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1 Reforming the U.S. Financial System: An International Perspective

15 Event Risk Premia and Bond Market Incentives for Corporate Leverage

31 Understanding International Differences in Leverage Trends

43 Monetary Policy and Open Market Operations during 1989

66 Treasury and Federal Reserve Foreign Exchange Operations

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This Quarterly Review *is published by the Research and Statistics Group of the Federal Reserve Bank of New York. Statement of* E. GERALD CORRIGAN, *President of the Bank, on reforming the U.S. financial system begins on page 1. Among the staff members who contributed to articles in this issue are* STEVEN A. ZIMMER *(on event risk premia and bond market incentives for corporate leverage, page 15); and* ELI M. REMOLONA *(on understanding international differences in leverage trends, page 31).*

A report on monetary policy and open market operations in 1989 begins on page 43.

A quarterly report on Treasury and Federal Reserve foreign exchange operations for the period February through April 1990 starts on page 66.

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Reforming the U.S. Financial System: An International Perspective

Good morning, Mr. Chairman. It is a pleasure to appear again before this Committee to discuss the pressing issues facing the U.S. banking and financial system and to stress the need to promptly enact broad-based legislation that would reform and modernize the structure of the U.S. financial system and many features of the supervisory arrangements associated with the operation of that system. As has been the case in the past, I want to state at the outset that the views I will express today are my own and, as such, they should not be construed to reflect the views of the Federal Reserve Board or the Federal Reserve System as a whole.

While I will, over the course of my remarks, address all of the issues raised in your letter of invitation, I intend, for the purpose of orderly presentation, to consider these issues in a different sequence than outlined in your letter, starting with the international side of the equation. Since the scope of the material to be covered this morning is very broad, I have attached to my statement a number of appendixes which I hope will be of value to the Committee and its staff in the effort to gain a broad perspective on the complex set of issues bearing on how we can best adapt the structure of the U.S. financial system over time.

Banking and financial structure abroad

The legal and institutional framework within which banking and financial systems operate in the major foreign industrial countries is of importance to the United States for a variety of reasons. Two are particularly relevant in the immediate context of this hearing: first, international differences in banking structure can have important implications for the competitiveness of U.S. institutions both here in the United States and around the world; and second, international differences in financial structure can introduce complex and potentially dangerous elements of tension into cross-border relationships as they pertain to the rights and privileges of banks and other financial firms to operate across national boundaries.

International differences in financial structure can introduce complex and potentially dangerous elements of tension into cross-border relationships as they pertain to the rights and privileges of banks and other financial firms to operate across national boundaries.

In order to provide the Committee with an overview of these structural arrangements abroad, the first appendix to this statement provides a broad—and admittedly oversimplified—summary of banking structures in the Federal Republic of Germany, Japan, and the United Kingdom as well as a brief description of the main thrust of the Second Banking Directive that will govern banking activities in the European Community. While I will not repeat the thrust of that appendix, I would stress the following major points:

Statement by E. Gerald Corrigan, President of the Federal Reserve Bank of New York, before the United States Senate Committee on Banking, Housing, and Urban Affairs, on Thursday, May 3, 1990. The appendixes referred to in this statement are available upon request from the Public Information Department of the Federal Reserve Bank of New York.

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- First, as a rough approximation, financial structure in the United Kingdom is quite similar to the financial structure in other countries with close historic ties to the United Kingdom such as Canada and Australia.
- Second, the prevailing structure in West Germany is very similar to that in the Netherlands and Switzerland and, to a somewhat lesser extent, other industrial countries in continental Europe such as France and Italy.

Looked at in that light, there are, as a rough approximation, three operational models of banking structure in the industrial world today, as follows:

- First, the West German–style universal bank in which the full range of banking and financial services is provided within a single legal entity. There is no holding company, and separate subsidiaries are used only at the convenience of the bank or when required by foreign regulatory authorities for particular activities conducted outside of Germany. In most universal banking countries, banks may, and often do, own sizable equity stakes in commercial concerns, but the opposite is generally not the case. In other words, manufacturing and other nonfinancial firms do not typically own and control banks. In this regard, it should also be said that in Germany the practice of banks owning large equity stakes in commercial firms has been the subject of lively political debate from time to time and the subject of renewed debate in the recent past.
- Second, the British-style universal bank, which differs from the German model in that (1) separate legal subsidiaries are more common; (2) bank holding of shares of commercial firms is far less common, and (3) combinations of banking and insurance firms are far less frequent — at least to date. But the operational character of the United Kingdom–style universal bank has much more in common with the German-style model than it does with arrangements here in the United States — a pattern which will be magnified when the EC banking directive becomes operational.
- Third, the fragmented systems such as currently prevail in the United States and Japan. In these models there are, of course, rigid legal and operational distinctions between classes of financial institutions, including but not limited to the separation between commercial and investment banking. However, even between the U.S. and Japanese systems, important differences exist — for example, the fact that holding companies do not exist in Japan and, in fact, are strictly forbidden by law. It should also be noted that some would suggest that the Japanese system shows some signs of moving toward a British-style universal bank, at least for wholesale banking, securities, and other financial services.

