Federal Reserve Bank of New York

Quarterly Review

Autumn 1985 Volume 10 No. 3

The Quarterly Review is published by the Research and Statistics Function of the Federal Reserve Bank of New York. Remarks of E. GERALD CORRIGAN, President of the Bank, on a perspective of public and private debt accumulation begin on page 1. Among the members of the staff who contributed to this issue are ALLEN J. PROCTOR *and* JULIE N. RAPPAPORT *(on federal tax reform and the regional character of the municipal bond market, page 6);* LAWRENCE J. RADECKI *and* JOHN WENNINGER *(on recent instability in M1's velocity, page 16);* CHARLES PIGOTT *and* VINCENT REINHART *(on the strong dollar and U.S. inflation, page 23);* CHRISTINE M. CUMMING *(on federal deposit insurance and deposits at foreign branches of U.S. banks, page 30); and* CARL J. PALASH *and* ROBERT B. STODDARD *(on the financing rate and impact on housing of ARMs, page 39).*

A semiannual report on Treasury and Federal Reserve foreign exchange operations for the period February through July 1985 starts on page 50.

Public and Private Debt Accumulation: A Perspective

I welcome this opportunity to address the American Bankers Association annual gathering of Chief Financial Officers. In reflecting on possible topics for my remarks, it struck me that this was a good opportunity to raise some questions about an all too well-known four-letter word. That word is "debt". Specifically, I want to review with you the facts as they pertain to the disturbing rate at which the U.S. economy is accumulating debt; to cite some of the factors which may lie behind the rapid growth in debt; and to make a few suggestions as to ways in which the growth in debt can be—perhaps I should say must be—moderated over time.

In each of the past several years total debt in the economy has risen markedly faster than GNP... Over the 1981-85 period, the ratio of debt to GNP will have risen by about 20 basis points to over 1.60—a very large change in a ratio of this nature.

By way of a general background, until recently, the growth in total debt in the economy tended to track closely the growth in nominal GNP. To be sure, there were some departures from this pattern for cyclical and other reasons, but the long run parity between the growth in debt and the growth in GNP was strikingly similar. But, beginning in the 1981-82 time frame something seems to have happened to that relationship. In each of the past several years debt has risen markedly faster than GNP. In fact, using 1981 as a base, the cumulative gap between the growth in debt and the growth in GNP is fifteen percentage points. Stated somewhat differently, over the 1981-85 period, the ratio of debt to GNP will have risen by about 20 basis points to over 1.60—a very large change in a ratio of this nature. A straight extrapolation of this recent trend over the next decade would suggest that by 1995 we would have about $2.25 in debt for every dollar of GNP.

In a proximate sense, it is widely recognized that the major factor contributing to the rise in total debt in recent years has been the string of massive Federal budget deficits which have been chalked up in the decade of the 80s. While that is certainly true, the rate at which debt is being accumulated in the private sector is also cause for concern. Let me cite a few statistics that seem particularly telling.

In the Federal sector, commentary about $200 billion deficits is now so commonplace that we may tend to lose sight of the financial implications of those mega-deficits. For example:

- This year, interest costs of servicing the burgeoning Federal debt will total about $130 billion. That will be roughly equal to total personal income tax collections from every taxpayer west of the Mississippi River. At the same time, more than $20 billion of those interest payments will go to foreign holders

Remarks of E. Gerald Corrigan, President, Federal Reserve Bank of New York, before the American Bankers Association Chief Financial Officers' Forum on Wednesday, September 18, 1985.

of Treasury securities. This, in effect, implies that a very sizable percentage of the proceeds of sales of new Treasury securities to foreigners are being used to pay interest to existing foreign holders of Treasury debt.

If the current efforts at reducing Federal budget deficits are not successful, then even under fairly optimistic economic conditions, the annual cost of servicing the Federal debt by 1990 will be in the neighborhood of $210 billion...For every five dollars collected from the individual income tax, two dollars will go toward paying Federal net interest liabilities.

- Looking out over the next few years, if the current efforts at reducing Federal budget deficits are not successful, then even under fairly optimistic economic conditions, the annual cost of servicing the Federal debt by 1990 will be in the neighborhood of $210 billion. That will mean that for every five dollars collected from the individual income tax, two dollars will go toward paying Federal net interest liabilities. Moreover, even if near-term deficits were reduced to levels consistent with the targets specified in the recent Budget Resolution, annual net interest payments by the Federal Government would still grow to $180 billion five years from now.

- Federal debt relative to GNP, which had been on a pronounced downward trend over most of the postwar period, is now rising very rapidly. Indeed, for 1985, Federal debt will amount to almost 40 percent of GNP—a rise .of more than twelve percentage points since 1981.

Short of worldwide economic conditions that would be most distasteful, it is difficult to foresee circumstances in which the foreign debt of the United States would not approach $500 billion by the end of the decade.

- An even more alarming picture arises when we look at the deficit relative to our domestic savings flows. In 1984, for example, the deficit consumed two-thirds of our net private domestic savings. While international comparisons are flawed, it is nevertheless noteworthy that in Japan, West Germany, and the United Kingdom, budget deficits consumed only 20 to 30 percent of net private savings flows despite the fact that in the cases of West Germany and the United Kingdom, the cyclical component of their deficits was larger than for the United States.

The growth in Federal debt lies at the root of another dramatic development regarding the United States, and that, of course, is the sudden and sizable shift in the position of the United States from a net creditor to the rest of the world to a net debtor. The immediate cause of this development is, of course, the unprecedented current account deficits we are running, but as this audience would recognize, the underlying causes for those current account deficits are importantly related to the budget deficit *via* the interest rate, exchange rate nexus. Here too, orders of magnitude are so large that they can lose meaning, but the following provides some perspective:

- At this juncture, and short of worldwide economic conditions that would be most distasteful, it is difficult to foresee circumstances in which the foreign debt of the United States would not approach $500 billion by the end of the decade. Indeed, some would suggest that we would have to be quite lucky if that figure were not larger than $500 billion. In considering the possible implications of external debt of this size, there is at least a question as to whether foreigners will be eager to continue to accumulate dollar denominated assets of the amounts suggested at current, much less lower, rates of interest.

For the private sector as a whole, the ratio of debt to GNP is at an unprecedented level and is still rising.

- Servicing $500 billion in external debt at roughly current interest rates could produce a $35 to $45 billion gap between our trade and current account deficits and would imply that even approaching current account balance will require not just a balancing of our trade account but moving the trade account into a sizable surplus position.

- The "Catch-22" of this situation, however, is that so long as our budget deficits are so large and our domestic savings so meager, we are vitally dependent on those same foreign savings flows which finance the current account deficit to finance our domestic activities including the budget deficit. At present, foreign savings flows are augmenting our net private domestic savings by a factor of

more than one-third and are directly or indirectly financing half or more of the budget deficit.

In summary, looking at the rate at which we are building debt in the Federal sector and looking at the closely related issue of the rate at which the United States is accumulating external debt, it is difficult to escape the conclusion that we are approaching or in uncharted waters. But, even that's only part of the story since it does not take account of developments regarding debt accumulation in the private sector.

Abstracting from internally generated equity, the 1984-85 period will, if current trends continue, see the *net* retirement of $150 billion of equity in the nonfinancial corporate sector—an amount which in nominal dollars exceeds the net issuance of equity by nonfinancial business over at least the entire post-Korean War period.

To some extent, private sector debt accumulation has been overshadowed by events in the public sector. And, to some extent they have been muted by what, in my judgment, may be a false sense of security growing out of some statistics which, for example, suggest that consumer liquidity is relatively high and rising or that certain debt ratios for nonfinancial business have stopped rising, or are falling slightly. Taking those and other statistical indicators at face value, one could, perhaps, conclude that outside of the Federal Government, all is reasonably well. Perhaps that is so, but I would suggest that a closer look at trends in the private sector may not justify that complacency.

I say that for several reasons including the following:

- For the private sector as a whole, the ratio of debt to GNP is at an unprecedented level and is still rising. To be sure, the increase is not as pronounced as for the Federal Government, but there is at least a question as to whether it is reasonable to assume there is that much more good quality debt relative to GNP today than there was a decade or two ago.

- The recent spurt in private sector debt accumulation has, to a large extent, occurred on the upside of the business cycle and the downside of the nominal interest rate cycle and despite what are generally seen as relatively high real interest rates. Since it does not seem at all prudent to assume that the business cycle is a thing of the past, servicing even existing levels of debt in a less favorable economic and interest rate environment could prove very difficult. This is especially true since generalized financial indexation has shifted a sizable fraction of overall interest rate risk from the financial sector to the nonfinancial and household sectors.

- Taking account of where we are in the business cycle, some measures of credit quality problems are disquietingly high. This is especially true, for example, for delinquency rates on home mortgages, and of the overall level of nonperforming loans in the banking system.

- The recent growth in debt has been associated with a very rapid retirement of equity which, in turn, is importantly—but not exclusively—related to leveraged buyouts and the threats of hostile takeovers.

For example, abstracting from internally generated equity, the 1984-85 period will, if current trends continue, see the *net* retirement of $150 billion of equity in the nonfinancial corporate sector—an amount which in nominal dollars exceeds the net issuance of equity by nonfinancial business over at least the entire post-Korean War period.

Given all that has happened regarding patterns of debt accumulation in recent years, it is not easy to capture the underlying reasons for these developments in a few paragraphs. In the case of the Federal sector, I believe that most would now agree that the problem is primarily one of a political nature. Thus, rather than rehashing the familiar elements of that situation, allow me to focus my commentary on the major factors which seem to lie behind developments in the private sector.

It would appear that at least some borrowers and their lenders are still assuming—consciously or subconsciously—that inflation will bail them out. To the extent that is true, it strikes me as a very bad bet.

To some extent, recent developments regarding private debt accumulation reflect longer-term trends. Among the longer-term factors, demographics are such that we now have a relatively heavy clustering of the population in age groups that are more prone to borrow. Similarly, a case can be made that a host of technological, institutional, and innovational factors ranging from credit cards to junk bonds are working in the direction of enhancing the accessibility to credit. So too,

a case can be made that the worldwide integration of money and capital markets broadens financing options and alternatives for many corporations at any given level of interest rates. These and other factors may be playing a role in the burgeoning rate of debt accumulation but they don't seem capable of fully explaining why the experience of the recent few years looks so different than earlier periods. At the margin at least, it would seem that still other factors must be at work. Let me suggest two or three factors that may help to further explain recent behavior.

- It would appear that at least some borrowers and their lenders are still assuming—consciously or subconsciously—that inflation will bail them out. To the extent that is true, it strikes me as a very bad bet. For one thing, it makes an assumption about monetary policy that, from my perspective, is simply wrong. However, it's a bad bet in a more fundamental way because renewed inflation would inevitably bring more instability, not less. Indeed, I don't think it unreasonable to assume that even a sniff of a new outburst of inflation would produce a financial market response in interest rates that could be quite harmful to those with high debt service burdens.

Reducing the budget deficit is central not only to establishing a better balance in the utilization of our domestic saving, but it is the only vehicle through which we can achieve an orderly reduction of our dependency on foreign savings while still leaving enough room to finance the domestic investment ultimately needed for economic growth.

- It is possible that very intense competitive forces in the banking and financial sector are such that the pricing of loans and other debt obligations does not fully take account of differences in credit risk, thereby diminishing the rationing effects of the pricing mechanism for debt.

- Financial innovation may be aiding and abetting the debt accumulation process in part by transferring the incidence of credit and interest rate risk in ways that may give rise to the illusion that such risks have been reduced or eliminated.

- Innovational forces have also given rise to certain highly sophisticated financing techniques which are designed to take maximum advantage of certain features of the tax code—a tax code which has strong incentives for debt accumulation in the first instance. Highly leveraged buyouts are the obvious example, but sophisticated tax shelter devices—which by definition spur debt creation—are now readily available even to individual investors with relatively modest income levels. A casual reading of the book *Funny Money* which deals with the Penn Square debacle provides a number of amusing but tragic insights into how easily even sophisticated investors can get duped by sure fire "deals" of this nature.

We must continue to resist the temptation that the solution to our debt accumulation problem lies with accepting a little more inflation.

What's interesting about those episodes in *Funny Money* is that they may be symptomatic of a cultural revolution about debt. Homeowners no longer burn the mortgage when it's paid; they quickly get another, and preferably one which, in effect, requires no payment of principal; commercial real estate developers shun even minimal equity investments in new projects; corporate takeover specialists finance their activity by leveraging to the hilt; and in each of these cases somewhere there seems to be a financial institution that will eagerly oblige.

In short, the factors that lie behind the rapid growth in debt in the U.S. economy represent a complex interaction of political, economic, technological, market, and attitudinal considerations that will not easily be reversed. Yet, common sense tells us that a continuation of recent trends is not sustainable over the long haul. Looked at in that light, the crucial question, of course, is how can we best go about the process of slowing the rate of debt accumulation in a way that maximizes the prospects for more balanced non-inflationary economic growth in the period ahead. From my perspective, the answer to that question lies in several closely related areas of public policy and private initiative, as follows:

- First, and perhaps most essentially, we simply must do more to reduce the budget deficit in a timely and credible manner. The recently enacted budget resolution—if adhered to—is a positive step and provides a margin of breathing room in the near term. But, more needs to be done in a context in which the next steps may be even more difficult to achieve. Reducing the budget deficit is central not only to establishing a better balance in the utilization of our domestic saving, but it is the only

vehicle through which we can achieve an orderly reduction of our dependency on foreign savings while still leaving enough room to finance the domestic investment ultimately needed for economic growth. And, only with that need for foreign savings reduced can we bring about the orderly adjustment in our external deficits that is also so essential.

- Second, we should continue to explore ways in which tax policy can be tilted in the direction of greater incentives for savings and equity investment. Indeed, the current tax codes—with across-the-board deductibility of interest and the *de facto* double taxation of profits—create powerful motives for debt accumulation by households and businesses alike. To the extent that situation can be altered somewhat in the direction of greater incentives to save and to finance through equity, we will be that much better off. Indeed to the extent we can achieve that tilt in a context in which the deficit is also coming down in a decisive way, our prospects for sustained growth will have been enhanced appreciably.

Despite enormous competitive pressure that works in the opposite direction, managers and directors of individual financial institutions will have to more fully recognize that more conservative lending and funding policies are ultimately in their individual and collective interests.

- Third, we must continue to resist the temptation that the solution to our debt accumulation problem lies with accepting a little more inflation. Indeed, and as I noted earlier, more inflation can only bring more instability and greater problems down the road.

- Fourth, we must seek out ways to adapt the bank supervisory process to the realities of contemporary banking markets—markets in which many of the traditional sources of restraint have been eliminated by a combination of deregulation and technologically-driven innovation. This effort must entail a general strengthening of the bank supervisory process but also the active exploration of approaches that can move in the direction of encouraging financial institutions to take on more liquid and less risky assets. The latter is one of the reasons why I am strongly attracted to the concept of seeking to take account of risk characteristics in the development and administration of capital adequacy standards for banking institutions.

- Fifth, turning to the private sector, we must see a greater renewal of the precepts of prudence and discipline in the management of banking and financial institutions. Even now there is some evidence to suggest that renewal is beginning to take hold as illustrated, for example, in the number of institutions that are maintaining capital positions well in excess of regulatory minimums. Yet, short-term preoccupation with growth and quarterly earnings performance still seems unbalanced and misplaced. More generally, and despite enormous competitive pressure that works in the opposite direction, managers and directors of individual financial institutions will have to more fully recognize that more conservative lending and funding policies are ultimately in their individual and collective interests.

In conclusion, the debt accumulation problem is a matter of concern. Some elements of it will be self-correcting but others will need an assist from public policy and from private initiatives. Those initiatives constitute something of an insurance policy—and a relatively inexpensive one at that—which can significantly raise the probabilities that we can sustain an economic and financial environment conducive to growth without inflation.

Federal Tax Reform and the Regional Character of the Municipal Bond Market

Of the various tax proposals that could affect the municipal bond market, reduction of marginal tax rates and repeal of state income tax deductibility require special attention. Analysts are aware that repeal of state income tax deductibility would increase the out-of-pocket, effective level of state taxation. They also know that lower federal marginal tax rates would reduce the value of federal tax exemption of municipal bonds.

That analysis is incomplete, however, because of two important characteristics of the municipal bond market. First, most states impose taxes on the income their residents earn from bonds issued out-of-state. Any increase in effective state income taxes would raise the value of in-state bonds to investors and equivalently penalize borrowers who need funds from out-of-state. Second, because the majority of municipal bonds are bought by local investors, the effects of reducing the value of a bond's federal tax exemption depend on how many investors are affected in each state.

Current federal tax law fosters some uniformity in the municipal bond market by limiting the variations across states due to these two market characteristics. Repealing deductibility and establishing fewer brackets at lower marginal rates would remove these limits. They would raise interest costs for borrowers in some states and lower costs for those in other states. Though these are only two of many reform proposals that affect the municipal bond market, they are interesting because each state is affected differently.[1]

In attempting to identify how widely the effects of reform may vary across states, this analysis begins by describing how state tax laws contribute to the regional character of the bond market. The second section describes the role of demand for bonds by state residents relative to in-state borrowing needs. State tax laws and populations in each tax bracket are then analyzed to contrast the effects of current federal law with those of the most recent Administration proposals. The findings suggest that these proposals may have effects on the cost of borrowing that vary widely from one state to another.

The authors would like to thank Daniel Chall for his derivations of state tax formulas.

[1]Some other proposals may affect the bond market to a larger degree, but their effects should be roughly similar across all states. They would raise or lower interest rates about the same for one state as for another. But the overall combined effect of the other proposals is uncertain. Viewed in isolation, some may create upward pressures on yields across states while others may create downward pressures. For example, the proposed elimination of federal tax exemption on many types of revenue bonds may reduce supply and lower yields. At the same time, a reduced number of alternative tax shelters may increase the value of tax-exempt bonds, raise demand, and lower yields. However, eliminating special treatment of commercial bank investment in tax-exempt bonds is likely to move many banks out of the market, lower demand, and raise rates over time. On balance, it is difficult to know whether yields will rise or fall as a result. For detailed analysis of the influence of federal tax law on commercial bank investment in municipal bonds, see Allen J. Proctor and Kathleene K. Donahoo, "Commercial Bank Investment in Municipal Securities", this *Quarterly Review* (Winter 1983-84). For approximations of possible effects on the average national level of interest rates, see Andrew Silver, "Three Aspects of the Administration's Tax Proposal: Tax-Exempt Rates", this *Quarterly Review* (Summer 1985).

State tax laws and the favored treatment of in-state bonds

The municipal bond market has a regional orientation for most borrowers. In general, local investors buy the bonds local borrowers issue and local market conditions determine their borrowing costs.[2]

There is also a more familiar national market, consisting of a relatively small number of nationally recognized borrowers who regularly issue large volumes of bonds. Investors throughout the country buy and sell their bonds, and national market conditions determine their borrowing costs.

One factor shared by municipal bonds in both markets is exemption from federal income taxes. Because no bond income needs to be set aside to pay federal taxes, investors are willing to accept lower yields than they would on investments subject to federal tax. The ratio of tax-exempt to taxable yields is often used to identify the federal tax bracket of the marginal investor in the national market.

Outside the national market, state taxation of municipal bonds becomes an important reason for the cost of borrowing to vary from one state to another. Puerto Rican municipal bonds are not taxable in any state, but 38 states presently impose some form of tax on other municipal bonds. Of the remaining 12, seven have no tax on any form of income and five impose no taxes on municipal bond income (Table 1).

Thirty-five of the states that tax municipal bond income use their tax laws to create special preferences for in-state borrowers. In-state bonds are tax-exempt while out-of-state bonds are not. For example, an investor who lives in a state with tax preferences earns $900 in annual aftertax income from a $10,000 in-state bond paying a 9 percent yield. If the state income tax is 5 percent, an equivalent out-of-state bond would provide only $855 of income after $45 in state taxes was paid. To return the same aftertax income as the in-state bond, the outside borrower must offer a resident investor a before-tax yield of 9.47 percent.[3] This preference creates an incentive for borrowers to sell their bonds in their home states. The preference also encourages residents to switch from out-of-state bonds to in-state bonds of equivalent value.

The primary reason for creating tax barriers against outside borrowers is to improve the balance of supply and demand between resident borrowers and investors. By making out-of-state entry into their markets more expensive, states hope to increase the demand for in-state bonds among resident investors. If demand for municipals by residents is large enough to meet borrowing needs, then in-state borrowers may be able to sell their bonds exclusively to residents and achieve the maximum reduction of borrowing costs that the tax barriers permit. If demand by resident investors remains too small to absorb the supply of in-state bonds, despite the state's encouragement of in-state investment, borrowers will need to attract investors from outside the state.

A municipal borrower who goes out of state to find enough funds, however, must compete in other borrowers' home markets and overcome whatever tax

Table 1

Effective State Income Taxes on Municipal Bonds

Type of security	No state tax*	All municipals exempt†	No tax preference for in-state bonds: No municipals exempt‡	Tax preference for in-state bonds: Only in-state municipals exempt§
Out-of-state municipal ..	—	—	S (1 – F)	S (1 – F)
In-state municipal ..	—	—	S (1 – F)	—
Number of states ...	7	5	3	35

Key: F = Federal marginal income tax rate.
S = State marginal income tax rate.
— = No income tax.

The exact tax preference for in-state bonds depends on state tax rules (Appendix 1) and is generally equal to the state tax rate reduced by the federal deduction of state taxes.

*Alaska, Florida, Nevada, So. Dakota, Texas, Washington, and Wyoming.

†Indiana, Nebraska, New Mexico, Utah, and Vermont.

‡Illinois, Iowa, and Wisconsin. Iowa exempts only Iowa State Board of Regents bonds and Wisconsin exempts only Housing Authority bonds.

§Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Georgia, Hawaii, Idaho, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York, No. Carolina, No. Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, So. Carolina, Tennessee, Virginia, and West Virginia. Colorado, Kansas, Ohio, and Oklahoma tax some types of in-state bonds.

Source: Hueglin and Ward, *op. cit.*

[2]For a discussion of the regional and national segments of the municipal bond market, see Robert Lamb and Stephen P. Rappaport, *Municipal Bonds: The Comprehensive Review of Tax-Exempt Securities and Public Finance* (1980), pages 27-50.

[3]Local income taxes are not considered in this study. These taxes will enlarge the basis point disadvantage placed on out-of-state bonds. Factors other than yield will also affect an investor's decision to buy out-of-state bonds: diversification, familiarity with the borrower, credit risk, etc.

barriers may be imposed. The borrower needs an underwriter who has a broad and strong broker network that can convince individual investors to buy unfamiliar, out-of-state bonds. The bonds must also offer a taxable yield that provides at least the same aftertax return the investor can earn from untaxed in-state bonds.

For the 15 states without tax preferences, the advantage of borrowing from resident investors and the importance of resident demand and supply is less clear (Table 1). Resident investors in these "free access" states receive the same tax treatment on in-state and out-of-state bonds. Outside borrowers, therefore, face no barriers to seeking resident investors, and in-state borrowers must always compete against borrowers from the other 14 free-access states. This generally will raise the in-state cost of borrowing. Moreover, changes in resident demand for in-state bonds may not be symmetrical when there are nationwide changes in demand for municipal bonds. Out-of-state borrowers have access to resident investors to try to shift part of any increase in demand away from in-state borrowers. At the same time, they may shift any reduction of demand onto in-state borrowers by intensified bidding for resident investors.

Current effectiveness of tax preferences

Even though use of tax preferences is widespread, their current importance depends on the size of the tax barriers and the need for borrowers to cross the barriers. Federal tax law plays an important role in each.

Federal deductibility of state income taxes lowers in-state bond demand by reducing the out-of-pocket cost of state taxes. This reduction occurs because each dollar of state income tax is partially offset by a reduction of federal taxes for taxpayers who deduct state income taxes. Instead of a combined federal (F) and state (S) tax rate of $F + S$, taxpayers face a rate of $F - FS + S$, where FS represents the federal tax reduction from deduction of state taxes. The effective out-of-pocket cost of state taxes is $S - FS$, which is restated as $S(1-F)$ in Table 1.

For example, an investor in the 25 percent federal tax bracket, who faces a 5 percent state tax on a $10,000 out-of-state bond yielding 9 percent, can use deductibility to reduce his federal taxes by one-fourth of his $45 state tax bill. Thus, he pays a $33.75 state tax on the income from his out-of-state bond.

Deductibility increasingly blunts the effectiveness of tax barriers as the federal tax bracket increases. At the top federal bracket of 50 percent, for example, state taxes are reduced by half. If the resident investor with the $10,000 bond and $45 state tax bill were in this bracket, his effective state tax would be only $22.50.

This federal offset also limits the yield an out-of-state borrower would have to offer a resident to equal the aftertax return of a comparable in-state bond. In the example above, the out-of-state borrower would have to pay a top-bracket investor 9.23 percent to equal the aftertax return on a 9 percent in-state bond. However, this increase of 23 basis points is lower than the 47 basis points the outside borrower would have to pay without federal deductibility.

Estimates of the size of tax preferences in each state show that current law with federal deductibility results in relatively modest barriers to outside borrowers.[4] Using comprehensive measures of effective state tax rates, Steven Hueglin and Karyn Ward calculate the aftertax return of equivalent bonds in each of the states with tax preferences. In about one-third of the states, the aftertax return of an equivalent outside bond is less than 30 basis points below an in-state bond. In all but five states, state taxation lowers the return on out-of-state bonds by less than 50 basis points. The states with larger barriers to outside borrowers are Delaware (61), Minnesota (89), Montana (52), New York (63), and West Virginia (71).[5]

Whether borrowers need to cross these tax barriers depends on the demand for their bonds in their home states. Each state's tax schedule and specific tax rules provide a unique schedule of effective tax rates by income bracket. Based on these tables and the actual interest rates on municipal, Treasury, and corporate bonds, it is possible to specify those investors who would prefer in-state municipal bonds to all other bonds. This pool of potential investors can be characterized as all taxpayers above a certain income tax bracket, which varies by state.

In California in 1984, for example, in-state municipal bonds provided the highest average aftertax returns for residents with taxable incomes above $24,600. Based on the tax formulas in Appendix 1, the average Treasury bond yielding 12.46 percent and the average medium grade corporate bond yielding 14.14 percent gave a California investor in that tax bracket aftertax returns of 9.35 percent and 10.07 percent, respectively. By comparison, the average California bond in 1984 yielded 10.11 percent. At higher tax brackets, the superiority of in-state municipals would widen. At lower tax brackets,

[4]Presumably all municipal bond investors lower their effective tax rates through deductibility. Seventy percent of all married taxpayers filing joint returns with taxable incomes over $30,000 deduct state and local income taxes. This income level coincides closely with the minimum taxable income for resident investors in most states.

[5]Steven Hueglin and Karyn Ward, *Guide to State and Local Taxation of Municipal Bonds* (1981). Their calculations are based on a 9 percent coupon bond selling at par using approximations of the formulas presented in Appendix 1. They also include personal property taxes for states that have such taxes. Since they performed their calculations, Connecticut has introduced taxation on out-of-state bonds.

corporate bonds would have a higher aftertax yield than both California municipals and Treasury bonds.

In other states with different tax schedules, rules, and average yields, the aftertax return on in-state bonds becomes superior at different income levels. These brackets are presented in Table 2 (column 1) based on 1984 tax laws and interest rates. In Alabama, for example, the average in-state yield becomes superior to other yields above the $35,200 income bracket.

The need for borrowers to go outside the state to find sufficient investors can be approximated by the ratio of total municipal borrowing in the state and the number of potential resident investors.[6] A high dollar value per investor suggests a high probability that borrowers in that state often cross state lines and possibly encounter tax barriers. This may occur because the state has few high-income residents to demand the bonds or because its borrowing needs create a relatively large supply of bonds. Conversely, a low value suggests that a state is able to function as a self-sufficient market in which all supply is taken up by resident demand. This may occur because demand is high owing to a large high-income population or because supply is low owing to relatively limited borrowing needs.

The estimates of bonds issued per potential resident investor range from a high of $60,700 in Wyoming to a low of $2,800 in Ohio and Indiana (Table 2, column 3). There is no particular level of per capita borrowing at which a state becomes self-sufficient. However, results from a study by Kidwell, Koch, and Stock suggest that at this time the majority of states are self-sufficient.[7] The estimates in Table 2, then, are one way to sort out which states lower their costs through tax preferences by being self-sufficient and which see their costs raised because they must cross other states' tax barriers.

About 30 of the 35 states with tax preferences may have enough resident investors to be self-sufficient for in-state borrowing needs if around $10,000 of borrowing per investor were the cutoff point. These may be the states, then, that are able to lower their borrowing costs by imposing taxes on out-of-state bonds.

On the other hand, Michigan, New Jersey, North Carolina, and North Dakota may not benefit from their taxation of out-of-state bonds. Borrowers in these four states issue much more than $10,000 per resident investor. They are more likely, therefore, to require additional investors from outside the state.

Most of the 15 states which do not protect their in-state borrowers have low borrowing needs relative to their investor pool. Their borrowers are probably able to avoid the increased costs of crossing the tax barriers of other states.

In sum, under present law, demand and supply conditions in most states do not indicate that a great deal of interstate borrowing is occurring in the municipal bond market. Local borrowing from local investors appears sufficient to satisfy financing needs in most states. For the relatively few borrowers who may depend on out-of-state sales, the effective state taxes they may encounter seem to be relatively modest.

Tax reform and its effect on interstate competition for investors

Federal tax reform has important effects on interstate differences in the municipal bond market. Resident demand for in-state bonds is sensitive to any change in federal tax rates, and the size of tax preferences is sensitive to any change in federal deductibility of state income taxes. Most proposals for federal tax reform will change at least one of these provisions. The remainder of this article uses the *President's Tax Proposals to the Congress for Fairness, Growth, and Simplicity* (Treasury II) to illustrate what the effects of these two provisions would be on regional municipal bond markets and why the effects would vary widely across states.

