

The Influence of Financial Changes on Interest Rates and Monetary Policy: A Review of Recent Evidence

by Paul Bennett

Changes in financial regulations, markets, and institutions have been altering the relationships between key interest rates and the effective degree of stimulus or restraint in sectors of the economy. Although the complexity of these developments has made them difficult to monitor, statistical evidence relevant to the topic is becoming available. This article reviews a number of recent studies that directly or indirectly consider the influence of financial changes on the behavior of interest rates and the transmission of monetary policy.

Before surveying the empirical evidence, it is useful to describe at a conceptual level how financial changes might affect interest rates and the transmission of policy. In principle, changes to the financial system may alter both the equilibrium level of interest rates—that is, the level consistent with a full employment noninflationary economy—and the size of interest rate changes consistent with the maintenance of good economic performance in the face of shocks to output and prices. If “nonprice” mechanisms that rationed credit in the past have been reduced, then more of the burden of credit allocation among potential borrowers will fall on interest rates. Without a perfectly elastic supply of savings at given interest rates, or any increase for other reasons in the amount of loanable funds available, the equilibrium level of rates will be higher. Moreover, if it is true that in the past the nonprice mechanisms tended to bind especially forcefully when interest rates were high and less so when rates were lower, then once these mechanisms have ceased to operate, interest rates may have to rise and fall more

to exert the same restraining or stimulating effects on the economy.

The core notion that allocational mechanisms other than explicit interest rates figure importantly in credit markets and affect the way monetary policy is transmitted is fairly widely accepted in the economics literature (for example, Brunner and Meltzer 1988, Blinder and Stiglitz 1983, and Bernanke and Blinder 1988¹). Nevertheless, these mechanisms are not explicitly incorporated in some of the most widely used economic models. A stylized neoclassical framework might emphasize individuals’ or firms’ saving and borrowing decisions that depend on interest rates, with borrowing and spending negatively related to interest rate levels except in cases where offsetting income or wealth effects arising from interest rate movements are present. Such a framework does not recognize that borrowing is often constrained by other factors, and the resulting “notional” demands for borrowing and spending—that is, the amounts individuals or firms would ideally choose at given interest rates—may not be an adequate description.

Two important categories of constraints on borrowing activity will be cited in the discussion that follows. One type of constraint reflects the possible inability of credit intermediaries to provide all the funds their loan customers demand. An example of such a “funding availability constraint” was the episodic inability of

¹Full bibliographical information for all sources cited in the text can be found in the reference list at the end of the article.

depository institutions to bid for deposits because of regulatory ceilings on deposit rates. To the extent that potential borrowers depended upon particular intermediaries or classes of intermediaries that were unable to supply all the funds demanded, borrowing—and spending—fell short of the “notional” amounts that would otherwise have occurred at given interest rates. A second type of constraint might be called a “credit qualification constraint.” Because of informational asymmetries, differing assessments of the underlying risks, or merely different attitudes toward those risks, a borrower may want to borrow more at the prevailing interest rate than a lender feels it can safely lend to that firm or individual.

Structural changes in financial markets and practices over the past few decades have encouraged reductions in these financing constraints and thereby raised potential borrowers' abilities to realize their notional demands for credit. Deposit rate ceilings have been eliminated, relaxing funding availability constraints since the 1970s and the early 1980s. The entry of foreign banks, the phasing out of interstate banking restrictions, the growth of commercial paper and other alternatives to loans, and the increased competition between depository and nondepository intermediaries have increased potential borrowers' choice of lenders.² These developments have reduced the likelihood that a borrower will be limited by an intermediary's own particular funding situation or credit evaluation process. The growth in committed bank lines of credit has made it less likely that difficulties or delays in borrowing will force a business to limit its productive activity. Securitization of assets has provided an important added dimension of funding flexibility for intermediaries, including those with limited scope for raising deposits or other liabilities.³ Like the removal of deposit rate ceilings, mortgage securitization has helped to eliminate funding availability bottlenecks in the housing market. Similarly, the growth and spread of consumer credit lines, including those backed by home equity, have reduced the likelihood that households will become constrained in their spending by slowness or difficulties in obtaining credit.⁴

Thus some borrowers can borrow more than before, and—for given interest rates and holding other factors equal—aggregate spending on goods and services is

²For foreign bank competition, commercial paper, and competition with nonbank competitors, see Estrella (1986); Hook and Alvarez (1986); and Mead and O'Neil (1986). On interstate banking, see King, Tschinkel, and Whitehead (1989).

³For a review of economic factors driving securitization of assets, see Cumming (1987).

⁴For a general description of consumer credit lines backed by home equity, see Canner, Fergus, and Luckett (1988).

stronger than it would have been in the absence of the financial changes. But because the overall productive capacity of an economy is limited and the supply of savings, domestic or international, is not perfectly elastic, the equilibrium level of interest rates is higher following the relaxation of the constraints.

In addition, the sensitivity of aggregate demand to changes in interest rates may have been altered. That is, the financial changes may have increased or decreased the size of movements in interest rates consistent with maintaining or restoring a noninflationary economic growth path. Many of the financial changes work in the direction of increasing the size of swings in interest rates needed to achieve a given impact on aggregate demand. The nature of funding availability and credit qualification constraints suggests that the degree to which they bind may vary somewhat systematically with the level of interest rates. When deposit ceilings were in effect, they tended to bind more when interest rates rose and to ease up when rates fell. Credit standards automatically tighten when interest rates rise, most obviously because debt service rises relative to current income but also because the resale value of collateral assets drops and expectations of future earnings or cash flows may be revised downward. Financial changes that reduce the likelihood that such constraints bind as interest rates rise (and ease up as rates fall) will tend to increase the size of interest rate movements relative to their effects on expenditures.

Other financial changes, however, may make expenditures more, rather than less, sensitive to interest rate movements. One very important example is the 1980s increase in the level of debt in the household and corporate sectors, itself a medium-term cumulative result of the relaxation of constraints on borrowing. Leveraging leaves borrowers' ability to obtain additional credit more sensitive to interest rates and credit market conditions generally. Another financial change that may increase potential borrowers' sensitivity to interest rates is the trend toward pricing credit more directly and competitively off of short-term market interest rates. While this trend is part of a broader set of changes making credit more widely available, floating rate loan pricing may affect borrowers' decisions more directly, possibly replacing credit rationing with a heightened interest rate sensitivity on the part of borrowers themselves. Thus the ability of monetary policy to affect certain types of borrowers through short-term market rates may be enhanced. Finally, categories of borrowers who were previously at the margin of markets for credit may now have more access. Some of these people and businesses may now rely more on debt than in the past and may therefore be more sensi-

tive to changes in credit market conditions.

Exchange rates also may be affected by reductions in nonprice credit rationing mechanisms. If the decline of such mechanisms leads to an increase in the domestic effective demand for credit, not only will interest rates increase but also the exchange value of the domestic currency will rise. In turn, imports will be encouraged and exports discouraged. Such an outcome presumes that parallel changes in other economies' financial systems do not lead to equally higher foreign interest rate levels, which would offset effects on exchange rates and require domestic interest rates to rise still more. More generally, domestic financial sector improvements that attract capital from abroad in one period might be imitated in foreign economies in subsequent periods. As financial changes that draw in capital and encourage spending and imports in one economy eventually make themselves felt in other economies, balances of trade will shift as well.

In addition to influencing the general levels of exchange rates, financial changes may also affect the size of swings in exchange rates through time. As noted, a country's own interest rates may be induced to rise or fall to a greater or smaller degree as a result of financial changes. Exchange rate movements might then tend to become correspondingly more or less volatile, reflecting the domestic interest rate changes, other factors equal.

Financial changes that affect the relationship between interest rates and economic activity also may have implications for monetary policy. At least temporarily, the monetary authorities can influence interest rates by adjusting the availability of bank reserves. However, if they were to attempt to hold down the level of interest rates artificially by supplying excessive reserves when macroeconomic equilibrium implied a higher interest rate level, then the result would be too rapid a growth of credit and an acceleration of inflation. More generally, if the authorities attempted to keep interest rates from changing appropriately in response to shifting macroeconomic forces, the result would be less economic stability.

To summarize the conceptual framework, financial changes that reduce constraints on funding availability or on credit qualification allow some businesses and households to spend at higher levels more closely approximating their ideal, notional demands. Such changes strengthen aggregate demand, pushing up interest rates and attracting foreign capital. To the extent that the lifting of financial constraints changes the sensitivity of aggregate demand components to movements in interest rates, the size of the interest rate responses to given demand shocks changes as well. Some developments may have made the marginal

effect of rate changes on spending smaller, but there have also been some offsetting increases in sensitivities to interest rate changes.

Evidence of the effects of financial change

This section reviews evidence of shifts in funding availability and credit qualification constraints on intermediation and borrowing. Central questions are whether financial changes have raised the level of interest rates consistent with noninflationary growth and whether a given fluctuation in aggregate demand now requires a different sized adjustment in rates than in the past to maintain macroeconomic equilibrium. This section also considers how the relative incidence of interest rate sensitivities may have shifted, among domestic sectors as well as external trade-sensitive sectors.

At the outset, it is useful to review some basic trends in interest and exchange rates. From a long-run perspective, interest rates have tended to be higher in recent years than in earlier decades. Table 1 shows average levels of short- and long-term interest rates over a series of five-year periods from 1955 to 1989. If one abstracts from the inflationary early 1980s, both short- and long-term rates show upward secular trends. Table 1 also shows the rates as "real rates," adjusted for inflation, and these too have been higher on average during the economic expansion of the 1980s.

Table 2 measures the average size of interest rate swings, calculated here as absolute values of December-to-December rate changes, averaged over five-year periods. It is not as clear from these volatility-type calculations whether interest rate changes have become

Table 1

Average Nominal and Real U.S. Interest Rates

	Long-Term†	Short-Term‡	Real	Real
			Long-Term§	Short-Term
1955-59	3.49	2.54	1.84	.89
1960-64	4.01	2.91	2.76	1.66
1965-69	5.37	5.54	1.95	2.13
1970-74	6.81	7.07	.68	.94
1975-79	8.23	7.22	.18	-.83
1980-84	12.39	12.17	4.88	4.66
1985-89	8.75	7.67	5.08	4.00

†Period-average ten-year Treasury.

‡Period-average federal funds rate.

§Period-average ten-year Treasury bond yield minus contemporaneous period-average consumer price index (CPI) inflation rate.

||Period-average federal funds rate minus the contemporaneous period-average CPI inflation rate.

