an adjustable rate. This estimate is based on partial data and the margin of error is probably about ±5 percentage points. Thrift institutions tend to specialize in ARM lending, and at these institutions approximately 40 percent of home mortgage assets carry adjustable rates. Included in the $1.85 trillion of home mortgage debt of households is $80 to $90 billion of home equity line credit, nearly all of which is adjustable rate. At the beginning of this decade probably less than 5 percent of home mortgage debt was adjustable rate.

Most of the outstanding ARMs reset the interest rate annually. A small proportion of ARMs hold payments constant for 12 months but allow the interest rate to adjust more frequently. Other ARMs adjust interest rates every three or five years. By far the most common index rate for one-year ARMs is the one-year Treasury yield, but a substantial number of ARMs, especially in the West, are tied to the average cost of funds at FSLIC-insured institutions, either in the 11th FHLB district or nationwide. In contrast to the typical closed-end adjustable-rate mortgages, most home equity lines are priced off the prime rate and reprice monthly.

Adjustable-rate lending is less common in the consumer credit market than in the home mortgage market. Between 80 and 90 percent of

all consumer credit is fixed rate. Of the adjustable-rate credit extended by commercial banks, the most common indexes are the banks' internal cost of funds, the bank's own prime rate, the prevailing prime rate, and a T-bill rate. Rates typically are adjusted every two or three months. Even though most consumer credit is fixed rate, the relatively short maturities of these loans cause the stock of credit to reprice much more rapidly than does home mortgage debt. The average initial maturity of consumer credit--including auto loans, revolving credit, and the smaller categories--is probably between 30 and 36 months. If this credit were all fixed rate, about one-third of the stock would be expected to mature, and therefore reprice, within 12 months.[5] Allowing for the adjustable-rate consumer loans, a ballpark estimate is that 45 to 55 percent of the stock of consumer credit reprices within 12 months of a change in market interest rates.

Given these estimates of the extent and pricing of household debt, how would aggregate household interest expense on the current stock of credit be expected to adjust to the recent rise in interest rates? Econometric estimates based on annual data for the post-WWII period indicate that in the past this adjustment has been quite slow and muted. Chart 1 shows that interest expenses on home mortgage debt and on consumer credit have been much less variable over time than has the

5. The implications for consumers of repricing of loans at maturity may be different from repricing owing to an adjustable-rate provision. At maturity, the loan balance typically has been retired, so that consumers will have to pay higher rates only if they choose to originate a new loan. On loans that reprice periodically before they mature, a borrower with few liquid assets may have no alternative but to pay the higher rate on the remaining balance.

rate of return on interest-bearing assets. However, the past may be a less accurate guide to the future in this instance, given the recent expansion of adjustable-rate lending. But even with this innovation, it appears that the response of household interest expense will continue to be rather slow. Most home equity lines and adjustable-rate consumer loans adjust within a month or two, but the much larger stock of ARMs and fixed-rate consumer credit will adjust more slowly as annual adjustment dates are reached and as fixed-rate consumer loans mature.

In summary, despite the growth of adjustable-rate mortgage lending and the short maturities on many consumer loans, only about one-third of the current stock of household debt will reprice within one year of a change in market interest rates. Over a three-year period, perhaps 50 to 60 percent of the total would reprice. The large stock of long-term, fixed-rate home mortgage debt keeps the response from being faster.

Of the household debt that does reprice, the adjustments in interest payments may not move closely with market rates. Many ARMs and home equity lines of credit have initial-period discounts. When these discounts expire, interest payments increase even if market rates do not rise. On the other hand, some of these loans have caps on the annual rate adjustments, which may slow the response to changes in market rates. In addition, some consumer and mortgage credit interest rates--especially on credit cards and on ARMs linked to thrifts' cost of funds--are sticky and do not move as much as market rates.

V. Aggregate Effects on Household Cash Flow

Combining the estimates of the preceding two sections, it appears that household interest income historically has responded more rapidly and in larger amounts to a change in market interest rates than has interest expense. The expansion of adjustable-rate lending in recent years has increased the speed with which liabilities reprice, narrowing the gap in adjustment speeds of effective interest rates on assets and liabilities. Nonetheless, because aggregate interest income substantially exceeds aggregate interest expense for the household sector, the net cash flow of households would be expected to increase in both the short and long run from an increase in interest rates.