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With that general description of the three prevailing models in mind, let me now turn to the major differences between the U.S. system and systems in the major industrial countries abroad. Placing aside supervisory issues, which I will come to shortly, the major structural differences are as follows:

- First, the bank or financial services holding company is unique to the United States. This is not an incidental difference when it is remembered that in this country such holding companies are almost always the financial and managerial nerve center of the entity as a whole. Abroad, those crucial functions — including the all-important point of access to capital markets — are almost always housed directly in the lead bank or lead financial institution itself. In this setting, even sophisticated foreign market participants *and officials* often have a great deal of difficulty understanding structural arrangements here in the United States — a situation that was amplified by the recent Drexel episode.

The United States is the only major country that does not have a true national banking system. While state initiatives are materially reducing the barriers to national banking in the United States, even after state initiatives have run their course, we will still be left with a crazy-quilt pattern of state and federal laws and regulations governing various aspects of interstate banking.

- Second, the United States is the only major country that does not have a true national banking system. While state initiatives are materially reducing the barriers to national banking in the United States, even after state initiatives have run their course, we will still be left with a crazy-quilt pattern of state and federal laws and regulations govern-

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ing various aspects of interstate banking. Such arrangements in this country will stand in increasingly sharp contrast to the situation in the rest of the world, and especially relative to Europe, once the new banking directive takes hold and all duly licensed banking entities — including subsidiaries of U.S. banking and securities firms — will be freely able to provide a full range of banking and financial services across the national boundaries of the twelve countries making up the European Economic Community. No small wonder, therefore, that prominent officials in Europe have some difficulty understanding the restrictions placed on the scope of geographic and product opportunities available to European institutions operating in the United States.

- Third, with the sole exception of Japan — and that will almost surely change in time whether or not we change — the United States stands out as the only country with a fragmented banking system that severely limits or restricts the type of *financial* products and services that can be offered by particular classes of institutions. Once again, and leaving aside what changes may occur in Japan over time, the comparative situation in the United States will only get worse when the banking directive becomes operational in Europe.

With the sole exception of Japan — and that will almost surely change in time whether or not we change — the United States stands out as the only country with a fragmented banking system that severly limits or restricts the type of *financial* products and services that can be offered by particular classes of institutions.

While these differences in structure are important, they become all the more important in the face of related differences in supervisory or so-called safety net arrangements in the other major industrial countries. In contrasting such arrangements in the United States with those in other countries, there are some striking differences. The most important of those differences are as follows:

- First, in every other country studied, consolidated supervision of mainstream banking and financial companies is the rule — without any exception that I am aware of. It is obviously the case with the German-style universal bank; it is unambiguously the case in practice in the United Kingdom; and it is the case in Japan, even in the face of Article 65. Moreover, in the few cases where commercial companies own banks — such as in France or Italy — the supervisory process pierces the "corporate veil" between the bank and the commercial company owning and controlling the bank. Maybe my friends and associates abroad tell me what they think I want to hear, but what they often say is that they are bewildered by those supervisory arrangements in the United States that do not rely on the principle of consolidated supervision.

In every other country studied, consolidated supervision of mainstream banking and financial companies is the rule — without any exception that I am aware of.

- Second, while twenty years in this business has taught me that there are no absolutes, the fact of the matter is that in no case that I have been able to discover are there firewalls in mainstream foreign banking firms that would routinely — but especially as a matter of law — restrict flows of funds and capital among affiliated entities within the same financial group except in extraordinary circumstances. My tendency to reject absolutes tells me there must be exceptions to this. But if there are, they are not prominent. For example, the absence of such firewalls is obviously the case for universal banks, but it is also the case within financial groups or firms in the United Kingdom, Japan, and elsewhere. That is not to say that strict regulations governing certain intracompany activities aimed at customer protection, competitive equality, and the facilitation of what we would call functional regulation do not exist, for surely they do exist. Rather, it is to say that in all major foreign countries studied, issues of liquidity and solvency are viewed at the level of the firm as a whole by both regulators and market participants. Thus, firewalls that wholly preclude or limit the flow of funds or capital within the firm are viewed as either unnecessary or counterproductive, except in extraordinary cases when they are imposed by the authorities in an effort to exercise "damage control."
- Third, in all of the countries studied, mainstream banking organizations as a whole — including their securities affiliates — have direct or indirect access to the payment, account, and liquidity facilities of their respective central banks. Indeed, even in Japan with its Article 65 separation of commercial and investment banks, the major securities firms