Table 2

Average Absolute Changes in Nominal and Real U.S. Interest Rates

(In Basis Points)

	Long-Term†	Short-Term‡	Real Long-Term§	Real Short-Term¶
1955-59	59	77	126	115
1960-64	32	77	67	87
1965-69	69	138	72	80
1970-74	64	241	214	237
1975-79	104	260	224	102
1980-84	163	334	230	254
1985-89	153	78	112	150

Note: Table shows five-year averages of absolute values of annual December-to-December rate changes.

†Ten-year Treasury bond yield.

‡Federal funds rate.

§Ten-year Treasury bond yield minus the twelve-month lagged

CPI inflation rate.

¶Federal funds rate minus the twelve-month lagged CPI inflation rate.

systematically larger or smaller in recent years.⁵ The changes in long-term real and nominal rates have been larger since the mid-1970s, but not especially larger since the mid-1980s. The two measures of average short-term rate movements, on the other hand, were moderate during the late 1980s, in the context of relatively stable macroeconomic conditions.

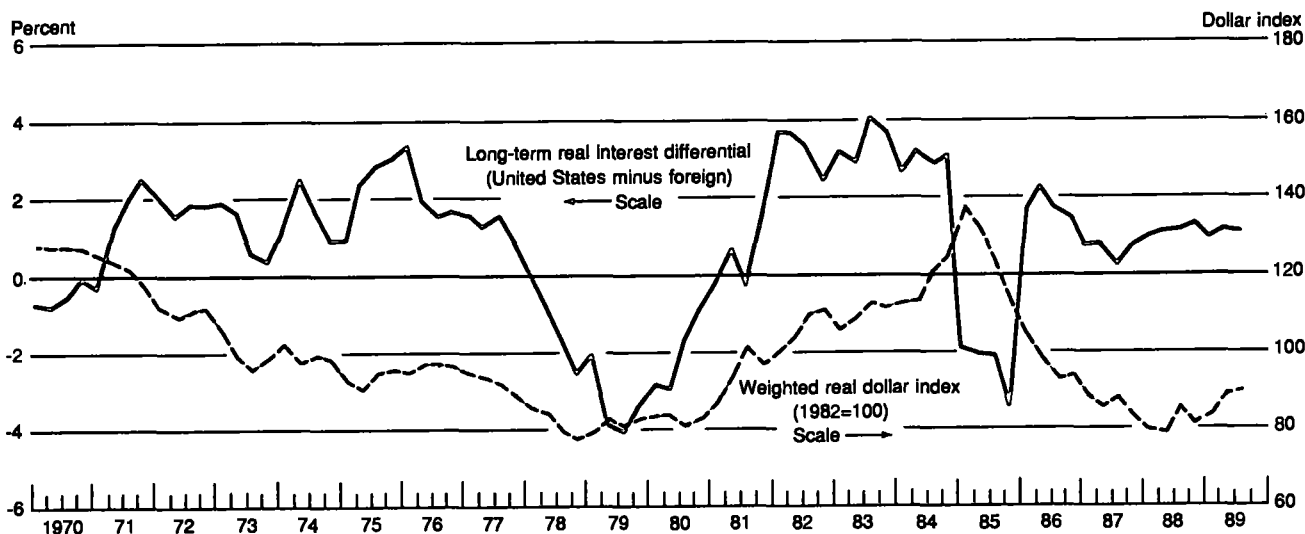
Chart 1 plots the differential between U.S. and foreign long-term interest rates against the weighted average exchange rate, adjusting both interest rates and exchange rates for price-level changes. The trend from the mid-1970s through the late 1980s was for U.S. real rates to rise relative to foreign real rates. The real dollar's strength in the first half of the 1980s and its drop in 1985-86 appear partly attributable to the interest rate differential. As Chart 2 shows, changes in the dollar were relatively large in much of the 1980s, even compared with the changes during the earlier floating rate period of the 1970s.

⁵To check robustness with respect to different choices of volatility measures, monthly and quarterly standard deviations of short- and long-term nominal and real interest rates were also computed, and the pattern was similar to that in Table 2.

Chart 1

Long-Term Real Interest Rate Differential and Real Dollar Exchange Rates

"Foreign Major Five" Countries



Notes: Foreign major five countries are Japan, Germany, the United Kingdom, France, and Canada. Weighted real dollar index is calculated using each country's GNP and GNP deflator relative to the U.S. GNP deflator. Long-term rates are calculated by subtracting inflation (four-quarter lags) from each country's nominal interest rate. The long-term interest rates used are from long-term industrial bonds (Japan), industrial bonds (Germany), twenty-year debentures (United Kingdom), public bonds (France), and industrial bonds (Canada). The AAA corporate bond rate is used for the United States.

The following subsections review the evidence on the effects of financial change on different parts of the U.S. economy, particularly such traditionally interest-sensitive areas as housing, consumer durables expenditures, and business investment. The possibility that exchange rates and international financial market linkages are assuming greater importance in the transmission of monetary policy is also discussed. In addition, attention is given to aggregate-level research that may clarify whether the financial changes are significant from a macroeconomic perspective.

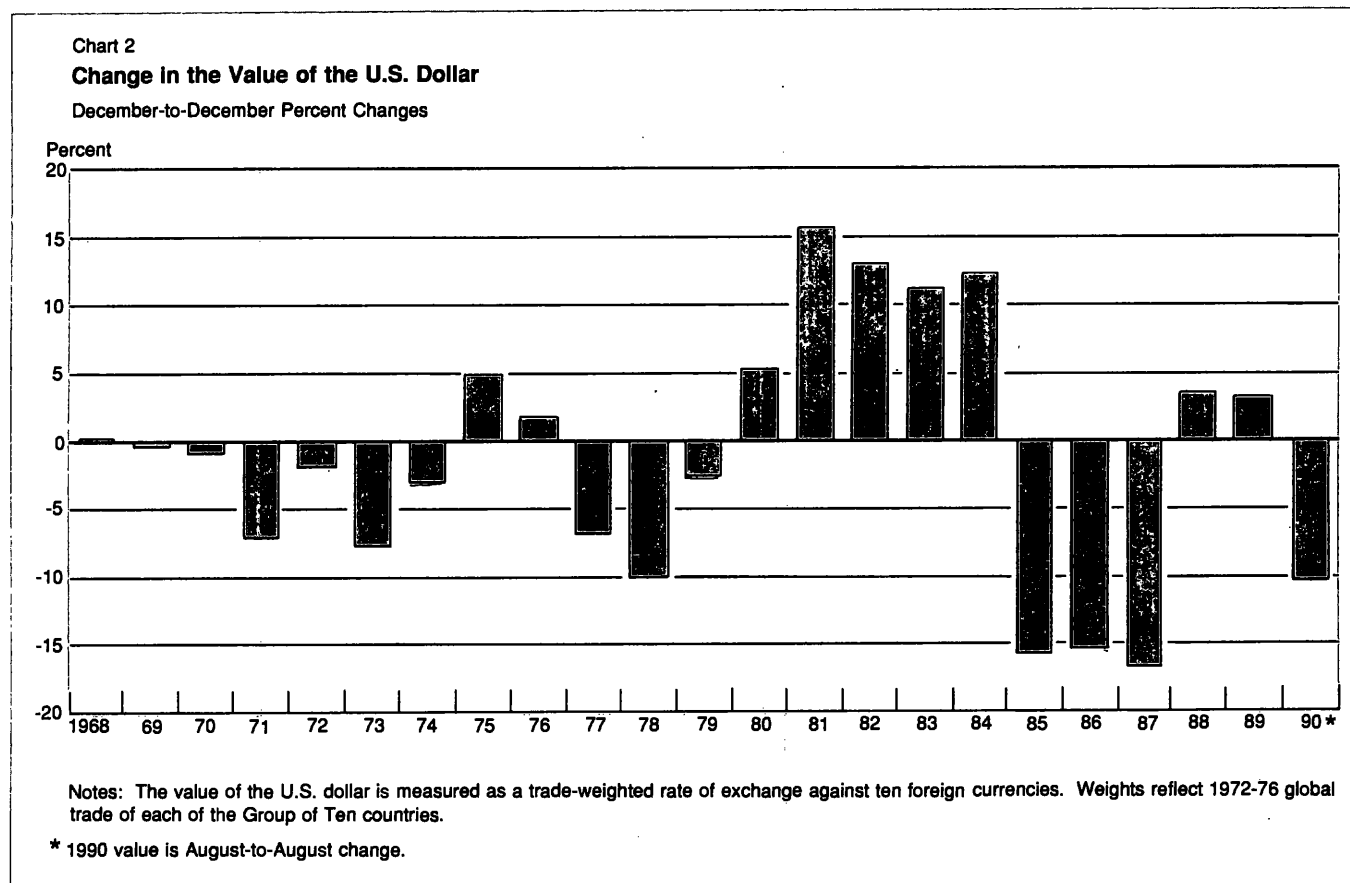
Housing and mortgage markets

Many analysts agree that financial changes have altered the relationships between interest rates and mortgage and homebuilding activity. During the 1960s and 1970s, tight monetary policy on several occasions slowed housing by pushing interest rates on short-term instruments such as Treasury bills above the maximum rate allowed under Regulation Q at depository institutions. As depositors withdrew funds to seek higher market rates—a phenomenon known as “disinter-

mediation”—many thrifts were unable to originate new loans.⁶

Econometric studies confirm that deposit deregulation increased the availability of funding for housing. Jaffee and Rosen (1979) estimate a model of the housing sector through the end of 1978, when deposit deregulation was just getting underway in the United States. Simulating forward, they find that the post-1978 growth of money market certificates kept housing starts higher than otherwise in the face of sharp interest rate increases. Throop (1986) presents evidence that the severe funding availability constraints under Regulation Q reduced residential construction by up to 12 percent in some quarters and that such effects have now been eliminated. Throop further calculates that financial deregulation since the mid-1970s increased the variability of interest rates, although only to a modest degree. Friedman (1989), using large econometric model estimates, finds that mortgage rates would have

⁶For further discussion of disintermediation effects on housing, see the article by John Ryding in this issue of the *Quarterly Review*.



to rise approximately 2½ percentage points to generate an impact on housing equivalent to that caused by a decline in mortgage funding availability typical of severe disintermediation episodes. Ryding (1990) presents econometric evidence that even the limited disintermediation taking place in the early 1980s dampened housing activity, although this effect was clearly less pronounced than in earlier periods because deposit ceilings were being phased out. Presumably by the middle 1980s the completion of the Regulation Q ceiling phaseout, together with the growth of secondary mortgage trading, had eliminated this type of disintermediation effect from the monetary transmission mechanism.