Increased need to borrow out-of-state

The federal tax reform proposal is structured so that tax rate cuts are not the same for every state pool of potential resident investors. Treasury II proposes marginal tax rates of 15 percent for incomes to $29,000, 25 percent for incomes to $70,000, and 35 percent for incomes over $70,000. In states like Colorado, present marginal investors in the resident pool have taxable incomes under $30,000. For them,

[6] The number of investors is approximated by the number of federal tax returns above the minimum taxable income level for each state. For this article, the alternative investments available to an investor are limited to U.S. Treasury bonds and corporate bonds. For other types of investments it is assumed that other factors, such as capital gains taxes or depreciation rules, are more important in calculating return than are income taxes, which are the focus of this article. See Appendix 1 for a discussion of how aftertax returns are calculated for each type of bond. An alternative measure of the ability to sell exclusively to residents is the ratio of dollars issued to the aggregate income of potential resident investors. Use of this measure does not alter the results appreciably.

[7] David Kidwell, Timothy Koch, and Duane Stock, "The Impact of State Income Taxes on Municipal Borrowing Costs", *National Tax Journal* 37 (December 1984) pages 551-562. Their study examines yields on general obligation bonds of less than $5 million which were bid competitively in 1980. The study finds that tax preferences on average are successful in reducing the cost of borrowing for in-state borrowers relative to outside borrowers. Significantly, however, the average reduction is a fraction of the value of the tax preferences. This partial effect may occur if the marginal investors for some of the bonds are not state residents and therefore do not benefit from tax preferences. In that sense, these results confirm that, while some municipal bonds are sold in-state (where tax preferences *lower* the cost of borrowing), a significant proportion of municipal bonds are sold out-of-state, where tax preferences *raise* the cost of borrowing.

the marginal tax rate will remain unchanged at 25 percent. In other states like Alabama, the marginal investor at current interest rates has taxable income of $35,200. The proposal reduces that investor's tax rate from the current level of 33 percent to 25 percent. And in states like New Jersey where the taxable income of the marginal investor is $45,800, the marginal tax rate declines from 38 to 25 percent.

These lower tax rates will reduce the appeal of municipal bonds relative to taxable bonds. Many of today's marginal investors will drop out of the market, causing demand for in-state bonds to decline and the minimum income level of the remaining potential investors to be higher. Estimates of these new income levels are presented in Table 2 (column 2) for current rates of interest.

For most states, the return on in-state municipal bonds will no longer appeal to residents earning less than $70,000. The current before-tax yield spread between in-state municipals and taxable bonds is too wide for most residents in the proposed middle tax bracket. In only nine states (Arkansas, California, Colorado, Delaware, Hawaii, Idaho, Maryland, Montana, and Oregon) do state and federal taxes on Treasury and corporate bonds combine to make current in-state municipal yields attractive to the middle-bracket investor earning between $29,000 and $70,000.

Estimates of the percentage of current potential investors who will continue to demand in-state municipals are presented in Table 2 (column 5). The nine states where middle-bracket investors are likely to remain in the market at current yields should face only

Table 2

State Characteristics of the Regional Municipal Bond Market

State	Minimum tax bracket of resident investors* In dollars: 1984 law (1)	Minimum tax bracket of resident investors* In dollars: Proposed law (2)	Dollar borrowing per potential resident investor† In thousands of dollars: 1984 law (3)	Dollar borrowing per potential resident investor† In thousands of dollars: Proposed law (4)	Retention of potential resident investors under proposed law‡ In percent (5)
Alabama	35,200	70,000	8.7	79.1	11.0
Alaska	29,900	70,000	24.8	116.4	21.3
Arizona	29,900	70,000	8.1	66.9	12.1
Arkansas	29,900	29,000	3.3	3.3	§
California	24,600	29,000	7.0	7.0	§
Colorado	24,600	29,000	8.7	8.7	§
Connecticut	50,000	70,000	11.0	18.4	59.6
Delaware	24,600	29,000	7.8	7.8	§
Florida	32,500	70,000	11.1	70.2	15.8
Georgia	29,900	70,000	9.5	77.7	12.2
Hawaii	24,600	29,000	6.1	6.1	§
Idaho	29,900	29,000	3.9	3.9	§
Illinois	45,800	70,000	15.8	27.2	58.2
Indiana	35,200	70,000	2.8	28.4	9.9
Iowa	45,800	70,000¶	19.2	33.5¶	57.1¶
Kansas	35,200	70,000	7.0	53.3	13.1
Kentucky	35,200	70,000	8.8	78.7	11.2
Louisiana	29,900	70,000	8.4	61.1	13.7
Maine	35,200	70,000	4.2	39.8	10.6
Maryland	29,900	29,000	3.7	3.7	§
Massachusetts	35,200	70,000	4.6	33.5	13.8
Michigan	45,800	70,000	13.7	24.4	56.0
Minnesota	35,200	70,000	7.5	63.8	11.8
Mississippi	29,900	70,000	5.8	49.3	11.7
Missouri	29,900	70,000	5.3	44.3	11.9
Montana	24,600	29,000	10.5	10.5	§
Nebraska	29,900	70,000	5.3	44.6	11.8
Nevada	35,200	70,000	7.1	52.2	13.6
New Hampshire	35,200	70,000	3.2	27.7	11.5
New Jersey	45,800	70,000	18.4	32.1	57.2
New Mexico	35,200	70,000	8.9	73.7	12.0
New York	29,900	70,000	5.3	34.2	15.6
No. Carolina	45,800	70,000	21.7	37.1	58.5
No. Dakota	35,200	70,000	16.9	136.1	12.4
Ohio	35,200	70,000	2.8	25.6	11.1

a small change in demand. All other states may face a significant loss of investors.[8]

The effect of these changes on the cost of borrowing in each state depends on how much demand falls short of local borrowing needs. Table 2 (column 4) presents estimates of the amount of borrowing per investor if 1984 borrowing needs continue. Virtually all the 41 states losing middle-bracket investors will have per capita borrowing levels that exceed current levels.

New York provides an illustration of the consequences of losing a large number of investors in the critical $29,000 to $70,000 range. New York borrowers currently issue about $5,000 in bonds per potential resident investor annually. This is low, but middle-bracket investors represent all but 15 percent of the investor pool. This is the very group that is likely to drop out of the market at current yields. If New York borrowers were to lose middle-bracket investors, their sales to resident investors would need to average $34,000 per potential investor. At present, only two states issue such a large amount of debt per capita.

The reduced pool of investors may not absorb so much debt at current yields. Evidence cited earlier suggests that the states with per capita borrowing above $10,000 may currently rely on out-of-state investors for at least part of their borrowing needs. Short of reducing their future bond issuance substantially, borrowers in the

[8]The current spread between municipals and taxable bonds is larger at short maturities than at longer-term maturities. The loss of in-state demand will be largest at the maturities with the largest spreads along the future yield curve.

Table 2

State Characteristics of the Regional Municipal Bond Market, *continued*

State	Minimum tax bracket of resident investors* In dollars: 1984 law (1)	Minimum tax bracket of resident investors* In dollars: Proposed law (2)	Dollar borrowing per potential resident investor† In thousands of dollars: 1984 law (3)	Dollar borrowing per potential resident investor† In thousands of dollars: Proposed law (4)	Retention of potential resident investors under proposed law‡ In percent (5)
Oklahoma	35,200	70,000	5.6	38.5	14.4
Oregon	29,900	29,000	4.7	4.7	§
Pennsylvania	35,200	70,000	5.3	45.5	11.6
Rhode Island	35,200	70,000	11.2	95.7	11.7
So. Carolina	35,200	70,000	10.1	94.5	10.7
So. Dakota	35,200	70,000	11.5	115.8	9.9
Tennessee	35,200	70,000	5.5	46.7	11.8
Texas	35,200	70,000	8.3	53.2	15.6
Utah	35,200	70,000	21.2	215.0	9.9
Vermont	45,800	70,000	30.6	55.0	55.6
Virginia	35,200	70,000	4.1	28.4	14.3
Washington	29,900	70,000	3.5	28.3	12.3
W. Virginia	35,200	70,000	4.4	46.0	9.7
Wisconsin	35,200	70,000	3.6	36.3	10.0
Wyoming	45,800	70,000	60.7	104.4	58.1

*The minimum taxable income in 1984 at which the Public Securities Association estimates of the average net interest cost on in-state municipal bonds exceeds both the aftertax return on ten- and 20-year Treasury bonds (whose 1984 yields averaged 12.46 percent) and the aftertax return on Baa corporate bonds (whose 1984 yields averaged 14.14 percent). See Appendix 1 for the formulas used to calculate combined federal and state income taxes. State and federal tax schedules are available from the authors on request. Use of narrower yield spreads in the calculations would result in lower minimum income levels. Calculations under the proposed law take into account both revised income tax brackets and repeal of federal deductibility, except for Iowa (see footnote below).

†For states with minimum taxable income levels up to $35,200 the number of potential investors is approximated by the number of federal returns with adjusted gross income (AGI) above $30,000. For states with minimum taxable income levels of $45,800 or $50,000 the proxy is the number of returns with AGI above $50,000. For a taxable income level of $70,000, the number of returns with AGI over $70,000 is computed as all returns above $100,000 AGI and one half the returns between $50,000 and $100,000 AGI. These estimates assume that 1984 levels of borrowing continue. Some other tax proposals may reduce future borrowing from current levels.

‡The estimated number of potential resident investors under the proposed law as a percentage of current potential resident investors.

§Virtually all potential resident investors will be retained.

¶If deductibility is repealed, the spreads used in the calculations are too large for in-state municipals to be attractive to residents at any income level. Therefore, the effect of repeal of deductibility is not reflected here.

Sources: Public Securities Association; Hueglin and Ward, *op. cit.*; Internal Revenue Service, *Statistics of Income*; Advisory Commission on Intergovernmental Relations; and Federal Reserve Bank of New York staff estimates.

majority of states, therefore, would have two options.[9]

- They could increase yields by enough to induce the remaining resident investors to increase their holdings of in-state bonds.

- They could sell their bonds out-of-state and pay premium yields to overcome the tax barriers other states may impose.

Table 3 (column 1) presents estimates for selected states of the increased yields necessary to replace the lost investors. For states losing investors, the estimated increases range from 4 to almost 60 basis points. For example, for New York borrowers to sell all their bonds to the remaining resident investors, they would need to increase the average yield by an estimated 46 basis points over the 1984 average interest cost of 9.04 percent reported by the Public Securities Association. In dollar terms, this increased yield would raise the debt service on a $10 million, 20-year bond issue by $920,000 over the life of the issue.

An important reason some states may need larger increases in yields than others is the difference in the share of resident demand for in-state bonds which middle-bracket residents now represent. Appendix 2 presents a method for estimating these shares.

In states with the largest estimated cost increases, middle-bracket residents currently represent a disproportionately large share of demand compared with top-bracket residents. To replace middle-bracket demand, the remaining top-bracket investors must be induced by large increases in yields to raise the share of their income being invested in local bonds.

By contrast, states in which top-bracket residents already account for most resident demand would have an easier time replacing their middle-bracket resident investor pool. For example, even though middle-bracket residents comprise about 90 percent of Utah's pool of potential resident investors, they have only an estimated 73 percent of the income of the pool. Utah may have to give only a 4-basis-point increase in yields to convince its top-bracket residents to invest enough additional income in local bonds.

As an alternative, borrowers may try to attract out-of-state investors. In outside markets they will have to compete with more borrowers, some of whom are facing the same problem. In addition, they may need to attract investors from states that tax the income on out-of-state bonds. Repeal of federal deductibility of state income taxes will have important effects on their cost of going out-of-state.

Increased barriers against out-of-state borrowing

Repeal of federal deductibility of state income taxes would remove the moderating role of federal tax law on state tax preferences. Effective state taxes on out-of-state bonds would rise, placing outside borrowers at a much greater yield disadvantage than they currently face relative to in-state borrowers.

Estimates of the increased size of these preferences are shown in Table 3 (column 2) for selected states. Since states differ in their tax rates and rules, repeal of federal deductibility would have different effects across states on the value of tax preferences.

For example, for a New York resident, repeal of deductibility would reduce the aftertax return of an out-of-state municipal bond by 35 basis points.[10] An outside borrower would have to increase the before-tax yield it pays by at least that much before it could compete with comparable New York borrowers for New York investors. This increase comes in addition to the 63-basis-point disadvantage out-of-state borrowers currently face in attracting New York residents.[11]

Some in-state borrowers in the 35 states with tax preferences may benefit from the increased barriers against outside borrowers. The increased value of state tax exemption may allow some in-state borrowers to reduce the yields they offer to residents. Residents who now hold out-of-state bonds may also replace some of them with in-state bonds and soften the effect of the loss of middle-bracket investors.

Combined effects of federal changes

The majority of municipal bonds are already sold on a regional basis in the United States. Revision of federal tax rates and repeal of deductibility would reinforce and possibly strengthen this local orientation of municipal financing. Repeal of deductibility would increase the incentive for borrowers to rely exclusively on resident demand for their bonds. At the same time, the possible loss of middle-bracket demand because of reduced federal tax rates would create a need for more intensive regional marketing of bonds in order to ensure enough resident investors for current borrowing needs.

Self-sufficiency in financing local borrowing with local investment, however, will be far easier for some states than for others. The combined effects of federal tax reduction and repeal of deductibility divide the states into three classes according to the

[9]A reduction of borrowing may occur in some states as a result of proposed restrictions on certain types of municipal bonds. Data are not available to permit estimation of possible reductions by state.

[10]New York City residents will be affected to a greater extent because they also pay local income taxes on out-of-state bonds.

[11]Hueglin and Ward, *op.cit.*

Table 3

Possible Effects of Personal Income Tax Reform on In-State Borrowing Costs

In basis points

State	Increased cost of in-state borrowing*	Increased tax barriers against out-of-state borrowers†
Alabama	14	15
Arkansas	0	19
California	0	13
Delaware	0	19
Florida	17	0
Hawaii	0	21
Indiana	59	0
Kentucky	19	18
Maryland	0	20
New York	46	35
Ohio	54	17
Oregon	0	27
Texas	25	0
Utah	4	0
Wisconsin	39	0‡

*The increase in in-state borrowing costs necessary to maintain current resident demand if federal tax rates become 15 percent for incomes to $29,000, 25 percent for incomes to $70,000, and 35 percent for incomes over $70,000.

†The decrease in a resident investor's aftertax return on an out-of-state bond relative to an equivalent in-state bond if federal deductibility of state income taxes is repealed.

‡The repeal of federal deductibility will reduce the resident investor's aftertax return on both in-state and out-of-state bonds by about 30 basis points. Because this state taxes both in-state and out-of-state municipal bonds, however, the repeal of deductibility will not affect the spread between the two types of bonds for a resident investor. A similar effect will occur in Iowa and Illinois.

Source: Federal Reserve Bank of New York staff estimates.

probable future cost of financing public projects:

- states which are most likely to face *increased* borrowing costs because of a large decline in middle-bracket demand and an absence of tax barriers to discourage residents from financing out-of-state projects;
- states that are most likely to become more autonomous with *reduced* borrowing costs because of a continued large potential resident investor pool and increased tax barriers to discourage out-of-state investment; and
- states that may become more autonomous but with *varying* changes in borrowing costs because a reduced resident investor pool will face increased barriers to investing out-of-state.

The 15 states without tax preferences will be the markets of choice for borrowers from out-of-state who need to replace their lost middle-bracket investors. The increased number of borrowers competing for a reduced investor pool may create substantial pressures on borrowers to raise yields.

For example, Texas borrowers may need to increase yields by an estimated 25 basis points in order to induce top-bracket resident investors to replace the demand of middle-bracket residents. If more out-of-state borrowers also try to attract investors in this state, the larger supply may force yields even higher for in-state borrowers. This effect could be limited if tax preferences were introduced.[12]

By contrast, nine states would encounter no loss of resident demand and their protection from outside competition would increase. For example, Oregon borrowers would increase their yield advantage over outside competition by an estimated 27 basis points while their borrowing needs would remain at the low level of $4,700 per resident investor. One consequence is that they might be able to reduce the yields they offer residents.

Twenty-six states may encounter the third class of effects: reform would increase the benefits of financial self-sufficiency at the same time that it would erode their ability to be self-sufficient. New York best represents this conflicting situation. In-state borrowers would be protected from outside competition for funds by one of the largest increases in tax preferences for in-state resident investment. At the same time, the predominance of middle-bracket residents in the New York investor pool would cause one of the largest decreases in resident demand. If the latter effect is larger, as estimated in Table 3, enhanced tax barriers would be of little benefit, and local borrowers might need to go out-of-state. They would have to find new markets, introduce unfamiliar New York local bonds to new investors, and possibly pay high enough yields to offset out-of-state taxation.

A final issue in evaluating federal tax reduction and repeal of deductibility is the effect of increased reliance on regional municipal bond markets. Under current law, states with large borrowing needs but relatively small high-income populations can seek investors in other states usually at little additional cost. These tax pro-

[12]The benefits of introducing tax preferences would be especially large in Wisconsin, Iowa, and Illinois which may lose resident demand as a result of each federal tax proposal. These states currently have no tax preferences because in-state bonds are taxed at the same rate as out-of-state bonds. Uniquely for them, repeal of deductibility would reduce resident aftertax returns on *in-state* bonds—by as much as 30 basis points in Wisconsin. Exemption of in-state bonds would prevent this effect and limit the problem to the replacement of middle-bracket demand.

posals would encourage states to tax out-of-state investment and to solve their financing needs more completely in local markets. Because of the variety of state tax laws and the diverse abilities of states to be financially self-sufficient, however, not all regional markets would fare equally well.

Allen J. Proctor and Julie N. Rappaport

Appendix 1: State Tax Formulas

This appendix presents the formulas used to calculate effective state and federal income tax rates on municipal, corporate, and Treasury bonds. These formulas are applied to taxable bond yields to determine the minimum income tax bracket for potential resident investors in each state (Table 2). They are also used to calculate the effect of repeal of deductibility on aftertax returns of out-of-state municipal bonds (Table 3, column 2). Tax rates on fixed income securities for states can be divided into six groups on the basis of their deductibility formulas. The formulas use the following symbols:

F = Federal marginal income tax rate
S = State marginal income tax rate
d = Deductibility of state and local income tax from the federal tax base:
  d = 1 under 1984 tax law
  d = 0 under proposed federal tax law
C = Effective combined federal and state income tax rate on corporate bonds
T = Effective combined income tax rate on Treasury bonds
M = Effective combined income tax rate on out-of-state municipal bonds

Under current law, taxpayers who itemize on their federal returns may deduct their state and local income tax from their federal taxable income, for states that impose a state tax. In those states that do not, only the federal tax rate, F, applies to both Treasury and corporate bonds, and the effective tax rate on all municipal bonds is zero. These states are Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming.

For many states, deduction of state and local income tax from federal taxable income reduces the effective state tax rate. These are their formulas:

$$C = F + [S(1-dF)]$$
$$T = F$$
$$M = S(1-dF)$$

These tax formulas apply to Arkansas, California, Connecticut, Delaware, Georgia, Idaho, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia, and Wisconsin. For Illinois and Wisconsin, the formula is the same for out-of-state municipals and in-state municipals.

Some states seek to lessen the tax burden further by also allowing the deduction of federal income taxes from state taxable income. For Alabama, Arizona, Iowa, Kentucky, Louisiana, Montana, and Oklahoma these tax formulas apply:

$$C = F + [[(1-dF)(S-FS)]/(1-dFS)]$$
$$T = F - [[(1-dF)(FS)]/(1-dFS)]$$
$$M = [S(1-dF)]/(1-dFS)$$

For Iowa the formula for out-of-state municipals also applies to in-state municipals.

In other states, however, the additional tax savings from state deductibility of federal taxes are reduced because all state and local income taxes that were subtracted from the federal tax base must be added back into the state tax base. As a consequence, Colorado, Kansas, Minnesota, Missouri, North Dakota, and Utah use these formulas:

$$C = F + [[(1-dF)(S-FS)]/(1-dFS-dS)]$$
$$T = F - [[(1-dF)(FS)]/(1-dFS-dS)]$$
$$M = [S(1-dF)]/(1-dFS-dS)$$

In some states, income tax is calculated as a percentage of federal income tax. For Nebraska, Rhode Island, and Vermont, one formula applies to both corporate and Treasury bonds:

$$C = T = [F(1+S)]/(1+dFS)$$

Tax treatment of municipal bonds differs among the three. Since Rhode Island exempts only in-state municipals from income tax, it has a separate tax formula for out-of-state municipals:

$$M = [FS(1-dF)]/(1+dFS)$$

On the other hand, Nebraska and Vermont exempt *all* municipal bonds, so that the effective combined tax rate on these securities is zero.

Finally, in Hawaii, state income tax is deductible from the state income tax base as well as from the federal tax base. As a result, Hawaii has unique tax formulas:

$$C = F - [[dFS/(1+S)] + [S/(1+S)]]$$
$$T = F$$
$$M = [S/(1+S)] - [dFS/(1+S)]$$

Appendix 2: Estimating Resident Demand

This appendix summarizes the methodology for estimating the demand for in-state bonds by resident investors. It also explains the calculation of the interest rate effects presented in Table 3 (column 1). In order to estimate the aggregate demand of potential investors in a given state two problems must be overcome. First, data on aggregate state income by bracket are provided for adjusted gross income (AGI). In contrast, taxable income is the basis for determining the minimum income of a potential investor. Consequently, the minimum taxable income levels in Table 2 must be converted to AGI. The initial AGI estimate is based on the ratio of AGI and taxable income for each state and the ratio nationally for each AGI bracket. This estimate is further adjusted by the average amount of state and local income tax deducted by the average taxpayer at that level of AGI.

The second problem occurs in estimating the aggregate AGI of residents above this minimum level. Internal Revenue Service (IRS) data on state aggregate AGI by income level use bracket ranges that are larger than the range of most of the income levels examined in this study. As a result, interpolating aggregate income within the published income brackets requires estimating an income distribution function for each state using the following procedure.

Based on IRS data on the number of returns and the value of income in each AGI bracket, we plotted two cumulative logarithmic distribution functions for each state: the cumulative percentage of returns by AGI bracket and a Lorenz curve of cumulative percentage AGI and cumulative percentage returns. We located the estimated minimum AGI levels along each distribution function with a cubic spline function and then converted the results into the total state AGI above each minimum AGI level.

The aggregate AGI of resident investors above the minimum taxable income level is approximated under 1984 law and the proposed law. The change in aggregate income due to the proposals is adjusted for the assumption that 70 percent of the residents deducted state income tax from federal taxable income and that they invested an average of one percent of their gross income in municipal bonds each year. This income reduction is divided by bond issuance in each state to approximate the percent change in demand for in-state bonds. Using an interest elasticity of 1.27, the percent change in net interest cost is calculated. The value in basis points is based on the 1984 average net interest cost for each state estimated by the Public Securities Association. The elasticity estimate is taken from Patric Hendershott and Timothy Koch, "An Empirical Analysis of the Market for Tax-exempt Securities", Monograph Series in Finance and Economics, New York University, Monograph 1977-4. For a discussion of using cubic spline interpolations of income distributions, see Christine Cumming and Roger Kubarych, "The Economic Effects of the Tax Deductibility of Interest", *Nominal and Real Interest Rates: Determinants and Influences,* Bank for International Settlements (1985).

Recent Instability in M1's Velocity

The behavior of M1's velocity during the 1980s has been remarkably different from the 1970s. After increasing about 3.5 percent per year during the 1970s, M1's velocity has shown virtually no growth during the 1980s (chart). And its volatility has increased remarkably. Velocity growth in the 1980s (measured from the fourth quarter of one year to the fourth quarter of the next) has already ranged from −5.6 percent to +5.3 percent. Over the entire decade of the 1970s, the range was from −0.1 percent to +6.0 percent.[1] Since the predictability of M1's velocity is a key element in implementing a monetary targeting strategy, such dramatic changes in the behavior of velocity raise questions about what the underlying causes might be.[2]

This article explores some of the reasons for the changed behavior of M1's velocity. The introduction of NOW accounts nationwide in 1981 is one factor. Another is the sharp decline in interest rates that has accompanied the reduction of inflation. In addition, swings in inventories and the deteriorating trade balance appear to be important. While the unusual behavior of velocity can be traced to several factors, these factors themselves, however, are not very predictable. Hence, movements in velocity measured in terms of GNP will probably continue to be difficult to anticipate.

The first section of this article presents a brief review of recent movements in money, income, interest rates, and velocity. The second section analyzes the recent behavior of velocity using a conventional money demand equation. The final section presents an alternative analysis using the money-income reduced form equation.[3]

Review of recent velocity movements

The declines in M1's velocity in three of the last four years are certainly related to movements in interest rates (Table 1, column 3).[4] In each year that velocity declined the Federal funds rate fell, with the largest decline in velocity occurring in the year with the largest percentage drop in the funds rate (1982-II to 1983-II, shown in Table 1, columns 2 and 3). In contrast, over the period from 1983-II to 1984-II the funds rate rose and velocity increased as well. Clearly, fluctuations in interest rates explain a large part of the movements in velocity. These movements reflect the public's changing demand for money as the level of interest rates and the opportunity cost of holding M1 balances change.

However, too much weight might be assigned to changes in interest rates if GNP is not a good proxy for

[1]Velocity is the ratio of GNP to M1. The behavior of velocity during the 1960s was quite similar to the 1970s. It grew about 3 percent per year, and stayed in a range of −0.2 to 5.9 percent.

[2]For more background on the 1982-83 decline in velocity, see "Monetary Targeting and Velocity", Conference Proceedings, Federal Reserve Bank of San Francisco (December 1983).

[3]Economists tend to look at the relationship between money and GNP, *i.e.*, velocity, from two different perspectives, the demand for money and the reduced form equation. In the demand for money, the public's holdings of M1 balances are related to current and lagged values of interest rates and GNP. The interest rate variable measures the cost of holding funds in M1 as opposed to investing them, while GNP measures the need for money for transactions purposes. In the reduced form equation, the growth of M1 is viewed as the primary determinant of aggregate demand. Hence, the growth of nominal GNP is related to current and lagged values of M1. Both of these approaches are useful in analyzing unusual movements in velocity.

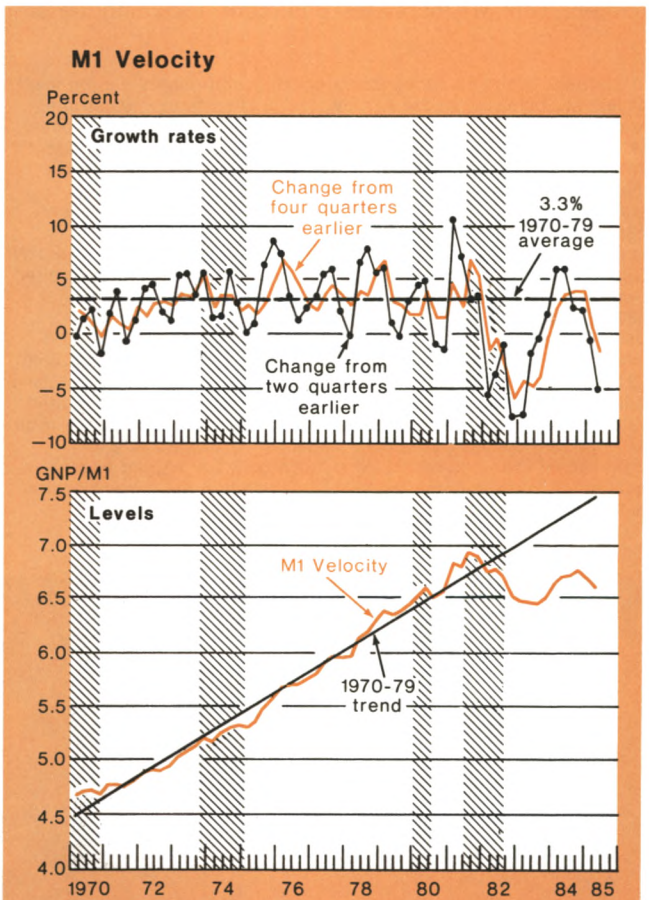
[4]The one-year periods run from the second quarter of one year to the second quarter of the next so that the first half of 1985 could be included.

the volume of transactions that is important for money demand. That is, in each of the three periods when velocity declined during the 1980s, GNP growth slowed because of a decumulation in inventories or a reduction of net exports or both. These two components of GNP may not generate demand for money to nearly the same extent as the other components of GNP. Hence GNP growth during the periods when velocity declined could have been understating the increase in the quantity of transactions balances demanded.

Velocity should measure the number of times per year a dollar of M1 is used for transactions purposes. GNP, however, is a measure of total production which can differ from total transactions for many reasons. For example, if consumers increase their transactions balances to purchase more goods, but firms choose to liquidate inventories rather than increase production, GNP is unchanged while M1 grows, and velocity declines. Likewise, if consumers increase their money balances to purchase more goods, but buy imports made attractive by a strong dollar, the money supply increases while GNP is constant, and velocity declines. Also, U.S. exports may affect the demand for money balances in foreign countries more than in the United States. Very little demand for M1 may be generated domestically by exports if inter-business transactions at the various stages of the production process result in relatively small balances in the checking accounts of business firms, compared with the balances consumers would keep to purchase the final product. Hence, if U.S. exports decline because of weak foreign demand, GNP falls while M1 demand remains relatively unaffected, and velocity weakens. In general, it might be better to look at gross domestic final demand (GNP less inventory investment and net exports) when assessing the transactions demand for M1.[5]

Inventories and net exports appear related to the recent declines in velocity measured in terms of GNP (Table 1, column 7). Over the past year, for example, gross domestic final demand has been running about two percentage points above GNP, and in the first half of 1985 when the decline in velocity was particularly sharp, the divergence was 3.2 percentage points. In the two earlier periods when velocity was declining, GNP growth was also weaker than gross domestic final demand. Since the transactions demand for M1 was stronger than GNP, velocity growth (measured in terms of GNP) appeared unusually weak. If no allowance was made for the effects of inventories and net exports, then too much weight might be given to interest rates in explaining movements in velocity.

Changes in net exports and inventories have also been an important source of quarter-to-quarter volatility in velocity. Table 2 presents the ten largest deviations in M1's velocity (measured in terms of GNP) from its trend growth rate over the past ten years in descending order. The third column shows the reduction of the deviations when velocity is computed with net exports and inventories excluded from GNP. In every case, the deviation of velocity from trend becomes smaller, with an average reduction of four percentage points.