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have accounts at the Bank of Japan as well as access to its discount window in exceptional circumstances. These global arrangements, among other things, reflect the implicit or explicit recognition that central banks have a unique role and responsibility to help safeguard the effective functioning of financial markets and institutions in order to help guard against disruptions that might have systemic implications.

In all of the countries studied, mainstream banking organizations as a whole — including their securities affiliates — have direct or indirect access to the payment, account, and liquidity facilities of their respective central banks.

- Fourth, in the area of deposit insurance, all of the countries studied have deposit insurance systems that have some similarities — but some important differences — compared with the system of deposit insurance in the United States. The most important similarity is that all such systems studied have formal or legal limits stipulating that only deposits up to a certain size are insured. The most important difference is that, as a rough approximation, appearances would suggest that the private sector has a larger role in the operation and administration of deposit insurance schemes in foreign countries than in the United States, and as a result, the *direct linkage* to the full faith and credit of the government may be less explicit than is the case in the United States.

From the above, one might be tempted to conclude that in foreign countries depositors are, in de facto terms, less protected than they are in the United States, or more broadly, that foreign banking and/or financial firms are somehow less "protected" and therefore subject to a greater degree of "market discipline" than is the case here in the United States. In order to gain some insights into these and related questions, the next section of this statement looks at some concrete examples of the workings of the so-called safety net in other countries.

The workings of the safety net abroad: some case studies

In order to gain some useful insights into the de facto workings of the safety net in other countries, I asked several of my colleagues at the Federal Reserve Bank of New York to research experience in that regard with respect to a number of highly visible cases of troubled financial institutions in foreign countries that have occurred over the past twenty-five years. The results of their work are summarized in Appendix II. Undertaking this effort was not easy, because in all such instances my associates relied essentially on publicly available information and data. While this approach has its limitations, it is also true that this information is that which market participants must use in assessing how the authorities will behave. On the other hand, this approach of course implies that factual details, but especially judgments about motivation, may not always be entirely clear. Yet for the purposes at hand, even the broad sweep of events surrounding these cases provides a useful insight into the de facto working of the safety net in other countries. Moreover, beyond these case studies, I have from time to time informally discussed this general subject with many of my colleagues in the major foreign central banks. On the basis of both the more formal research and impressions gained in discussions with officials abroad, I would draw the following conclusions concerning the de facto operation of the safety net in major foreign countries:

- First, with the sole exception of the Herstatt failure in 1974, I am unable to find *any* case in which the authorities have been willing to permit the sudden and disorderly failure of an important banking or nonbanking financial institution. (As I will indicate below, the meaning of the word "important" in this context *clearly* is not limited to size.) Indeed, the experience with Herstatt and its long and painful aftermath seem to have provided the authorities in all countries with a lasting impression of the grave dangers associated with the sudden and uncontrolled collapse of an important financial institution, especially one with significant — although again not large by today's standards — international operations.

Notwithstanding the presence of legal or formal limits on the extent of deposit insurance coverage, authorities in *all* foreign countries have, as a matter of general practice, gone to considerable lengths to protect depositors from loss.

- Second, notwithstanding the presence of legal or formal limits on the extent of deposit insurance coverage, authorities in *all* foreign countries have, as a matter of general practice, gone to considerable lengths to protect depositors from loss. Indeed, my overall impression is that the number

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of instances in which depositors—*large or small, insured or not*—have incurred actual losses are few and far between. And where they have occurred, they have been limited to isolated cases or to cases in which the depositors had other relationships—such as being shareholders—with the failed institutions. Having said that, I should quickly add that we have never seen anything abroad even remotely approaching the scope of the thrift industry problem, although the U.K. secondary banking crisis had many structural characteristics in common with the thrift problem in the United States.

- Third, in a number of prominent cases, some covered in the appendix and some not, the authorities, including central banks, have moved swiftly and decisively to intervene in the cases of troubled *nonbank* financial institutions—here too, some conspicuously small in size. Such interventions have involved the use of central bank credit facilities, public monies, and at times a degree of moral suasion, if not arm twisting, that, from my experience, simply would not work in the United States.