VI. Distributional Considerations

The aggregate figures discussed above conceal the distribution of assets and liabilities across households, and this distribution may affect how interest rate changes bear upon the debt-servicing ability of consumers. Although distributional information on household balance sheets is incomplete, some broad observations can be derived from household survey data.

From the Board-sponsored Surveys of Consumer Finances in 1983 and 1986, we know that the bulk of household debts are owed by people in the higher-income brackets. The highest-income quintile, for instance, owes a bit more than 40 percent of consumer installment debt, and one-half of home mortgage debt. The highest two income quintiles together owe two-thirds of the consumer debt and three-quarters of the mortgage debt. These two income quintiles also account for the preponderance of

financial assets held by households. Thus, roughly speaking, household sector debt appears to be concentrated in the groups that have the income and assets to service it most readily.

This level of disaggregation still leaves open the question of whether, within a specific income group, those with the debts are also those with the assets. Further analysis of the survey data reveals that nondebtors among higher-income households have considerably more financial assets per household than do debtors, but that the debtors nevertheless hold substantial amounts of assets relative to debt. On average, a debt-free household in one of the two upper-income quintiles holds about four times as much in financial assets as does a household with debt. But the average financial assets of the indebted households in these income groups are still about as large as the average amount of debt that they owe.

The two Surveys of Consumer Finances also recorded whether a household's primary home mortgage was adjustable or fixed rate, and obtained some detail on types of assets, although not in classifications very suitable for assessing the interest-sensitivity of earnings. Those surveys did not determine the adjustability feature of second mortgages, but two other smaller surveys sponsored by the Board provide considerable information on consumers with home equity lines of credit (almost all of which have adjustable rates). Little survey information is available specifically for holders of adjustable-rate consumer loans, but such loans are far less important sources of variability in interest payments than are ARMs and home equity lines.

Adjustable-Rate Mortgages

From the 1986 survey, it is estimated that 64 percent of the nation's households owned their own homes in that year. Of these, 57 percent had mortgages on their homes. In 11 percent of these cases, or 4 percent of all households, the primary home mortgage carried an adjustable interest rate.[6]

Table 4 presents data on the asset holdings, mortgage obligations and incomes for U.S. households based on the survey responses, along with data for nonhomeowners and for homeowners with no mortgage. Separate statistics are shown for those with fixed-rate mortgages and those with adjustable-rate mortgages. In addition, the mortgage debtors are classified by the amount of their interest-sensitive assets relative to their mortgage balances.

This breakdown shows that relatively few ARM debtors have adjustable-rate asset holdings that constitute more than a small fraction of ARM debt.[7] For instance, about 2.7 million households out of an estimated 3.3 million ARM debtors had adjustable-rate assets that

6. This 11 percent figure may appear low compared with the earlier statement that approximately 25 percent of all home mortgage debt is adjustable rate. However, the Survey of Consumer Finances is now two years old and predates a period of ARM popularity. Also, because ARMs have, on average, been issued more recently than FRMs, ARMs tend to be larger, on average. Lastly, the debt total of 25 percent includes home equity lines of credit, which boost this percentage by approximately 5 percentage points.

7. While the surveys compiled comprehensive data on asset holdings, the groupings are not ideal for categorizing assets by the sensitivity of their yields to movements in interest rates. In this memo, two variables are combined to provide a rough approximation of "adjustable-rate assets." One variable is "money market accounts and certificates of deposits"; the other is "checking, statement savings, passbook, share draft, or other savings accounts."

were less than 25 percent of the mortgage balance, with a median asset holding of $2,000 and a median mortgage debt of $39,600.[8] Only about 2 percent had adjustable-rate assets that exceeded the amount of their mortgage. In contrast, 17 percent of the fixed-rate mortgage debtors had adjustable-rate assets that exceeded their mortgage. This no doubt partly reflects the fact that ARMs are a relatively new instrument compared with FRMs. Recent homebuyers are younger on average than the typical homeowner, and so ARM borrowers probably are relatively young. Most young adults have accumulated few financial assets (or have exhausted what they had when purchasing their home). On the other hand, many of these young adults can expect that their labor income will increase as they gain work experience.