Shaded areas represent periods of recession, as defined by the National Bureau of Economic Research.

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

[5]As long as the empirical analysis is done in a long-run context, the distinction between GNP and gross domestic final demand would not be all that important. Their long-run average growth rates have been about the same. However, during the 1980s net exports and inventories have had much larger effects than in the past and, therefore, the distinction between GNP and gross domestic final demand has become more important for understanding the demand for M1. For example, the mean absolute difference between the growth rates of GNP and gross domestic final demand has been 2.7 percentage points in the 1980s compared with 2.1 percentage points in the 1970s and 1.8 percentage points in the 1960s.

Analysis using a demand for money equation

An econometric model of the demand for M1 can also illustrate the effects of inventories and net exports. In the conventional transactions approach, real GNP and short-term nominal interest rates, currently and in past quarters, determine the volume of real M1 balances.[6] In this article, the difference between real GNP and real gross domestic final demand (that is, the impact of net exports and inventories on GNP growth) is an additional explanatory variable used to capture the effect noted in the previous section.

A few calculations will show the contribution of this variable in the money demand equation. Ignoring time lags and the impact of the interest rate variable, assume an income elasticity of 0.5. That would yield a relationship: $m = 0.5y$, where m is the growth rate of real M1 and y is real GNP's growth rate. If GNP increases 10 percent, real M1 increases 5 percent. Including the difference between real income and gross domestic final demand (yf) would result in the following equation, assuming the elasticities of y and yf are both 0.5:

$$m = 0.5y - 0.5\,(y - yf)$$

In this case, a 10 percent increase in GNP due to a 10 percent increase in gross domestic final demand causes m to increase 5 percent as in the previous example. However, if yf increases 10 percent but y does not increase because inventories are run down, m will still increase 5 percent. In other words, the transactions demand for m will increase when the volume of transactions increases, even if GNP (the level of gross domestic production) does not increase because of inventory rundowns or increased imports.

The empirical results show that inventory investment and net exports are statistically important in a money demand equation (Table 3). The estimated coefficient for this variable is highly significant (at the 98.6 to 99.9 percent levels) in the three sample periods, thus improving the explanatory power of the equation about 20 percent. Moreover, the coefficient on the current quarter's GNP becomes more significant with the addition of this variable.

To show the importance of this additional variable for tracking the growth of M1 during the past few years, the regression equation was simulated after estimating the coefficients with and without the additional variable (Table 4). The simulation results are reported using coefficient estimates obtained from the 1971-80 and 1975-84 sample periods. The earlier sample period allows for an 18 quarter simulation period beyond the last year used for estimation. Alternatively, the 1975-84 sample period includes several quarters important for obtaining good coefficient estimates. Movements in M1, GNP, interest rates, inventories, and net exports were

[6] In the past, the most conventional specification related the log level of real M1 balances to the log levels of a short-term interest rate, real GNP, and lagged real M1 balances. For example, see Stephen M. Goldfeld, "The Demand for Money Revisited", *Brookings Papers on Economic Activity III* (1973), pages 577-638, and "The Case of the Missing Money", *Brookings Papers on Economic Activity III* (1976), pages 683-739. More recent research, however, suggests changes in logs, rather than log levels, would be a better way to specify the equation. See, for further detail, James S. Fackler and W. Douglas McMillin, "Specification and Stability of the Goldfeld Money Demand Function", *Journal of Macroeconomics* (Fall 1983), pages 437-459. In such equations, the coefficient on lagged money balances is quite small, suggesting that the lag from income and interest rates to money demand is short. To avoid constraining both GNP and the interest rate to the same implicit lag structure by using a lagged dependent variable, in this article the current and lagged values were incorporated directly in the regression. It appears to be an important distinction to make because the interest rate is insignificant in the current quarter, but significant lagged one quarter. GNP, on the other hand, is significant in the current quarter, but insignificant lagged one quarter.

Table 1

Recent Velocity Movements

In percent

Time period	Change in the level of Federal funds rate (1)	Percentage change in the level of Federal funds rate (2)	Velocity growth (3)	M1 growth (4)	Nominal GNP growth (5)	Gross domestic final demand growth (6)	Difference (7)=(6)−(5)
1984-II to 1985-II	−2.6	−25	−1.4	+7.3	+5.8	+7.6	+1.8
1983-II to 1984-II	+1.8	+20	+3.7	+7.5	+11.6	+10.9	−0.7
1982-II to 1983-II	−5.7	−39	−4.6	+11.9	+6.7	+8.4	+1.7
1981-II to 1982-II	−3.3	−18	−0.2	+5.1	+4.9	+5.7	+0.8

quite sharp in the 1980s. Moreover, financial innovation and deregulation have affected the demand for M1 since the mid-1970s, suggesting that earlier data might bias coefficient estimates.

In the 1971-80 sample period, including the difference between GNP and gross domestic final demand in the equation causes the average absolute forecast error of the one-quarter growth rate of M1 to fall 1.4 percentage points, or almost one-third. This, of course, still leaves an average quarterly miss of three percentage points. In the second sample period, ending the estimation period in 1984 leaves only two quarters to test the model's ability to track actual money growth beyond the estimation period.

However, these two quarters are of particular interest because of the extremely sharp decline in velocity. Therefore, the objective of this exercise is to see whether an equation estimated through the early 1980s, when velocity growth slowed and its variability increased, could track this most recent acceleration in M1 growth. The equation predicts 9 percent growth for the first half of 1985, while the actual growth is 10.4 percent. This relatively accurate forecast results from the larger estimated interest rate elasticity (in absolute value) in the later time period that occurs when earlier data are excluded and from the additional variable to control for the effects of inventories and net exports.[7]

Table 2

Ten Largest Deviations in Velocity (Quarterly growth rates, from 1975 to 1985)

In percentage points at annual rates

Date	Deviation in velocity growth from 1975 to 1985 average: Using GNP	Using GNP less inventories and net exports	Difference in absolute value
1981-I	16.0	8.3	7.7
1982-IV	−13.7	−8.6	5.1
1982-I	−10.8	−6.1	4.7
1978-II	10.3	7.4	2.9
1980-III	−8.3	−6.5	1.8
1985-II	−7.6	−3.6	4.0
1981-III	7.5	4.7	2.8
1985-I	−7.0	−5.8	1.2
1975-III	6.8	3.1	3.7
1984-I	5.8	0.8	5.0
Mean absolute average	9.4	5.5	3.9

Analysis using a reduced form equation

Another way to analyze velocity movements is by using a reduced form equation relating the current quarter's GNP growth rate to current and past M1 growth.[8] In this section, the analysis with the reduced form equation shows that much of the apparent instability in velocity, particularly in 1982 and 1985, stems from inventories and net exports as well as from the introduction of nationwide NOW accounts in 1981.

The reduced form equation says that GNP growth equals average velocity growth plus a weighted average of M1 growth in the current and four past periods. In other words, recent M1 growth is the primary determinant of current nominal aggregate demand. The basic form of this equation is shown as equation 1 in the right side of Table 5. To further refine this relationship, an article in an earlier *Quarterly Review* showed that M1 growth coming from other checkable deposits (OCD) tends to have only a little more than half of the impact on GNP that M1 growth coming from currency and demand deposits (MA) has.[9] This result appears in equation 2. The third equation in Table 5 is the same as the second equation except that gross domestic final demand (YF) replaces GNP (Y) as the dependent variable.

In the context of the reduced form equation, the logic for subtracting inventories and net exports from GNP is different from that for money demand. In this case, stronger M1 growth creates greater demand for goods and services, but if imports or inventories satisfy some of that demand, GNP growth does not pick up as much

[7]Other analysts have noted that the interest elasticity in the conventional money demand equation increases in absolute value when the sample period excludes earlier data. In part, this could be due to the nationwide introduction of NOW accounts in 1981. NOW accounts earn explicit interest and consumers with NOW accounts could be more sensitive to changes in market rates than those with demand deposits. Moreover, with the introduction of money market funds and MMDAs, it has become easier for consumers to shift their liquid assets into and out of M1 when market rates change. For more detail, see Howard Roth, "Effects of Financial Deregulation on Monetary Policy", *Economic Review*, Federal Reserve Bank of Kansas City (March 1985); and M.A. Akhtar, "Financial Innovations and Their Implications for Monetary Policy: An International Perspective", Bank for International Settlements, *Economic Papers No. 9* (December 1983).

[8]Over the years, many objections have been raised to the reduced form approach. In particular, M1, like GNP, is an endogenous variable and the correlation observed in the reduced form equation results from both variables responding in a systematic way to other factors in the economy. Even if M1 is not exogenously determined, however, this relationship can be useful if M1 responds sooner to these other factors and hence is a good leading indicator of GNP. For more detail, see John Wenninger, "The M1-GNP Relationship: A Component Approach", this *Quarterly Review* (Autumn 1984).

[9]Wenninger, *op. cit.*

Table 3

Estimation Results for the Demand for Money

Sample period	Dependent variable	Coefficient estimates						Summary statistics		
		Constant	r	r(−1)	y	y(−1)	NE+II	ρ	$\bar{R}^2$	SE
1960-84	m	−0.0013	0.0065	−0.039	0.32	0.094	*	0.28	0.41	0.0070
		(1.0)	(1.1)	(6.3)	(4.1)	(1.2)				
1960-84	m	−0.0024	0.0063	−0.031	0.49	0.036	−0.49	0.29	0.48	0.0065
		(1.9)	(1.1)	(5.3)	(5.8)	(0.5)	(4.1)			
1971-80	m	−0.0043	0.014	−0.027	0.48	−0.013	*	0.10	0.51	0.0070
		(2.7)	(1.6)	(3.2)	(4.3)	(0.1)				
1971-80	m	−0.0056	0.011	−0.021	0.63	−0.009	−0.55	0.06	0.58	0.0065
		(3.8)	(1.3)	(2.6)	(5.3)	(0.1)	(2.5)			
1975-84	m	−0.0001	0.0055	−0.061	0.24	0.095	*	0.32	0.50	0.0081
		(0.0)	(0.5)	(5.8)	(1.8)	(0.7)				
1975-84	m	−0.0014	0.0038	−0.045	0.46	−0.005	−0.69	0.38	0.61	0.0069
		(0.6)	(0.4)	(4.7)	(3.6)	(0.0)	(3.9)			

Definition of variables:
m = Δln (M1/GNP deflator). r = Δln (3-month Treasury bill rate). y = Δln (real GNP).
NE+II = Δ(ln [real GNP] − ln [gross domestic final sales/GNP deflator]).
*Not included.

Table 4

Simulation Results for the Demand for Money

In percent at annual rates

Date	Actual M1 growth	Predicted M1 growth using equation estimated 1971-80		Predicted M1 growth using equation estimated 1975-84	
		Without net exports plus inventory investment	With net exports plus inventory investment	Without net exports plus inventory investment	With net exports plus inventory investment
1981-I	3.3	6.6	5.1	0.7	−0.2
1981-II	8.8	−2.2	−0.2	5.5	6.1
1981-III	3.1	14.0	12.3	12.4	11.5
1981-IV	5.1	−3.8	−2.4	−0.2	0.6
1982-I	8.9	6.9	7.8	8.1	9.7
1982-II	2.9	7.3	4.9	2.3	0.3
1982-III	5.9	0.6	4.0	3.5	6.9
1982-IV	16.3	10.2	10.4	12.9	12.6
1983-I	11.3	19.0	13.9	16.1	10.1
1983-II	12.2	9.7	13.5	6.0	11.3
1983-III	10.2	11.5	10.6	12.4	10.7
1983-IV	6.3	9.9	10.1	9.6	10.2
1984-I	6.2	10.1	8.0	10.4	7.7
1984-II	6.5	3.1	7.2	3.0	8.1
1984-III	4.5	4.2	2.2	4.9	2.6
1984-IV	3.2	3.6	3.6	3.3	3.7
1985-I	10.6	6.7	6.3	10.5	9.0
1985-II	10.2	7.7	9.8	5.7	9.1
Average absolute error		4.5	3.1	3.0	2.3

as would be expected. Slow GNP growth relative to M1 growth reduces velocity from what it would have been if domestic production had risen. Likewise, the demand for exports can weaken significantly for reasons unrelated to M1 growth; for example, sluggish growth in the economies of our trading partners. Reduced demand for exports weakens GNP but leaves M1 growth unchanged, causing velocity growth to slow.

The left side of Table 5 shows the simulation errors from each of these three equations. Average errors appear in the upper half of the table and average absolute errors in the lower half. The average error (a measure of bias) for the entire period falls from −2.8 percentage points to −1.1 percentage points when OCD and MA are allowed to have different impacts on GNP growth. It declines further, to just −0.4 percentage point, when YF replaces Y as the dependent variable. The reduction of the average error for the entire period stems mostly from better performance in 1982 and in the first half of 1985.

Another striking improvement is the decline in the average absolute error (lower half of Table 5). The average absolute error declines from 5.3 to 4.4 percentage points when OCD and MA are allowed to have different-sized impacts, and declines further to 2.7 percent when gross domestic final demand is used as the dependent variable. The reduction of the error for the period as a whole is found in mostly 1981, 1982, and the first half of 1985.

The questions remain whether GNP growth in individual quarters has been particularly difficult for these equations to track and whether the distinction between GNP and gross domestic final demand would have made any difference in those quarters.[10] Table 6 shows

[10]One way of exploring this question is to include a zero-one dummy variable for each quarter since 1979. Those dummy variables that are statistically significant—the estimated coefficient before the dummy variable is significantly different from zero using a t-test—occur in quarters where the equation had significant forecast errors. For more on this approach, see R.W. Hafer, "Monetary Stabilization Policy: Evidence from Money Demand Forecasts", Federal Reserve Bank of St. Louis *Review* (May 1985).

Table 5

Reduced Form Results

In percentage points at annual rates

In-sample average errors	Y on M (1)	Y on MA, OCD (2)	YF on MA, OCD
1980	−0.1	0.0	0.1
1981	1.5	4.1	2.7
1982	−7.6	−4.2	−1.8
1983	−3.6	−1.9	−3.4
1984	0.6	2.0	1.6
1985 (first half)	−6.3	−5.8	−2.6
1980-85	−2.8	−1.1	−0.4
In-sample average absolute errors			
1980	2.4	2.5	2.7
1981	6.8	6.2	3.3
1982	7.6	4.2	1.8
1983	3.6	2.6	3.5
1984	2.3	2.9	2.1
1985 (first half)	6.3	5.8	2.6
1980-85	5.3	4.4	2.7

Equations	$\bar{R}^2$
(1) $Y = 3.4 + 0.97M$ (6.2)	0.23
(2) $Y = 2.9 + 1.17MA + 0.65\ OCD$ (6.7) (3.4)	0.27
(3) $YF = 3.4 + 1.08MA + 0.66OCD$ (7.1) (3.9)	0.30

Sample periods: 1949-II to 1985-II

Y = quarterly growth rate of GNP.

M = quarterly growth rate of M1.

OCD = quarterly M1 growth due to the other checkable deposit components of M1.

MA = quarterly M1 growth due to M1 less OCD.

YF = quarterly growth rate of GNP less inventories and net exports.

The equations are estimated with polynominal distributed lags covering the current quarter and four lags.

the results by year for GNP and gross domestic final demand.[11]

In terms of GNP, four quarters out of 22 in the simulation period show statistically significant errors ranging from 10.7 to 13.5 percentage points: 1981-I, 1982-I, 1982-IV, and 1985-II. In all four cases, however, the errors become smaller (roughly half as large) in absolute value and turn statistically insignificant when gross domestic demand rather than GNP is used as the dependent variable. But the error in the first quarter of 1983 becomes larger in absolute value and turns significant when gross domestic final demand is used. In that quarter, when net exports and inventories were adding five percentage points to GNP growth, its growth was still considerably weaker than would have been expected from the very rapid pace of M1 growth. Hence, it appears that some "outliers" will still occur from time to time, even though the distinction between gross domestic final demand and GNP can reduce many of the large errors in the reduced form equation.

[11]The distinction between OCD and MA could not be made in this exercise. Nationwide NOWs were introduced in 1981. With a dummy variable for each quarter in the post-1979 period, it is not possible for the regression to assign separate weights to OCD and MA.

Conclusions

While it is not possible to account precisely for every quarterly movement in velocity, several factors have played important roles in recent years. From the point of view of money demand, these factors include the declines in interest rates, an increased responsiveness in the public's demand for M1 when interest rates change, and the consideration that GNP is not a good proxy for the total volume of transactions when net exports or inventories are strongly affecting its growth rate. From the perspective of the reduced form equation, the errors in predicting GNP with M1 are lowered when M1 growth is split into its interest bearing and non-interest bearing components, and when the distinction between GNP and gross domestic final demand is made.

However, it is very difficult to predict swings in inventories, net exports, interest rates, and the split in M1 growth among its components. Moreover, there has not been enough experience with M1 in this more deregulated environment to estimate very precisely the interest elasticity of the demand for M1. Hence, even though some of the reasons for the instability of velocity in the 1980s (measured in terms of GNP) can be identified *ex post*, velocity is not likely to be more predictable as a result.

Table 6

Significant Errors in Reduced Form Equations

In percentage points at annual rates

Quarter	1980		1981		1982		1983		1984		1985	
	Y	YF	Y	YF	Y	YF	Y	YF	Y	YF	Y	YF
I	1.8	1.0	10.7	3.1	−11.8	−5.9	−9.4	−12.5	4.6	−0.9	−6.5	−4.4
	(0.4)	(0.2)	(2.3)*	(0.7)	(2.5)*	(1.4)	(1.9)	(2.9)*	(1.0)	(0.2)	(1.4)	(1.0)
II	−1.3	−5.0	−6.1	−4.5	−3.8	−5.9	−6.0	−4.7	0.7	4.2	−10.0	−4.3
	(0.2)	(1.1)	(1.3)	(1.1)	(0.8)	(1.4)	(1.2)	(1.1)	(0.1)	(1.0)	(2.1)*	(1.0)
III	−3.8	−0.5	5.3	2.0	−6.8	−2.2	−5.9	−6.3	−3.2	−2.3		
	(0.8)	(0.1)	(1.1)	(0.5)	(1.5)	(0.5)	(1.2)	(1.5)	(0.6)	(0.5)		
IV	−1.0	1.0	−5.7	−4.1	−13.5	−5.9	−1.3	−2.3	−0.2	−0.6		
	(0.2)	(1.2)	(1.2)	(1.0)	(2.8)*	(1.3)	(0.3)	(0.5)	(0.0)	(0.1)		
Average error	−1.1	−0.9	1.1	−0.9	−9.0	−5.0	−5.7	−6.5	0.5	0.1	−8.3	−4.3
Average absolute error	2.0	1.9	7.0	3.4	9.0	5.0	5.7	6.5	2.2	2.0	8.3	4.3

Equations:

Y = 2.9 + 1.19 M + dummy variable for each post-1979 quarter.
(6.7)

YF = 3.2 + 1.12 M + dummy variable for each post-1979 quarter.
(6.7)

*Significant at 95 percent level, see notes in Table 5 for explanation of variables.

Lawrence J. Radecki and John Wenninger

The Strong Dollar and U.S. Inflation

U.S. inflation has changed remarkably little during the present recovery. Consumer prices rose at a 3.8 percent annual rate during the first half of 1985, barely different from the 3.7 percent increase posted for the first year of expansion.

The steadiness of the inflation rate over the past two and one-half years is somewhat surprising in view of several factors that might have reduced it further. Oil and several other key commodity prices have fallen sharply since 1982 (Table 1), while significant slack remains in labor markets, as indicated by an unemployment rate still above (according to most analysts) the "full-employment" level. In addition, the dollar has appreciated nearly 17 percent (trade-weighted average basis) over the same period (Chart 1). In the past, these conditions have often been associated with falling inflation—so why not during this recovery?

This article focuses on the dollar's impact on U.S. inflation over the last several years. The dollar's rise since 1982 has not led to the fall in aggregate import prices that past experience would have suggested, perhaps helping to explain why inflation has not moderated further. Much of the surprising relative strength of import prices can be attributed to the sharp recovery in domestic real growth, which led to increases in import demand that substantially offset the downward pressure on import prices from the dollar appreciation. This experience suggests that the dollar depreciation since February may not add much if at all to domestic inflation unless domestic demand picks up markedly from the sluggish pace of the first half of 1985.

Experience

The recent pattern of a strong dollar with virtually unchanged domestic inflation differs considerably from 1980 to 1982, when the dollar rose by 20 percent while the inflation rate fell nearly eight percentage points. It differs as well from the late 1970s experience of dollar depreciation accompanied by rising inflation. Of course, other factors, notably substantial differences in government policies, were primarily responsible for this contrast. Still, the impression persists that inflation has not responded to the dollar as much in the last two years as it did in the past.

Statistical estimates of the response of domestic prices to changes in the dollar, most derived from data drawn largely from the 1970s, reinforce this impression. Though estimates vary substantially, depending on the model and period of estimation (appendix), the consensus is that a 10 percent rise in the dollar's value will reduce the Consumer Price Index (CPI) inflation rate by about 0.6 percent in each of the following two years. On this basis, the dollar's appreciation since the last cyclical trough should have reduced the CPI by nearly 1.5 percent below the level it would otherwise have reached. But such a dampening effect on inflation from the rising dollar is not obvious from the actual data.[1] This raises a natural question prompted by the substantial fall in the dollar since last February: will U.S. inflation remain unaffected, or will it rise as the experience prior to 1982 might suggest?

Import prices

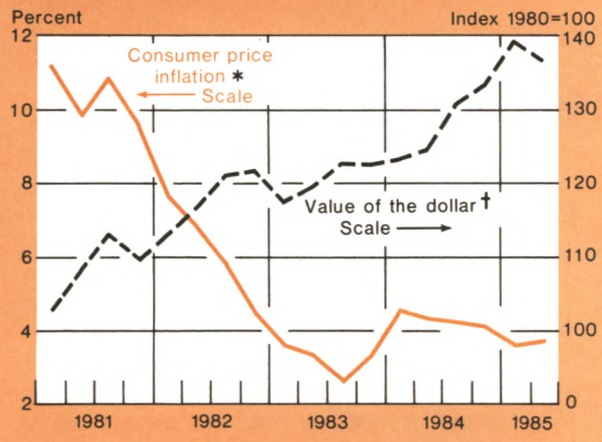
That the relation between exchange rate movements and inflation seems to vary is not surprising since the two are linked through several channels.[2] Changes in

[1] This is not to say that inflation did *not* fall through 1984. Rather, the extent of that decline, 0.4 percentage point, was slight relative to the movements in factors generally thought to influence inflation.

[2] By "linkage" we mean an association between the two endogenous variables (exchange rates and prices), not a statement about causation.

Chart 1

Inflation and the Value of the Dollar

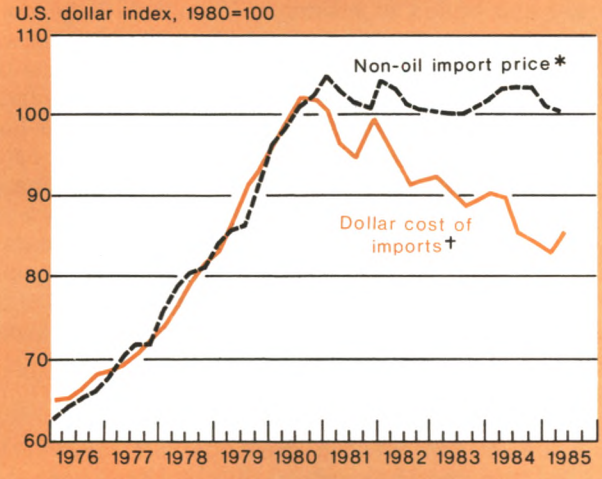


* Year-over-year annual rate.

† Trade-weighted average of dollar's value vis à vis 12 industrial countries' currencies; weights are bilateral shares of U.S. trade.

Chart 2

Price and Dollar Cost of Imports



* Non-oil import unit value index.

† Measured as the average of foreign export price indexes of 12 countries converted to dollars; weights are bilateral shares of U.S. trade.

Sources: International Monetary Fund, International Financial Statistics, various years and U.S. Department of Commerce.

the dollar directly affect import prices, which are components of the CPI and other domestic price level measures. Dollar appreciation, for example, reduces the cost expressed in dollars of foreign produced goods, allowing import prices to fall without any reduction of foreign exporters' profit margins. However, the extent to which this cost-reduction is "passed-through" to import prices may change with economic circumstances. Furthermore, the response of inflation to the dollar will also depend on how domestic product prices and wages are affected by import price changes, on the response of government policies, and possibly on other factors as well. Thus there are several potential explanations for the apparent change in the relation between the dollar and U.S. inflation in recent years.

Nonetheless, the following data suggest that a shift in the pass-through of dollar cost changes to import prices may be a significant part of the explanation. The trade-weighted value of the dollar increased by nearly 17 percent from the first quarter of 1983 through the second quarter of 1985, while foreign export costs (as measured by local currency export prices) rose by an average of 8 percent. Taken together, these suggest that the cost expressed in dollars ("dollar cost") of goods exported to the United States has declined by over 7 percent since the first quarter of 1983.[3] Since aggregate non-petroleum import prices have *risen* by nearly 0.4 percent over the same period, there effectively has been no pass-through of this change in dollar cost to the average price paid for imports in the United States. (Pass-through, *as defined here,* is the ratio of the actual change in import price to the change in dollar import cost over a given period). In effect, foreign exporters' profit margins have widened significantly with dollar appreciation. Note, however, that while nominal import prices have remained nearly flat, they have fallen substantially *relative* to prices of domestically produced goods.[4]

[3] The dollar cost of imports refers to their foreign production cost (in local currency) converted to dollars at prevailing exchange rates. Thus, for example, a 10 percent rise in the dollar would, all other factors unchanged, lower the dollar cost of U.S. imports by the same amount. Using aggregate foreign export price indexes to measure the local currency production cost clearly is only approximate (in part because the composition of aggregate foreign exports may differ from that of their exports to the United States). However some alternative measures (*e.g.*, foreign wholesale prices) lead to very similar conclusions.

[4] Import prices have declined nearly 9 percent relative to the CPI since the first quarter of 1983, so that dollar appreciation has had a significant impact on the "real" price (*i.e.*, relative to prices of domestic substitutes) and volumes of imports. Furthermore, the virtually zero pass-through (as defined here) does not mean that import prices necessarily would have remained unchanged had the dollar not appreciated. Indeed, the arguments later in the text and in the box suggest that import prices would have risen significantly further had the dollar stayed at its first quarter 1983 level.

The pass-through over the current recovery has been substantially lower than that seen in 1981-82, and strikingly lower than during the late 1970s (Table 2 and Chart 2). Indeed, the pass-through was more than complete over 1977-78, when the dollar was depreciating and U.S. inflation was rising, while it was about one-quarter over 1981-82, when inflation was declining.

Underlying the apparently low pass-through of the dollar appreciation to aggregate import prices is a fairly wide divergence among major product components (Table 3). The average price of imported automobiles (including parts) has increased nearly 10 percent since the cyclical trough, and over 30 percent since the end of 1980. Prices of imported capital goods have also risen over the recovery while imported consumer goods' prices have fallen only slightly. The price of industrial supplies (and of agricultural imports since 1980) has, by contrast, fallen considerably more. This divergence also differs from the 1977-78 period, when, except for autos, the increase in prices was significantly more uniform among categories.

The rise in auto prices after 1980 might be considered a special factor that has distorted the measured pass-through. This is because imports from Japan (which account for the bulk of total imports of finished autos) until recently were limited by an effective quota. Because of this quota, the dollar's rise is unlikely to have affected auto import prices significantly over this period. The price of imports excluding autos *and* parts has fallen by nearly 2.5 percent during the recovery, and by nearly 9 percent since the end of 1980, but the implied pass-through is still well below that for 1977-78.

Possible explanation

The apparently low pass-through of the dollar's appreciation to import prices might seem to reflect "monopolistic" or other noncompetitive practices. However, there is an alternative explanation that seems reasonably consistent with the actual record and is compatible with competitive behavior by exporting and importing firms.[5] This is based on changing relations among inflation, growth, and exchange rates since the 1970s, which have altered movements of import costs relative to the domestic demand for imports.

The dollar's depreciation over 1977-78 was substantially offset by differential U.S.-foreign inflation. Consequently, the dollar cost of imports from abroad, U.S. import prices, and the prices of domestically-produced goods all rose together and by roughly the same amount. By contrast, the dollar's rise since 1980 has

[5]This explanation is not meant to exclude the possibility of oligopolistic or monopolistic practices, at least in some industries. Furthermore, it does generally presume that U.S. import demand is a significant share of the world total.

Table 1

Consumer Prices and the Exchange Rate

Percent change

Period	United States CPI (1)	Dollar exchange rate* (2)	Index of oil prices (3)	End of period level: Unemployment rate (4)
1985-II/1984-II	3.7	9.5	−1.9	7.3
1983-IV/1982-IV ...	3.3	0.8	−13.7	8.5
1982-IV/1981-IV ...	4.5	11.1	−5.0	10.6
1981-IV/1980-IV ...	9.6	9.4	8.6	8.2
1980-IV/1979-IV ...	12.5	−0.7	43.2	7.4
1985-II/1983-I	9.3	16.5	−13.4	7.3
1982-IV/1980-IV ...	14.4	21.5	3.2	10.6
1978-IV/1976-IV ...	16.2	−9.9	9.8	5.9

*Trade-weighted average value of the dollar *vis-à-vis* currencies of 12 foreign industrial countries.

Table 2

Import Prices and the Exchange Rate

Percent change

Period	Foreign export cost* (1)	Dollar exchange rate (2)	Dollar import cost† (3)	Import price (4)
1985-II/1983-I	8.0	16.5	−7.3	0.4
1982-IV/1980-IV ...	9.8	21.5	−9.6	−2.3
1978-IV/1976-IV ...	7.9	−9.9	19.8	23.8

*Foreign export cost is measured as a trade-weighted average of export prices (in local currency) of 12 foreign industrial countries.

†Change in foreign export cost expressed in dollars (*approximately* equal to column 1 minus column 2).