  In all such cases, public intervention was apparently motivated by concerns about systemic risk, but as suggested above, in several instances the troubled institution was not particularly large and in other cases was distinctly "nonbank" in character.
- Fourth, in a number of prominent cases, again some covered in the appendix and others not, the "rescue" efforts undertaken by the authorities entailed a joint effort with public and private entities. Indeed, at the risk of overgeneralization, it seems fair to say that the foreign official institutions seem better able to call upon, if not insist upon, the participation of private entities in such rescue operations than is the case in the United States. In a number of cases, though, including the silver market crisis in 1980, the LDC debt crisis, the Continental Illinois Bank problem, and the 1987 stock market crash, joint public and private actions were very much in evidence in the United States. Nevertheless, my impression—unscientific as it is—remains that private institutions either are more willing or feel more compelled to participate in stabilization or rescue efforts in foreign countries than they do in the United States.

  If that impression is correct, it raises the obvious question why private foreign financial institutions play a larger role in such rescue operations than is the case in the United States. Here one can only speculate that part of the answer may simply lie in history: that is, it has been done that way for many, many decades. It may also be true that where a handful of banks dominate national banking systems, that handful of banks feel more directly threatened by potential dangers of a systemic nature than do institutions here in the United States. Finally, when the headquarters of that same handful of banks are typically located only minutes away from the central bank, and when so few must agree on a particular course of action, it is obviously much easier to bring things together than it is here in the United States. For example, there is some substance to the suggestion that one of the most potent tools available to the Bank of England in time of stress is the Governor's eyebrow!

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In summary, experience abroad suggests that authorities in foreign countries behave in a manner very similar to the authorities in this country when faced with problems in financial institutions. If anything, the protections provided by authorities abroad seem, on balance, to go further than might reasonably be expected in this country. This, of course, is another way of saying that institutions in this country are subject to at least the same—if not a greater—degree of market discipline than is the case abroad.

Yet it seems clear to me that over the past fifteen years, the United States has had more than its share of banking and financial market disruptions. In those circumstances, a question naturally arises why we have had, in relative terms, so many such disruptions in recent years.

Given the experience in other countries, it is very hard to make the case that the de facto operation of the safety net in this country in and of itself is accountable for the problems and strains in our financial system.

For many, the answer to that question comes easily: too big to fail, de facto full insurance of deposits, overextension of the safety net, not enough market discipline. While there is some truth in all of these generalizations, the answer clearly is not all that simple. One thing, however, strikes me as quite clear: namely, given the experience in other countries, it is

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very hard to make the case that the de facto operation of the safety net in this country in and of itself is accountable for the problems and strains in our financial system. Even greater market discipline may be needed, but the evidence as a whole suggests that there is something much more fundamental at work.

To complete the analysis of the international side of the equation, one more piece of the puzzle must be put in place. That piece, of course, relates to the international competitiveness of U.S. banking and financial institutions.

The international competitiveness of major U.S. financial institutions

In recent times, the subject of the international competitiveness of U.S. financial firms has received increasing attention. In order to shed some further light on this subject, my associates at the Federal Reserve Bank of New York have been engaged in an effort to analyze more systematically both the myths and the realities of this situation. As a part of that effort, I have attached to this statement as Appendix III a paper summarizing the results of some of this work. That paper provides a summary of selected performance traits of a cross section of fifty-one major and internationally active banking and securities companies from seven major industrial countries. Before I attempt to summarize the results of this analysis, allow me to emphasize a number of qualifications about these data and the delicate task of drawing reasonable and reasoned conclusions from the data:

- First, due to substantial differences in regulatory, accounting, and tax rules in the respective countries, many of the cross-border comparisons are seriously distorted if taken at face value. Indeed, to properly interpret the data, one must have at least a general sense of these accounting and related differences in order to have the proper perspective on the various statistics. To cite just an example or two:
  - —I know that the underlying capital position of one or more groups of foreign banks is a good deal stronger than the raw statistics would suggest, in part because accounting rules and tax rules allow some groups of banks a great deal of flexibility with regard to the accounting for, and accumulation of, so-called hidden reserves.
  - —I know that the statistics on profitability are seriously distorted—perhaps more so than any other grouping of these data—in a way that tends to understate the "core" profitability of U.S. banks relative to one or more of the other groupings of national banks.
- Second, even aside from data problems, the information contained in this appendix is limited in the extent to which it provides decisive insights into the international competitiveness of one national group of banks versus others. In part this is true because of certain individual institutions in this country and abroad that stand out to such an extent from their domestic peers that they seem to defy these international comparisons.
- Third, under the best of conditions, aggregate performance data at the level of the individual firm tell only a part of the story. Accordingly, my associates are also seeking to investigate international competitiveness of U.S. firms in a number of specific but discrete markets, ranging from foreign exchange and interest rate swap markets to retail banking. This is of course a very difficult undertaking but the initial impression one gets from this line of approach is that U.S. financial institutions continue to be seen in the markets as strong and imaginative competitors in many individual product and service lines, especially in the more sophisticated and innovative areas. This work has a long way to go, but if it is successful, we will find an appropriate vehicle to make the results public sometime late this year or early next year.

With those qualifications in mind, my personal interpretation of the data and information contained in Appendix III leads me to the following main conclusions:

- First, on balance, I would place the U.S. banks somewhere roughly in the middle of the pack of the national groups of banks studied in terms of all the performance measures studied.
- Second, looking at U.S. banks and securities firms combined, relative to the German-style or British-style universal bank or relative to the combination of Japanese banks and securities companies, I would be inclined to a similar "middle-of-the-pack" or perhaps slightly weaker relative ranking of U.S. institutions.
- Third, while hindsight in this regard is far from twenty-twenty, my strong hunch is that a similar exercise performed ten or twenty years ago would have provided a result in which the rankings of U.S. firms would have been higher and perhaps materially higher. In other words, while the data may suggest that U.S. firms are still quite capable of holding their own in an international context, there is no doubt in my mind that as a group their position has slipped.

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Before I turn to the final two sections of this statement, allow me to summarize its main points thus far. First, the basic structural *and* supervisory framework governing the operations of U.S. banking and financial firms is materially different from that in all other countries studied and, as things now stand, will become increasingly so in the foreseeable future. Second, despite sharp differences in key elements associated with the structure and design of the so-called safety net, the de facto operation of the safety net — including the extent of depositor protection — appears quite similar across the industrial countries. If anything, market discipline may, on balance, play a larger role in this country. Yet over the past fifteen years, the United States has had more than its share of banking and financial disruptions, therefore casting some doubt on the oft-cited proposition that these problems have as their *basic cause* the tendency for authorities in this country to bail out troubled financial institutions. Finally, the analysis of the international competitiveness of U.S. financial firms places such firms somewhere in the middle of the pack, a position that almost surely reflects a deterioration in standing from ten or twenty years ago.

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Of the many questions raised by these interim conclusions, two stand out: first, if the de facto operation of the safety net is quite similar across countries, why have we in the United States witnessed what strikes me as a disproportionate number of financial disruptions in recent years; and second, what accounts for the less than strong overall performance of U.S. firms in an international setting, especially if, as I believe, that performance has slipped in the last decade or more?

Underlying factors influencing the performance of banking and finance

At the risk of great oversimplification, it seems to me that there are five major reasons that we see a U.S. banking and financial system characterized by the dual conditions of recurring bouts of instability and competitive slippage both at home and abroad:

- The first major factor that is helping to shape these trends in the banking and financial sector — especially in a comparative international context — is macroeconomic performance and policies. Over the last decade and a half, volatility in GNP, high and volatile rates of inflation, low savings, and our weakened external position have all contributed to a financial environment that breeds difficulties at home and contributes to slippage abroad. With regard to the latter, there is simply no question in my mind that one of the key reasons for the emergence of the Japanese financial institutions as so large a force in global markets is rooted in Japan's strong overall economic and financial performance over much of that period.

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- Second, for a variety of reasons — many rooted in technological advances in telecommunications and in the information sciences — the historic value of the banking franchise is under great pressure. The institutionalization of savings, the securitization of financial assets and liabilities, the easy access to information about creditworthiness of individual borrowers, and even the "800" telephone number are all symptomatic of a rapidly changing banking and financial environment that has unquestionably undercut the once considerable value of the banking franchise. This tendency is reinforced by the fact that due to these same technological and informational factors, the "shelf life" of most innovations in banking and finance is very short in duration.

  As one reflection of this, the most creditworthy corporate borrowers can now fully bypass the entire banking and financial system for many of their day-to-day credit needs. For example, we now have instances in which firms with particularly strong credit ratings are able to place their own

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commercial paper directly with institutional and other investors, thereby bypassing not only the commercial banking system — once the exclusive source of such short-term credit — but also the underwriting and placing capabilities of the investment banking industry. Now that is disintermediation!