Ryding also offers evidence that the growth of secondary mortgage trading has affected the cost of housing finance. In the mid-1980s the sharp rise in the proportion of outstanding single-family mortgages trading in securitized form helped to break the links between particular institutions' ability to attract deposits and individual households' ability to obtain mortgage credit. In addition, the increased competition among originators and among investors in mortgages implied by the secondary market growth, together with the credit enhancement provided by federally sponsored mortgage-backed securities programs, suggests lower all-in funding costs to homebuyers; Ryding shows that lending spreads have indeed been narrower as a result.

In principle, increased mortgage lending competition may also make it easier for some borrowers to qualify for loans because there are more lenders seeking to identify acceptable credits. Also contributing to this increased flexibility in qualifying borrowers for mortgage credit is a series of innovations stimulated by lenders' attempts to accommodate the effects of inflation on cash flows. While high nominal interest rates reflect expectations of general price and wage increases, lending decisions out of prudence must give less than full weight to such projected inflation. Jaffee and Rosen model the demand for housing as depending in part on nominal, rather than only on real, interest rate levels. New types of mortgages reducing cash flow requirements and increasing credit qualification began to be used with the arrival of very high nominal interest rates in the early 1980s.⁷ In addition, some mortgage lenders eased their limits on acceptable levels of debt service relative to income.⁸ With lower inflation, some of these changes in lending standards may have been

⁷For example, see Jones (1982) and DeMagistris (1982).

⁸Wojnilower (1985) notes that lenders became markedly enthusiastic (partly also for legal reasons) about taking households' second incomes into account in credit evaluations. See especially p. 354.

reversed, but others persist. Adjustable rate mortgages (ARMs), for example, developed in an inflationary environment but have continued to some extent even with lower rates.

ARMs are a particularly successful innovation because they help intermediaries better manage repricing and prepayment risks, and they also tend to allow lower monthly payments for borrowers. The better risk-management opportunities encourage intermediaries to extend ARM credit, although variable payments raise credit risk for marginal borrowers. Borrowers too must balance the lower starting payments against the greater cash flow uncertainty. Studies have tended to find that adjustable rate lending has had a very modest positive impact on the effective demand for housing.⁹

While ARMs probably make housing credit somewhat more available and affordable, they may also increase the sensitivity of housing to marginal changes in short-term rates, which in turn are most influenced by monetary policy. Ryding shows that, particularly in the last few years, the ARMs share of new mortgage originations has fluctuated closely in line with the spread of fixed rates relative to the ARM rate.¹⁰ That is, people tend to take the lower rate. If tight monetary policy raises short-term rates, some potential home buyers could choose fixed rates instead of adjustable rates. But to the extent that there now exists a component of housing demand that is especially dependent upon the normally lower ARM rates, a rise in short-term rates may have a direct negative impact on some home purchase decisions.¹¹

On balance, it appears fairly clear that housing finance is better insulated from periods of major credit stringency than in the past, mainly because of deposit deregulation but also because of the growth of the secondary mortgage market. In addition, the market appears generally more competitive, providing credit-worthy borrowers better access. By contrast, it is not as clear how financial changes have affected sensitivity to less dramatic movements in interest rates. It seems at least possible that ARMs may have created a slightly

⁹For discussions of the theoretical issues and for empirical findings, see Brueckner and Follain (1988); Goodman (1985); Palash and Stoddard (1985); Stutzer and Roberds (1988); Esaki and Wachtenheim (1984-5).

¹⁰See the accompanying article by Ryding in this issue of the *Quarterly Review*. A different viewpoint emphasizes that having ARMs as an alternative to fixed rate lending may reduce some borrowers' sensitivity to long-term rates, because they can use the floating rate alternative if they believe market interest rates will fall more rapidly than implied by the rates on fixed rate mortgages. See Bosworth (1989, pp. 80, 81).

¹¹For some evidence that ARMs borrowers tend to be relatively illiquid, see Goodman, Luckett, and Wilcox (1988).

closer link between housing and short-term rate fluctuations, but this last point is still conjectural.

Consumer expenditures

Relationships between interest rates and household consumption spending may have changed as well. Traditionally, spending on goods other than consumer durables has not been very interest sensitive.¹² One reason is that many households are net lenders of funds and receivers of interest income. For example, many elderly people are spending down their accumulated lifetime savings and could therefore spend more if interest rates were to rise, particularly now that small savings accounts pay variable market rates.¹³ This logic extends also to middle-aged people accumulating savings for retirement, especially if their liabilities are

locked in at fixed (for example, mortgage) rates.¹⁴ Goodman, Luckett, and Wilcox (1988), however, show that for some younger households, particularly those with ARM loans and relatively few liquid assets, higher rates would squeeze their cash flows and presumably force less spending.

A recent article by Cantor (1989) investigates how the effects of interest rates on household cash flows changed in the 1980s. He takes into account the growth since the 1970s of assets linked to market rates, particularly in the wake of deposit deregulation, in addition to the growth of ARMs and other liabilities. Cantor finds that, on balance, the increases in rate-sensitive assets and liabilities have largely offset each other. Thus they have not caused major changes in the overall sensitivity of household cash flows to interest rates over the last decade, although some modest

¹²Regarding the relative interest insensitivity of consumption outlays, particularly purchases other than of durable goods, see Hall (1988) and Campbell and Mankiw (1989).

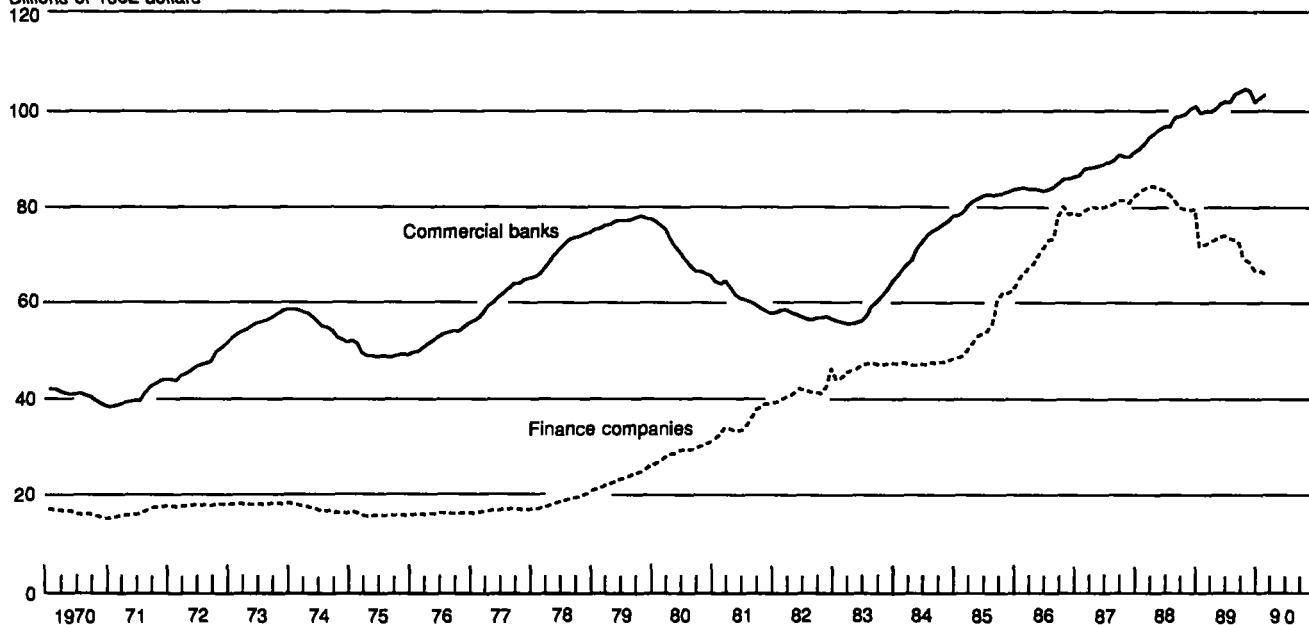
¹³On the savings behavior of the elderly, see Hurd (1987).

¹⁴The logic here is analogous to the result that higher interest rates increase the net asset value of pension funds, even those invested in fixed-rate assets, because their retirement funding goals or obligations are of still longer duration on average. See, for example, Estrella (1984).

Chart 3

Net Extensions of Auto Credit

Billions of 1982 dollars



Source: Federal Reserve Board.

Note: Chart shows nominal net extensions of auto credit deflated by the consumer price index component for new cars.

increase in sensitivity occurred before 1978. Cantor concludes that any positive impact that higher interest rates might have on consumption because of cash flow effects remains a comparatively minor positive offset to the more generally restraining effects of interest rates on spending.

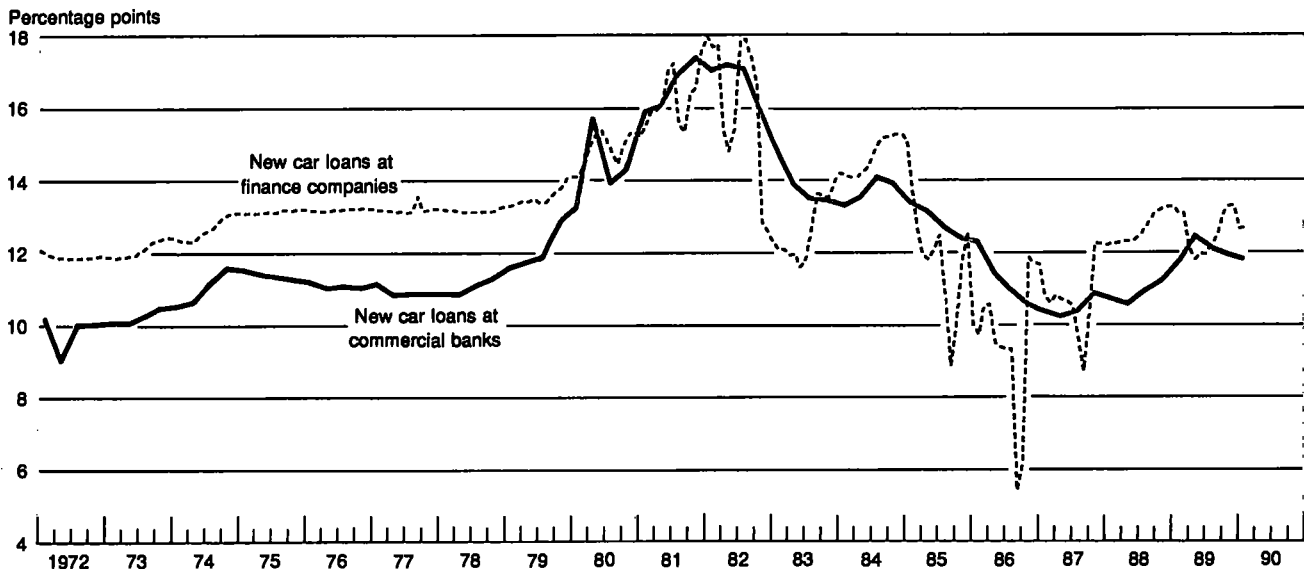
The mechanisms through which market rate changes influence expenditures on consumer durables have undergone substantial changes. Traditionally, banks' willingness to extend consumers credit has played a significant role in the transmission mechanism. Evidence presented by John Duca (1987), for example, indicates that banks' credit extensions to support consumer durables expenditures have been related to their "willingness to lend," as measured in this case by an index derived from the Federal Reserve Senior Loan Officer Surveys. The banks' willingness to lend in turn has been related to interest rate changes, although Duca's statistical tests reveal little *direct* linkage between rates and consumer outlays once the intermediate willingness-to-lend effect is taken into account.