Table 3

Components of Import Price Change

Category	Percent change unit value over: 1985-II/1983-I	1982-IV/1980-IV	1978-IV/1976-IV
Total non-oil	0.4	−2.3	23.8
Autos	9.7	17.5	34.7
Capital	7.3	−6.9	22.8
Consumer	−3.3	3.2	19.8
Industrial supplies	−8.2	−7.6	16.0
Food, feeds, and beverages ..	−0.3	−13.6	16.7
Import price excluding autos..	−2.4	−5.3	21.2

greatly exceeded U.S. relative to foreign inflation.[6] Thus the dollar cost of imports has fallen during the 1980s while domestic U.S. prices have continued to rise, although more slowly than before. In short, cost pressures reinforced domestic demand pressures to push import prices up during the late 1970s, but more recently these forces have tended to offset one another.

[6]This amounts to saying that the dollar's real value—its nominal value adjusted for U.S.-foreign inflation—has risen sharply since 1980, whereas it changed considerably less over 1977-78.

Supply and Demand Explanation

The argument can be put in the familiar supply and demand framework. The supply of imports typically increases with the ratio of the domestic selling price to the dollar cost of their production. This is represented by the upward-sloped supply schedule in Chart 3. Import supply also increases with foreign export capacity (which shifts the supply curve). Import demand declines as the domestic import price rises relative to the prices of domestically produced products, as shown by the downward-sloped schedule in Chart 3, and increases with domestic real income.

An exchange rate depreciation amounts to a reduction of supply—an upward shift in the supply schedule. With no change in demand, the extent of pass-through depends on the relative slopes of import supply and demand, and will generally be incomplete. The pass-through will be greater the more elastic is supply and inelastic is demand, and will be complete only if supply is perfectly elastic or demand inelastic. (More generally, the pass-through from an exchange rate change, given no change in domestic or foreign prices and incomes, is equal to the ratio of the supply price elasticity to the sum of the supply and demand price elasticities.)

However, when exchange rate depreciation is accompanied by domestic price and income increases, the demand schedule also shifts up (Chart 4). In this case, domestic demand increases reinforce the impact of dollar depreciation in raising the dollar cost of imports (the shift in supply), leading to a higher pass-through than when supply alone is shifting. The observed response of imports to the depreciation will thus be greater the more demand increases. Indeed, if domestic prices increase (relative to abroad) by the same proportionate amount as the exchange rate depreciates, the observed pass-through will be complete, regardless of the elasticities of import supply and demand (unless real growth rates diverge considerably). This is essentially the environment that prevailed over 1977-78, during which the pass-through of the dollar's decline appeared virtually complete in nearly all major import categories.

This can be seen in terms of the specific contributions of changes in import costs and import demand to import prices. To a foreign supplier sending goods into the U.S. market, a dollar depreciation amounts effectively to a proportionate increase in the dollar cost of delivering a given amount. But the extent to which this increase in cost is passed-through to the actual dollar import price also depends on what is happening to import demand. If demand is not growing, the foreign supplier can fully pass-through the increased cost to the price only by selling less than before. For this reason, the price is apt to rise somewhat less than the cost, that is, the pass-through will be less than complete, and exporters' profit margins probably will fall. However, the pass-through is apt to be greater if demand is increasing, either because prices of domestically produced goods are rising, making imports more attractive, or because domestic real income is growing. More generally, this implies that the apparent impact of exchange rate changes on domestic import prices is likely to be significantly greater when cost and demand pressures are reinforcing one another than when they are not (box).

In the general inflationary environment of 1977-78, the increasing dollar cost of imports associated with exchange depreciation was accompanied by increasing domestic prices and real income and hence increasing demand for imports. The apparent pass-through would be expected to be relatively high under these circumstances. This is because the effect of rising domestic prices and income on domestic demand for imports reinforced the exchange rate depreciation in pushing up import prices. Furthermore, with costs and demand pressures moving so closely together, it is not surprising that the pass-through was virtually complete—and in all major categories.

Since 1980, however, the dollar's appreciation has led to a fairly steady decline in import dollar costs. A significant portion of this cost decrease continued to be passed-through to prices over 1981-82, in large part because domestic demand growth also slowed markedly.[7] Subsequently, however, aggregate demand has grown fairly rapidly on average, so that the falling dollar cost of imports has been partially *offset* by the upward pressures on import demand from rising domestic prices and strong real income growth. This may largely explain why the pass-through of exchange rate changes to import prices now appears to be much lower than before (as well as why exporters' profit margins have widened). And with import prices varying with exchange rates less

[7]Pass-through *averaged* 25 percent over 1980-IV to 1982-IV although there was considerable variation within the interval. Despite the dollar's appreciation, substantial pass-through would be expected during this period given that weakening domestic activity probably exerted little, if any, offsetting pressure on import prices.

Chart 3

Determination of Import Price Under Depreciation

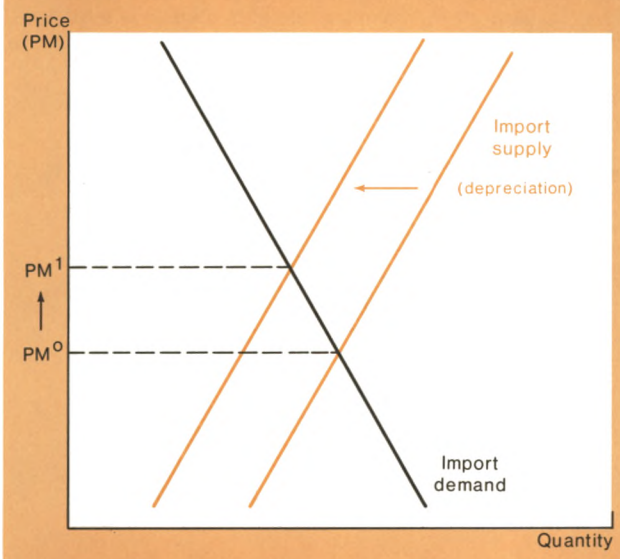
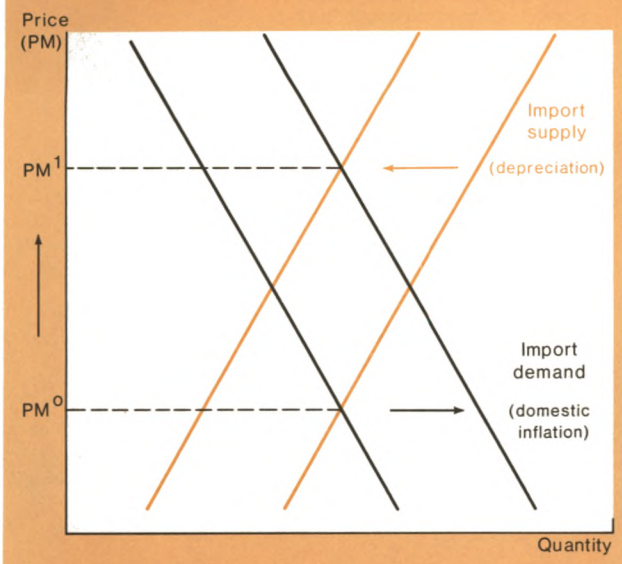


Chart 4

Depreciation Accompanied by Domestic Price Inflation



than before, the seeming failure of inflation to respond to recent dollar appreciation is more understandable.

The same patterns emerge in the data for major product categories. Investment and, to a lesser extent, consumer spending have been unusually strong (on average) over the current recovery, suggesting that the domestic demand influence on the prices of these products has been expanding relatively rapidly. These factors may help explain why the dollar's appreciation seems to have had especially little impact on prices of imported capital and consumer goods.[8]

If the dollar falls

If the changing import pass-through over the past ten years is due to shifting import cost and domestic demand influences, then it could be misleading to extrapolate mechanically from recent behavior to assess the implications of future dollar movements. Suppose, for example, that the dollar were to fall substantially from its present level over the coming year. What would be the likely impact on inflation of this reversal?

The pass-through observed during the last two and one-half years might suggest no significant change in either import prices or domestic consumer prices. However, this overlooks a fundamental change in import cost relative to demand movements that could occur with a dollar decline. A substantial dollar depreciation would raise the dollar cost of imports considerably, reversing the pattern of the last two and one-half years. The response of import prices again will largely depend on the course of domestic demand.

If strong U.S. growth were to resume, the cost and demand influences would reinforce one another, leading to a higher pass-through than has been observed over the last several years. Indeed, prior experience suggests that the pass-through to import prices could be as high as 50 to 70 percent. This means that exporters' profit margins would absorb one-third to one-half of a substantial dollar depreciation, or perhaps even more given that these margins are now relatively high, with the remainder passed on to higher import prices. On the other hand, if the economy were to expand sluggishly, the demand pressures on import prices would be much less, even absent. In that case, shrinking profit margins probably would largely offset a dollar decline, leaving little if any impact on import prices.

[8]As explained in the box, the pass-through would be expected to be lower the more elastic is demand. Previous studies suggest that demand for imported capital and consumer goods is more price elastic than that for materials and agricultural imports, which also helps explain the contrast.

Charles Pigott and Vincent Reinhart

Some Recent Evidence on the Dollar/Price Link

This appendix surveys the recent literature on the impact of dollar depreciation on domestic inflation. These results are summarized in the table.

Two main strategies have emerged in the work on the inflation consequences of exchange rate changes. In the first, a "small-model" approach, an import price variable is included among the explanatory variables in a standard inflation-determination equation. This is the approach taken in the small models summarized in the first portion of the table. To estimate the impact of exchange rates on domestic prices, we must first gauge their impact on import prices. In what follows we assumed that 60 percent of a change in the exchange rate is passed-through to import prices.*

The second approach to judging the impact of the dollar appreciation is to consider the predictions generated by large scale macroeconometric models where the linkages between exchange rates and domestic prices are made explicit in a number of equations. Such structural models often report the impact on both consumer prices and the GNP deflator, and typically it is the former that increases more. This is because imports directly enter the CPI but enter the deflator only indirectly (through the prices of domestically produced goods).

*To replicate Gordon's results his basic inflation determination equation was re-estimated. The coefficient estimates obtained, which are close to those Gordon reports, are used for the simulation results reported in the table.

The Impact on Domestic Inflation of a 10 Percent Dollar Depreciation in One Quarter
Measured as percentage points added to average yearly rates

Study	Price index	First year	Second year	Remarks
		Small model results		
Dornbusch-Krugman (1976)	Consumer prices	0.8	0.5	• Import prices are included in a standard inflation determination equation. • Elasticity of CPI inflation with respect to import price inflation is 0.14 in the short run, 0.42 in the long run. • Estimates use annual data from 1957 to 1973. • We assumed a pass-through of 0.6.
Kwack (1977)	Consumer prices	1.5	0.3	• The model specifies the price linkages for 12 countries, determining consumer, import, and export prices. • Estimates from 1957 to 1973 use annual data. • A 1 percent change in the exchange rate causes a more-than-complete pass-through of 1.23. • We simulated the U.S. sector in isolation.
Spitaller (1978)	Consumer prices	0.5	0.5	• Estimates are derived from CPI inflation equation using money growth, industrial production relative to trend, and import price inflation. • Elasticity of CPI inflation with respect to import price inflation is 0.04 in the short run and 0.27 in the long run. • Estimates from 1958 to 1976 use four-quarter rates of change. • We appended a pass-through equation.
Gordon (1982 and 1983)	Fixed weight GNP deflator	1.1	0.8	• The model estimates an inflation determination equation using lagged inflation, exchange rate changes, the unemployment rate, and dummy variables. • Gordon does not report enough coefficients to simulate the model so we re-estimated over the quarterly data from 1975 to 1984.

Some Recent Evidence on the Dollar/Price Link, *continued*

The Impact on Domestic Inflation of a 10 Percent Dollar Depreciation in One Quarter
Measured as percentage points added to average yearly rates

Study	Price index	First year	Second year	Remarks
		Large model results		
Federal Reserve Board of Governors' Multi-Country Model	Consumer prices	0.5	0.5	• The model links domestic macro models for the United States, Germany, Japan, the United Kingdom, and the rest of the world. • The equations, with a few exceptions, were estimated over the quarterly observations available from 1961 to 1975.
IMF's Multilateral Exchange Rate Model	Consumer prices			• This is a mathematical simulation model with a complete microeconomic specification in which *a priori* judgment is used in the choice of parameters. • The MERM estimates the medium term (two to three years) effects of exchange rate changes. • The low feedback case assumes that a 1 percent increase in the CPI raises wages by 0.5 percent. • The high feedback case assumes that a 1 percent increase in the CPI raises wages by 0.85 percent.
Low feedback		1.4 (total impact)		
High feedback		4.4 (total impact)		
OECD interlink	Domestic demand deflator	1.0	0.4	• The model groups together medium-sized macro models (about 150 equations each) for 23 countries. • Some of the coefficients are estimated with the rest assigned according to the judgment of the modelers.
Federal Reserve Board of Governors' FMP Model	Consumer prices	0.8	0.5	• This is a quarterly model with approximately 500 equations. • There is a complete modeling of capital flows, with exchange rates endogenous to the system.
	GNP deflator	0.5	0.3	
Data Resources	Consumer prices	0.4	0.3	• This is a quarterly model with approximately 1200 equations. • The exchange rate is determined endogenously.
	GNP deflator	0.1	0.4	

Federal Deposit Insurance and Deposits at Foreign Branches of U.S. Banks

Should the Federal Deposit Insurance Corporation (FDIC) charge insurance premiums on deposits in foreign branches and International Banking Facilities (IBFs) of U.S. banks? Such a proposal has appeared as one of many possible changes to the Federal deposit insurance system, but the issue has received relatively little attention.[1]

This article airs the issues involved in an extension of the FDIC premium to foreign branches without taking a position on the question. Levying premiums on these deposits would alter the distribution of premium charges significantly. But as this study shows, how equitable the proposed redistribution would be depends on how one views key characteristics of FDIC insurance coverage. Further, the change could have important repercussions for the competitive structure of banking inside and outside the United States.

The nature of the proposal

Several proposals have been made to include deposits at foreign branches of U.S. banks in the base used to compute FDIC insurance premiums. These proposals would not, however, extend FDIC insurance coverage to foreign branch deposits. For this article, foreign branch deposits are defined to be both the deposits of foreign and U.S. residents booked at U.S. banks' offices located overseas and foreigners' deposits in IBFs and Edge Acts located in the United States. Deposits by foreigners in domestic offices of U.S. banks are already covered under the FDIC insurance system.

This article considers a general version of the proposals. Banks would pay a gross premium rate of one-twelfth of 1 percent on deposits at their foreign branches, the same rate as on deposits at their domestic offices, but would receive no FDIC insurance coverage on these deposits.[2]

Proponents of imposing FDIC premiums on foreign branch deposits identify two major benefits from the proposed change: a fairer division of the FDIC premium burden and an improved competitive position for small banks relative to large ones. This article will analyze the proposal only in light of these two goals. Equity and competitiveness are desirable characteristics of an effective deposit insurance system, but not its overriding goals. The primary purpose of deposit insurance is to provide a safety net for depositors in the event of a bank failure and thereby to protect the integrity of the

The author would like to thank Edward Frydl, Sherrill Shaffer, Robert McCauley, and Melissa Berman for their comments, and David Bush for his assistance.

[1] *Recommendations for Change in the Federal Deposit Insurance System*, Working Group of the Cabinet Council on Economic Affairs (January 1985), and *Deposit Insurance in a Changing Environment*, Federal Deposit Insurance Corporation (April 15, 1983).

[2] Banks pay the gross premium rate on their deposits, but the FDIC has always rebated a portion of it at the end of the fiscal year. The gross premium rate less the portion rebated is the net, or effective, premium.

banking system. Equity and competitiveness are also not the only goals that have been put forward in the broader discussion of deposit insurance reform.

The two goals represent separate issues, which can and should be analyzed separately, as they are in this article. Analysis may suggest accepting one goal but not the other. Considering the goals separately is meaningful because a deposit insurance scheme can be designed to accomplish both goals, or one goal without the other.[3]

The first goal, a fairer division of the premium burden, is a matter of equity. The relevant issue is the relationship between the burden borne by an individual bank and the benefits accruing to the bank and its depositors.[4]

The second aim, improved competitive position for small banks, focuses on the *marginal* cost of deposit insurance, the premium rate on those liabilities that banks use to adjust their funding on a short-run basis. Here the analysis concentrates on the limited issue of whether large banks face such significantly lower marginal deposit insurance costs under the present premium arrangements that they have a competitive advantage over smaller banks in pricing loans.

This is not the only bank competitiveness issue raised by deposit insurance. Another, perhaps more important issue relates to depositor perceptions of how deposit insurance coverage applies in practice. Small bank representatives generally maintain that they are at a competitive funding disadvantage because the public views insurance of large bank deposits as more extensive. The cost consequences of *perceptions* of deposit insurance *coverage* are different from the cost consequences of the deposit *base* for insurance premiums and are not examined here.

A fairer distribution of premiums

The first goal of the proposed extension of the premium base is to produce a fairer distribution of the premium burden. And the proposal does substantially redistribute the burden toward large banks. But the proposal's equity depends on how one views the insurance coverage—this is a matter open to considerable debate. Differing views involve distinctions on two crucial issues: how extensively uninsured deposits are covered and how banks of different types are treated in the event of a failure.

The distinction concerning coverage can be described in terms of limited *de jure* versus more comprehensive *de facto* insurance coverage. *De jure* insurance coverage may be used to denote the insurance explicitly provided by law, which is limited to $100,000 for each depositor.[5] *De facto* insurance coverage, in this discussion, refers to the protection uninsured depositors perceive they have, since they may actually suffer no losses when the FDIC merges or sells, rather than liquidates, troubled institutions. The need to economize and conserve FDIC resources requires minimizing the cost of handling troubled institutions. In the vast majority of cases this has resulted in purchase and assumption arrangements that have maintained the value of all deposits. Even in circumstances where a merger or sale of assets cannot be arranged, other considerations, such as fears of systemic risk and the desire to avoid interruptions in depositor service may lead the FDIC to provide more than the legally required deposit protection.

A second distinction involves perceptions of how the FDIC treats banks of different types, particularly in the event of a failure. If all banks receive the same treatment, the system may be termed *unified.* But if banks fall into two groups according to their size, for example, with uninsured liabilities treated differently if they fail, the system should be described as two-tiered or *dual.*

To highlight the role of these distinctions in evaluating the proposal's equity, this article examines two very stylized versions of the deposit insurance system. Actual FDIC practice lies somewhere between them. It is important to remember that far more often than not, the practice here and abroad is to merge or sell failing institutions rather than to liquidate them. Thus, uninsured depositors have generally not suffered losses in bank failures. Moreover, the decision to merge or to liquidate is made on a case-by-case basis according to the specific circumstances of the troubled bank, and not just on the basis of a bank's size, as these highly stylized versions of coverage might suggest. Therefore, some uncertainty about the extent of *de facto* coverage exists for all banks, regardless of their size. The case-by-case approach means that depositors probably would

[3]For example, it could be achieved through a combination of lump-sum and marginal insurance premiums.

[4]This article focuses on one aspect of the fairness of the distribution of premium charges—the relationship of the premium base to insured deposits. There are other aspects of fairness that the proposal does not address and which therefore are not discussed here. Among them is the extent to which differing riskiness of individual banks should be incorporated into the premium structure.

A second issue is the extent to which deposit insurance is equally valued by the depositors at small and large banks. Depositors can evaluate the creditworthiness of large depository institutions better than smaller ones because more financial analysis and credit evaluation is available for large banks. For small banks, deposit insurance can substitute for this kind of information.

[5]Technically, coverage is limited to the first $100,000, aggregated over all accounts for each right and capacity of the depositor. This means that an individual can set up separate rights and capacities through joint accounts or trusteeships in addition to his or her individual right and capacity. For corporations, the ability to establish additional rights and capacities through joint tenancy is a matter of controversy.

not perceive the level of *de facto* coverage based solely on the observed frequency of mergers or sales in resolving bank failures.

The two very stylized views of the insurance system which emerge from these distinctions are:

- *Deposit insurance coverage as a unified system.* Depositors at all banks receive the same *de jure* protection of insured deposits and no coverage of uninsured liabilities. A variant of this first view perceives a unified system in which as a general practice uninsured depositors at all banks, regardless of size, receive the same *de facto* coverage of legally uninsured liabilities.

- *FDIC insurance coverage as a dual system.* Legally uninsured as well as insured liabilities are *de facto*-covered at larger banks, but as a general practice only insured deposits are protected at smaller institutions. Since the dividing line between large banks and small banks is unclear, large depositors have an incentive to evaluate carefully the creditworthiness of banks holding their deposits.

As the next sections explain, each of these stylized views of FDIC coverage leads to a different assessment of the proposed extension of the FDIC premium base. Under the unified system view, the proposal appears to *increase* inequity when coverage is only *de jure*, but as the extent of *de facto* coverage increases, this effect diminishes. Under the dual system view, the effect of the proposal would be ambiguous.

Discrepancy between cost and benefit under the current premium system

FDIC insurance protects the first $100,000 of each domestic deposit account at premium-paying banks. In return, banks pay a uniform premium rate of one-twelfth of 1 percent on *all domestic* deposits, including that portion of deposits over the $100,000 ceiling and thus not covered by FDIC insurance.

The FDIC describes this as a "flat-rate" system, because banks pay the same premium on all domestic deposits. But "flat rate" may be a misnomer since it suggests that banks pay a uniform price for insurance coverage. In fact, they do not. Based on the cost per dollar of domestic deposits, a bank that relies heavily on large (over $100,000) Certificates of Deposit (CDs) for its funding will pay more for its *de jure* coverage than a bank with mostly retail deposits under $100,000 each. If the deposit insurance system is viewed as unified and *de jure*, treating all banks equally and insuring each depositor only up to $100,000, then the average large bank may subsidize the average small bank (assuming that all banks are equally risky), because proportionally more uninsured liabilities are held at large banks (Table 1).[6] Subsidization may also occur among banks of similar size, since the reliance on uninsured deposits among banks varies. For example, some small banks have substantial uninsured deposit liabilities.

Table 1

Share of Large Deposits at Insured Banks

By size of bank, as of June 30, 1984

FDIC-insured banks with assets of:	Number of banks	Uninsured domestic deposit liabilities*	Deposits at foreign branches
0 to $300 million	13,670	10.7	0.1
$300 million to $1 billion ..	453	19.8	0.4
$1 billion to $5 billion	201	27.7	7.0
$5 billion to $10 billion	34	28.9	14.1
Over $10 billion	23	22.6	48.3
All FDIC-insured banks ...	14,381	20.1	18.4

*Calculated as total deposits over $100,000 (large deposits) less $100,000 times the number of large deposits.

Source: *Call Reports* (June 1984).

What if the system is viewed as unified but offering partial *de facto* coverage for legally uninsured liabilities? According to the FDIC,[7] uninsured depositors assume that they have at least partial *de facto* deposit protection because the FDIC tends to arrange the merger or purchase of a troubled or closed bank, rather than its liquidation. If so, then charging insurance premiums on the legally uninsured portion of deposits can be appropriate, but the premium rate should reflect the extent of *de facto* coverage, generally less than for fully insured deposits. Under the current premium arrangements, if there is the same partial *de facto* coverage for all banks, the extent of subsidization of some banks by others becomes unclear. Banks with substantial domestic and few foreign uninsured liabilities still pay more for their coverage than banks with mostly insured deposits, since the premiums do not reflect the different levels of coverage of insured and uninsured deposits, but the disparities are smaller than those under a unified

[6] June 1984 rather than March 1985 data are used because data on insured and uninsured liabilities are collected only once a year on the *Call Reports*. Uninsured liabilities are measured as the excess of each deposit over $100,000, a somewhat inaccurate measure (see footnote 5 for further reference).

[7] Deposit Insurance, *op. cit.*

system with *de jure* coverage only. The situation is less clear for banks with substantial foreign as well as domestic uninsured liabilities. The premiums on the domestic uninsured liabilities may be high relative to the partial coverage they receive, but banks pay no premiums on the foreign branch liabilities. Thus, whether these banks pay too much or too little for their coverage depends on the level of *de facto* coverage and the distribution of deposits between foreign and domestic uninsured liabilities.

Adopting the dual system view alters the evaluation dramatically. Some observers have suggested that *de facto* insurance coverage of uninsured deposits at large banks, but only large banks, is widely perceived to be 100 percent. The view is an extreme characterization, but for some it seems to be reinforced by the manner in which the problems of Continental Illinois were handled last year.[8]

Perception is inherently hard to ascertain, however. Reasoning very generally that the disruption and drain on the FDIC's resources in the event of a large bank failure could be too great, depositors may assume that the FDIC would never liquidate in such a case, but would arrange for a purchase or merger into another institution. Large depositors would generally suffer no losses in such a merger.[9] Under this view, large depositors in large banks may appear to face less risk than large depositors in small and medium-sized banks. But experience shows that at the first sign of trouble, large depositors may quickly shift deposits to another institution. Such behavior is potentially inconsistent with a perception of full *de facto* coverage.

Under the dual system view, the largest banks pay too little for their insurance, because they do not pay premiums on their foreign branch deposits which are covered *de facto*. Meanwhile, smaller banks with substantial uninsured domestic deposits pay too much. How equitable the system is to small banks with mostly insured deposits under such a system is unclear; their premiums per dollar of insured deposits could be higher or lower depending on the distribution of uninsured deposits in the dual system's two tiers. Of course, this analysis ignores any differences in risk among different classes of banks.[10]

[8]The sharp rise in rates paid on Continental Illinois' and other banks' CDs during the late spring and early summer of 1984, however, indicates that this perception was not universally held.

[9]A recent proposal by the FDIC to introduce a modified payout (only partial reimbursement) to uninsured creditors could affect these perceptions.

[10]But note that the risk-related premium system advocated by the FDIC and the Treasury studies already cited would not correct the discrepancy between the premium base and the amount of coverage.

In summary, then, if one analyzes the current premium arrangements according to the stylized unified system view with *de jure* coverage of legally uninsured liabilities, banks with sizable uninsured domestic liabilities appear to pay more for their insurance coverage than banks with mostly insured liabilities, assuming they are of equal risk. If all banks have some *de facto* coverage, banks with uninsured domestic liabilities and no foreign liabilities still appear to pay more for their insurance coverage. Banks with substantial foreign liabilities, however, may pay more or less relative to other banks depending on the extent of the *de facto* coverage and the distribution between uninsured domestic and foreign deposits. If one accepts the stylized dual system view, small and medium-sized banks with substantial domestic uninsured deposits appear to pay more for their coverage than large banks.[11]

Redistribution of premiums under the proposal

The proposed extension of the premium base would redistribute premiums substantially (Table 2). Based on March 31, 1985 *Call Reports* data for 14,379 FDIC-insured banks, the major burden of expanding the premium base would fall on the 24 banks with assets of $10 billion or more; their combined increase in premiums would amount to $239 million per year. Another 137 banks with assets between $1 billion and $10 billion would pay $35 million in additional premiums. Among smaller banks, 53 have foreign branch deposits and these banks together would pay $1 million more. The result would be a rise of $276 million in total FDIC premiums, an increase of 21 percent.

The proposal as a repricing of FDIC insurance

Bringing the deposits of foreign branches into the FDIC premium base can be viewed as a way to reprice the insurance. Comparing the proportion of selected large liabilities before and after foreign branch deposits are included shows how the repricing would work (Table 3).

Under the current premium arrangements, the largest banks pay relatively more for their *de jure* insurance coverage. The *de jure* protection declines as the share of uninsured domestic deposit liabilities increases—and that share is much higher for large banks than for small banks (Table 3, column 1). Adding the foreign deposits to both the uninsured liabilities and the base produces an even steeper rise in the share. Now, the share rises from

[11]There are more sophisticated ways to measure the degree of subsidization, including incorporating a measure of the institution's riskiness. See, for example, Alan J. Marcus and Israel Shaked, "The Valuation of FDIC Deposit Insurance Using Option-Pricing Estimates", *Journal of Money, Credit, and Banking*, Volume 16, No. 4, Part 1 (November 1984), pages 446-460. But as the sophistication of the methodology grows, the possible objections multiply and uncertainty about the validity of the result increases.

11 percent for the smallest banks to 44 percent for the largest. Under the proposed arrangements, it would range from 11 percent all the way up to 71 percent.

It is not just large banks that currently face this kind of gap between the premium base and insured deposits. At 300 banks, the share of uninsured domestic deposit liabilities in all domestic deposits exceeds 40 percent, the average share of these accounts at large banks. Of the 300 banks, more than half have assets of less than $300 million, about 1 percent of all banks in that size class.

Under a unified deposit insurance system with the same partial *de facto* coverage of uninsured liabilities for all banks, to include foreign branch deposits would still leave a gap between the deposit base and insurance coverage. The size of the disparity would depend on how much partial coverage uninsured liabilities received; it would only disappear when *de facto* insurance coverage reached 100 percent. All told, under the stylized unified system view, the proposal would make banks with large deposits pay more for their coverage relative to smaller banks than they do now.

However, if one sees the insurance system as dual, the repricing creates different effects. The size of foreign

Table 2

FDIC Premiums Under the Proposed Extension of the Premium Base

Computed as of March 31, 1985

Group of banks	Number in group	Number with foreign deposits	Domestic deposits (Millions of dollars)	Foreign deposits* (Millions of dollars)	Current premium† (Millions of dollars)	Proposed premium‡ (Millions of dollars)	Difference (Millions of dollars)
All insured banks	14,379	214	1,605,560	330,702	1,338.0	1,613.6	275.6
Banks with assets of less than $1 billion	14,106	53	789,898	1,422	658.2	659.4	1.2
Banks with assets of $1 billion to $10 billion	249	137	490,838	42,044	409.0	444.1	35.1
Banks with assets of $10 billion or more	24	24	324,824	287,237	270.7	510.1	239.4

*Deposits at foreign branches, Edge Acts, and International Banking Facilities.
†One-twelfth of 1 percent of domestic deposits.
‡One-twelfth of 1 percent of total deposits.
Source: *Call Reports* (March 1985).