As another, more recent example, AT&T — with its vast financial and technological resources — has recently entered the credit card business and in the process is offering consumers very attractive terms on such cards in a context in which there would appear to be potentially very considerable synergies between this line of business and AT&T's traditional lines of business.

The institutionalization of savings, the securitization of financial assets and liabilities, the easy access to information about creditworthiness of individual borrowers, and even the "800" telephone number are all symptomatic of a rapidly changing banking and financial environment that has unquestionably undercut the once considerable value of the banking franchise.

The diminished value of the banking franchise in this country appears, for a variety of reasons, to be somewhat more advanced than is the case in other countries — although that may not last. For example, capital markets are not nearly as well developed in Japan as they are in the United States, the result being that the role of the deposit intermediary is still more central in Japan than it is in the United States. Some would also suggest that the very close relationships between banking and large industrial firms in other countries work in the direction of helping to preserve the banking franchise. Finally, some would also suggest that the authorities in other countries may tilt a bit in the direction of trying to preserve the value of the franchise where that is possible.

In suggesting that the value of the banking franchise has declined, I am not suggesting that the developments that have given rise to this situation are all bad. To the contrary, most of them are very good in terms of efficiency, reduced costs, greater competition, and vastly increased choices for savers and investors. But taken as a whole, these developments have clearly and irreversibly changed the rules of the game in a manner that, at the very least, makes for difficult transitional problems for the affected institutions and markets.

- Third, partly because of the competitive implications of the technological and market forces described above and partly because we have so many financial institutions and so many classes of financial institutions that compete with each other, we now have, in my view, excess capacity in large segments of banking and finance. This same condition appears to exist internationally, at least in some segments of wholesale markets. The symptoms of this condition abound in razor-thin spreads and pinched margins, and perhaps especially in the troublesome manner in which we see vast amounts of very short-term churning and trading in so many segments of the financial markets. As I have said on other occasions, this situation seems at times to create a vested interest in volatility, since opportunities for trading profits at the level of the individual firm or individual trader seem greatest when swings in interest rates and exchange rates are also the greatest. Whatever else one can say about this, it reinforces the unrelenting preoccupation with the short run we see in financial markets and in corporate America more broadly.

Partly because of the competitive implications of ...technological and market forces...and partly because we have so many financial institutions and so many classes of financial institutions that compete with each other, we now have, in my view, excess capacity in large segments of banking and finance.

What may be even more important, however, is that if my conjecture about excess capacity in financial services is correct, it would clearly imply that we will have to go through a period of at least some consolidation in banking and finance. In saying this, I am not suggesting for one minute that we will end up with a highly concentrated banking and financial system along the lines of what we see in many other countries. The trick, of course, is to shape public policies in a manner that provides the highest assurance that the process of financial market consolidation in the United States occurs in an orderly and equitable manner consistent with broad national goals and priorities.

- The fourth factor I would cite in this regard is the direct subject of these hearings: namely, the outdated legal and institutional framework within which the U.S. banking and financial institutions operate. As the first section of this statement makes clear, the U.S. banking system is simply out

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of step with the rest of the world, and more important, it is out of step with the realities of the marketplace. Even more important, the system as now configured may be risk and accident prone rather than risk adverse. Fragmentation alone may produce that result since fragmentation can inhibit diversification of risks on both sides of the balance sheet. Similarly, the inescapable tendency of firms and market participants to push the spirit and the letter of law and regulation to the limit in a fragmented system brings with it its own elements of risk and perversity. Finally, fragmentation inevitably brings with it the tendency to shift activities offshore, which in turn entails loss of income, loss of jobs, and in some cases the loss of some element of managerial and supervisory control.

- A final factor I would cite that bears particularly on the relatively high incidence of financial disruptions in this country is what are often called gaps or lapses in the supervisory process. The most important illustration of this, by far, is to be found in the thrift industry situation, which was far, far more a fatal flaw in the legal and supervisory process than a flaw in the architecture of the deposit insurance system. More generally, I believe at least something of a case can be made that the highly fragmented nature of the U.S. banking and financial system may, in its own right, contribute to gaps in the supervisory process.

I believe at least something of a case can be made that the highly fragmented nature of the U.S. banking and financial system may, in its own right, contribute to gaps in the supervisory process.