In recent years, however, the banks' role in financing consumer durables expenditures has been firmly challenged by the activities of the automobile finance companies. The share of auto loans made by the finance companies has risen significantly in the 1980s

(Chart 3). Previously, auto finance rates were lower at banks, leaving the higher cost lending of the finance companies for the riskier end of the market (Chart 4). But now, with both bank and finance company lenders competing for business, car buyers may be less likely to be constrained in their purchase decisions by funds availability or credit qualification limits. In addition, the growing issuance of securities backed by auto receivables, while minor compared to mortgage securitization, nonetheless works in the same direction. A broader implication of the auto financing shifts appears to be that, at a given level of market interest rates and with the many other factors influencing car sales held constant, the effective demand for autos may be greater than in the past.

Moreover, the recurrent willingness of auto companies to subsidize lending by their financing subsidiaries as a means of combating sales slowdowns may tend to offset market interest rate changes to some extent. Chart 5 illustrates not only the generally strong inverse historical relationships between auto loan rates and auto sales, but also the apparent extension of the inverse relationship to periods of steep discounting of loan rates. If such discounts are systematically used to offset weak sales, market rate increases may not reduce auto loan demand as effectively as they did in

Chart 4
Interest Rates on Auto Credit
 Commercial Banks and Finance Companies



Note: The maturity for new car loans at commercial banks was thirty-six months before 1983 and forty-eight months since.

the past.

This pattern of discounting to offset negative sales effects from high market rates would seem to imply that larger market rate increases would have to be associated with given declines in consumer durables outlays. But little clear statistical evidence supports this view. For example, the study by Akhtar and Harris (1986-87) finds no econometric evidence that the sensitivity of consumer durables spending to interest rates has lessened in the 1980s, and the results of other studies have tended to be mixed at best.¹⁵ It is possible that episodes of loan rate discounts have reinforced an interest rate consciousness among car buyers, who have learned to time durables purchases to take better advantage of low rates, whether or not their longer run demand elasticities have changed. It also may be that—partly as a result of market-based loan pricing—market rates on the whole have become

¹⁵Akhtar and Harris obtained this result after controlling for effects of the 1980 credit controls. If the auto finance companies' loan pricing strategies had lessened the sensitivity of auto buyers to market interest rates, this effect should have shown up even after the 1980 credit controls episode was accounted for. Friedman (1989) too finds little support for a reduced sensitivity, although Kahn (1989) does report a reduction in interest sensitivity in his consumption equation.

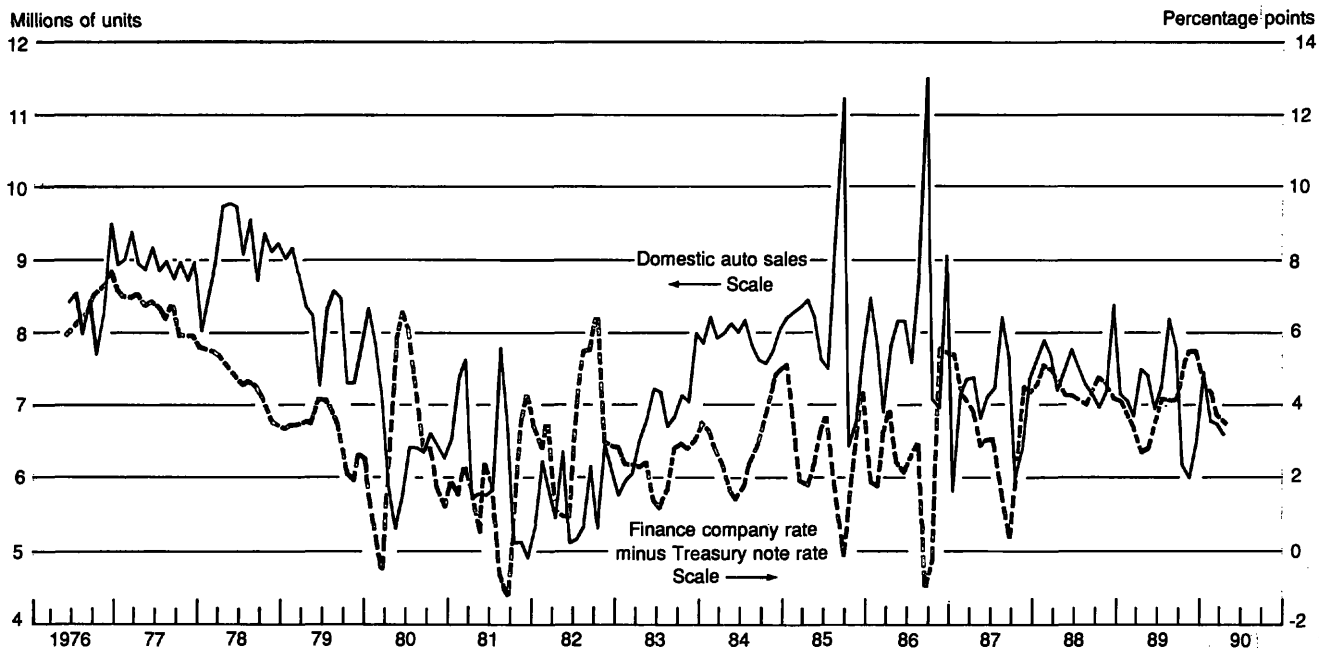
better "proxy" measures of the terms, conditions, and credit requirements available to car buyers, a development that would boost the statistical explanatory power of the market rates. In addition, as Bosworth (1989) argues, the phasedown of the tax deductibility of consumer interest payments may have raised the sensitivity of such expenditures to rate movements. Whatever the reason, to date there appears little solid econometric support for the hypothesis that sales of autos, or consumer durables, have become any less sensitive to market interest rates.

Formal statistical evidence relating more generally to consumption by the household sector is scarce, but there is still reason to believe that more available credit or better opportunities to qualify have increased the effective demand for spending at given levels of interest rates. Paquette's (1986) study of household debt service payments pointed out that the extension of maturities on automobile and other loans was a response to the difficulty of meeting income-to-debt service requirements during the high-inflation, high-interest rate period of the early 1980s. While lending policies have at least partly reverted to more conservative shorter maturities as inflation and nominal interest

Chart 5

U.S. Auto Sales and Financing Rates

Domestic Passenger Car Sales and Spread of Auto Finance Company Loan Rates over Two-Year U.S. Treasury Note Rates



rates have eased in the later 1980s, certain of the enhanced credit-qualification practices surely have persisted. Longer run developments such as the spread of credit cards and the related growth of computerized central credit file vendors appear to be part of a secular trend toward improved access to credit by individuals. Moreover, banks and other intermediaries that take advantage of the increased credit information can more aggressively solicit potential loan customers nationwide. In effect, wider competition allows households to choose the lenders doing the most to promote funds availability and easy qualification terms. Better collateralization of credit, in the form of home equity-backed consumer credit lines, represents yet another innovation relaxing credit qualification constraints on household spending.¹⁶ Partly because this innovation was spurred by tax law changes and targeted largely toward households with high net worth, it appears to have initially supported only modest amounts of net new lending, with low utilization of existing lines.¹⁷ More generally, however, the comparatively low ratios

of household savings to disposable income in the 1980s (Chart 6) and the buildup of household debt levels (Chart 7) appear symptomatic of a situation in which better funding availability and enhanced credit qualification have allowed consumer spending to remain stronger in the face of high interest rates than would have been possible in the absence of the financial changes.

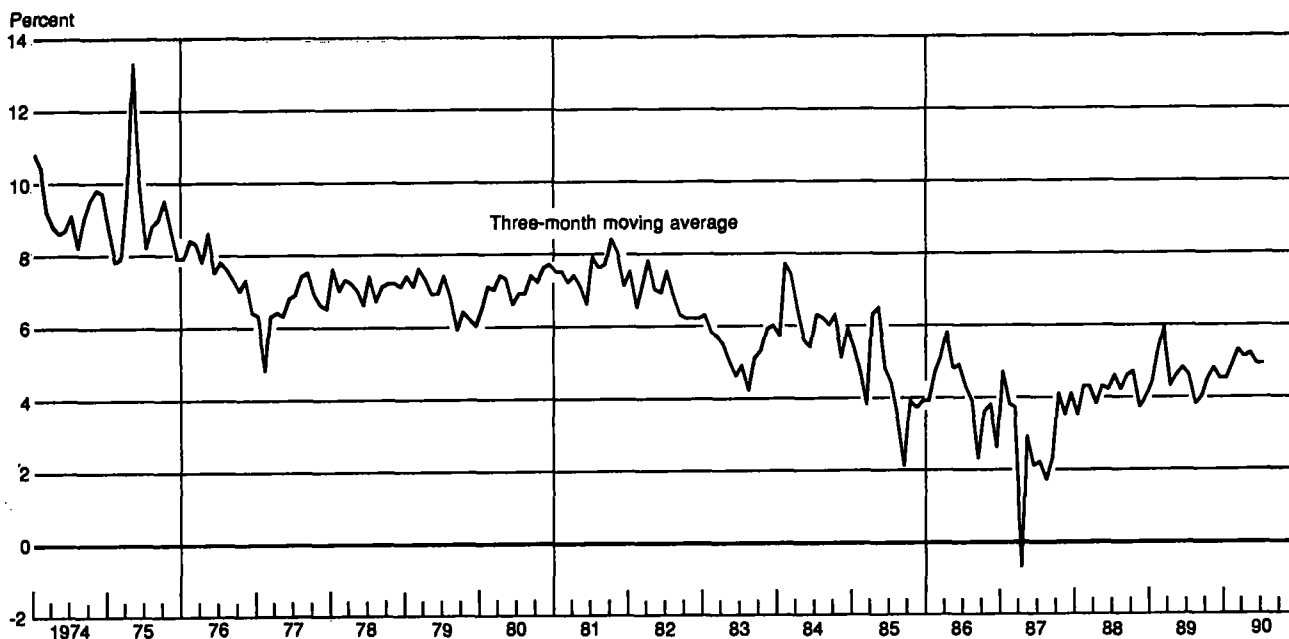
Business expenditures

Increased funding availability and enhanced ability to qualify for credit have been cumulative trends in the corporate business sector for many years. Nevertheless, the number of empirical statistical studies directly testing or documenting the effects of such changes on business borrowing and spending behavior has been limited. Wojnilower (1980, 1985) points out many of the market and regulatory changes—often stimulated by recurrent funding availability difficulties—that removed obstacles to the smooth intermediation of funds to business corporations. Hester reviews several key innovations in the 1960s and 1970s that reduced constraints on business borrowing activity, including commercial banks' development of markets in federal funds, negotiable certificates of deposit, Eurodollars,

¹⁶For a description of the market for home equity credit accounts, see Canner, Fergus, and Luckett (1988).