Table 3

Proportion of Selected Large Deposits in the Premium Base

As of June 30, 1984

FDIC insured banks with assets of:	Number of banks	Using domestic deposits as the premium base (1) Uninsured domestic deposit liabilities*	Using domestic deposits as the premium base (2) Foreign branch deposits	Using all deposits as the premium base (3) Uninsured domestic deposit liabilities plus foreign branch deposits
0 to $300 million	13,670	10.7	0.1	10.8
$300 million to $1 billion	453	19.9	0.4	20.2
$1 billion to $5 billion	201	29.8	7.6	34.7
$5 billion to $10 billion	34	33.7	16.3	43.0
Over $10 billion	23	43.7	93.5	70.9
All FDIC insured banks†	14,381	24.6	22.5	38.5

*Calculated as all deposits over $100,000 (large deposits) less $100,000 times the number of large deposits.
†Since the large banks dominate the average, especially after the inclusion of foreign deposits, a comparison of the large bank proportion to the average is not very meaningful.
Source: *Call Reports* (June 1984).

deposits relative to the base provides an indicator of the amount of excess *de facto* coverage large banks now receive. The foreign branch deposits of banks with assets over $1 billion are substantial, relative to the present premium base, and jump sharply with bank size (Table 3, column 2); for the top 23 banks, foreign branch deposits nearly equal all domestic deposits. Under the dual system view, these very large banks would wind up paying less for their actual coverage than smaller banks because the FDIC to some extent protects foreign branch deposits of large banks.[12]

Including foreign branch deposits redistributes, but does not eliminate, the discrepancy between the base on which premiums are charged and the deposits covered by insurance, under the dual system view. The revised premium base narrows the gap for any banks viewed as being in the first tier which has some *de facto* coverage, eliminating it only if the *de facto* coverage is 100 percent. But for banks considered to be in the second tier, adding foreign branch deposits has the same effect as the unified system view implies: it creates a sharp rise in large banks' share of uninsured liabilities in their premium base. For the 34 banks with assets between $5 billion and $10 billion, the share increases from 34 percent to 43 percent, while for the 23 largest banks, it jumps from 44 percent to 71 percent. Among banks with assets under $1 billion, foreign branch deposits are so small that including them makes little difference.

To sum up, the proposed extension of the premium base cannot produce an unambiguously fairer distribution of the FDIC premium burden, no matter which of the two views of the deposit insurance system one accepts. These stylized views should help to highlight how differentiation in the treatment of banks and in the extent of *de facto* coverage influence the fairness of the proposed redistribution. Under the unified system view, the proposal only exacerbates the disparity between the premiums paid and the deposits insured, unless *de facto* coverage is thought to be *total*. Even under the dual system view, the change does not fully align premiums with the perceived differences in coverage between the dual system's two tiers of banks because the first tier (with *de facto* insurance) is not distinguished from the group of banks with large uninsured and foreign branch deposits. The proposed redistribution will not be fair to some members of the latter group. An arrangement that imposes premiums by deposit type, rather than bank type, charges some banks for coverage they will not get under the dual system view. Indeed, a full evaluation of the equity of the proposal under the dual system view would require an explicit definition of the first and the second tiers. The inherently arbitrary nature of such a distinction underscores the extreme character of the dual system view.

[12]Some of these uninsured deposits are liabilities to other U.S. banks, as they are in the domestic market.

Improving the competitiveness of small banks

The second goal of a proposed extension of the FDIC premium base is to improve the competitive position of small domestic banks relative to large ones. To accomplish this, the proposal tries to equalize the marginal cost of deposit insurance across all deposit types for all U.S. banks.[13]

The change would tend to raise the marginal cost of funding for large banks relative to small ones. Applying an FDIC premium to deposits at foreign branches would equalize the marginal insurance cost (but not necessarily the total marginal cost) on international and domestic deposits. Funding costs for U.S. banks in the international markets would increase, because the highly competitive nature of those markets would prevent U.S. banks from passing on much of the increased cost to their deposit customers. If the new relative funding costs then get incorporated into loan pricing, the cost of loans at large banks with access to the Euromarket would rise relative to that of small banks with a purely domestic base. The change would in theory tend to shift market share of total loans and deposits held by U.S. banks toward small banks and away from large banks.

The size of the impact would depend on how much small funding cost differences determine market structure in the banking industry. Research on this question suggests that other factors—such as regulation, economies of scale in providing certain services, and advantages gained by specializing in particular services—play an important role in the structure of competition between large and small banks.[14] This literature emphasizes that local banking markets are small; as a consequence, regulatory control of entry and branching is very important. Further, cost savings may arise from the joint production of several banking services. By contrast, the funding cost advantage of access to the Euromarkets has received little or no weight. Therefore,

[13]Differences in marginal insurance premiums are only a part of the difference in marginal funding costs across banks, so the proposal would not equalize marginal funding costs for all banks.

[14]See, for example, George J. Benston, Gerald A. Hanweck, and David B. Humphrey, "Scale Economies in Banking: A Restructuring and Reassessment", *Journal of Money, Credit, and Banking*, Volume 14, No. 4, Part 1 (November 1982), pages 435-456; Thomas Gilligan, Michael Smirlock, and William Marshall, "Scale and Scope Economies in the Multi-Product Banking Firm", *Journal of Monetary Economics*, Volume 13, No. 3 (May 1984), pages 393-405; and Sherill Shaffer, "Competition, Economies of Scale, and Diversity of Firm Sizes", *Applied Economics*, forthcoming. A number of studies are summarized in R. Alton Gilbert, "Bank Market Structure and Competition", *Journal of Money, Credit, and Banking*, Volume 14, No. 4, Part 2 (November 1984), pages 617-645.

small changes in relative funding costs alone are unlikely to have any great effect. Altogether, the degree of competition among banks of similar size is quite possibly greater than that among banks of different size.

Some observers have argued that perceived differences in bank safety are a major factor affecting competition. Since the proposal does not include formal extension of FDIC coverage to deposits at foreign branches of U.S. banks, implementing it should not alter these perceptions.

However, the analysis of the impact of FDIC premiums on market terms and market shares would be different if foreigners and U.S. residents viewed deposits in foreign branches of U.S. banks as effectively having more insurance protection than before, notwithstanding the lack of formal *(de jure)* coverage. Such reassurance could be quite valuable. The normal tiering in the Euromarket suggests that safety may be worth more than 8 basis points, the increase in cost from imposing FDIC premiums on foreign branch deposits.

Extending FDIC insurance premiums to foreign deposits of U.S. banks may not give such a clear signal to market participants, however. Extending the base appears consistent with the dual insurance system view by implying that some *de facto* coverage for large deposits at international banks already exists. But important features of that system remain unspecified, particularly the boundary between banks with some protection of uninsured liabilities and those without it. Foreign branch depositors would be left uncertain about just how much of their deposits would be covered in a bank failure—as is now the case.

U.S. competitiveness in domestic markets and abroad

The proposed change in premium structure could alter the competitive structure of banking in the United States and abroad. To begin with, applying an FDIC premium to foreign branch deposits would raise the cost of external funds. Under the assumption that the FDIC would rebate nothing from the gross premium, the effective rate of premium would be one-twelfth of 1 percent or 8.3 basis points.[15] For banks subject to the 3 percent reserve requirement on Eurocurrency liabilities, the effective cost of external funds would rise 8.6 basis points.[16] These are small changes compared with the daily volatility of Eurodollar rates, for example, which in 1984 averaged 140 basis points when measured by the standard deviation. However, these small changes are large relative to current Euromarket margins. Further, the change would create a permanently higher average cost of external funds and their effects would tend to persist.

Higher external funding costs could place modest upward pressure on domestic funding costs and lending rates. Applying an FDIC premium to foreign branch deposits would reduce the competitiveness of U.S. banks with foreign deposits relative to non-U.S. banks operating in the Euromarkets. The increased cost of external funds, relative to domestic funds, would lead large banks to adjust their marginal funding from foreign to domestic markets, especially since they might not be able to shrink assets rapidly enough in response to declines in liabilities.

Impact on the market shares of U.S. banks at home and abroad

How much market shares in the Eurocurrency and domestic lending markets change would depend on how market terms responded to a shift in U.S. bank funding costs. While the cost differences would be small, they would be large relative to current Euromarket margins, and since the volumes are large, the size of the impact cannot be determined precisely. However, since the Eurocurrency market is highly competitive, flows might well be significantly redirected.

In the domestic market, higher marginal funding costs could lead large banks to price loans higher, at least on the parts of their loan portfolio with thin profit margins. On loans with higher profit margins, the banks might instead absorb all the funding cost increase. Smaller domestically-funded banks, with lower marginal funding costs, could build up profits or quote slightly lower loan costs. That would push market share toward small banks.

In the Euromarkets where profit margins are already thin, more expensive funds would probably impel U.S. banks to quote less favorable terms. Since U.S. banks form a large segment of the market, foreign banks would find themselves attracting depositors and borrowers in the Euromarkets away from U.S. banks, thus increasing their market share.

Of course, foreign banks would only be willing to expand their Eurocurrency balance sheets at current interest rates if they faced no legal or internal balance sheet constraints.[17] In the short run, such constraints

[15]The FDIC rebate has declined in recent years; it rebated only 13.5 percent of the premium to the banks in 1983 compared with as much as 60 percent earlier.

[16]For banks subject to reserve requirements on Eurocurrency liabilities, the effective cost of external funds is:

$$\frac{i_{E\$} + \text{FDIC}}{1 - RR_{E\$}} = \frac{i_{E\$} + .083}{1 - .03}$$

where $i_{E\$}$ is the relevant Eurodeposit offer rate (*e.g.*, three months),

Footnote 16, continued
FDIC is the premium rate, and $RR_{E\$}$ is the reserve requirement on Eurocurrency deposits.

[17]Another possibility is that foreign banks not now active in the Euromarket would enter. This seems less likely now than it would *(p.38)*

How Interest Elasticity Affects Deposit Losses

The extent of deposit losses under the proposed extension of the premium base would depend on the interest elasticity of deposits and the level of interest rates. Estimating these losses requires knowledge of depositor interest sensitivity, and the overall level of interest rates. The elasticities are difficult to measure, since the small differences in rates to which banks and depositors respond are not observable without continuous data collection on interest rates over the day. One can only infer that the elasticity is quite high.

Sample computations provide some idea of the magnitude of deposit losses and revenue shortfalls under different assumed depositor interest elasticities and levels of interest rates in the Euromarket (table). Interest elasticities can range from zero (interest insensitivity) to infinity.* The elasticities here reflect a range of low to high, but it is quite likely that foreign branch deposits are even more interest-sensitive than implied by the interest elasticity of ten. The range of the interest rate is representative of Eurodollar rates over the last ten years.

The computations here assume that imposing an FDIC premium on deposits at foreign branches of U.S. banks would have no effect on U.S. domestic rates or on deposit rates at non-U.S. Euromarket banks. If deposit rates at non-U.S. Euromarket banks fall, their decline would blunt the impact of the FDIC premium.

Only at fairly high elasticities would the deposit losses and FDIC revenue reductions become substantial. The deposit losses range from one-tenth of 1 percent if rates were high and the elasticity low, to about 17 percent at an interest rate of 5 percent and an elasticity of ten. The maximum loss of revenue to the FDIC on the table is $46 million, still less than one-third of the amount rebated for 1983. Larger declines are possible if the interest elasticity of foreign branch deposits is higher.† The relatively small share of branch deposits in total deposits limits the maximum possible revenue loss through this channel to about 17 percent of revenues, the share of foreign deposits in total deposits.

Assuming no FDIC rebate, not just the foreign but the domestic deposit base could also erode. FDIC revenue shortfalls would eventually require higher FDIC premiums, which would lower domestic deposit rates in the United States. The interest sensitivity of domestic deposits in aggregate is likely to be less than that of foreign deposits, since domestic deposits include small transactions accounts and time deposits with low interest elasticity along with highly interest-sensitive ones. But since the base of domestic deposits is much larger, even modest declines in deposit rates following an FDIC premium increase could produce very substantial revenue losses.

*The interest elasticity gives the percentage decline (increase) in deposits for a 1 percent decline (increase) in interest rates. Interest sensitivity increases as the elasticity rises in value. As it approaches infinity, small changes induce depositors to withdraw all their deposits and invest them in an alternative instrument.

†The revenue losses will increase proportionally with the elasticity (*e.g.*, an elasticity of 20 will produce double the revenue decline of an elasticity of ten).

FDIC Revenue Reductions Under Alternative Interest Rate and Interest Elasticity Assumptions
In millions of dollars

	Assumed interest-elasticity	Domestic deposits	Foreign deposits	Premiums under proposed premium base extension	Reduction of premium from base case
Current (March 1985)	*	1,605,560	330,702	1613.6	*
Interest rates of 5 percent	0.2	1,605,560	329,600	1612.7	−0.9
	1.0	1,605,560	325,190	1609.0	−4.6
	10.0	1,605,560	275,585	1567.7	−45.9
Interest rates of 10 percent	0.2	1,605,560	330,151	1613.1	−0.5
	1.0	1,605,560	327,946	1611.3	−2.3
	10.0	1,605,560	303,144	1590.6	−23.0
Interest rates of 15 percent	0.2	1,605,560	330,335	1613.3	−0.3
	1.0	1,605,560	328,865	1612.1	−1.5
	10.0	1,605,560	312,330	1598.3	−15.3

*Not applicable.

could leave foreign banks little choice but to adjust to some of the impact of higher U.S. bank funding costs in larger spreads and higher profit margins. But eventually, accumulated capital from those higher profits would ease the balance sheet constraint and allow foreign banks to pursue a larger market share. Similarly, foreign banks would only expand their balance sheets at current rates if the marginal costs of loan production do not rise too sharply. Credit evaluation and loan servicing costs may be higher for loans to new borrowers than for their normal loan portfolio. This would lead foreign banks to compensate by increasing their spreads charged over LIBOR, possibly eliminating their competitive advantage. But experience and economies of scale may allow spreads to narrow in the longer run.

In summary, the extent to which U.S. banks would lose market share and bid-offer spreads would widen depends mainly on two things: the willingness of foreign banks to increase their Eurocurrency balance sheets, and the interest sensitivity of depositors, borrowers, and lenders. Euromarket participants could, of course, shift their activities to other markets as well as to other agents in the Euromarket. In general, the more willing foreign banks are to increase balance sheets and the more sensitive market participants are to interest rates, the greater U.S. losses in market share would be and the smaller changes would be from current market terms. These effects would be mitigated if depositors perceived greater coverage for their funds in foreign branches or reinforced if depositors became more uncertain of the extent of coverage.

Consequences of a falling U.S. market share

Any reduction of the U.S. banks' share of the domestic or Eurodeposit market would tend to shrink the deposit base on which premiums would be charged, assuming no growth in deposits. The magnitude of the decline is difficult to judge, but the possibility that it could be sizable cannot be ignored.[18] Moreover, the deposit shrinkage does not imply that the FDIC would immediately need less funds. In the long run the FDIC's exposure should decline along with the deposit base (assuming the deposit base does not fund riskier assets). In the short run, however, its exposure reflects past experience.

Thus, the financing cushion the proposed change would provide to the FDIC may be smaller than expected. With a substantial erosion of the deposit base, revenues from the foreign branch deposits might not be as high as projected (box). Currently, the FDIC rebates the excess premium paid, and this allows some margin for the inevitable error in gauging its needs and revenues. That margin has been disappearing, though, and the rebate has shrunk.

Conclusion

Extending the premium base for FDIC insurance to deposits at the foreign branches of U.S. banks would raise FDIC revenues by 21 percent and substantially redistribute deposit premiums from small and medium-sized banks to large ones. Whether this redistribution is appropriate depends largely on how one views the extent of *de facto* coverage and the unity of treatment of banks of differing characteristics, including size. At one extreme, if one accepts the dual insurance system view that large banks regularly receive more *de facto* insurance protection than small banks, then large banks would in fact be paying more for the effectively higher coverage they receive. At another extreme, if one views the system as unified, the proposal would raise the insurance cost per dollar of insured deposits to all banks with deposits at foreign branches. This is true whether all banks tend to receive the same partial *de facto* coverage of uninsured deposits or none at all. But the proposed change would not eliminate the discrepancy between the premium base and the amount of insurance coverage for all groups of banks, under either stylized view of the system. For many medium-sized and fairly large banks with foreign deposits, the proposal may widen the gap substantially.

The competitive implications of the proposal also raise questions. Equalizing the marginal insurance cost of funds between the Euromarkets and the domestic money markets for U.S. banks would necessarily raise the funding costs of U.S. banks relative to those of other banks in the Euromarkets.

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Footnote 17, continued
have been in the 1970s, when participation in the Euromarket was increasing rapidly.

[18] The decline in the deposit base does not necessarily have to reflect a shrinking U.S. share of world bank *liabilities*. Financial innovation, in the form of new non-deposit liabilities, could follow a rise in insurance premiums on Eurodeposits. The proposed premium could also further encourage the growth of off-balance sheet transactions by banks.

ARMs: Their Financing Rate and Impact on Housing

When widespread use of adjustable rate mortgages (ARMs) was permitted in April 1981, some analysts expected housing demand to become stronger and less sensitive to interest rate fluctuations as prospective homebuyers turned to this new way of financing homes. Because housing is one of the most interest-sensitive sectors of the economy, this effect could influence the dynamics of the business cycle and the countercyclical effectiveness of monetary policy. Recent evidence suggests, however, that ARMs have not had a large impact on housing demand. This seems paradoxical because ARMs have captured a large share of new mortgages, particularly between mid-1983 and mid-1984. We offer a twofold explanation for this paradox. First, we show that ARMs have in effect generally not been priced much lower than fixed-rate mortgages (FRMs). Second, we examine some characteristics of ARMs that may explain their popularity over FRMs as a mode of finance, even though these features have not significantly increased the incentives to purchase a home.

Econometric evidence on housing demand

In several recent studies, analysts have found that adding variables representing ARMs contributes little, if any, tracking power to traditionally specified models of housing demand.[1] For example, the equation specified by Esaki and Wachtenheim, which has no ARMs variable, has a post-sample (1982-I to 1984-IV) mean absolute error of 77,000 units, about 8 percent of single-family housing starts (Table 1). And it shows no consistent tendency to underpredict, a tendency that would indicate a failure to capture the positive influence of ARMs in the housing market; instead the equation mostly overpredicts. The tracking performances of the Esaki/Wachtenheim and other recent models suggest that at most ARMs have had a minor impact on housing demand.

The econometric approach, however, may be of limited value for analyzing the impact of this financial innovation since there is not a long series of consistent data on ARMs. Thus, we obtain independent confirmation of these analysts' results by evaluating the long-term expected financing rate of a mortgage, *i.e.*, the average rate an owner expects to pay over the period of home ownership. If the long-term financing rate of ARMs has been significantly below the FRM rate, then housing demand should have been boosted substantially.

The financing rate of mortgages

The financing cost underlying the demand for housing is the interest an individual expects to pay over the

The authors would like to thank the following individuals for their comments and suggestions: M. A. Akhtar and A. Steven Englander (Federal Reserve Bank of New York); James L. Freund and John L. Goodman (Board of Governors of the Federal Reserve System); Michael J. Lea (Federal Home Loan Mortgage Corporation); and Randall J. Pozdena (Federal Reserve Bank of San Francisco).

[1]See Howard Esaki and Judy Wachtenheim, "Explaining the Recent Level of Single-Family Housing Starts", this *Quarterly Review* (Winter 1984-85), pages 31-38; James L. Freund, "A Small Econometric Model for Predicting Residential Construction Activity: Some Preliminary Results", Board of Governors of the Federal Reserve System, paper presented at the 1984 meeting of the American Real Estate and Urban Economics Association; and Michael J. Stutzer and William Roberds, "Adjustable Rate Mortgages: Increasing Efficiency More Than Housing Activity", Federal Reserve Bank of Minneapolis *Quarterly Review* (Summer 1985), pages 10-20.

period of ownership. In the case of an FRM, the expected cost, excluding the initial points that exist also for ARMs, never exceeds the amount determined by the contract rate and may be lower if market rates fall enough to make refinancing advantageous. With an ARM, the expected cost is contingent upon future short-term rates. Thus, the first-period rate discount of an ARM is only one element of the total financing cost, and has to be considered along with the likely course of future rates and the expected holding period in judging the costs of an ARM.

Nonetheless, some analysts believe that this relatively low first period rate of ARMs boosts housing demand, regardless of the expected course of interest rates, by permitting more people to qualify for a mortgage. Many more individuals will meet a stipulated maximum limit on the share of income earmarked for mortgage payments if the first-year ARM rate instead of the FRM rate is used to calculate the carrying costs for a prospective borrower.[2] From the lenders' perspective, relaxing screening procedures may have been one way to encourage a faster reshuffling of their portfolios from FRMs to ARMs; the lower interest rate risk of ARMs to lenders may more than compensate for the higher credit risk. Moreover, some market observers say that lenders may have eased qualification criteria in the belief that the default risk is carried by mortgage insurers and repurchasers. Some of these insurers and repurchasers, however, have recently responded by encouraging or requiring lenders to tighten their qualification criteria for ARMs.[3] Independently, borrowers may be "self-policing" by avoiding a commitment that might have a high risk of default.[4] On balance, the extent of the effects of the ARM qualification criteria on housing demand are not clear.

The low initial ARM rate also might raise housing demand through its effect on the pattern of mortgage payments over time. When the market yield curve is upward sloping, the early years' payments with an ARM are less than with an FRM, but payments are likely to be higher in later years. Similar to the advantages of graduated payment mortgages, this timing of ARM payments might be desired by some people because they feel that their incomes are also likely to rise in the future. In this case, the carrying burden of a mortgage may be more uniform over time instead of being heavier initially as it is with an FRM. It is not clear, though, whether this feature of ARMs, by itself, would significantly boost housing demand. Esaki/Wachtenheim, for instance, do not find that variables representing the different payment streams of ARMs and FRMs, *e.g.*, the spread between the FRM and initial ARM rates, help their equation track housing in recent years. Moreover, basing a purchase decision solely on this consideration would be risky given the uncertainty of future ARM rates.

In any case, the long-term expected financing rate of ARMs is likely to be a key element in a home purchase decision. However, individuals' expectations of future rates—the main component of this expected financing rate—are not observable. And there is no consensus on how these expectations are formed. Some analysts believe that people base their expectations on the most recent movements of rates. Others believe that individuals tend to accept the expectations built into the market yield curve, *i.e.*, the relationship between long-

Table 1

Tracking Performance of the Esaki/Wachtenheim Econometric Model of Housing Demand*

Predicted less actual; thousands of units at an annual rate

	Post-sample prediction errors
1982-I	40
1982-II	122
1982-III	59
1982-IV	4
1983-I	60
1983-II	143
1983-III	140
1983-IV	12
1984-I	−92
1984-II	94
1984-III	105
1984-IV	57

Positive errors indicate overprediction, *i.e.*, predicted level exceeds actual level.

*Howard Esaki and Judy A. Wachtenheim, *op. cit.* The equation tracks single-family housing starts. The sample period is 1959-IV–1981-IV, and the mean absolute error of the sample period is 55.

[2]See John L. Goodman, Jr., "Adjustable Rate Home Mortgages and the Demand for Mortgage Credit", Board of Governors of the Federal Reserve System, presented at the 1984 meeting of the American Real Estate and Urban Economics Association. He shows that the use of a 10 percent first-year ARM rate allows 38 percent of households to qualify for a mortgage, while a 13.5 percent FRM rate allows only 25 percent to qualify. Both are representative rates for the period July 1983-May 1984. Esaki and Wachtenheim, *op. cit.*, though, do not find that a variable representing such an ARM-related reduction of mortgage carrying costs helps their econometric model predict single-family housing starts.

[3]See Dennis Jacobe, "Mortgage Insurers Mix ARMs and GPMs to Justify Rates", *Savings Institutions* (October 1984), pages 41-45.

[4]See John L. Goodman, Jr., *op. cit.*, for evidence supporting this view.

and short-term rates.[5] For example, when long-term rates exceed short-term rates, people generally expect that short-term rates will increase but on average will be equal to the current long-term rate. This second viewpoint may well describe a prospective homebuyer. Because a house represents a large share of a typical homeowner's total assets, the consequences of basing a purchase decision on wrong expectations can be quite costly. To reduce this risk, people probably are most comfortable relying on market expectations in making the decision. Our analysis of the long-term financing rate of ARMs, thus, is based on the assumption that the market yield curve essentially represents the average of expected future interest rates held by prospective homebuyers.

Whether most borrowers view the long-term financing rate of ARMs as being higher or lower than the FRM rate, therefore, depends on how lenders price ARMs and FRMs relative to the market yield curve. The relative pricing of these mortgages, in turn, depends on the net balance, from the lenders' perspective, of the risks and other characteristics of each type of mortgage. Specifically, ARMs are more attractive than FRMs to lenders because they eliminate or reduce risks related to balance sheet considerations—*i.e.,* the possibility of lower income when the return from mortgage-type assets does not rise as quickly as the cost of funds to a lender—and mortgage prepayment. On the other hand, increased credit risk, a less developed secondary ARM market, and interest rate caps may push up the relative cost of ARMs.

One important factor that would cause lenders to lower the financing rate of ARMs is the shift of interest rate risk to the borrower. If the expected financing rate of an ARM, however, is below that of an FRM only because of this shift, then ARMs would not boost housing demand: the risk of greater-than-expected increases in rates still would have to be compensated for by the return from home ownership. Indeed, given the size of investment a home purchase represents, as well as the substantial costs and discomfort of having to default if rates climb much higher than expected, individuals might require a relatively large cut in the ARM rate to compensate them for assuming the interest rate risk. In other words, a significant increase in housing demand might result only if lenders price ARMs much below FRMs.

On the basis of the analysis which follows, however, we conclude that, at least since the start of 1984, the net effect of the various factors that distinguish an ARM from an FRM has been small. That is, the long-term expected financing rate of an ARM for most people has been about the same as an FRM. To arrive at this result, we first look at the various factors underlying ARM pricing.

Balance sheet considerations of lenders

By reducing the interest rate exposure of an entire asset portfolio, ARMs may significantly improve the viability of thrift institutions since for tax purposes they are required to hold a large portion of their assets as mortgages.[6] When financial deregulation, particularly the phasing out of Regulation Q, allowed rates on deposits to vary with market conditions, the large concentration of FRMs in these institutions' assets made them vulnerable to substantial income losses when interest rates rose.[7] ARMs permitted a better match between their return on assets and their cost of funds. This may be an additional gain beyond the reduction of interest rate risk inherent in each mortgage, and thus may persuade these lenders to price ARMs attractively.

Lenders that are not required to hold mortgages in their portfolios, *e.g.,* commercial banks, credit unions, and insurance companies, presumably were less affected by the introduction of ARMs. If in response to financial deregulation these institutions chose to hold fewer fixed-rate instruments, they had a broader choice of variable-rate assets, *e.g.,* commercial loans, from which to select. The major impact of ARMs on these lenders may have been to maintain their presence in the mortgage market, thus helping to prevent mortgage rates from rising relative to other interest rates. It is not surprising, then, that thrift institutions have been the most active lenders of ARMs. In 1984, for instance, ARMs accounted for about two-thirds of the mortgages originated by thrifts, but less than 40 percent of those issued by commercial banks.[8]

[5]For an analysis of "term structure" theory, see Franco Modigliani and Robert J. Shiller, "Inflation, Rational Expectations, and the Term Structure of Interest Rates", *Economica* (February 1973), pages 12-43. Recent tests indicate some slight variation in the behavior of interest rates from that implied by term structure theory. However, this variation might be explained in terms of a variable risk premium in long-term rates, which would not be inconsistent with our approach to analyzing ARMs. See Robert J. Shiller, John Y. Campbell, and Kermit L. Schoenholtz, "Forward Rates and Future Policy: Interpreting the Term Structure of Interest Rates", *Brookings Papers on Economic Activity I* (1983), pages 173-223.

[6]See Robert Van Order, "A Simple Model of Variable-Rate Mortgages", *Housing Finance Review* (July 1982), pages 299-311.

Because of the large losses sustained by many thrift institutions in recent years, some have enough loss carryover that they do not pay any taxes. As a result, these institutions do not feel compelled to hold the required portion of their portfolios as mortgages. Nevertheless, according to Flow of Funds data, mortgages (including ARMs) and U.S. government agency issues (mostly mortgage pass-through securities) constituted substantially more than half of thrift institutions' assets during 1984.

[7]Some thrift institutions have addressed this interest rate risk by hedging in futures markets and engaging in interest rate "swaps". These activities, though, have not been widespread.

[8]See Federal Home Loan Bank Board, *News* (February 4, 1985).

Prepayment risk

Lenders also may price ARMs more favorably than FRMs because of the reduced risk of borrowers prepaying before maturity. Since individuals are often permitted to prepay a mortgage at face value without penalty, the expected return from an FRM is uncertain even though its rate is fixed. The FRM rate, therefore, may embody a charge to cover this uncertainty.[9] In contrast, ARMs are less likely to be prepaid when market interest rates fall since their rates, assuming there are no binding caps, would decline as well. Moreover, even if an ARM is prepaid, its rate would likely be the same as that on the newly issued ARM that replaces it. Thus, ARM rates are likely to contain no prepayment premium, or at most one that is not as large as that embodied in the FRM rate.

Credit risk

Other factors, however, may reduce the attractiveness of ARMs to lenders. Both ARMs and FRMs are vulnerable to the typical factors behind borrower default, *e.g.*, cuts in income and net worth, but ARMs are also subject to rising interest rates, which may raise the probability of default. The prospect of higher interest rates in the future does not necessarily mean that defaults on ARMs will increase, particularly if the rise in rates is a result of higher inflation. In this case, most household incomes should expand as well, permitting borrowers to handle the larger carrying costs of ARMs. Indeed, to the extent that lenders use some measure of the long-term expected financing rate of ARMs (which embodies expectations of future rates) to screen borrowers, the default risk may be kept down. Relatively tough qualification criteria and rate caps also may help reduce this risk. Nevertheless, future interest rates might rise substantially more than was expected when the loan was originated and result in an increase in defaults, particularly if the increase in rates is not matched by comparable income gains.