In considering all the factors cited above, note that for the most part they are secular in nature and, as such, reflect "outside" forces impacting on the environment within which banking and financial institutions operate. However, one should not conclude from this that all of the elements that have produced strains in banking and finance are of this nature. For example, there are internal forces — such as the current problems in real estate markets or the overhang in the market for high-yield securities — that importantly reflect a lack of prior restraint on the part of some market participants. Similarly, we have seen all too many instances of poor management, overly aggressive strategies, and unfortunately, elements of highly questionable behavior, including some outrageous instances of outright criminal activity.

But problems growing out of poor management, recklessness, or even illegal activities — outside of the thrift industry problem — are relatively few in number, although at times highly visible in nature. Moreover, existing regulatory and legal sanctions can probably cope with these problems, especially with the strengthened provisions in the Financial Institutions Reform, Recovery and Enforcement Act. The more generalized situation having to do with the competitive well-being and the underlying stability of the banking and financial system must be looked at in the broader light of the other issues raised in the earlier parts of this statement.

Reform and modernization of the U.S. banking and financial systems

In approaching the reform and modernization of the U.S. banking and financial system, this Committee and the Congress as a whole can, as I see it, choose among four basic alternatives or models: (1) the current fragmented system, (2) the German-style universal bank, (3) the British-style universal bank, or (4) the financial services holding company approach along the broad lines suggested in my 1987 essay, *Financial Market Structure: A Longer View.* For my part, I would quickly rule out the status quo and the German-style universal bank. In the latter case, I would come to that conclusion because of my discomfort about the nature and extent of the "banking-commerce" linkages that the German-style universal bank seems to imply.

In approaching the reform and modernization of the U.S. banking and financial system, this Committee and the Congress as a whole can, as I see it, choose among four basic alternatives or models: (1) the current fragmented system, (2) the German-style universal bank, (3) the British-style universal bank, or (4) the financial services holding company approach along the broad lines suggested in my 1987 essay.

In a consideration of the relative merits of the financial services holding company versus the British-style universal bank, there are three major areas of potential difference — aside from supervisory arrangements, which will be considered later. Those areas of difference are (1) the definition and scope of financial activities that can be conducted within the group or company; (2) the presence or absence of the holding company itself, keeping in mind that these holding companies are, in a U.S. context, the financial and managerial nerve center of the company as a whole; and (3) the nature and extent of the rules and regula-

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tions limiting or preventing various classes of transactions or other relationships between the various component parts of the entity as a whole—that is, Chinese walls and/or firewalls. While it does not necessarily follow, there may also be differences as they relate to whether and under what conditions the entity or its parts may have access to the account, payment, and liquidity facilities of the central bank.

In choosing between these two alternatives, I would still have a preference for the financial services holding company, particularly given where we are as a nation in terms of the evolution of our attitudes on these matters. Having said that, if I had the liberty of starting with a clean slate, I might well opt for the British-style universal bank. In either case, I strongly believe that the approach must be reciprocal along the broad lines of the philosophy of the Proxmire-Garn bill. That is, for example, if banks can get into the securities business as a general matter, securities companies—with some possible exceptions—can get into the banking business. In the case of either model, I also believe that

There must be strong Chinese walls that provide protections against conflicts of interest, unfair competition, and certain kinds of "tie-ins." Similarly, I believe there should be reasonable protections against undue concentrations.

there must be strong Chinese walls that provide protections against conflicts of interest, unfair competition, and certain kinds of "tie-ins." Similarly, I believe that there should be reasonable protections against undue concentrations, recognizing, of course, that some consolidation in banking and finance will occur under any circumstances. Finally, I believe that there must be an instrumentality that would be responsible for the ongoing task of defining and limiting the scope of activities that can be conducted in the group as a whole.

I believe with more conviction than ever that we must have a system of consolidated supervisory oversight of any company that has direct or indirect access to the "safety net."

There are, however, three areas in which my personal views may place me somewhere between a distinct minority and a voice in the wilderness—and probably closer to the latter. They are:

- First, I believe with more conviction than ever that we must have a system of consolidated supervisory oversight of any company that has direct or indirect access to the "safety net." To me, the minimum that this entails includes (1) systematic reporting of financials for both on- and off-balance sheet activities at the level of the holding company and all of its subsidiaries and affiliates; (2) minimum capital standards, including those for the holding company level; and (3) standby authority for inspectors or examiners to do on-site reviews in any entity within the group, including the parent holding company.

  Where the dominant company is a banking entity, the Federal Reserve would be responsible for consolidated oversight. Where the dominant firm is a securities entity, that task could be given to the Securities and Exchange Commission. Functional supervision, much as we have it today, would apply to the component parts of the group as a whole.