¹⁷See Canner and Luckett (1989).

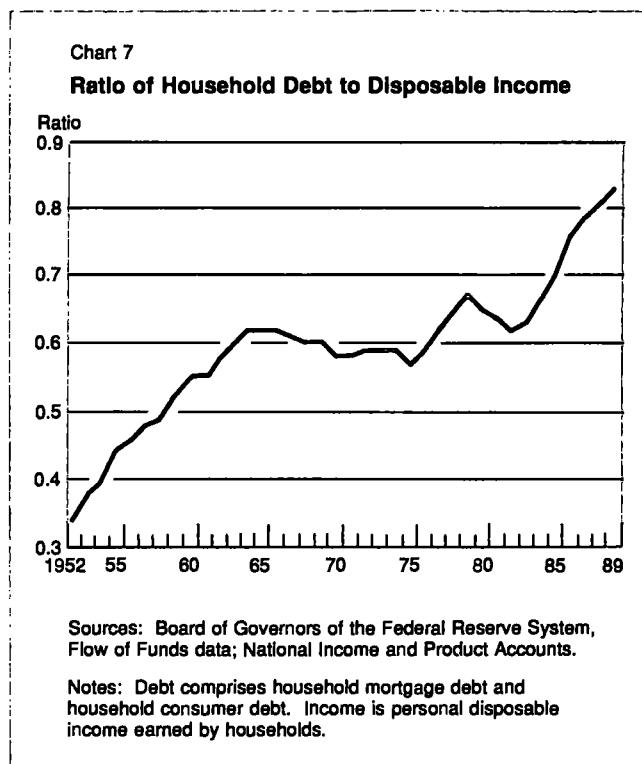
Chart 6
Consumer Savings Rate
 Seasonally Adjusted Annual Rate



and repurchase agreements. These innovations helped circumvent Regulation Q ceilings, allowing funds to continue flowing as the level of interest rates rose. Brimmer (1989) recounts how the remaining Regulation Q ceilings on large deposits were lifted to accommodate smooth commercial bank reintermediation of business commercial paper financings in the wake of the Penn Central bankruptcy in June 1970.

The lessening of constraints on bank intermediation to business is reflected also in the changed role of the prime rate, once the rate charged the most credit-worthy customers. In a 1983 article, Arak, Englander, and Tang provided statistical evidence that, as banks were increasingly forced to offer more competitive pricing options to large business loan customers, the prime rate itself began to move in a "stickier" fashion, reflecting its applicability mainly to less mobile customers. These authors suggested that as the process continued and the prime rate became applicable to an even smaller set of business borrowers, its pricing would become stickier than ever. In fact, by the mid-1980s, even individuals had become eligible for prime-based loans in the form of home equity loan pricing.¹⁸ This

¹⁸See Canner, Fergus, and Luckett (1988) and Canner and Luckett (1989).



change in the role of the prime rate is indicative of the spread of greater lending competition from the highest rated corporate customers to the household level.

After the middle 1970s, commercial banks' access to money market funding sources was relatively free, particularly in the absence of Regulation Q ceilings on large deposits. At the same time, well-known loan customers were themselves increasingly able to borrow directly from the commercial paper market and other nonbank sources.¹⁹ Moreover, in recent years commercial banks have also increasingly marketed their contingency funding capabilities in the form of committed lines of credit, which often complement or back up business corporations' open market borrowings. Sofianos, Wachtel, and Melnik (1990) provide some statistical support for the assertion that committed bank credit lines protect customers from credit rationing; this implies that the granting of credit is determined more directly by notional credit demands at given interest rates. This conclusion in turn can be interpreted as consistent with the idea that when loan commitments are available, the equilibrium level of interest rates will be higher than in their absence, particularly under periods of relatively tight credit. Morgan (1989) also discusses the role of bank loan commitments, particularly their usefulness when the timing of loan needs is uncertain and default costly, and he too emphasizes that commitments give greater prominence to high interest rates as a means of allocating scarce credit. Berger and Udell (1989) investigate the empirical significance of loan commitments and find, for 1977-88, weak evidence of rationing of credit to commercial borrowers and small effects of loan commitments on the amounts of credit extended during periods when rationing appeared most likely to occur.

Hirtle (1990) further analyzes the monetary policy consequences of the growth of bank loan commitments. She provides evidence that the growth of commitments has been accompanied by a decreased responsiveness of output to interest rate movements. Hirtle attributes this relationship to a change in the composition of commercial and industrial loan customers. Large corporate borrowers now tend to rely less on bank borrowings, and for many companies, committed bank lines represent only one of several competing sources of funds. These borrowers can apply to a variety of banks, the commercial paper market, or other sources to satisfy their short-term needs for funds. Therefore, the productive activities of such highly rated borrowers are generally well insulated from their current financing needs. Thus the statistical relationship between economic activity and the amount

¹⁹See, for example, Estrella (1986).

of bank loans made under commitment is not particularly strong. Conversely, loans not under commitment, which presumably tend to go to borrowers more dependent on their banks, appear to be more closely correlated with output.

Although the ability to borrow is essential for many businesses to be able to modernize or expand, in the 1980s the loosening of the link between borrowing and spending was manifest in the widespread restructuring of corporate balance sheets. The rise in corporate leverage during the 1980s may have been partly the result of expanded financial sector capabilities. Yet leverage itself affects a firm's flexibility to borrow more under various contingencies. Thus, leverage may affect how much a firm's real outlays are influenced by interest rate changes or other factors shifting the firm's demand for and access to funds.

The changing relationship between interest rates and business activity has been the focus of recent articles examining the potential impact of rising corporate leverage on cash flow and on real investment and employment decisions. Bernanke and Campbell (1988) simulate how interest rate and recession shocks such as those of 1973-74 and 1981-82 would have affected a large number of corporations if the shocks had

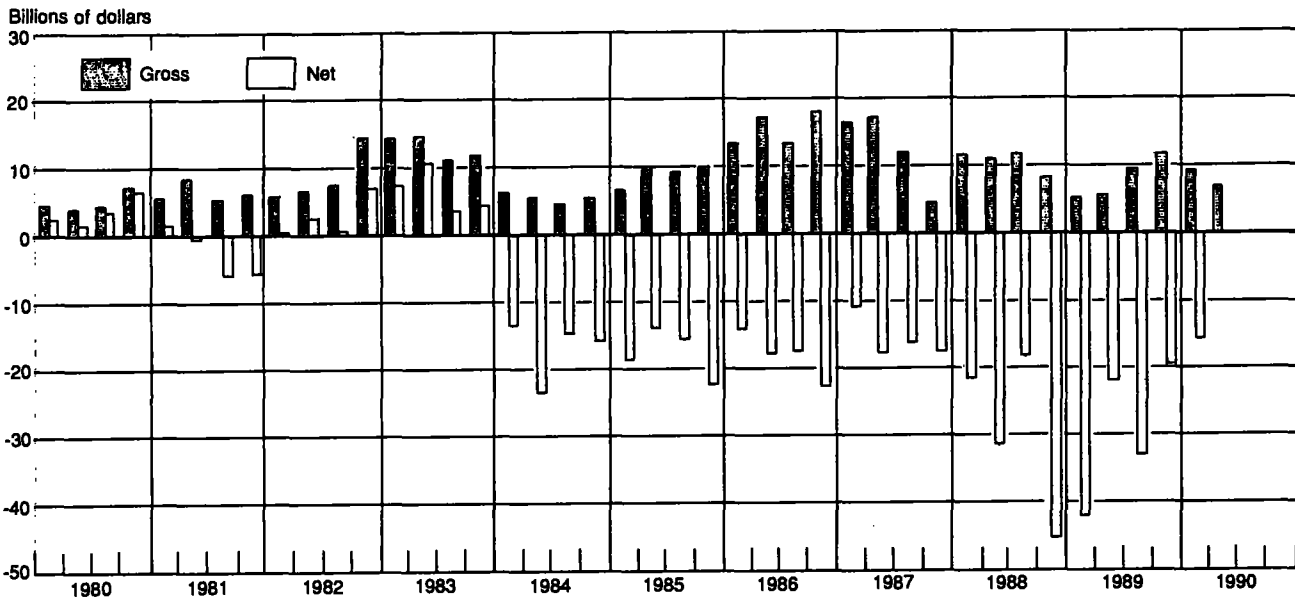
occurred later in the 1980s. They find that in the context of 1986 corporate financial structures, significantly more corporations were vulnerable to cash flow squeezes or insolvencies than was true earlier. Taken alone, however, their results may underestimate the extent of potential corporate financing problems. One reason is that the Bernanke-Campbell sample includes only companies whose stock is publicly traded, thus excluding the many (in some cases large) firms taken private by LBO transactions. Another reason is that their statistical results use 1986 data; as Charts 8 and 9 illustrate, the leveraging trend through the late 1980s continued to erode corporate equity and to raise interest servicing burdens. More recently, Bernanke, Campbell, and Whited (1990) update the earlier study through 1988. Simulating the 1973-74 and 1981-82 experiences with more recent financial structures, they find that the potential impact on corporate financial conditions appears to have worsened. Moreover, their findings also cast doubt on the assertion that the leverage increases have been confined to noncyclical industries.