In any event, it seems clear that for the vast majority of ARM debtors, the impact of rising interest rates on their mortgage payments would be only minimally offset by rising interest receipts. The $35,000 median income of such debtors might in most instances be ample to handle an increased debt payment, but some households undoubtedly would encounter serious cash flow problems.

Home Equity Lines of Credit

Surveys taken last spring and fall obtained information on the types of households that have acquired a home equity line of credit and the ways in which they have used these accounts. While a few lenders have been offering fixed-rate lines, virtually all of the existing HELC

8. Median values are used here to avoid the distortion caused by a small number of respondents with extremely large asset holdings or incomes. In several cases, particularly for the asset categories, mean values substantially exceeded the medians.

accounts are variable rate. The prime rate is by far the most common index rate, and adjustments most commonly are made monthly or quarterly. Federal law now requires that lifetime caps apply to HELC interest rates, but most lenders have established relatively high caps, and annual caps are not mandated. Considering all these attributes, it is clear that rates on HELC borrowings can track general rate movements rather closely. As noted, we estimate that outstanding HELC balances may total $80 to $90 billion at present, or a bit less than 5 percent of all home mortgage debt.

The financial attributes of HELC account holders and the generally moderate and responsible use of this credit suggests that these households would in most cases be able to absorb higher required interest payments. So far, homeowners with home equity accounts have considerably higher incomes than those without such accounts ($42,000 compared with $27,000), and also substantially higher median home equity ($64,000 compared with $46,000). The surveys indicate that the most common initial use of an HELC account (by about half of the account holders) is to repay other debts. Home improvement is the second most common initial use, and the most common use for subsequent drawdowns. About half of the respondents had drawn upon their account only once. The median size of a credit line is $30,000 and the mean about $45,000. These figures represent about half of the available equity that account holders have in their homes.

VII. Effects on Consumption.

If a rise in interest rates results in an increase in net interest income to the household sector, it seems plausible that consumer spending might increase. However, in most instances, including the present situation, it is more likely that consumer spending will decline in response to a rise in rates, notwithstanding the positive effect on household cash flow.

Consumer spending is more responsive to expectations of long-run or "permanent" income than to current income. This permanent income in turn can be viewed as the income generated by the consumer's stock of human and non-human wealth.[9] A rise in interest rates leads to a reduction in the current stock of wealth, because a higher discount rate is applied to the future labor and non-labor income. Thus consumer spending would be expected, to the extent of this wealth effect, to decline in response to an increase in interest rates.

Empirical evidence suggests that this wealth effect is the dominant influence of a rise in rates on consumer spending. However, some households are "liquidity constrained" in their current-period spending, in that their cash flow is inadequate to support the level of consumption that they would prefer, given their expectations of future income. Furthermore, they have inadequate assets and borrowing ability to cushion temporary shortfalls in income. These consumers would be expected to use any increase in cash flow to increase their consumption.

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9. Human wealth is the present value of expected lifetime labor earnings. Non-human wealth is valued as the discounted present value of the net flow of services from tangible assets plus the discounted present value of interest and dividends yielded by financial assets.

Empirical evidence on the importance of these liquidity constraints is somewhat mixed, although they have often been invoked as an explanation for why consumption tracks current aggregate income as closely as it does.[10]

The recent growth of adjustable-rate borrowing by households may have increased the proportion of households that could become liquidity constrained as interest rates rise. Among these consumers, increases in interest rates could cause a reduction in consumption expenditures, because income remaining after payment for housing would be reduced.

What can be said about marginal propensities to consume out of interest income and labor income? In general, marginal propensities to consume out of various types of income can differ for two reasons. First, the marginal propensity to consume (mpc) will be higher the more permanent are the changes in income. Second, the mpc will be higher if the recipients of the particular form of income tend to be liquidity constrained. For many consumers, fluctuations in labor income and interest income may be about equally "permanent"; hence, this may not be an important factor causing mpc's to differ by source of income. As for liquidity constraints, however, it is likely that most recipients of interest income are not liquidity constrained, precisely because they hold interest-generating assets. Therefore, it is reasonable to conclude that the mpc out of interest income should be lower than that

10. For example, Marjorie Flavin, "The Adjustment of Consumption to Changing Expectations about Future Income, *Journal of Political Economy* 89 (October 1981): 974-1009.

for labor income. Complete analysis of the issue, however, cannot be based solely on current-period cash flow--even if the mpc's are estimated correctly. The reason is that changes in interest rates that cause changes in cash flow will also give rise to changes in wealth that are in the opposite direction.