So far, defaults on ARMs do not appear to be a major problem. Since January 1985, when separate data on ARMs were first reported, the ARM delinquency rate has been below that of FRMs, possibly because interest rates were falling.[10] Nonetheless, ARMs may not always have the better record, particularly if interest rates climb steeply. For example, the default rate for ARMs could jump sharply if their rate rises faster than individuals' incomes, particularly among borrowers with relatively little accumulated equity in their homes.[11] Thus, the credit riskiness of ARMs may represent a potential problem.

Mortgage liquidity

Another factor that could impinge on the advantages of ARMs to lenders is the absence of a large secondary market for these mortgages. As a result, ARMs are much less liquid than FRMs, for which a well-developed secondary market exists. According to market observers, the growth of a secondary market has been slow because ARMs lack uniformity and because investors are concerned that ARMs may carry more credit risk than FRMs.

Caps on ARM rates

Unlike the other characteristics of ARMs that affect either borrowers or lenders, caps on the periodic change and life-of-loan level of ARM rates affect both borrowers and lenders. For instance, while these caps may prevent the return on ARMs from keeping pace with a lender's cost of funds, they also reduce the interest rate risk for a borrower. Consequently, even if caps increase ARM rates, borrowers may be willing to pay for these safeguards.

The value of caps depends on the course of future interest rates. Thus, an *ex ante* valuation should be based on the yield curve. When the yield curve is steep, indicating that interest rates are likely to rise sharply in the future, caps should be worth more to a borrower. In addition, caps would be more valuable to the extent that they prevent an initial ARM rate reduced by a first-period discount from climbing to the fully indexed level after the first period.[12] At the other extreme, when the yield curve is downward-sloping, a cap on the periodic change in an ARM rate may have negative value to borrowers if it prevents an ARM rate from falling as much as market interest rates.

In principle, borrowers and lenders can value caps

[9]The risk of prepayment is an important consideration in the pricing of a mortgage. See Henry J. Cassidy, "Selection of an Index for Variable Rate Mortgages", *Journal of Retail Banking* (Winter 1982), pages 27-36; Alden L. Toevs and Jeffrey H. Wernick, "Hedging Interest Rate Risk Inclusive of Prepayment and Credit Risks", *Identification and Control of Risk in the Thrift Industry,* Federal Home Loan Bank of San Francisco, Proceedings of the Ninth Annual Conference (December 1983), pages 97-122.

[10]Delinquency rate data were obtained from the U.S. League of Savings Institutions. These data, however, may be biased against

Footnote 10, continued
FRMs because no adjustment is made for the length of time mortgages are in existence. Since the FRMs in this sample were outstanding for more years than ARMs, they, according to market observers, are more prone to default.

[11]See Peggy J. Crawford and Charles P. Harper, "The Effect of the AML Index on the Borrower", *Housing Finance Review* (October 1983), pages 309-320. See also Robert M. Buckley and Kevin E. Villani, "Problems with the Adjustable Rate Mortgage Regulations", *Housing Finance Review* (July 1983), pages 183-190.

[12]The initial period pricing of an ARM is the sum of three parts. The first element is an index rate, *e.g.*, the one-year Treasury *(p. 44)*

Valuation of Caps

To estimate the value of caps, we analyze how ARMs would have behaved with and without caps if they had been available through the 1970s. By determining, *ex post*, how the financing costs would have differed with varying discounts and caps, we hope to capture the current *ex ante* expectations for these ARM modifications.

Two horizons for expected home ownership are considered: three and eight years. The eight-year horizon represents the average duration of a mortgage,* while the three-year horizon is applicable to about one-quarter of homebuyers, those who expect to resell quickly.† In each case, the fully-indexed ARM rate was assumed to equal 2.8 percentage points above the one-year Treasury rate and to adjust every twelfth month. The use of a constant markup and the one-year Treasury rate as a representative index are consistent with recent surveys.‡ Simulations of hypothetical ARMs, with and without caps, were run starting in 1970 for each month for which there was data, *i.e.*, ending in 1977 with the eight-year horizon and in 1982 with the three-year.

From the simulation results we can find the discounted present values of caps in each month.§ First, we calculate the present value of the mortgage payments,

*Frederick E. Balderston, *op. cit.*

†John L. Goodman, Jr., *op. cit.*

‡The first survey was taken in November 1984; see *The Primary Mortgage Market*, Federal Home Loan Mortgage Corporation (January 1985). The later survey, taken in February 1985, is unpublished.

§Our technique is similar to one developed independently by Patrick H. Henderschott and James O. Shilling, *Valuing ARM Rate Caps: Implications of 1970-84 Interest Rate Behavior*, unpublished paper, Ohio State University.

Effective Values of Caps
In percentage points

A: 8-Year Horizon

Group*	Yield curve slope	First-period discount	Effective value of: Lifetime cap: 5%	Annual cap: 2%	Both caps
Low	<0.5	0.0	0.00	−0.02	0.00
		1.0	0.01	0.04	0.06
		2.0	0.06	0.11	0.16
		3.0	0.17	0.19	0.30
Middle	0.5-1.5	0.0	0.13	0.20	0.29
		1.0	0.24	0.26	0.41
		2.0	0.39	0.34	0.59
		3.0	0.61	0.44	0.88
High	>1.5	0.0	0.68	0.43	0.73
		1.0	0.93	0.49	1.04
		2.0	1.24	0.64	1.36
		3.0	1.59	0.89	1.78

B: 3-Year Horizon

Group*	Yield curve slope	First-period discount	Effective value of: Lifetime cap: 5%	Annual cap: 2%	Both caps
Low	<0.5	0.0	−0.04	−0.22	−0.22
		1.0	0.00	−0.13	−0.13
		2.0	0.01	−0.05	−0.05
		3.0	0.02	0.02	0.02
Middle	0.5-1.5	0.0	0.00	0.00	0.00
		1.0	0.01	0.04	0.04
		2.0	0.02	0.12	0.12
		3.0	0.06	0.27	0.27
High	>1.5	0.0	0.06	0.27	0.27
		1.0	0.12	0.42	0.42
		2.0	0.21	0.61	0.61
		3.0	0.35	0.81	0.81

*Each group consists of one-third of the simulation results, ranked by the magnitude of the value of both caps.

along the lines of option pricing models, which assign probabilities to possible future interest rate paths and then average them.[13] Rather than using this approach, we estimate the value of caps by calculating the extent to which they would have held down the interest costs of ARMs if they had been issued since 1970 (box).

To represent the holding period of a mortgage, we use two horizons: eight and three years. The eight-year horizon approximates the average holding period of all mortgages, and as such is representative of the holding period for borrowers in the aggregate.[14] We assume that most ARMs have an annual cap of two percentage points and a lifetime cap of five percentage points. These caps are among the most popular of the recommended configurations proposed by the Federal National Mortgage Association.

According to our calculations, the value of these caps for an eight-year horizon varied between zero and 1.8 percentage points, depending in part on the size of the first-period discount. For example, an ARM issued in 1970 without a discount would not have been affected at all by the presence of our caps. Thus, their value at that time was zero. In contrast, the rate on an ARM issued after 1971 would have been constrained not only by the annual caps but also by the lifetime cap. In these cases, the worth of the caps moved toward the high end of the range.

As we expected, caps would have been less valuable to people with short horizons, *e.g.*, three years, than to those with long horizons. The three-year and eight-year values differ mostly because lifetime caps were never binding over the first three years of an ARM during the 1970s. In general, our calculations indicate that borrowers with short horizons face little likelihood that lifetime caps will ever come into play. To be sure, these individuals would value first-period discounts more highly than people with longer horizons since they amortize the discounts over fewer years. Nevertheless, we find that the combined value of caps and discount usually favors borrowers with longer horizons.

Footnote 12, continued
rate. The second element is a constant markup. The sum of these two is called the fully-indexed rate. The third element is the first-period discount, which reduces the fully-indexed rate for the first period of the mortgage only. The fully-indexed ARM rate less the first-period discount is called the initial rate.

In the second period, the uncapped ARM rate has only two parts. It is the sum of the index rate as of the beginning of the period and the same markup as in the first period.

[13]See Randall J. Pozdena and Ben Iben, "Pricing Mortgages: An Options Approach", Federal Reserve Bank of San Francisco *Economic Review* (Spring 1984), pages 39-55.

[14]See Frederick E. Balderston, *Thrifts in Crisis* (1985).

Valuation of Caps, *continued*

including prepayment of the principal, over the mortgage horizon assuming no caps; we call this the base present value. Second, we recalculate the present value imposing, individually and combined, caps of two percentage points each year and of five percentage points over the life of the mortgage. The differences between these values and the base present value measure the present values of the cost saving resulting from the respective caps. Expressing each difference as a percent of the face value of the loan converts the saving into the equivalent of closing points. Then calculating how much these points change the effective yield provides a measure of the effective value of the cap.

For a borrower to accept an uncapped ARM instead of a capped ARM, its markup (over the base rate) would have to be lower by this effective value. (Equivalently, a larger first-period discount could be offered.) Since, in our simulations, the cap was tied to the initial rate rather than the fully-indexed rate, the value of a cap increases sharply as the discount increases.

Since caps only have value when they lower the interest rate on the mortgage, their value depends on the course of future interest rates. Thus, an *ex ante* valuation is based on the steepness of the yield curve. When the yield curve rises sharply, reflecting a market expectation of high future interest rates, caps will be worth more. On the other hand, when the yield curve is downward-sloping, caps may turn into "floors" for borrowers and could have a negative value.

To capture the effect of the market yield curve, we divide the months of the simulations into three equal groups, ranked by value of the caps. (This ranking is similar to one based on the steepness of the yield curve at the time a hypothetical ARM was issued.) Then we average the values in each group. For each group we show, in the tables, for different first-period discounts, the effective value of the caps, singly and in combination. In examining the recent *ex ante* valuation, we use the relative steepness of the yield curve to select an appropriate value from the tables. For example, when the difference between the ten-year and one-year Treasury rates exceeds 1.5 percentage points, we use the average of the highest third as the value of the cap or caps. The average of the lowest third applies to yield curve differences of less than one-half percentage point. In cases near a boundary, we chose an average value of the two groups.

Using our estimates of the value of caps, we next determine the extent to which the long-term expected ARM financing rate has been below the FRM rate.

Financing rate: ARMs versus FRMs

We evaluate the financing rates by comparing the initial period pricing of an ARM and the FRM rate with the corresponding points on the yield curve in the market for Treasury securities. Since the Treasury yield curve embodies only expectations of future rates and an interest rate risk premium in longer-term rates, subtracting it from the yield curve implicit in the mortgage market shows the impact of the other factors that distinguish ARMs from FRMs.[15] Consider, for example, an ARM without a discount or caps whose first-period rate is three percentage points above the one-year Treasury rate. If the FRM rate were only, say, two percentage points above a long-term Treasury rate, then the net effect of the distinguishing factors would make the long-term expected financing rate of an FRM lower than that of an ARM by one percentage point (Chart 1).[16]

[15] Shiller, Campbell, and Shoenholtz, *op. cit.*, show that long-term Treasury rates can be expressed as the sum of an interest rate risk premium and an arithmetic average of weighted expected future short-term rates, where the weights sum to one. Expected rates receive less weight the further they are in the future.

[16] More precisely, in this case all expected ARM rates in the future are also three percentage points above expected future one-year Treasury rates, since the markup is constant. Thus, the expected long-term ARM rate exceeds the expected average one-year Treasury rate by three percentage points. This difference can be compared with the spread between the FRM and longer-term Treasury rate, in which the expected future short-term rates and interest rate risk premium are netted out. What is left over are the *(p.46)*

Table 2

Value of Discounts and Caps in 1984 and 1985

In percentage points

Quarter	Size of discount*	Yield curve†	Eight-year horizon: Effective value of discount‡	Eight-year horizon: Effective value of caps‡	Three-year horizon: Effective value of discount‡	Three-year horizon: Effective value of caps‡
1984-I	2.0	1.8	0.4	1.4	0.8	0.6
1984-II	2.9	1.7	0.6	1.6	1.2	0.7
1984-III	2.5	1.1	0.5	0.9	1.0	0.3
1984-IV	1.4	1.7	0.3	0.9	0.6	0.4
1985-I	1.4	2.2	0.3	1.2	0.6	0.5
1985-II	0.9	2.3	0.2	0.9	0.4	0.3

*Discount is estimated as the excess of the sum of the one-year Treasury rate and 2.8 percentage points over the initial rate, as reported by the FHLMC.

†Difference between the rates on ten-year Treasury notes and one-year Treasury bills.

‡The effective values of the discount and caps are the consequential reductions of the effective yield of a mortgage over the stated horizon.

Estimated by the authors using data from the Federal Home Loan Mortgage Corporation and the Federal Reserve *Bulletin*.

Table 3

Evaluation of the Financing Rate of ARMs in 1984 and 1985

In percentage points

Quarter	Eight-year horizon: Adjusted ARM rate less one-year Treasury rate*	Eight-year horizon: FRM rate less ten-year Treasury rate	Eight-year horizon: Difference	Three-year horizon: Adjusted ARM rate less one-year Treasury rate*	Three-year horizon: FRM rate less three-year Treasury rate	Three-year horizon: Difference
1984-I	1.0	1.4	−0.4	1.4	2.1	−0.7
1984-II	0.6	0.9	−0.3	0.9	1.4	−0.5
1984-III	1.4	1.6	−0.2	1.5	1.8	−0.3
1984-IV	1.6	1.9	−0.3	1.8	2.5	−0.7
1985-I	1.3	1.5	−0.2	1.7	2.4	−0.7
1985-II	1.7	1.9	−0.2	2.1	3.0	−0.9

*Calculated as the constant ARM markup of 2.8 percentage points less the sum of the effective values of caps and discounts, shown in Table 2.

Evaluating the expected long-term ARM financing rate involves several steps. To take account of caps and the first-period discount, we add the present value of each to the face value of a mortgage and calculate the reduction of the effective yield over the holding period. We call this reduction the "effective value" of the caps and first-period discount. By subtracting this effective value from the fully-indexed ARM rate in the first period, the net result, the "adjusted" ARM rate, can be compared with the one-year Treasury rate as previously discussed.

We apply this approach beginning in 1984, which is the first year for which rates on a fairly homogeneous sample of ARMs are available. These data, compiled by the Federal Home Loan Mortgage Corporation (FHLMC), show the initial ARM rate. The difference between this rate and the one-year Treasury rate equals the markup less the first-period discount. To disentangle the first-period discount, we rely on two FHLMC surveys, taken at different times, indicating that the markup over the one-year Treasury rate for a typical ARM has been constant at 2.8 percentage points.[17] On the basis of these survey results, we assume that all the variation in the initial ARM/one-year Treasury spread represents changes in the first-period discount. Since January 1984 this discount has varied between 0.9 and 2.9 percentage points, which, for an eight-year horizon, translates into a range of effective values between 0.2 and 0.6 percentage point (Table 2).

Effective values of caps depend on the expectations of and the risks associated with future rates—both of which are embodied in the yield curve—and the discount. Thus, we apply our estimated values to 1984 according to the slope of the yield curve and the size of the discount in each month, as described in the box. Caps were worth the most for ARMs issued in 1984-II and the least in the second half of 1984 and 1985-II.

Using the Treasury yield curve and our estimated values of the discount and caps, we now determine how attractive ARM pricing has been for the average holding period. For each quarter since the beginning of 1984 we calculate the adjusted ARM rate, as described above, and subtract from it the one-year Treasury rate. We then compare this difference with the spread between the FRM rate and ten-year Treasury rate.[18] Table 3 shows that the two spreads were similar in every quarter, implying that the long-term expected financing rates of ARMs and FRMs were about the same. In other words, to the extent that individuals had the same expectations as the market, the average of expected ARM rates over the length of home ownership was close to the FRM rate. This has been the case when FRM rates were low, as in early 1984 and 1985, as well as when they were temporarily high, as in mid-1984.

Even if ARMs do not appear to have been priced much below FRMs for the typical individual, ARMs might be favored by people with short horizons, *e.g.*, an expected length of home ownership of three years, to avoid paying a long-term rate on a short-term loan.

To evaluate the expected financing rate of an ARM for these borrowers, we compare the spread between the adjusted ARM rate and the one-year Treasury rate with the spread between the FRM rate and the three-year Treasury rate. In this comparison, the adjusted ARM/one-year Treasury difference has varied between 0.3 percentage point and 0.9 percentage point less than the FRM/three-year Treasury rate difference since January 1984. While the differences may have been large enough to significantly affect these individuals' demand

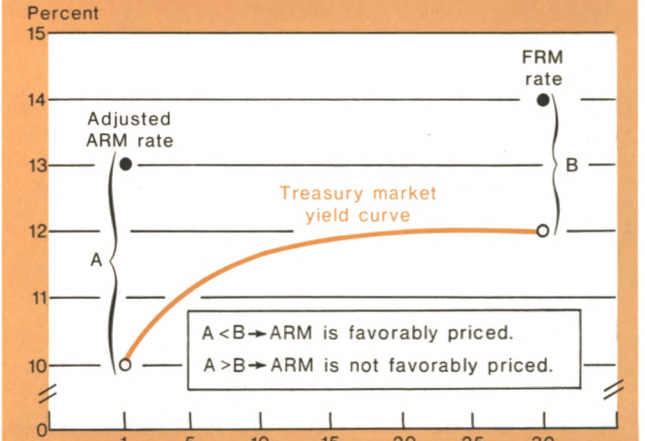
Footnote 16, continued
effects of the distinguishing characteristics of FRMs from ARMs. The long-term expected financing rate of an FRM would differ from that of an ARM by these effects as well as the interest rate risk premium.

[17]The first survey was taken in November 1984; see Federal Home Loan Mortgage Corporation, *The Primary Mortgage Market* (January 1985). The later survey, taken in February 1985, is unpublished. The one-year Treasury rate has gained in popularity as the index rate for ARMs over cost-of-fund indexes and by 1984 was used by about 90 percent of lenders surveyed.

[18]The ten-year Treasury rate most closely matches the average holding period of a mortgage. Because the yield curve in the past several years has been essentially flat past a maturity of seven years, choosing other long-term rates does not significantly alter our results.

Chart 1

ARM Pricing and the Treasury Market Yield Curve: An illustration*



* Constructed by the authors.

Table 4

Spread Between the FRM and Ten-year Treasury Rates

In percentage points

1970-78 average	1.3
1979	1.8
1980	2.3
1981	2.7
1982	3.1
1983	2.1
1984	1.4

Federal Home Loan Mortgage Corporation and Board of Governors of the Federal Reserve System.

for housing, this group includes somewhat less than a quarter of all homebuyers at a given time.[19] Thus, any resulting boost to aggregate housing demand is likely to have been relatively small.

In sum, our estimates indicate that ARMs have generally not been priced significantly below FRMs. Inasmuch as our calculations are based on several approximations, however, the precise estimates should not be taken literally. Nevertheless, the pricing of an ARM most likely has to be substantially more favorable than an FRM to persuade someone to purchase a house on the basis of the more risky financing rate. In this light, our results suggest that even if some of our approximations are not entirely correct, the alternatives are unlikely to be so different as to change the basic conclusion: ARMs do not seem to have been priced attractively enough to raise housing demand in the aggregate by a large amount.

ARMs and the FRM rate

ARMs may have still provided an indirect boost to housing by putting downward pressure on the FRM rate. Two arguments have been advanced along this line. First, to the extent that the FRM rate in the past contained a premium to cover the risk associated with the imbalanced portfolios of thrifts, the ARM-induced reduction of this risk might cut the premium.[20] Second, with ARMs having captured a growing share of new mortgages, the supply of FRMs in the secondary mortgage market may not have kept up with demand, especially after demand was bolstered by the development of collateralized mortgage obligations in 1984.[21] As a result, the price of FRMs may have been bid up, which reduced the FRM rate.

Unfortunately, experience with ARMs has been too brief to distinguish their effect on the FRM rate from other influences. In fact, the FRM rate fell relative to other long-term rates over the past two years (Table 4). However, in 1982 the spread between them had widened to an unprecedented extent, most likely reflecting to some degree a jump in the FRM's prepayment risk premium that ocurred when interest rates climbed to exceptionally high levels. The FRM rate subsequently declined relative to other rates at least in part because this risk premium fell along with the overall level of rates.

The share of ARMs in newly issued mortgages

Even though our calculations point to little impact of ARMs on housing demand, small differences in the perceived financing costs of ARMs and FRMs could still have a large effect on how people choose to finance a home. Because these two types of mortgages are so closely substitutable, the differences may greatly influence the choice between an ARM or an FRM once an individual has decided to purchase a home. Although it is very difficult to know at this point all the determinants of the share of ARMs in new mortgages, we investigate in this section two systematic factors that might tilt the financing choice: the distribution of risks surrounding the market's expectations of future rates and the pattern of mortgage payments over time.

In deciding whether to finance a home purchase with an ARM or an FRM, individuals presumably consider the risks surrounding market expectations of future rates. When interest rates look as if they will be rising, *i.e.*, the yield curve slopes upward sufficiently, FRMs may be viewed as a better hedge than ARMs. Conversely, when rates look as if they will be falling, *i.e.*, the yield curve is downward sloping, ARMs might be considered a good risk. From this perspective, then, the slope of the yield curve may indicate the predominant financing choice.

Another factor that may influence the mode of home finance is the pattern of mortgage payments over time. One way to represent the different payment patterns of ARMs and FRMs is to use the difference between the FRM and the first-period ARM rates. The larger this spread, the lower the near-term payments of ARMs relative to those of FRMs and, thus, the more attractive ARMs may appear.

Experience to date seems to support the roles played by these two factors. Since mid-1981 there have been two periods in which the share of ARMs in new mortgages has risen sharply—the first half of 1982 and the second half of 1983 through the first half of 1984

[19] John L. Goodman, *op. cit.*

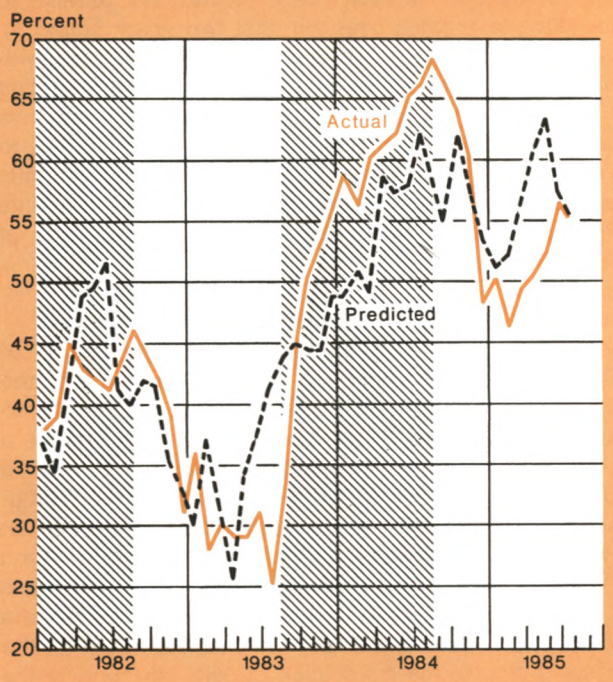
[20] Robert Van Order, *op. cit.*

[21] See Joseph Hu and Judy Hustick, "Major Developments in Housing and Mortgage Finance", *Bond Market Research*, Salomon Brothers Inc. (January 1985).

Chart 2

Share of ARMs in Mortgages Closed

Shading shows periods of increasing ARM popularity



The predicted values are from the estimated equation:
(t-statistics are shown in parentheses)

$$YT_t = \underset{(-1.78)}{-2.333} + \underset{(8.17)}{1.130}\ INITGAP_t - \underset{(-3.40)}{0.366}\ SLOPE_{t-2} + \underset{(1.68)}{0.142}\ RFRM_{t-1}$$

Sample period: January 1982 - July 1985 $\bar{R}2 = 0.65$ D-W = 0.822

YT = $\log_e$(JARM) - $\log_e$(1-JARM)

JARM = Share of ARMs in new single-family home mortgages closed

INITGAP = Interest rate on FRMs less the initial interest rate on ARMs

SLOPE = Yield on 20-year Treasury bills less the yield on one-year Treasury bills (constant maturity)

RFRM = Interest rate on FRMs for new single-family homes

The transformation of the predicted values of YT into the share is given by:

$$\hat{JARM}_t = (1+e^{\hat{YT}_t})^{-1}$$

The dependent variable is so transformed to restrict its range to the interval [0, 1].

Sources: Federal Home Loan Bank Board and Board of Governors of the Federal Reserve System.

(Chart 2). During the first episode, the share peaked at 46 percent, and during the second period it reached 68 percent. Outside of these episodes—from the end of 1982 to the summer of 1983, and in late 1984 and early 1985—ARMs lost some of their popularity.

In the first episode, the primary reason for the increased use of ARMs may have been related to the risks surrounding the yield curve. Over the first year or so since widespread use of ARMs was permitted in April 1981, the yield curve was downward sloping or fairly flat (Chart 3). People may have taken advantage of ARMs in the belief that the potential for future declines in interest rates made this form of financing a good risk. In contrast, the timing of ARM payments was probably not important since the initial ARM rate was not much different from the FRM rate during this period.

The second surge in ARM popularity that began in the fall of 1983 may have been related to a widening spread between the FRM and initial ARM rates. In the spring of that year, first-period discounts became widely available and were more and more prevalent through the first half of 1984. These heavily advertised discounts may have reinforced people's perceptions of the different payment streams associated with ARMs and FRMs. The yield curve was fairly steep during this period and, thus, was unlikely to be behind the growing share of ARMs in newly issued mortgages. However, the yield curve flattened substantially in the summer of last year and may have helped extend the popularity of ARMs through most of the remainder of 1984, despite a narrowing in the FRM/ARM spread.

Finally, in almost all the periods when most people turned to FRM financing, neither the yield curve nor the FRM/ARM spread would have encouraged the widespread use of ARMs; the yield curve was steep and the FRM/ARM rate difference small. Individuals with short horizons, however, would have chosen ARMs on the basis of the steep yield curve.

Since the beginning of 1985, though, the FRM/ARM spread has begun to widen at the same time that the yield curve has remained very steep. So far, the share of ARMs has stayed around 50 percent, well below its previous peak. One factor that may be bolstering FRMs is that since the end of 1984 their rates have been close to their lowest level of this expansion. The long-term financing rate of a mortgage, thus, is perceived to be about as low as can be expected, thereby encouraging borrowers to lock in the FRM long-term financing rate.[22]

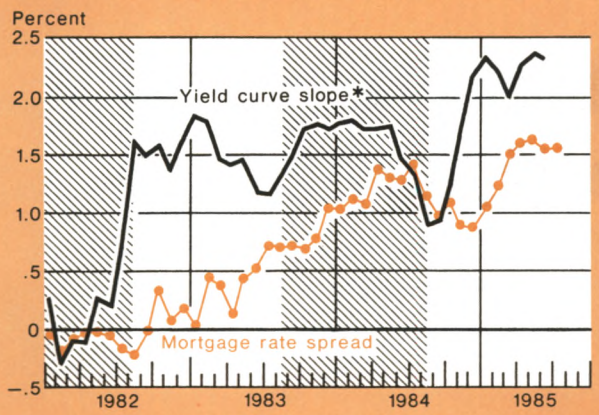
For confirmation that these systematic factors play a role in determining the mode of mortgage, we estimated

[22] See *Freddie Mac Reports*, Federal Home Loan Mortgage Corporation (May 1985), for a similar analysis.

Chart 3

Slope of the Treasury Market Yield Curve and Spread Between the FRM and Initial ARM Rates

Shading shows periods of increasing ARM popularity



*Difference between ten-year and one-year Treasury rates.

Sources: Federal Home Loan Bank Board and Board of Governors of the Federal Reserve System.

several simple equations relating the share of ARMs to the yield curve, the FRM/ARM spread, and the level of the FRM rate. In the best of these equations, the explanatory variables, for the most part, were statistically significant and explained much of the variation in the share of ARMs (Chart 2).

Conclusion

Our analysis suggests that ARMs have not had a major effect on the demand for housing. We have shown that for most people the pricing of ARMs has been such that their expected long-term financing rate may not have differed much from the FRM rate, assuming individuals have the same expectations of future rates as the market. For people who hold mortgages only a short time, the effects could be important, but this group tends to be less than one-quarter of all homebuyers at a given time. Nonetheless, small differences between ARMs and FRMs may have produced large swings in the mode of home finance, once the decision to purchase a house was made. We believe that this dual approach goes a long way in resolving the apparent paradox of the recent econometric findings that indicate little impact of ARMs on housing and the observed popularity of ARMs.

Our results, to be sure, are based on short and limited experience with ARMs. The economy has not yet gone through a period of sharply rising interest rates while ARMs were widely available and familiar to most people. The impact of ARMs on housing demand might then be more pronounced than under recent financial market conditions.

Judging from recent experience, however, our analysis also implies that ARMs have not significantly influenced the dynamics of the business cycle by altering the interest responsiveness of housing demand. Of course, ARMs may have other effects on the business cycle by making spendable income after mortgage payments, and thus consumption, more sensitive to interest rate changes. Nevertheless, since the long-term expected financing rate of ARMs seems to move broadly in line with the FRM rate, the aggregate demand for housing should continue to respond to interest rate movements as it has in the past.

Carl J. Palash and Robert B. Stoddard

February-July 1985 Semiannual Report
(This report was released to the Congress and to the press on September 6, 1985)

Treasury and Federal Reserve Foreign Exchange Operations

During the period under review many observers of the foreign exchange markets were uncertain about the sustainability of the global economic expansion, now into its third year. The vigorous upswing in the United States had faltered in the third quarter of 1984, and market participants were anxious for evidence whether domestic demand would remain strong enough to support renewed increases in production and employment in 1985. Doubts developed about other countries' ability to continue to expand should U.S. growth remain subdued, since exports to the United States had been the major source of stimulus abroad.

Meanwhile, inflation had decelerated in almost all of the industrial countries, but the scope for making further progress in the fight against inflation was seen as more limited at this stage of the business cycle. At the same time, market attention was focused on concerns about the imbalances in the structure of the current recovery—imbalances reflected in a large U.S. fiscal deficit, unprecedented disparities in the current account positions of the largest industrialized countries, interest rates at levels that appeared high relative to current inflation rates, and persistent unemployment problems abroad.