Lee (1990) further investigates the vulnerability of leveraged corporations to economy-wide developments. Lee notes that leverage not only results from

Chart 8

Gross and Net Corporate Equity Proceeds

Financial and Nonfinancial Quarterly Volume



strategic financing decisions but also can reflect cumulative earnings and cashflow results. Combining firm-specific factors with macroeconomic influences, he develops a statistical model isolating the induced changes in leverage associated with changes in cash-flow, inflation, and interest rates—as distinct from purposeful leverage changes associated with financial restructuring strategies. Even after explicitly controlling for many of the microeconomic factors affecting leverage, Lee finds that the corporate sector has indeed become more exposed to macroeconomic shocks, as Bernanke and his colleagues found. Moreover, Lee separates cyclical from noncyclical firms and finds that although the earnings of cyclical firms are by definition more vulnerable to business recessions, the noncyclical firms can be quite sensitive to inflationary cost pressures and accompanying high interest rates. Lee concludes that the risks are more symmetrical than might have been supposed, in the sense that

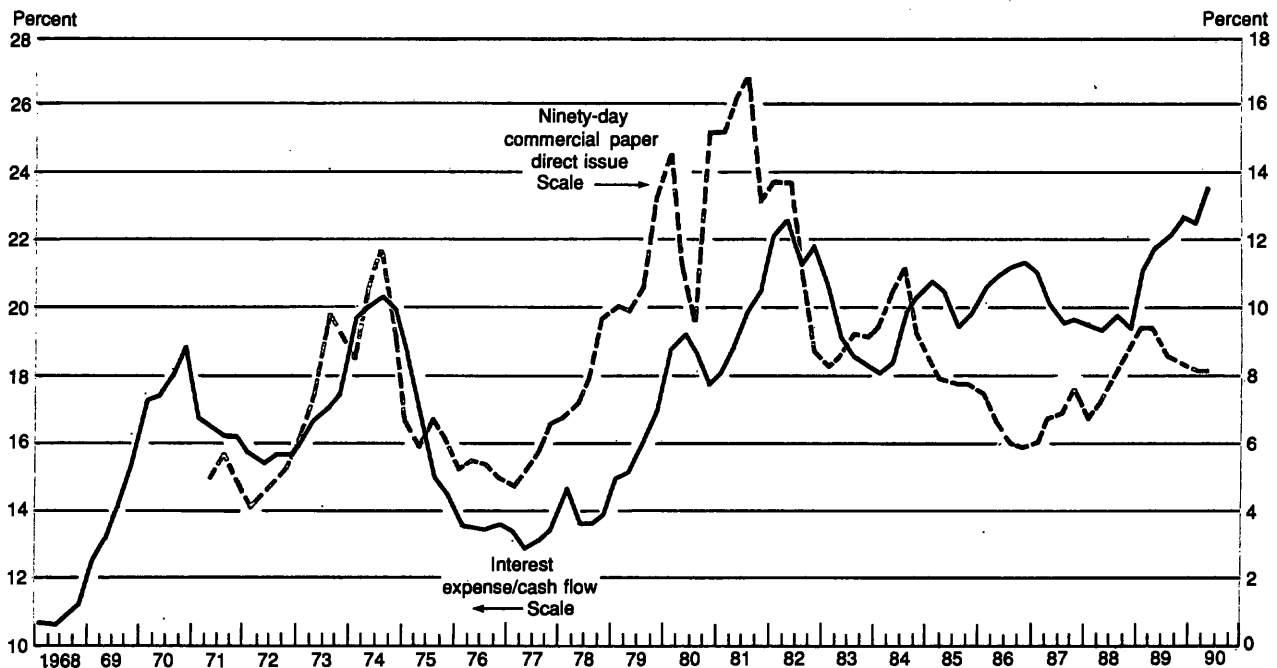
leveraged businesses are potentially vulnerable not only to recession but also to macroeconomic overheating and increased input cost pressures.

If the vulnerability of corporate financial structures has risen, what, if anything, does this imply about the potential for cutbacks in real investment and employment should business finances come under stress? An argument can be made that such effects would be limited. When a company is having difficulties, or even in bankruptcy, it is often in the creditors' and other parties' collective interests not to disrupt activities generating gross revenues net of operating expenses. Thus the bankruptcy process itself does not necessarily imply extensive layoffs or plant closings. In addition, some leveraged firms experiencing debt servicing difficulties have been able to renegotiate terms, sell assets, or exchange debt for equity stakes rather than undergo bankruptcy. Indeed, refinancing and asset sales capabilities developed in conjunction with the

Chart 9

The Short-Term Interest Rate and the Interest Coverage Ratio

Ninety-Day Commercial Paper Rate and Ratio of Interest Expense to Cash Flow for U.S. Nonfinancial Corporations



Sources: Federal Reserve System and U.S. Department of Commerce.

Note: The interest coverage ratio is defined as net interest paid divided by the sum of net interest paid, corporate profits before tax, capital consumption allowance with capital consumption allowance adjustment, and inventory valuation adjustment.

buyout and acquisition activity may help protect real business operations from the effects of financial stress. It could also be argued that any inability or unwillingness of a leveraged firm to pursue profitable investment spending opportunities as they arise would be effectively counterbalanced by the activities of better financed competitors, at least to the extent that they were positioned to realize the opportunities.

It may be more realistic, however, to expect that in a macroeconomic scenario with widespread increased interest costs and/or reduced net operating revenues, the abilities of firms to refinance bonds or exchange equity for debt would be hampered. Sales of corporate assets could also be problematic, particularly if attempted by many firms at the same time to compensate for shortfalls in revenues. Manager-owners of leveraged firms under stress could be expected to reduce discretionary outlays—implying job losses and investment spending cutbacks—to avoid losing corporate control and the associated possibility of longer term profitability. And given a general environment of uncertainty, better financed competitors might not be able or willing to pick up the spending slack in the short run.

Several recent studies suggest that companies experiencing financing constraints are more likely to respond to cash flow fluctuations by adjusting their real investment and employment outlays than are firms operating with more financial slack. Fazzari, Hubbard, and Petersen (1988) show that a sample of firms with tighter cash flow availability—quantified in terms of a low dividend payout rate—exhibit a closer correlation between changes in investment outlays and fluctuations in cash flow than do firms with better overall cash availability. In other words, when cash flow is scarce, it seems to matter more for investment, at least in the short run. Gertler and Hubbard (1988) report similar findings, and Whited (1990) presents additional evidence that U.S. firms with low net financial asset positions are constrained in their real investment spending decisions.

Cantor (1990) has extended this broad line of research to focus specifically on leveraged U.S. corporations. Fazzari, Hubbard, and Petersen's division of firms according to dividend retention rates in effect identifies a number of smaller, faster growing companies whose ability to invest is tied to their ability to generate cash earnings. Cantor's classification according to leverage indicators also results in a cash-constrained subsample, but in this case it includes mature, slow-growing firms that are more typical of participants in the 1980s takeover and buyout activity. Cantor shows that the cash flows remaining after debt servicing at leveraged firms are proportionally more variable; that is, leveraging has not only been occurring at firms with

unusually stable revenues. Furthermore, he confirms that the leveraged firms' investment spending tends to fluctuate more in line with cash flow than is the case at less leveraged firms. Finally, Cantor presents some evidence that employment at leveraged firms is also more affected by cash flow availability than is employment at better capitalized firms.

Thus the empirical work appears to confirm the basic notion that a more leveraged business sector exhibits an increased sensitivity of spending to interest rate changes and other factors, including variations in revenues. Higher interest charges may lead cash-constrained firms to cut back more aggressively on investment and employment. The implication would appear to be that by increasing leverage, corporations have become more, rather than less, responsive to given changes in interest rates, so that even moderate changes in rates may be capable of restraining or stimulating their expenditures in the face of economic shocks of a given size. A caveat is that, again because of leverage, the economic shocks themselves may be more severe, in the sense that a given slowdown in corporate sales revenues may more quickly multiply into adverse investment and employment decisions. If shocks to leveraged firms were to cumulate in such a manner, sizable adjustments in interest rates might be needed to reestablish equilibrium. Put differently, while leveraged firms may indeed be more sensitive to interest movements, they are correspondingly more sensitive to other influences as well. So the size of interest rate changes required to offset the effects of other shocks may be at least as large as in the past.

In sum, although the reduction of financial constraints has provided more funding options, competitive forces have prompted firms to use these enhanced capabilities to raise leverage, a step that increases firms' vulnerabilities to recession, cost-push inflation, or higher borrowing costs. A rise in interest rates, particularly if caused by a change in interest rates that is unanticipated or outside the range contemplated when leveraging occurred, would squeeze vulnerable firms' cash flows, investment, and employment. The basic notion that greater leverage can create a possibility of larger swings in firm spending and macroeconomic activity is further developed by Bernanke and Gertler (1989). Bernanke pursues a related point in a 1983 article, arguing that the Depression of the 1930s was exacerbated by business failures that disrupted financial intermediation.

External trade and finance

Reduced costs of transportation and communication have encouraged a secular increase in the volume of international transactions, including trade in real goods

and services as well as cross-border financial investment and trading. U.S. imports and exports have risen relative to total U.S. GNP (Chart 10). Shorter term fluctuations in the amount of trade are influenced by exchange rates, and thus by U.S. interest rates and monetary policy. Other factors equal, a high level of U.S. interest rates relative to foreign interest rates attracts capital inflows, tending to raise the exchange value of the dollar, at least in the short run. Thus the monetary restraint of higher domestic interest rates on domestic demand is supplemented by the restraint of a stronger dollar on U.S. net exports. In addition, a strong dollar may also have direct disinflationary effects on import prices and prices of trade-competitive goods.²⁰ As net exports grow secularly as a proportion of U.S. total GNP, these external channels of monetary policy transmission increase in importance.