In the current context, the negative wealth effect seems likely to outweigh the positive cash flow effect. That is, an increase in interest rates may cause an increase in interest income, yet a reduction in aggregate consumer spending compared with its level if interest rates were unchanged. In closing, we note that the effects of rising interest rates examined in this paper are distinct from effects operating through other macroeconomic channels. The most important of these is aggregate demand. By restraining total demand, higher interest rates reduce labor income and thus consumer spending.

Table 1

FINANCIAL ASSETS AND LIABILITIES
OF THE HOUSEHOLD SECTOR, DECEMBER 31, 1987
($ billion)

Financial assets	**11,512**
Deposits, MMFs, and currency	2,993
Checkable deposits and currency	521
Small time and savings accounts	2,021
Money market funds	284
Large time deposits	167
Credit market instruments	1,233
Government securities	600
Savings bonds	101
Other Treasury securities	418
Agency issues	81
Other	633
Tax-exempts	286
Corporates	119
Mortgages	146
Open-market paper	83
Corporate equities	2,151
Mutual fund shares	396
Other corporate equities	1,755
Equity in noncorporate business	2,392
Pension fund reserves	2,235
Life insurance reserves	290
Other	217
Liabilities	**2,904**
Credit market instruments	2,810
Home mortgages	1,847
Consumer credit	701
Security credit	46
Other	48
Financial net worth	**8,608**

Source: Flow of Funds Accounts.

Table 2

INTEREST EARNED AND PAID BY HOUSEHOLDS
($ billion)

	1983	1984	1985	1986	1987
Interest received	255.0	294.8	304.9	308.3	313.4
Interest paid	175.4	202.2	225.9	240.4	253.6
Owner-occupied real estate	113.5	129.7	143.3	151.3	161.5
Other interest paid to business	61.9	72.5	82.6	89.1	92.1

Source: Survey of Current Business, Tables 8.8 and 8.9 of Annual National Income and Product Account Tables.

Table 3

IMPACT ON OWN RATES OF 100 BASIS POINT INCREASE
IN FEDERAL FUNDS RATE
(Basis points)

	Cumulative change	
	Year 1	Year 2
Currency	0	0
Demand deposits	0	0
Other checkable deposits	16	26
Savings deposits	18	28
MMDAs	63	80
MMMFs	87	97
Small time deposits (new accounts)	90	100

Source: Money Market Model, Division of Monetary Affairs, Federal Reserve Board.

Table 4

MORTGAGE DEBT, ASSETS, AND INCOME BY HOMEOWNER STATUS IN 1986

Homeowner status	Number of U.S. households (thousands)	Percent of total in category	Median mortgage debt	Median asset holdings: Adjustable rate	Median asset holdings: Total financial	Median household income
			In thousands of dollars			
Non-homeowners	29,553		--	.7	1.0	16.0
Homeowners without mortgage	23,149		--	5.0	10.5	16.1
Fixed-rate mortgagees	26,917	100.0				
Adjustable-rate assets:						
Exceed mortgage	4,809	17.9	10.4	26.0	47.6	42.0
25-99% of mortgage	6,068	22.5	19.8	10.0	21.0	40.0
0-24% of mortgage	16,040	59.6	28.1	1.5	3.8	33.0
Adjustable-rate mortgagees	3,272	100.0				
Adjustable-rate assets:						
Exceed mortgage	77	2.4	21.1	41.0	42.8	55.0
25-99% of mortgage	461	14.1	29.8	8.0	22.0	45.0
0-24% of mortgage	2,733	83.5	39.6	2.0	4.2	35.0

Source: 1986 Survey of Consumer Finances.

Chart 1

Interest Rates