With the major money and capital markets of the world increasingly integrated through progressive liberalization of exchange controls and other regulations, shifts in sentiment about these uncertainties were associated with sizable movements in dollar rates. During the six months February through July, the dollar briefly continued its four and one-half year climb, advancing strongly to hit record levels in the floating rate period. Thereafter it depreciated, at times quickly, to close the period much lower.

A report by Sam Y. Cross, Executive Vice President, Federal Reserve Bank of New York and Manager of the Foreign Operations of the System Open Market Account. Officers of the Foreign Exchange Function, together with Richard F. Alford, Elizabeth A. Goldstein, Thaddeus D. Russell, and Elisabeth S. Klebanoff contributed to its preparation.

The dollar's continued rise: February to early-March

The dollar was buoyed early in the period by an improving outlook for the U.S. economy and the implications for U.S. monetary policy. Data being published at the time pointed to a significant rebound in the fourth quarter that had been unanticipated just months before, and economic forecasters were beginning to present reassuring projections of moderate growth for 1985. An accelerating expansion of monetary aggregates was seen as limiting the scope for any further easing of U.S. monetary policy and might even suggest some tightening. As a result, there was a perception in the market that the decline in U.S. interest rates, which had brought short-term deposit rates down more than three percentage points in about six months and was marked by two half percentage point cuts in Federal Reserve discount rates, was not likely to continue. As this shift in expectations occurred, market rates for long-term as well as short-term instruments backed up somewhat during February and into early March.

The economic outlook abroad was more guarded. The performance of many of the European economies had not been sufficient to dispel concerns about their longer-term growth potential. Industrial production statistics for

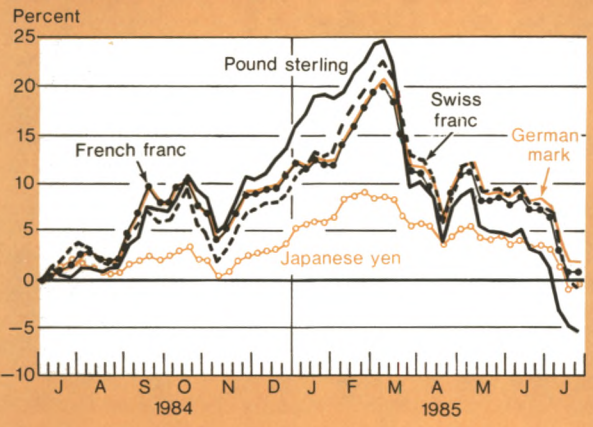
the first quarter, while hard to interpret because of temporary disruptions associated either with labor disputes or an unusually severe winter, pointed to declines in output in many large countries. Also, business opinions and press commentary appeared to reflect a lack of confidence in most countries that domestic demand could revive sufficiently to ensure a continued expansion should U.S. growth be subdued. Fiscal policies abroad were regarded as being almost universally restrictive, as the authorities sought further progress in achieving their medium-term goal of reducing fiscal deficits as a proportion of national income. Monetary policies were also generally restrained.

Thus, few market observers thought that foreign central banks would welcome pressures emanating from either a renewed firming of interest rates in the United States or a continuing decline in their currencies to tighten monetary policy any more. Yet the impact on domestic prices of the progressive decline in these countries' currencies against the dollar was showing through, at least in Germany where import prices were rising more quickly. Market participants therefore became wary of the possibility that the authorities there, as well as in other countries, might use intervention in an effort to stop the currency depreciations.

The full range of these international issues had already been discussed at a G-5 meeting late in January. Moreover, the May 1983 Williamsburg agreement to undertake coordinated intervention as necessary was reaffirmed at that meeting and visible foreign exchange market operations had subsequently been undertaken by the authorities of several countries. Market partici-

Chart 1

The Dollar against Selected Foreign Currencies



Percentage change of weekly average bid rates for dollars from the average rate for the week of July 2-6, 1984. Figures calculated from New York noon quotations.

Chart 2

U.S. Interest Rates

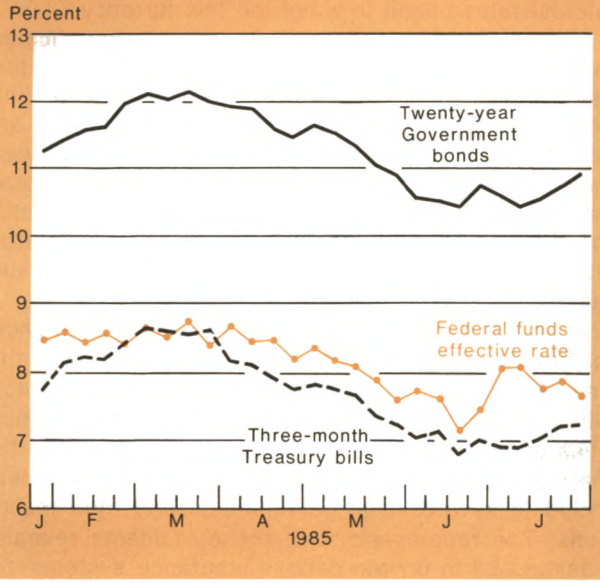
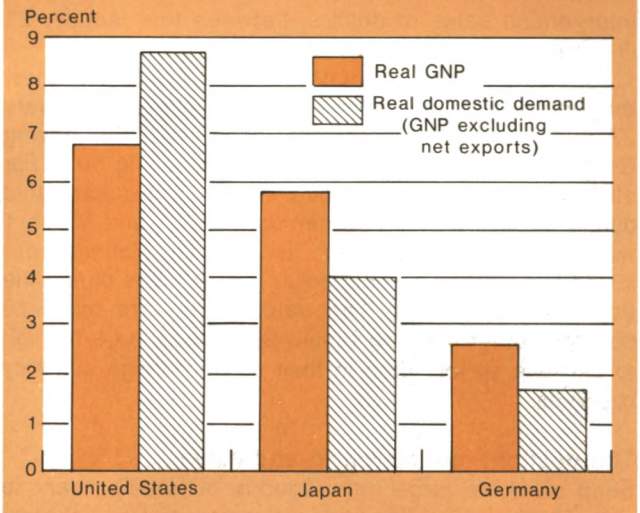


Chart 3

Real GNP and Real Domestic Demand Growth

In 1984



Source: Organization for Economic Cooperation and Development, 1984.

pants perceived the central banks to be more willing to intervene than before. But they were uncertain about the circumstances in which the central banks would judge intervention to be appropriate.

At the same time dealers remained impressed by the strength of demand for dollars in the exchange market. Enthusiasm spread about the degree of interest coming from abroad in the Treasury's February refunding operations. Commercial entities were frequently seen as buyers of dollars, presumably to hedge future commitments in light of the improving outlook for the dollar. As sentiment toward the dollar became increasingly bullish, the dollar rose through levels at which, in earlier months, some central banks had intervened and previously provided resistance. The dollar's rise then gained momentum, markets became one-sided, and dollar rates moved quickly to successive highs against several European currencies. By February 26, the dollar had risen nearly 10 percent against major European currencies while rising 3 percent against the Japanese yen. At this point the dollar was at its highest level of the six-month period under review, trading around DM3.48 and $1.03 against the German mark and British pound, respectively.

On three occasions during the first three weeks of February, the U.S. authorities intervened, selling a total of $242.6 million against marks, $48.8 million against yen, and $16.4 million against sterling to counter disorderly market conditions in operations coordinated with foreign central banks. Between February 27 and March 1, the U.S. authorities sold another $257.4 million against marks in the New York market in a concerted intervention. These operations brought the total of U.S intervention sales of dollars, between the January 21 G-5 meeting and March 1, to $659 million.

As for the central banks of most other G-10 countries, they intervened much more heavily between February 27 and March 1 than before, selling dollars, buying German marks and other currencies, or doing both. For all G-10 countries as a group, the total of dollars sold during the five weeks between January 21 and March 1 was about $10 billion. This series of operations constituted one of the biggest dollar interventions during the floating rate period. The sales of dollars by G-10 countries other than the United States was large enough to cause a sizable drop in their official foreign currency reserves.

Table 1

Federal Reserve
Reciprocal Currency Arrangements
In millions of dollars

Institution	Amount of facility July 31, 1985
Austrian National Bank	250
National Bank of Belgium	1,000
Bank of Canada	2,000
National Bank of Denmark	250
Bank of England	3,000
Bank of France	2,000
German Federal Bank	6,000
Bank of Italy	3,000
Bank of Japan	5,000
Bank of Mexico	700
Netherlands Bank	500
Bank of Norway	250
Bank of Sweden	300
Swiss National Bank	4,000
Bank for International Settlements:	
Swiss francs-dollars	600
Other authorized European currency-dollars	1,250
Total	30,100

The decline: mid-March to end-July

Even after the large interventions of late-February to early-March, the dollar traded close to its late February highs for about two weeks. But the intervention had resulted in an accumulation of dollar-denominated assets in private hands. Talk had begun to spread earlier that portfolio managers were gearing up to provide more currency diversification to customers' portfolios, taking advantage of assets that appeared undervalued at current exchange rates and capitalizing on the possibility of future currency appreciation. Then, around mid-March, a more pessimistic reassessment of the outlook for the U.S. economy and a shift of view about interest rates began to weigh on the currency.

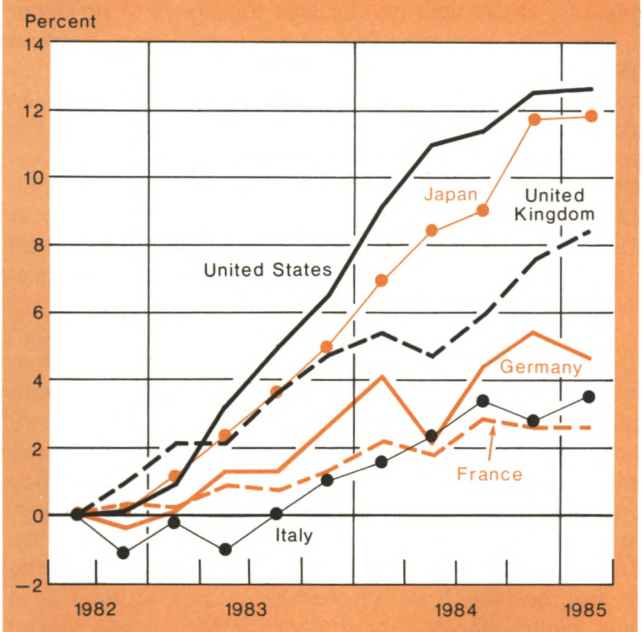
By mid-March, a variety of statistics were indicating that economic activity in the United States was proceeding only at a relatively slow pace. While final demand remained buoyant, the demand for labor and growth of production in the manufacturing sector were much weaker than had been assumed in most forecasts earlier in the year. Market participants came to realize the extent that demand was being diverted away from U.S.-produced goods, thereby jeopardizing the sustainability of economic expansion here.

At the same time, signs of strain in U.S. financial markets became more prominent, raising the risk that financial as well as economic dislocations would intensify. The failure of three secondary government securities dealers, though constituting a very small part of the market, imposed losses for a number of customers, including several local governments and thrift institutions. The repercussions of these incidents revealed weaknesses in private deposit insurance systems and

Chart 4

Cumulative GNP/GDP Growth

Quarterly data



led to large deposit outflows from state-insured thrifts, particularly in Ohio, before the governor of that state temporarily closed the affected institutions. Pictures displayed prominently by the media of queues of depositors unable to withdraw their funds heightened concern about the authorities' ability to deal adequately with problem situations. Since difficulties had already been identified in energy, real estate, and agricultural portfolios, this weakness was perceived as having potentially far-reaching implications.

Against this background, market participants adjusted their assessments of the outlook for U.S. monetary policy and interest rates. Dealers were sensitive to the implications of the imbalances in the economy for the industrial sector and the prospects for sustained growth. Money as measured by M1, though remaining well above target, was growing somewhat more slowly on a month-to-month basis. Inflation rates were still low, a renewed weakness in oil prices helped keep inflationary expectations at bay, and signs of Congressional action to reduce the fiscal deficit lent some relief to the bond market.

Thus, most observers came to expect the Federal Reserve to give priority to supporting the economy and providing assistance to the domestic financial system. Market interest rates of all maturities started to decline in a trend that was to last about three months, while expectations developed that the Federal Reserve would announce a series of cuts in its discount rates. By mid-June short-term interest rates had fallen two percentage points or more, with the Federal Reserve lowering its official rates just once—by half of a percentage point, effective May 20. Long-term rates also declined, but more slowly. As a result of these declines, most U.S. interest rates were below levels prevailing at the depth of the 1982 recession.

As these developments began to unfold, the dollar fell substantially in the exchange markets. Many market participants were concerned for a time about the magnitude of any drop in the dollar, if foreign investors tried to liquidate dollar assets accumulated during previous years. Indeed investors acted to protect the value of their portfolios, mostly by selling dollars in the forward market but also by shifting into assets denominated in other currencies. Commercial customers postponed dollar purchases in the expectation of being able to buy later at more attractive rates. Bank dealers and speculators on organized exchanges also sought to sell the dollar and to establish short positions. Under these circumstances the dollar moved lower. As it fell through levels at which resistance had previously been expected, the pace of the decline quickened. From its peak in late-February to the middle of April, the dollar dropped 20 percent against sterling, 15 percent against the continental currencies, as well as 6½ and 4 percent against the Japanese yen and Canadian dollar, respectively.

Late in April, however, the dollar firmed and then traded relatively steadily through the end of June. Market participants perceived that foreign investors had not liquidated their dollar holdings in large scale so that fears of an early and precipitous fall in the dollar faded. Instead, inflows of new funds were continuing, especially from Japan at the beginning of that country's new fiscal year in April, as well as from countries suffering from serious inflation problems. Also, persistent strains in the U.S. financial sector were being well contained. Interest yields on dollar investments were still relatively attractive. The scope for hedging the currency risk should the dollar decline had been demonstrated. And profits realized from earlier hedging operations increased the overall rate of return on dollar portfolios sufficiently to protect against even significant future declines in the dollar. In effect, the dollar retained its stature as the principal medium for investment.

Meanwhile, the currencies that traditionally benefit from a shift of investor preference out of dollars, the German mark and Japanese yen, had appreciated rel-

atively modestly as the dollar had declined. The U.S. economy had still outperformed those of most other industrialized countries and talk continued of a renewed acceleration of U.S. growth in the second half of 1985. The only currency to challenge the dollar as an investment alternative was pound sterling. With the outlook for economic growth in the United Kingdom brighter than for most other countries and interest rate levels there comparatively high, sterling-denominated assets provided an attractive outlet for investors reluctant to accept declines in yields elsewhere. Thus by the end of June, the dollar was trading above its mid-April lows against all currencies except sterling.

Many market observers had supposed that the authorities abroad would have taken advantage of the decline in U.S interest rates that occurred during the spring to ease their own monetary policies. But in Germany and Japan the authorities appeared reluctant to cut short-term interest rates until they were more confident about the exchange market situation. In the other countries, the authorities were cautious about letting interest rates at home get too far out of line with those of their closest trading partners. To varying degrees, foreign central banks instead took advantage of the decline in the dollar to rebuild their foreign currency reserves. The authorities in several countries acquired sizable amounts of both dollars and German marks, currencies that could be used in future intervention operations to support their own currencies. By the end of June the G-10 countries as a group had largely recovered the reserves lost in the early months of the year.

In July the dollar resumed its decline. During the spring, the gap had continued between strong growth of U.S. domestic demand and weak expansion of domestic production. As a result, the regular flow of economic statistics had presented conflicting signals. By early July, however, it again became clear that U.S. economic activity had not increased as much as most observers had expected. An acceleration of real GNP growth in the second quarter was more moderate than anticipated, and anecdotal information for July suggested that the third quarter was getting off to no better a start. The mounting U.S. trade and current account deficits were increasingly perceived by market participants as a drag on the domestic economy. Noting an increase in protectionist pressures, they considered the possibility that the Administration might welcome a further decline in the dollar to help restore external balance. At the same time, disappointment developed over the prospects for meaningful reduction of the fiscal deficit, as efforts in the Congress to adopt a compromise budget resolution appeared to falter.

During the month, interest rate developments tended to move in the dollar's favor. In the United States, interest rates started to firm. Market participants here came to expect the Federal Reserve would not be more accommodative until it could assess more fully the implications of the drop in interest rates that had already occurred and of a renewed acceleration in M1 growth. In Europe, interest rates began to ease more rapidly. The central bank in Germany began to provide liquidity at progressively lower interest rates and, at least for a time, central banks in other continental countries moved in a similar direction. Thus, interest differentials actually moved in favor of the dollar during the month.

Nonetheless, sentiment toward the dollar had become cautious. Market professionals had already begun to set up positions in anticipation that the dollar might resume its decline. Thus, when others came into the market to sell, dollar rates moved down through the end of the month, dropping well below the lows of mid-April. Sterling continued to lead the rise in foreign currencies against the dollar. After mid-July, however, when a

Table 2

Drawings and Repayments by the Argentine Central Bank Under Special Swap Arrangements with the U.S. Treasury

In millions of dollars; drawings (+) or repayments (−)

Drawings on the United States Treasury	Outstanding September 31, 1984	1984-IV	1985-I	1985-II	Outstanding July 31, 1985
$500 million	*	+500	−230 −270	-0-	-0-
$150 million	*	*	*	+75 +68	+143

Data are on a value-date basis.

*Not applicable.

realignment within the European Monetary System (EMS) drew attention to the mark's potential for revaluation in that arrangement, the German currency also began to strengthen more rapidly than before. During the entire February-July period under review, the dollar had fallen on balance 20 percent against sterling to $1.4135, 12 percent against the mark to DM2.7850 and by approximately similar magnitudes relative to most other continental currencies, and by 8 percent against the Japanese yen to ¥236.

Meanwhile, during late June and July, progress was being made in some of the largest Latin American countries to deal with the serious imbalances in their economies. In Argentina, the government came to an agreement with the International Monetary Fund (IMF) on a stabilization program that entailed currency and wage/price reform designed to brake the country's rapidly accelerating inflation. Upon completion of an agreement by the IMF to provide a standby, the U.S. Treasury and 11 other monetary authorities acted to facilitate the provision of a $483 million bridge financing facility for Argentina, of which the U.S. portion was $150 million. Argentina made two drawings of roughly equal size on this facility, on June 19 and on June 24, for a total of $460 million. The Treasury's portion of these drawings was $143 million. Argentina is scheduled to repay the drawings in two installments after the period. In Mexico, the government tightened fiscal policy, liberalized trade policy, and made major changes in the structure of its exchange market. These actions were undertaken in order to align Mexico's cost and price structure more closely with world markets and aid in bringing inflation down to targeted levels.

In the period February through July, the Federal Reserve and the Exchange Stabilization Fund (ESF) realized no profits or losses from exchange transactions. As of July 31, cumulative bookkeeping or valuation losses on outstanding foreign currency balances were $871 million for the Federal Reserve and $578 million for the Treasury's Exchange Stabilization Fund. These valuation losses represent the decrease in the dollar value of outstanding currency assets valued at end-of-period exchange rates, compared with the rates prevailing at the time the foreign currencies were acquired.

The Federal Reserve and the ESF invest foreign currency balances acquired in the market as a result of their foreign operations in a variety of instruments that yield market-related rates of return and that have a high degree of quality and liquidity. Under the authority provided by the Monetary Control Act of 1980, the Federal Reserve had invested $1,009.2 million equivalent of its foreign currency holdings in securities issued by foreign governments as of July 31. In addition, the Treasury held the equivalent of $1,756.0 million in such securities as of the end of July.

Table 3

Net Profits (+) or Losses (−) on United States Treasury and Federal Reserve Current Foreign Exchange Operations

In millions of dollars

Period	Federal Reserve	United States Treasury Exchange Stabilization Fund
February 1 - July 31 ...	-0-	-0-
Valuation profits and losses on outstanding assets and liabilities as of July 31, 1985	−871.1	−578.3

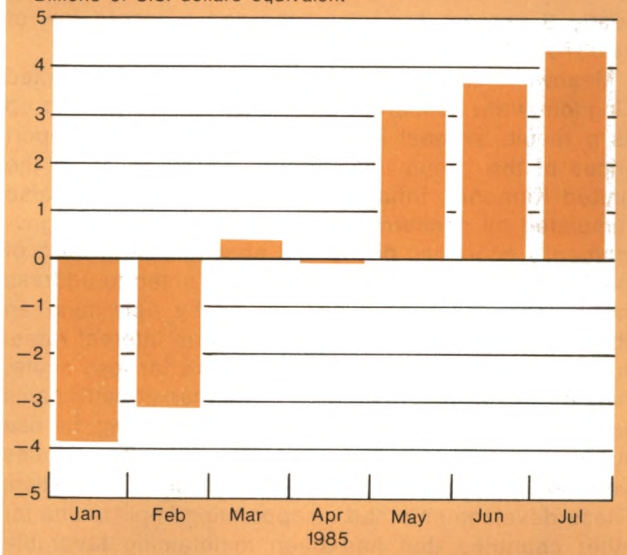
Data are on a value-date basis.

Chart 5

Changes in Currency Reserves of G-10 Countries

Excluding United States

Billions of U.S. dollars equivalent



Foreign currency reserves shown in this and the following charts are drawn from IMF data published in International Financial Statistics.

Adjustments for gold and foreign exchange swaps against European currency units done with the European Monetary Fund are incorporated.

European currencies

Coming into the six-month period, progress appeared to stall in resolving the economic problems facing European countries. During the months of severe winter weather, growth in several countries slowed, unemployment in some continued to drift upward, and a deceleration in inflation petered out. At the same time the trend toward greater convergence of economic performances started to dissipate, notwithstanding the fact that governments in almost all of these countries continued to be committed to common goals for economic policy: reducing government deficits and containing inflation. Under these circumstances, there were some adjustments among the relationships of all European currencies as they declined and then rose against the dollar.

Early in the period, with the dollar strengthening across the board, the continental currencies as a group fell about 10 percent. The Swiss franc dropped to SF2.9405, the lowest level in more than 10 years, and the German mark posted a low for the floating-rate period at DM3.4780. The Dutch guilder, the French and Belgian francs, and the Italian lira dropped to record lows of NG3.9430, FF10.6300, BF69.90, and LIT2167, respectively. Sterling, which had been the target of especially heavy selling pressure just before the period, declined somewhat more slowly against the dollar during February. Nevertheless, by February 26 it had declined nearly 9 percent and also recorded a record low of $1.0370.

Meanwhile, authorities in Germany and the United Kingdom were concerned that inflation was picking up as a result, at least in part, of the impact on import prices of the continuing strength of the dollar. In the United Kingdom, inflationary expectations were also stimulated by concerns over the priorities of the government's economic policy and above-target growth of money. But the British authorities had acted to address these concerns prior to the period by permitting an abrupt and sharp increase in short-term interest rates. In Germany, where the pressures were far less acute, market rates also tended to firm. But market participants perceived the German authorities to be resisting the rise out of concern that significant increases in interest rates were not appropriate to the domestic economic situation. These developments had disappointing implications for other countries that had been maintaining favorable interest rate differentials relative to Germany. The central banks in France, Italy, and Belgium, for example, saw the opportunity for them to lower interest rates in response to earlier improvements in their price performance as quickly slipping away.

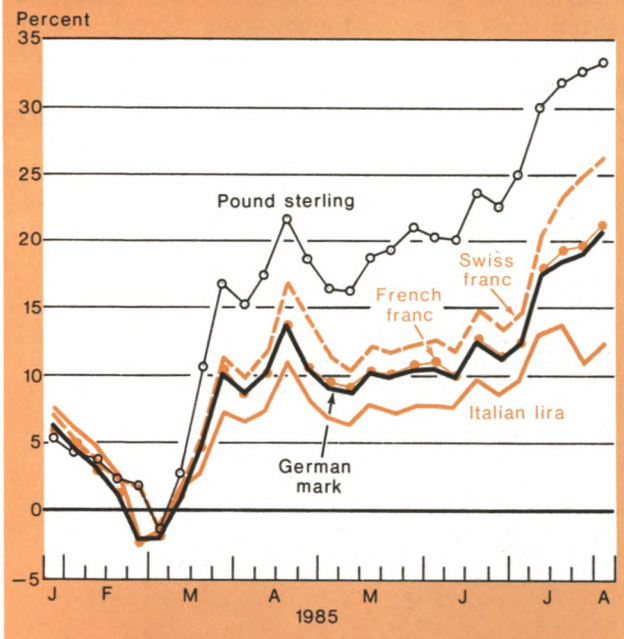
Following the G-5 meeting in January most European central banks participated in the coordinated interventions that took place through early March. All of those participating sold dollars, at times in sizable amounts. Some supplemented their dollar sales with purchases of marks and a couple of other currencies, either against dollars or their own currencies.

From mid-March, when the dollar began to decline, to end-June, sterling was the currency that rebounded most strongly to lead the rise in European currencies against the dollar. The Swiss franc also benefited more than many others, while the German mark was not particularly buoyant.

This pattern of exchange rate changes surprised market observers who had anticipated that, once the dollar started to fall, the mark would reassert itself as the principal alternative for investment. But as it turned out, the currencies to benefit most from the dollar's initial decline were, for the most part, those with assets yielding relatively high interest rates. Foreign capital was drawn into sterling, enticed by high yields on gilts and other fixed income securities as well as the breadth and liquidity of London's financial markets. Residents in high

Chart 6

Selected Foreign Currencies against the Dollar



Percentage change of weekly average bid rates for selected foreign currencies from the noon rates on February 28, 1985. Figures calculated from New York noon quotations.

interest rate countries borrowed abroad where the cost of funds was lower to finance trade and domestic expenditures. The Swiss franc firmed against many other currencies, even though Swiss interest rates remained relatively low, because the impression spread in the markets that monetary policy in Switzerland was not likely to be eased. In Germany, interest rates were also lower than in most other countries, and economic indicators for the first quarter were being interpreted in the market as disappointing. Expectations developed that the Bundesbank would cut interest rates as soon as exchange market conditions permitted and U.S. interest rates declined.

Although the upward pressure on European interest rates subsided as the dollar declined during the spring, the European monetary authorities were slower to reduce interest rates than many market observers had expected.

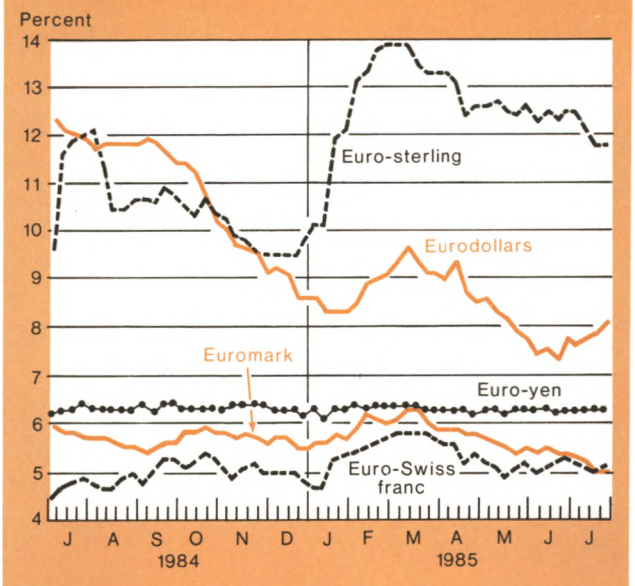
In the United Kingdom, the authorities were intent on reassuring markets of their commitment to strict financial policies. A cautious budget, presented in March, called for both a drop in the public sector borrowing requirement and reductions of growth targets for Britain's two monetary target variables, M0 and M3. As interest rates in the United States declined and capital inflows into sterling exerted upward pressure on the pound, the Bank of England allowed interest rates to ease somewhat. But the authorities were perceived as acting to slow the decline—an approach that appeared reasonable as long as the economic outlook for the United Kingdom was more optimistic than for most other countries. By late June, short-term interest rates were still above 12 percent and differentials *vis-à-vis* dollar interest rates were even wider than they had been early in February.

In Germany, also, the Bundesbank did not judge the domestic situation as warranting a change in the course of monetary policy. The central bank saw the underlying trend of economic activity still pointing upward. Central bank money stock was growing close to the top of its target path, buoyed by an acceleration of domestic credit growth early in the year. The public sector in particular was temporarily having an expansionary impact on monetary growth. And by late spring a public debate had emerged over accelerating proposed tax cuts. The Bundesbank did not wish to suggest that an easing of policy was appropriate by announcing reductions of its official rates. But it was willing to provide sufficient liquidity to the banking system mainly through repurchase agreements. These operations reduced banks' use of Lombard credit and guided day-to-day money rates cautiously lower. By the end of June, three-month money rates had eased 75 basis points from

Chart 7

Selected Interest Rates

Three-month maturities*

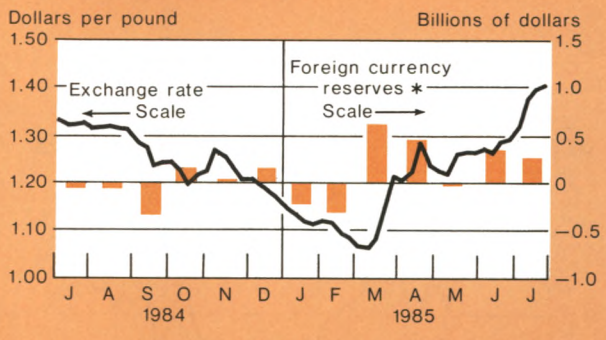


*Weekly averages of daily rates.

Chart 8

United Kingdom

Movements in exchange rate and official foreign currency reserves



Exchange rates shown in this and the following charts are weekly averages of noon bid rates for dollars in New York.

*Foreign exchange reserves for the United Kingdom and other members of the EMS, including Germany, incorporate adjustments for gold and foreign exchange swaps against European currency units done with the European Monetary Fund.

levels of end-February, less than half the decline for comparable rates in the United States.