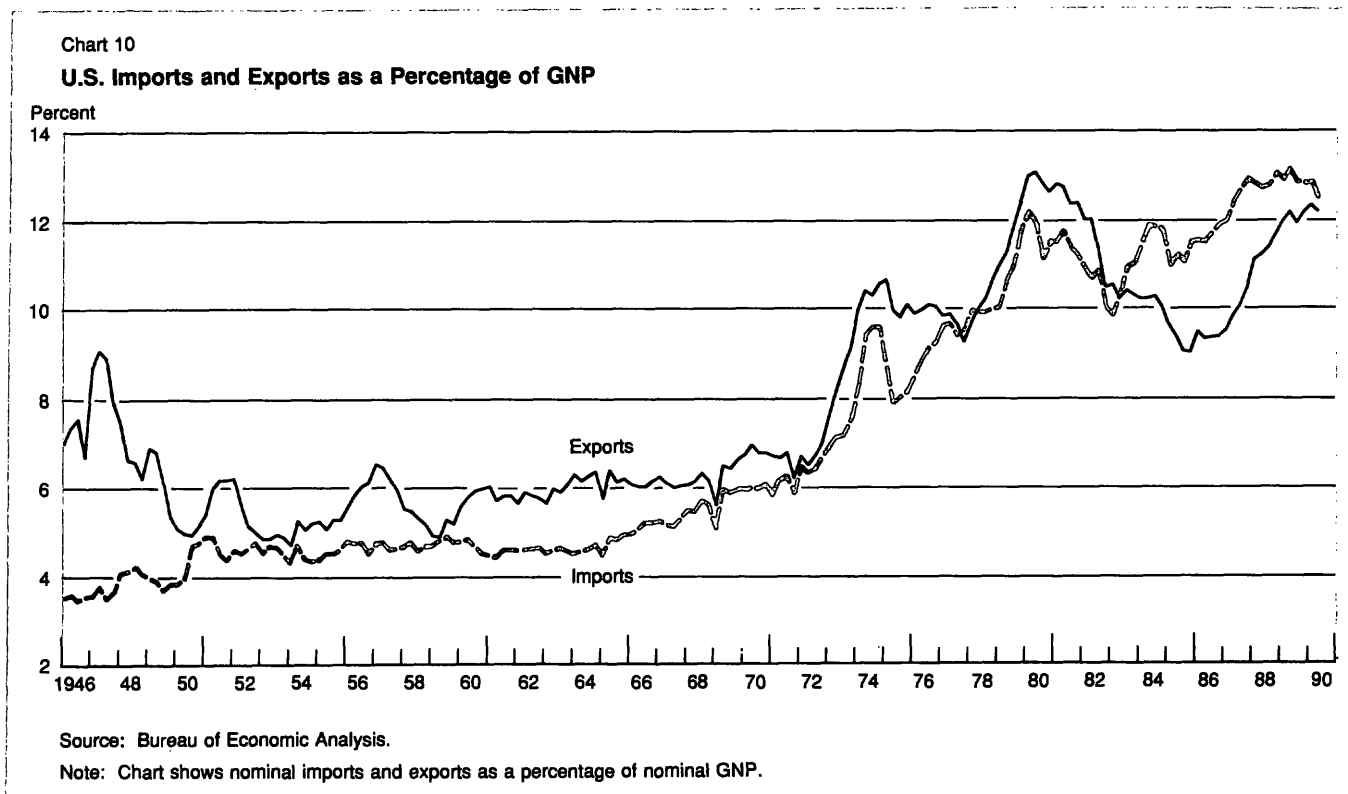
Moreover, the propensity of financial capital to flow back and forth across borders in response to shifting risks and relative rates of return is now greater, because of the reduction of foreign capital controls, improved access to information, the increasingly inter-

national strategies of institutional investors, and the success of risk management innovations such as interest rate swaps and futures, currency futures, and longer term currency swaps.²¹ Chart 11 shows the burst of cross-border buying and selling of bonds and equities since the mid-1980s. Chart 12 demonstrates that with the relaxation of capital controls in many countries, closer arbitrage linkages have emerged between domestic short-term interest rates in different currencies, hedged with forward exchange contracts. Chart 13 illustrates the rapid growth of the interest rate swap market. Combined with currency swaps, the interest rate swaps mean that credit risk on a loan or security can now be at least partly "unbundled" from its repricing and currency risk characteristics. This development has given issuers and investors broader access to competitive international markets, thereby helping to lessen potential constraints on funding availability and credit qualification.

Closer links between financial markets also lead to shared sensitivities — sensitivities not only to liquidity

²⁰On the price pass-through effects of exchange rate changes, see, for example, Hooper and Mann (1989), including their discussion of parameter stability on pp. 320-321.

²¹The increasing integration of shorter term interest rate and exchange markets is discussed in Jeffrey A. Frenkel (1989). Another recent piece by Koh and Levitch (1989) discusses such arbitrage in currency futures.



and trading conditions in individual markets but also to economic factors affecting them all. One issue is whether the tightening of linkages creates so much cross-border sensitivity to liquidity conditions that national monetary authorities begin to have less influence over domestic interest rates and securities prices, particularly on longer term instruments. A related question is the extent to which shocks to securities prices, from whatever source, are now more readily transmitted from one market to another. A floating exchange rate regime, such as has been in effect since the mid-1970s for the United States and other industrial countries, ensures the long-term independence of national monetary policies and inflation performances. On a shorter run basis, however, a rise in the responsiveness of globally oriented investors to price movements in various national markets could cause securities returns to become more mutually sensitive and interrelated, even when denominated in different currencies.

Studies exploring whether longer term securities prices or returns are becoming more interrelated through time are still somewhat scarce. With regard to fixed-income securities, Kasman and Pigott (1988) find

little evidence that during the 1980s long-term interest rate fluctuations in the United States became more closely aligned with rate movements in other major countries, on a quarterly average basis. Several papers, however, have demonstrated statistically that stock price movements in different countries have become more correlated in recent years—even aside from the highly visible round-the-world “market breaks” in October 1987 and October 1989. Using various approaches, Friedman and Weiller (1987), Bennett and Kelleher (1988), and von Furstenberg and Jeon (1989) find increased similarity of price movements in major stock market indexes, including higher frequency (that is, daily) returns.

On balance, while the evidence is still preliminary, globalization has had profound effects on financial markets, although the effects on liquidity and monetary policy are still only partly understood. Credit can now be more readily extended across borders, with appropriate hedges available for unwanted currency and repricing risks that in the past might have discouraged movements of capital even in the absence of regulatory controls. In an environment in which domestic access to credit by households and businesses has been improving, the increased ease with which savings can be drawn in from other countries takes on added significance. While monetary authorities can still conduct independent policies to the extent that exchange rates are allowed to float, tight credit conditions may attract capital inflows from abroad more readily than in the past. Other factors equal, greater competition from foreign lenders and other offshore sources of funds will increase the availability of credit to domestic borrowers, further reducing the odds that credit or funding constraints will be binding. In addition, on a short-term (for example, daily or weekly) basis, disturbances to stock (and possibly bond) prices appear to be transmitted across international markets more than in the past, a development which also carries the potential for complicating the conduct of monetary policy at times.

Aggregative studies

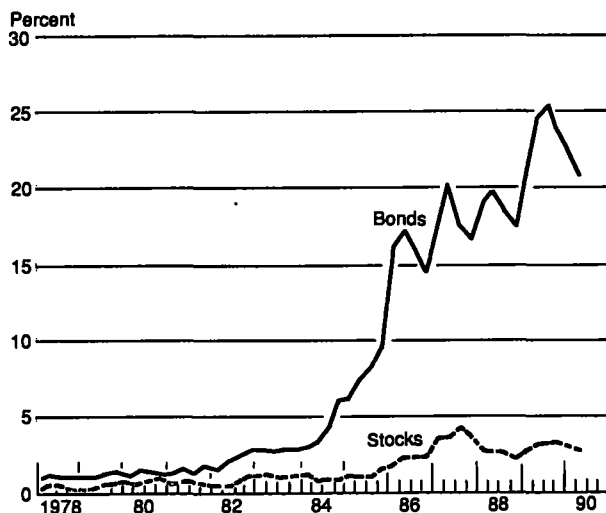
Several studies in the past few years have investigated whether financial changes have altered the relationships between interest rates (and exchange rates) and broader macroeconomic performance. While some look directly at aggregate output, others take a sector-by-sector approach, focusing on areas of the economy traditionally sensitive to interest and exchange rates.

The sector-by-sector studies support the notion that the incidence of interest rate effects has been shifting across different parts of the economy. Akhtar and Harris (1986-87) examine shifts in interest rate effects on real activity, using a set of equations for traditionally

Chart 11

Gross Securities Transactions across U.S. Borders

As a Percentage of Nominal U.S. GNP



Sources: Federal Reserve System, U.S. Treasury Department, and U.S. Department of Commerce.

Note: Gross securities transactions consist of sales and purchases of U.S. securities by non-U.S. residents and sales and purchases of non-U.S. securities by U.S. residents.

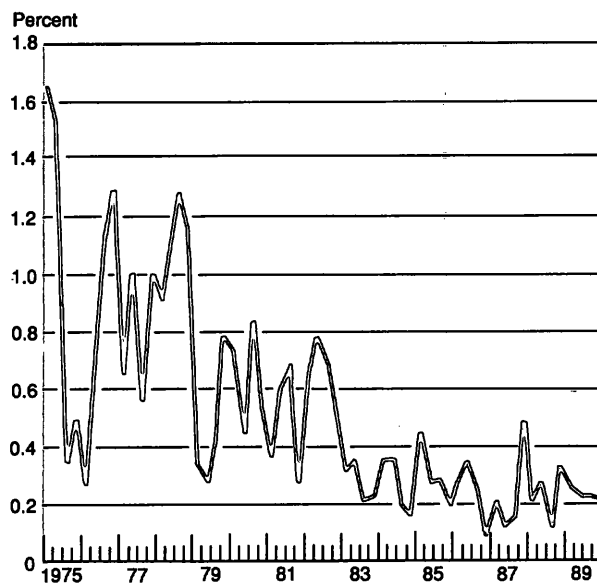
interest-sensitive sectors, including housing, durables consumption, business investment, and net exports. They conclude that the net effects of interest rate changes on the overall economy have not declined through time, although they attribute this result partly to their explicitly controlling for episodes of funding availability problems affecting housing and consumer durables. Friedman (1989), also using sector equations, finds significant changes in the interest sensitivities of sectors, particularly when the reduction of funding availability effects on the housing market is included. Although Friedman concludes that housing has become less interest sensitive, he finds that business investment has become more sensitive, leaving it unclear whether the aggregate responsiveness of the economy to rates has changed. Bosworth (1989) also reviews developments in housing, consumption, business investment, and net exports. He contends that

housing has become less interest sensitive, but he points to offsetting increases in sensitivity for net exports and, possibly, consumption. Kahn (1989) estimates sector equations as well, finding decreased interest sensitivity in housing and consumption, increased sensitivity in net exports, and little or no sensitivity of business investment to interest rates. Thus virtually all the sector-by-sector studies support the view that housing has become less interest sensitive, mainly because of deposit deregulation, and a majority find that net exports have become a more important channel of monetary policy, if only because of the rapid growth of traded goods and services. Their findings on consumer durables and business investment, however, are mixed. With respect to business investment, the hypothesis relating increased interest sensitivity to leverage may not be adequately addressed by the aggregative studies, since the main support for that hypothesis is derived from studies using data on individual firms. More generally, the sector-by-sector studies support the notion that the incidence of monetary restraint has changed, most clearly moving away from housing and toward net exports.