The relative stability of interest rates in Germany was a factor limiting the scope for interest rate declines in other European countries. The authorities there had accepted that domestic interest rates would remain considerably higher than those in Germany because inflation rates were higher and current account positions were not as strong. Yet their currencies were being buoyed relative to the mark by the inflow of interest-sensitive capital. Under the circumstances, these central banks also looked to relatively subtle techniques to ease money-market rates gradually, so as not to suggest that a change in policy was underway. The Bank of France, for example, lowered its money market intervention rate, acting cautiously by moving in several small steps. In this way, short-term interest rates in France declined somewhat more than in Germany. A more substantial change in technique occurred in Belgium where the National Bank decided to adopt a more flexible and market related practice for fixing the discount rate. Henceforth the discount rate was to be linked to the rate on three-month Treasury certificates. As a result, a decline that had already occurred in market rates was acknowledged and rates continued to ease modestly through the end of June.

Against this background, the authorities in many European countries also chose to respond to the favorable exchange market environment for their currencies by acquiring foreign currency reserves. During the second quarter a number of central banks were active buyers of dollars either in the market or from customers. They also purchased substantial amounts of other currencies, especially the German mark, because it is a currency frequently used for intervention within the EMS and is of increasing importance in the reserve holdings of other European countries. As a result of these operations, many countries restored the reserves lost during their intervention operations in late January through early March. France and Italy had among the largest increases in reserves. Germany's increase was the greatest, even though it refrained from intervening for much of the period.

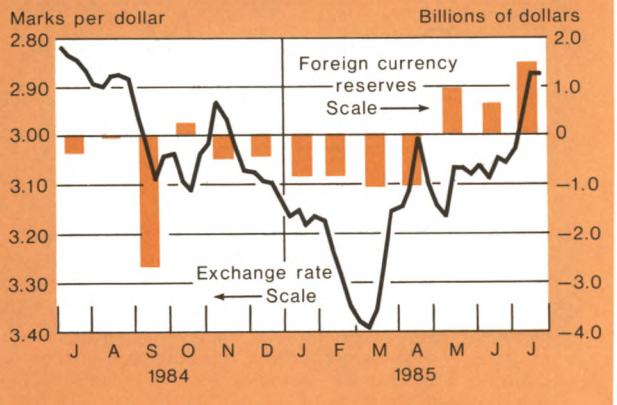
Meanwhile, the Italian lira had broken stride with the other European currencies. During February it had risen against the dollar more slowly than the others. As a result, it had moved from the top to the bottom of the narrow EMS band between early February and mid-March and then traded consistently about 1 1/2 percent below the bottom-most currency in the narrow band during the second quarter. Fiscal policy in Italy had been expansionary, with the government deficit expected to grow to 17 percent of GDP in 1985. Moreover, Italy's inflation remained high relative to that of other countries and successive increases in wage settlements eroded the country's competitiveness all the more. Accordingly, the current account had deteriorated, with imports of capital goods quickening. Under these circumstances, market participants came to anticipate that the Italian authorities might welcome a decline in their currency.

Sentiment toward the lira was briefly buoyed in May and June when the government's position strengthened with a defeat of a referendum reinstating wage index-

Chart 9

Germany

Movements in exchange rate and official foreign currency reserves

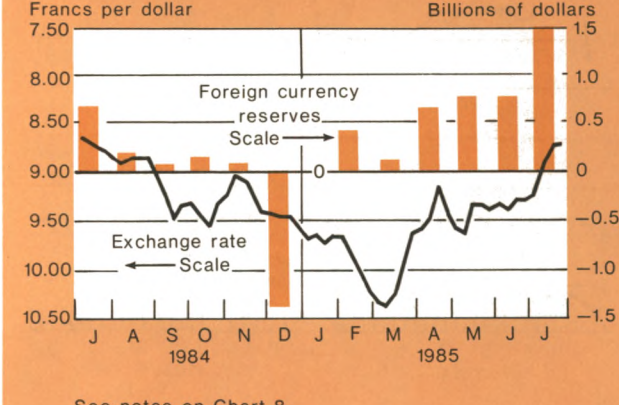


See notes on Chart 8.

Chart 10

France

Movements in exchange rate and official foreign currency reserves



See notes on Chart 8.

ation and a smooth transition to a new presidency. But by July the lira had resumed its slide toward its lower EMS limit. This depreciation helped to offset the competitive disadvantage resulting from accumulated inflation differentials but removed room for movement of the exchange rate within the wide band available to the lira in the EMS arrangement. The Italian authorities therefore decided to seek a realignment of the lira's central rates. Thus, after the lira dropped to its existing lower limit in hectic trading on Friday, July 19, the authorities closed the foreign exchange markets in Italy after the fixing. That weekend the EMS countries agreed to a realignment that took the form of a 7.8 percent devaluation of the lira's bilateral central rates against all other active EMS members. As a result, the lira's European currency unit central rate fell by 7.7 percent while the others rose by 0.15 percent.

The July realignment of the EMS served to focus market attention on the risks of further adjustments in the exchange rate relationships among European currencies. Market operators began to hedge their borrowings in low interest rate currencies and their investments in high interest rate currencies. The monetary authorities in countries like France and Belgium found the scope for letting interest rates ease or for adding to official reserves more circumscribed than before. At the same time the Bundesbank found that the exchange rate environment, together with a reaffirmation of the government's policy of fiscal consolidation, afforded an opportunity to let short-term interest rates decline more quickly. A similar development occurred in the Netherlands.

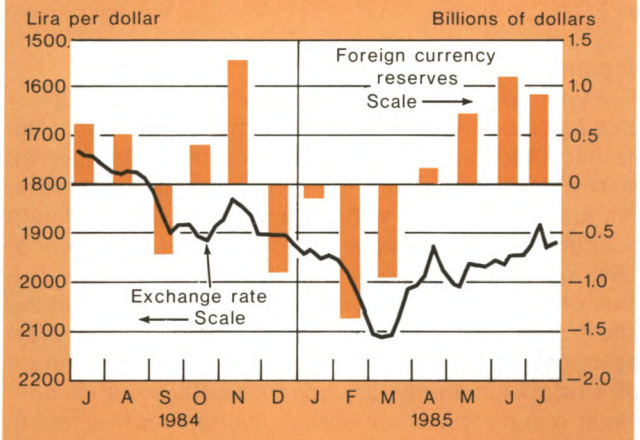
About the same time in July sentiment toward sterling began to soften as well. The pound had risen progressively against the mark to levels that brought into question Britain's competitive position *vis-à-vis* its European trading partners. Moreover, the earlier optimistic assessment of the country's economic prospects gave way to a more guarded outlook in the face of a weakening flow of new orders and a flattening of output growth. Market participants came therefore to expect the Bank of England to permit a more rapid decline in interest rates, even if the pound were to weaken as a consequence. Indeed, during the month, money market rates in London declined toward the 11 percent level and favorable interest rate differentials relative to the dollar narrowed by about one and one-half percentage points. In response, sterling gave up some of its gains *vis-à-vis* the mark late in the month.

Thus, the decline in the dollar in July came to be reflected in a somewhat more rapid rise in the German mark than before. Even so, at the end of the six-month period under review, the pound had still risen from the February lows against the dollar by more than the other

Chart 11

Italy

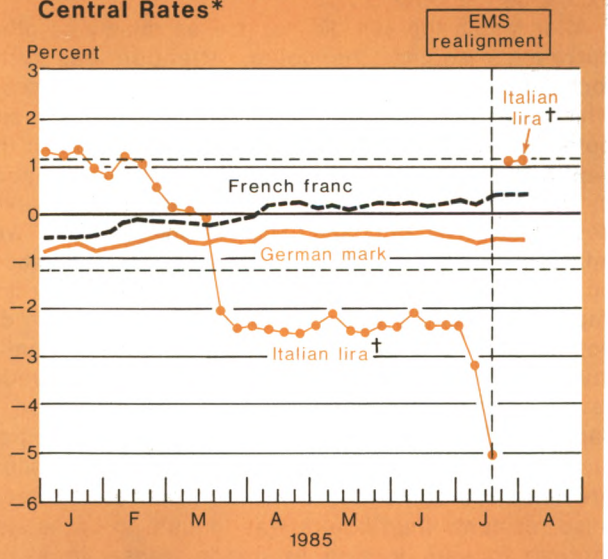
Movements in exchange rate and official foreign currency reserves



See notes on Chart 8.

Chart 12

Percent Deviation of Selected EMS Currencies from their Bilateral Central Rates*



*Weekly averages of daily 9 a.m. rates.

†The Italian lira may fluctuate ± 6 percent from its central rate with other participating currencies.

European currencies. It closed the period up 38 percent from the end-February lows at $1.4350. The mark rose 25 percent during the same period to DM2.7800, with the Swiss franc and most EMS currencies moving roughly in line with the mark. The lira rose 18 percent to LIT1872.

Japanese yen

The yen generally moved in line with European currencies against the dollar during the six-month period, but its fluctuations were narrower. As the period opened, market sentiment toward the yen was relatively positive. An annualized 9 percent rise in GNP in the fourth quarter of 1984 and optimistic projections for calendar 1985 compared favorably with the experience and outlook of other countries. Inflation remained low, with the effect of the yen's depreciation against the dollar offset by its rise against other currencies and by the weakness of world commodity prices, particularly petroleum. Japan's current account surplus had grown to a record $35 billion in 1984. Thus the yen did not fall as rapidly against the dollar as the European currencies during February.

Japanese fiscal policy continued to be one of gradually reducing the government's fiscal deficit as a proportion of GNP. The Bank of Japan maintained its accommodative monetary stance, but the central bank refrained from reducing its official lending rates, citing as its main reason the need to support the yen in the exchange markets.

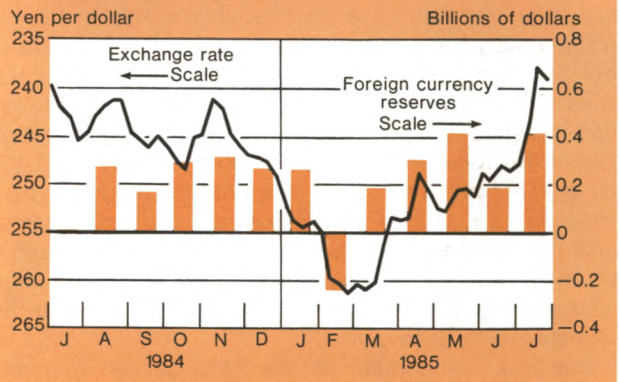
After March the yen did not rise as rapidly as other currencies against the dollar. Attention was often focused on Japan's huge long-term capital outflows—which had reached $50 billion in 1984—as a major potential source of unpredictable pressure against the yen. At times during the period, the yen's performance in the exchange market—as well as credit market developments in both Japan and the United States—was influenced temporarily by reports and rumors about possible changes in rules or preferences governing Japanese investment abroad. In any case, the yen did not benefit, as did the European currencies, from a favorable shift of capital flows late in the period under review. Long-term capital outflows, as measured in Japanese net purchases of foreign bonds, actually grew larger to set new records in June and July. But since a greater proportion of the outward investment by Japanese residents than before was thought to be hedged through forward foreign exchange transactions and short-term dollar borrowings, the resulting pressures against the yen were substantially mitigated.

Rising foreign protectionist threats against Japan, and demands that the Japanese government step up its actions to reduce the trade imbalance, also attracted

Chart 13

Japan

Movements in exchange rate and official foreign currency reserves



See exchange rate footnote on Chart 8.

attention in exchange markets at times as a potentially negative background factor for the yen. Generally, however, such pressures did not have immediate exchange-rate influences. Announcements in April and June of new Japanese government programs to open domestic markets by reduced tariffs, liberalized investment rules, and administrative reforms had little apparent impact on the yen rate at the time.

By the end of the period, Japanese foreign currency reserves had risen by almost $1.2 billion to $2.38 billion, largely reflecting interest earnings.

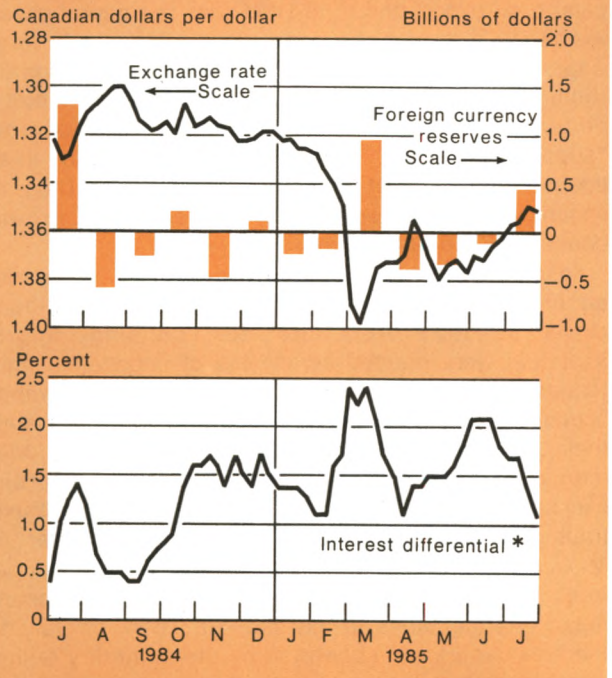
Canadian dollar

The Canadian dollar, like other currencies, weakened considerably against the U.S. dollar early in the period. The rise in U.S. interest rates during January and February fanned renewed debate over priorities for monetary and fiscal policies in Canada. Inflation in Canada had stabilized under 4 percent on a year-on-year basis but the unemployment rate had recently moved back over 11 percent. Market participants, noting that Canada's traditional interest rate advantage had dwindled to about one percentage point by early February, questioned the willingness of Canadian authorities to permit increases in interest rates comparable to those in the United States. Moreover, uncertainty developed as to whether Canada's newly elected government would deal decisively with its plan to reduce the budget deficit and improve the investment climate. At the same time unease developed surrounding potential capital outflows related to the acquisition by Canadians of foreign-owned assets in the petroleum sector.

Chart 14

Canada

Movements in exchange rate, official foreign currency reserves, and interest differential



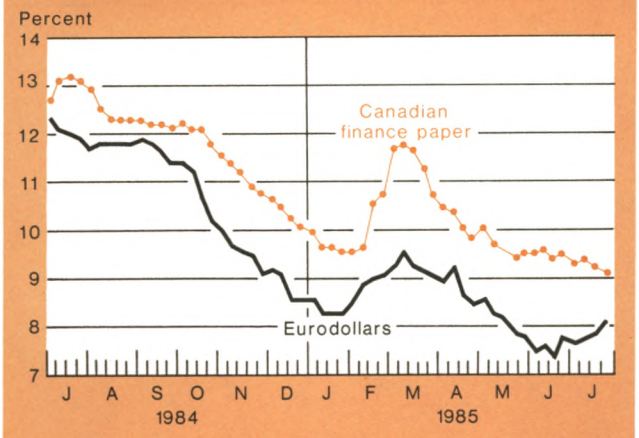
See exchange rate footnote on Chart 8.

*Canadian finance paper minus Eurodollars. Weekly average of daily rates.

Chart 15

Interest Rates in Canada and the Eurodollar Market

Three-month maturities*



*Weekly averages of daily rates.

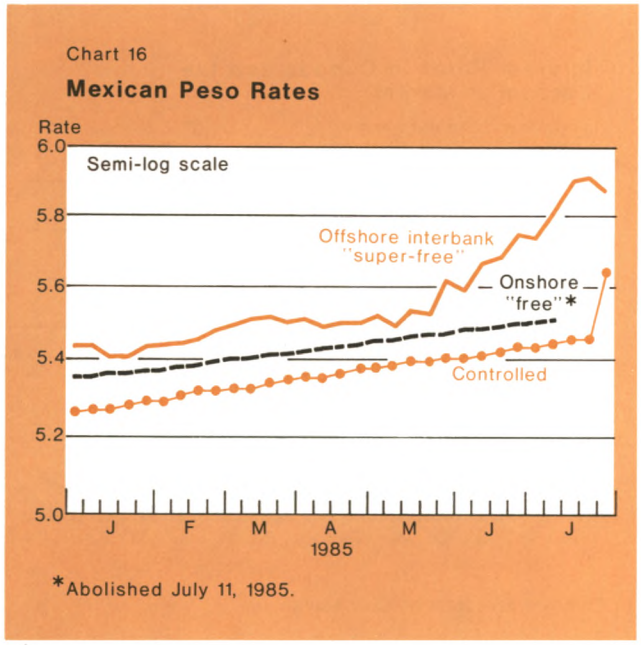
Against this background, sentiment toward the Canadian dollar deteriorated sharply. Speculative selling and an adverse shift in commercial leads and lags put pressure on the exchange rate which fell to an all-time low of Can.$1.4070 ($0.7107) early in March, a decline of 6 percent from the end of January. The authorities intervened heavily to moderate the decline, financing their dollar sales by drawing on the government's credit lines with commercial banks and borrowing in the Eurodollar market. Moreover, the Bank of Canada allowed interest rates to rise more sharply than U.S. rates, and the currency's interest rate advantage widened to 2½ percentage points.

These developments helped to convince market participants that the authorities' approach to the exchange rate had not been changed. In addition, the Canadian government announced plans for tax increases and expenditure cuts to reduce the fiscal deficit together with legislation to remove impediments to foreign investment in Canada, thereby reducing uncertainty further. Moreover, a strong external performance, signs of a pickup in the domestic economy, and low wage settlements provided a more encouraging outlook for the currency.

Thus, the Canadian dollar recovered after mid-March most of the ground it lost earlier in the period to close at Can.$1.3539 ($0.7386), down only 2 percent on balance over the six months. Under these circumstances, interest differentials eased back to fluctuate around 1½ percentage points over the remainder of the period. The Bank of Canada made net dollar purchases as its currency rose, which it used to repay debt on its commercial bank credit lines and bolster reserves. In addition, a further U.S. dollar borrowing in the U.S. market served to boost the level of foreign exchange reserves. By the end of July, foreign exchange reserves were up $498 million over the period under review at $2.1 billion.

Selected Latin American currencies

During the six months under review, two major Latin American countries, Mexico and Argentina, introduced new economic packages that included, among other measures, reforms to their respective foreign exchange systems. In the case of Mexico, this package was designed to get its stabilization efforts of the past three years back on track. In the case of Argentina, the task was to embark on major reforms to reverse long festering economic imbalances that were being reflected in spiraling inflation rates.



Mexico

Mexico had posted a significant improvement in its trade account, which had swung from a deep deficit into surplus in 1983 and 1984. However, the surplus had subsequently narrowed. During the first four months of this year, the weakening of Mexico's external position was being accentuated by a nearly 10 percent fall in total exports. Oil shipments dropped in the face of weakening prices elsewhere, the competitiveness of non-oil exports declined with a real appreciation of the "controlled" exchange rate, and the pressures of increasing internal demand deflected production to the home market. Under these circumstances, Mexico's current account surplus for all of 1985 was also expected to diminish, notwithstanding the reduction of interest payments stemming from declining interest rates.

Meanwhile, Mexico's fiscal deficit through June rose to well above target levels. The budget overrun reflected the lower-than-anticipated oil revenues and increased government spending resulting partly from higher-than-expected inflation and greater internal interest payments.

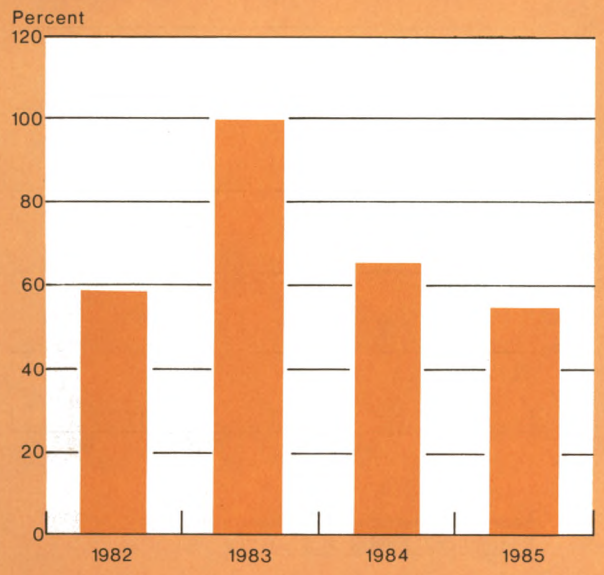
In response to these pressures, beginning in late May the discounts widened between Mexico's "controlled" exchange rate for licensed transactions and the two free market rates—the internal "free" rate and the "super-free" rate across the Mexican border. Thus, the improvement in the foreign exchange position of the Mexican peso, which had occurred in late March and in April following announcement of new understandings with the IMF on 1985 economic policies and the signing of the first phase of Mexico's multi-year rescheduling, quickly dissipated. By late spring the external market was subject to recurring rumors of an impending peso devaluation, an increase in the daily rate by which the authorities adjusted the crawling "controlled" rate, and cuts in oil export prices. By mid-July, the gaps between exchange rates for the peso were increasingly large. Exporters had the incentive to delay or divert revenues required to be converted in the "controlled" market to either the domestic "free" market or the external, "super-free" market. Also, the volume of trading in the internal "free" market diminished substantially. Thus, the widening gap of peso rates was a source of growing concern to the authorities.

To deal with this situation, the Mexican authorities adopted a series of measures, starting in mid-June. Under Mexico's procedures for licensing imports, exporters were granted certificates of importation rights (called "DIMEX"), permitting them to import without license a range of raw materials and inputs to make their operations more efficient. Effective June 28, Mexican banks were allowed to operate in the foreign exchange market at the "super-free" rate by establishing trading houses designed for this purpose. After the Mexican banks were able to participate in the "super-free" market via their trading houses, they became major intermediaries in that market. Then, on July 11, the Mexican banks, supported by the monetary authorities, decided to stop trading at the internal "free" rate. As a result transactions were switched from the "free" market, where the peso was trading at 247.3 pesos per dollar the day before, to the "super-free" market, where the peso was at 312.0 pesos per dollar before the announcement of this change. This switch constituted a 26 percent devaluation for transactions not eligible for the "controlled" rate. Then on July 25, the Mexican government announced additional economic reforms including:

- A 17 percent devaluation of the "controlled" exchange rate, from 232 to 279 pesos per dollar.
- The introduction of a "regulated float" to replace the earlier crawling system involving a fixed, daily slide of the peso against the dollar for the "controlled" market.
- Elimination of import permits on goods accounting for about 37 percent of its imports, thereby making a total of over 60 percent of Mexican imports subject to tariffs rather than non-tariff barriers, and a further enlargement of the "DIMEX" arrangements.
- A cut in current government expenditures,

Chart 17

Mexican Inflation Rate



Sources: International Monetary Fund, International Financial Statistics; and Banco de Mexico, Informe Anual.

amounting to 150 billion Mexican pesos during 1985, that entailed a 20 percent cut in budgeted expenditures on goods, the elimination of several highly visible government positions, and major cutbacks in expenditures by public enterprises.

The purpose of these reforms was twofold. First, they were expected to relieve demand pressures in the economy coming from the public sector. Second, they were intended to improve competitiveness by adjusting the exchange rate and by opening the domestic market to lower-priced imports for raw materials, intermediate products, and capital goods.

During the period between the announcement of the abolition of the internal "free" market and the rest of the economic reforms, the peso weakened sharply as Mexican residents rushed to buy dollars in anticipation of a further devaluation. By July 24, the market rate in Mexico and abroad had fallen a further 20 percent to 374 pesos per dollar, and the discount relative to the "controlled" rate widened to more than 60 percent. But by the end of July, the peso recovered to 354.50 pesos per dollar, and the discount from the "controlled" rate narrowed to about 27 percent.

Argentina

In Argentina a newly constituted democratic government had been attempting to grapple with a debilitating wage/price spiral without jeopardizing promised increases in real incomes. But the domestic economy was in severe disequilibrium. The central bank had monetized years of oversized fiscal deficits. It found that, with public sector wage increases and fiscal policy stimulating demand, efforts to restrict excessive bank lending through interest rate ceilings and credit allocation schemes led to a diversion of financing to an informal inter-company market.

Argentine officials had repeatedly spoken of the need for programs to stabilize the economy over time by tightening monetary and fiscal policies. As recently as December 1984, Argentina had announced a 15-month standby arrangement with the IMF. But the country was from the start not in compliance with the standby provisions and the rise in Argentina's inflation rate continued to accelerate. In the process, the strategy of gradual adjustment had lost credibility. By early 1985 the internal chaos wrought by an economy reeling toward hyperinflation provoked political demands for a new approach that promised quicker results, even if the approach involved immediate sacrifice.

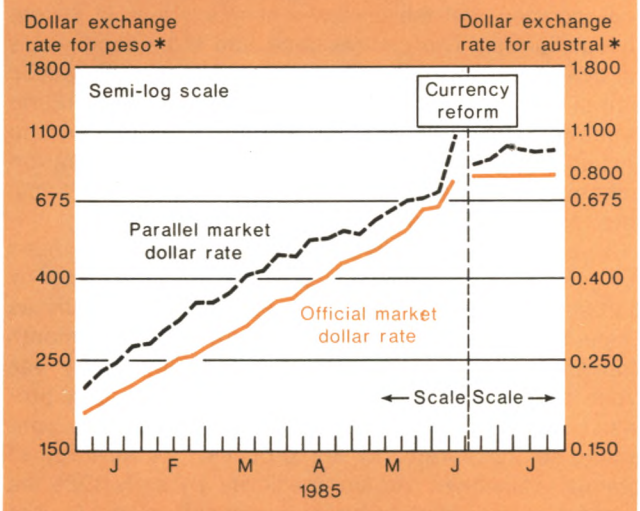
Thus, in March President Alfonsin, with a new economic team, began to adopt a series of new measures to achieve rapid adjustment and a radical restructuring of the economy. First, regulated deposit rates were raised to levels comparable to the monthly inflation rate. Interest rates were deregulated on some bank liabilities to attract funds back into the banking system where the authorities could exert more control on credit creation. Public utilities also raised prices significantly to increase revenue.

On June 11, the government announced an 18 percent devaluation of the Argentine peso in the official market. Previously, the government had implemented "mini-devaluations" rarely exceeding 4 percent, and averaging about 1 percent per day to adjust for the inflation differentials between Argentina and other countries. Following this action, and amid rumors of dramatic economic measures, the premium which Argentine residents had to pay for dollars in the parallel market widened to 35 percent.

Then on June 14, President Alfonsin announced a package of bold economic reforms, centering on a further, substantial cut in the fiscal deficit and a pledge to stop monetizing the deficit. The deficit, which had fluctuated in the range of 10 to 12 percent of GDP since the end of 1983, was to be slashed to only 2.5 percent for the second half of this year. In support of this plan, price and wage ceilings were frozen—actions described as interim steps toward eliminating the country's price and wage indexation system that

Chart 18

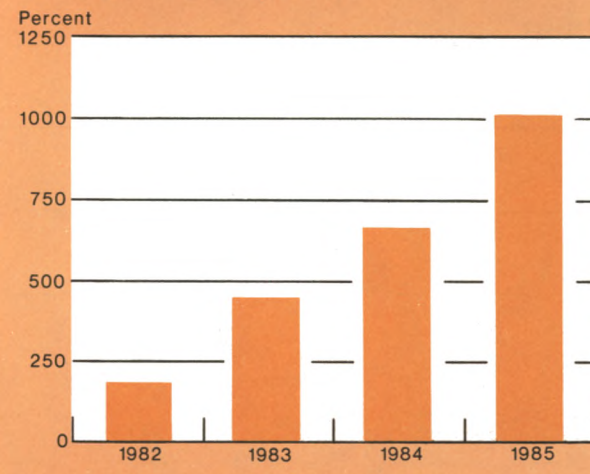
Argentine Currency



*One austral = 1,000 pesos (weekly observations).

Chart 19

Argentine Inflation Rate



Sources: International Monetary Fund, International Financial Statistics.

was perpetuating Argentina's inflation problem.

In addition, currency reform was instituted to replace the Argentine peso with a new currency, the austral, at a rate of 1000 pesos to 1 austral. Effective June 16, the austral was given a fixed parity of 80 austral cents to the U.S. dollar.

On the basis of these measures the government was able to shore up Argentina's external financing position and reduce cash flow problems. It completed negotiations for reactivating the IMF program, which was approved on August 9. It also took steps to reduce interest arrears on public sector debt, using funds from official reserves and drawing upon a multilateral bridge financing facility backed by the monetary authorities of the United States and 11 other participating countries. The government's actions also set the stage for completion of a rescheduling agreement and a new lending program with commercial banks.

The announcement of the government's adjustment program was generally well received in Argentina. In the exchange market, too, the Argentine currency appeared to have gotten a steadier footing by late July. Capital inflows began to materialize, taking the form at least in part of a reversal of commercial leads and lags.

NEW PUBLICATION

The Federal Reserve Bank of New York has issued a revised and expanded version of its booklet, *Open Market Operations*.

The 48-page booklet by Paul Meek gives an insider's view of the mechanics of open market transactions and the implementation of monetary policy. The booklet evolved from four earlier editions by Mr. Meek. It is now directed at undergraduate students of economics, participants in the financial markets, and the general public.

Mr. Meek retired earlier this year as vice president and monetary adviser in the New York Fed's open market operations area.

Topics covered in the booklet include:

- How the New York Fed carries out open market operations on behalf of the Federal Reserve System by purchasing securities to supply reserves to the banking system and selling securities to withdraw reserves;
- The significance of Federal Reserve float, Treasury cash balances, and currency in circulation in managing bank reserves; and
- The trading desk's daily agenda, as well as Federal Open Market Committee meetings with primary dealers and conferences with representatives of the Treasury and Board.

Single copies of *Open Market Operations* are available free from the Public Information Department, Federal Reserve Bank of New York, 33 Liberty Street, New York, N.Y. 10045. Reasonable quantities are available upon request.

Subscriptions to the *Quarterly Review* (ISSN 0147-6580) are free. Multiple copies in reasonable quantities are available to selected organizations for educational purposes. Write to Public Information Department, 33 Liberty Street, New York, N.Y. 10045 (212-791-5000). Single and multiple copies for United States and for other Western Hemisphere subscribers are sent via third- and fourth-class mail, respectively. All copies for Eastern Hemisphere subscribers are airlifted to Amsterdam, from where they are forwarded via surface mail. Multiple-copy subscriptions are packaged in envelopes containing no more than ten copies each.

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