Complicating the question of incidence are the different lengths of time required in the different sectors of the economy for interest or exchange rate changes to influence the pace of activity. In principle, financial or

Chart 12
Dispersion of Covered Short-Term Interest Rates

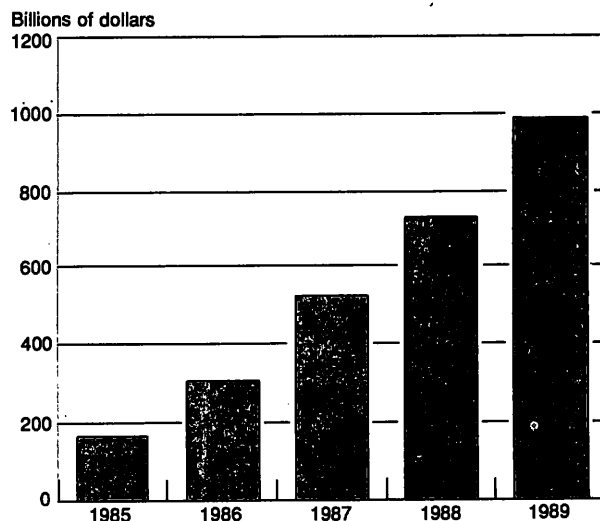
Three-Month Money Market Yields in Dollar Terms for the United States, Germany, Japan, Canada, and the United Kingdom



Notes: Chart shows mean absolute deviation of quarterly average short-term yields (converted to dollar terms by the forward exchange rate premia) from the simple average of the five countries. Yields used were U.S. three-month CD rate, West German three-month money market rate, Japanese three-month Gensaki rate, Canadian ninety-day finance company paper rate, and British three-month sterling interbank deposit rate.

Chart 13
Size of Interest Rate Swap Market

Notional Value of Outstanding U.S. Dollar Interest Rate Swaps



Source: International Swap Dealers Association.

other changes could alter the length of these lags in particular sectors, but in practice there is not enough data to detect or accurately measure lag changes. Whether or not sector lags have been changing, the aggregate lag may change if there are sizable differences in lags among sectors whose relative weights in the monetary transmission process are shifting. A key change here is the shift away from domestic interest rate impacts and toward the effects of interest rates on exchange rates, net exports, and trade-sensitive prices. Although policy lags are intrinsically difficult to measure and possibly inherently uncertain, statistical evidence tends to show that the lags in the effects of interest and exchange rates on net exports are longer than lags in the effects of interest rates on domestic sectors. The Federal Reserve's macroeconomic model of the U.S. economy, for example, shows that a change of monetary policy has its greatest impact on the growth rate of GNP within one year.²² Bryant, Holtham, and Hooper (1988) review a dozen econometric models and find a similar result, on average.²³ In contrast, econometric estimates typically show that the effects of a change in the dollar on real net exports require several years to be substantially realized. This long delay in the effects of exchange rates on U.S. real net exports is illustrated by the experience of the 1980s: the dollar fell sharply in 1985, yet real net exports did not significantly outpace imports until 1987, 1988, and the first part of 1989. Bryant, Holtham, and Hooper also compare the responses of various econometric models to effects of dollar changes on U.S. net exports; on average, the models they review show a lower dollar continuing to have a stimulative impact on the U.S. economy for up to four years.²⁴

The picture is further complicated because exchange rate changes also have direct effects on prices in the economies involved, by means of the prices of imports and exports. Although the price effects may occur relatively quickly (in contrast to exchange rate effects on real net exports), they are particularly uncertain in magnitude.²⁵ For example, the proportionate impact of dollar movements on the U.S. price level may depend on capacity utilization rates, the types of goods and

services traded, companies' strategies for market share, profit levels, and perceptions about the permanence of exchange rate changes.²⁶ As noted earlier, in the comparisons of model simulations performed by Bryant, Holtham, and Hooper a "consensus" simulation showed that an (exogenous) appreciation in the dollar restrains real U.S. GNP by way of weaker real net exports. Nevertheless, the dispersion of individual model effects around this "consensus" is striking, and the degree of price pass-through is one of the main sources of divergence.²⁷

Although the evidence appears to suggest that the effects of monetary policy may now occur with a longer and more uncertain lag because of an increase in the relative importance of net exports, this conclusion may be premature. Because part of the implicit goal of monetary policy is to achieve objectives within some time frame, shifts in the incidence of policy cannot be fully evaluated independently of the relative timing and reliability of effects. The long lags of the effects of dollar changes, combined with the uncertainty regarding the strength of the effects, might make this channel less useful for the conduct of policy. If policy were attempting to, say, restrain aggregate demand, the parts of the economy that react more quickly to policy actions might tend to bear more of the overall restraint.

Conversely, a sector that is in principle sensitive to policy but only with a long lag might turn out to be less influenced during the time frame within which policy is seeking results. For example, a sector such as housing that responds relatively rapidly to interest rates has become less interest sensitive, while net exports appear to have become more sensitive, although only with a substantial time lag. In this example, achieving a given degree of stimulus or restraint within a given time frame may require wider movements in rates since this objective must be largely realized through the housing sector.

The question then becomes how the longer lagged effects on net exports subsequently complicate policy and economic performance. One possibility is that the lagged effects would provide too much further stimulus or restraint after the initial policy effects had already occurred, and thereby risk destabilizing the economy. This particular possibility appears somewhat unlikely. For example, one cause of the apparent lags in exchange rate effects on net exports is the existence

²²See, for example, Brayton and Mauskopf (1985), especially pp. 180-81 and Table 4.

²³One of the comparison simulations run by Bryant, Holtham, and Hooper on twelve models was to accelerate U.S. money growth by 2 percent in year one and 4 percent in year two, relative to baseline. The average effect on the level of U.S. real GNP was plus 3/4 percent in year one and plus 1 percent in year two, dissipating thereafter (see Figure 3-10). The standard deviation among the twelve models' real GNP impacts was about 3/4 percent by year two.

²⁴See Bryant, Holtham, and Hooper (1988, Figure 3-20).

²⁵See Hooper and Mann (1989, pp. 320-21).

²⁶For example, see Froot and Klemperer (1989) for a summary of recent theories on the pass-through from exchange rates to import prices; the authors present some evidence that market share considerations and expected future exchange rate changes may have important effects on the degree of pass-through.

²⁷See Bryant, Holtham, and Hooper (1988); also see Brayton and Mauskopf (1985), especially Table 4 and pp. 181-82.

of long-term contracts (for example, for made-to-order equipment). A new exchange rate would have to persist at least over the remaining life of a contract to have an effect on the value and volume of trade when the contract finally comes up for renewal. But if the initial monetary policy impacts have already worked their way through the economy, then by the time of renewal the interest and exchange rates would already have readjusted as well, with little effect on the subsequent contracts. Similarly, if businesses have long-term import or export strategies (for market share and so forth), then they may resist altering pricing or sales goals when exchange rate swings are recognized as temporary. This may blunt the exchange rate effects not only on net exports but also on the degree of price pass-through. More generally, except in special (hard-to-identify) cases when activity in the future is strongly affected, not by future exchange rates or by average exchange rates over the intervening horizon but specifically by exchange rate values today, the likelihood of destabilizing delayed effects via lagged exchanged rates appears minor. It follows that the influence of interest rate movements or monetary policy changes will fall on traditionally sensitive domestic sectors, and the net effect may be a decline in the overall interest sensitivity of aggregate demand rather than merely a shift in its incidence across sectors.

Indeed, two recent studies have examined more directly whether overall GNP—rather than particular industries or sectors—has changed in its responsiveness to interest rate changes. Kahn (1989) econometrically compares the effects of changes in the federal funds rate on real GNP in two subperiods, 1955-79 and 1983-89 (skipping the early 1980s). He finds that the effect on real GNP growth of a 1 percent change in the interest rate was substantially larger in the earlier period. More recently, Hirtle and Kelleher (1990) also test for changes in the impact of interest rates on GNP but, rather than break the sample into two parts, they allow a time path for the interest rate coefficient. Notwithstanding the different specification, they find a decline in interest sensitivity qualitatively similar to Kahn's result.²⁸ Interestingly, however, Hirtle and Kelleher calculate that interest sensitivity declines in the 1950s, 1960s, and 1970s, and then levels off or

even increases moderately again in the 1980s. Taken at face value, this finding would suggest that some of the more significant structural changes actually occurred much earlier, for example, with the interbank funding developments discussed by Hester (1981). The elimination of retail deposit interest ceilings and the growth of secondary mortgage markets and other sources of funding flexibility for thrift institutions during the 1970s and 1980s would then appear to have had analogous effects on the sensitivity of the economy to interest rate changes. Although the more recent financial market developments in the 1980s have further reduced the constraints on funding availability and the credit qualification process, it is possible that they have been quantitatively less significant than the changes in earlier decades and, particularly in the latter 1980s, offset by the increase in leverage-related sensitivities.

Conclusions

Relationships between interest rates and economic activities are of central importance to the transmission of monetary policy. There is little basis, however, for presuming that these relationships are static or unchanging. On the contrary, a variety of institutional developments and statistical findings confirm the notion that the ways monetary policy and interest rates affect the economy have been evolving. Several factors have contributed to this evolution: changes in structure and competition in financial services industries; regulatory changes; advances in communications, data processing, and information management technology; the geographic enlargement of markets; and the rapid development of new financial instruments or techniques. Financial changes have made credit more widely and competitively available, reducing intermediation costs and eliminating or reducing constraints on funding availability and credit qualification. This development in principle should raise the equilibrium level of interest rates and may help account for the erratic upward movement of nominal and real rates during the past several decades.

The removal of constraints on funding availability and credit qualification also may alter the degree of real stimulus or restraint associated with rate changes. There is some limited statistical support for the view that the interest elasticity of aggregate demand has fallen during the past several decades. More recently, however, leveraging of some businesses and the rise in borrowing by some households may have had an offsetting effect, replacing traditional constraints on borrowing at the margin with new leverage-related credit qualification and cash flow constraints. The rise in leverage should make some components of aggregate spending more, rather than less, sensitive to interest

²⁸Akhtar (1983) also reports, in the context of a single equation model, a statistically significant decline after 1977 in interest sensitivity for U.S. and Italian aggregate spending, while for other major economies he finds a rise in sensitivity during that period. Like Hirtle and Kelleher, Akhtar finds that allowing for the parameter shift raises his overall interest elasticity estimate values. Akhtar and Dennis (1984) report qualitatively similar post-1977 declines in interest sensitivity for the United States, Canada, and Italy, but they report increases in sensitivity in Japan, Germany, France, and the United Kingdom in the corresponding time period.

rate movements. In theory such a development might reduce the size of movements in interest rates required to stabilize spending by leveraged firms and households, barring scenarios in which the leveraging magnifies the force of inflationary or recessionary influences that monetary policy seeks to counteract. In addition, the growth of international goods and services suggests a greater external channel for monetary

policy, through the effects of exchange rates on output and prices. A practical limitation on this channel, however, is the long and uncertain lag with which it tends to operate. Finally, the international integration of capital markets not only accentuates the elimination of domestic constraints on funding availability and credit qualification but also implies greater mutual sensitivity and shared liquidity conditions across national markets.

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