  To me, the world we live in, together with the nature of the potential systemic risks we face in banking and finance, demands that we move in this direction. Some two and a half years ago, I summarized for this Committee the thinking that led me to this conclusion. I have appended to this statement, as Appendix IV, an excerpt from that earlier testimony on this subject. At this juncture, all I would add is that events since then, including the Drexel episode, have strengthened my views in this regard.

I remain strongly opposed to the merging of banking and commerce and to any arrangements that would even remotely contemplate the ownership and control of bank holding companies or financial services holding companies containing depository institutions by commercial concerns.

- Second, I remain strongly opposed to the merging of banking and commerce and to any arrangements that would even remotely contemplate the ownership and control of bank holding companies or financial services holding companies containing depository institutions by commercial concerns. Here too, on an earlier occasion, I spelled out before this Committee the reasons for my concerns in this regard, and I have provided an extract of that earlier testimony as Appendix V.

  Notwithstanding the observations I made earlier about the diminished value of the banking franchise and the inroads of commercial firms into

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financial businesses, I still look with concern, if not alarm, at the economic, financial—and perhaps even social—implications of Exxon owning Chase Manhattan, Ford owning Citicorp, or RJR Nabisco owning J.P. Morgan. Obviously, those examples draw on more than a little hyperbole in order to stress the point. But once that door is opened, there is absolutely no way to anticipate how events will shake out over time. Therefore, and absent that compelling public policy reason I spoke of in my earlier testimony, I would strongly urge that we maintain a strict separation of banking and commerce.

It may be, in appropriate circumstances, that a case could be made that a margin of added flexibility could be provided whereby a bank or financial services holding company could own somewhat more than 4.9 percent of the equity of a nonfinancial concern and vice versa. However, even this would have to be approached with care in view of the often razor-thin distinctions that now exist between various classes of "equity" and "debt" securities, keeping in mind that the issue here is not arithmetic but influence and control.

Similarly, some added flexibility might be considered where a bank or financial services holding company owns even a "controlling" interest in a nonfinancial firm so long as that latter firm is, in some sense, *de minimis* relative to the bank or financial services holding company as a whole. However, this too would have to be approached with great care, keeping in mind the extent of the problems that can arise, for example, with a seemingly *de minimis* real estate development company. The need for great care in this regard is strongly reinforced by case after case that illustrates that

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the well-being of the company as a whole cannot be safely disentangled from problems or adversities affecting an affiliated company, no matter how thick the firewalls nor how well constructed the legal separation. Indeed, in times of stress, not only does the marketplace fail generally to accept these distinctions, but the directors and managers of the firms under stress do not accept them either.

- Third, as suggested above, I have real worries about "firewalls" becoming "walls of fire." For these purposes, I want to distinguish between (1) "Chinese walls"—which, like regulations 23-A and 23-B, seek to protect against conflicts and unfair competition—and/or other such regulations governing "normal" business relations among affiliated companies, and (2) "firewalls," which strictly limit or prevent the mobility of funds and capital among affiliates. My problem here is not with well-conceived "Chinese walls" but rather with ill-conceived "firewalls."

From a broad public policy perspective, the case for very thick and very high firewalls rests heavily on concerns about overextension of the safety net, threats to the deposit insurance fund and ultimately to the taxpayer, and the more subtle, but very important, moral hazard dilemma. Taken individually or collectively, these issues cannot be dismissed lightly.

Just as we cannot dismiss these concerns lightly, neither can we dismiss what the marketplace tells us both here and abroad. And what the marketplace tells us with almost unfailing regularity is that in times of stress, some parts of a financial entity cannot safely be insulated from the problems of affiliated entities. Investors, creditors, and even managers and directors simply do not generally behave in that fashion, and the larger the problem the less likely they are to do so. Because this pattern of behavior seems so dominant and

There seems to me little doubt that taken to an extreme, absolute firewalls can aggravate problems and instabilities rather than contain or limit them.

because the authorities throughout the rest of the industrial world generally frame their policies with this in mind, there seems to me little doubt that taken to an extreme, absolute firewalls can aggravate problems and instabilities rather than contain or limit them. Indeed, I do not have to stretch my imagination or my memory very far to find examples in which a heavy-handed approach to firewalls could easily have been the source of significant problems.

There is also a matter of logic here: That is, if we are prepared to accept the proposition that greater flexibility in allowing combinations of entities providing financial services makes sense, we must be saying, at least implicitly, that such combinations make sense on economic grounds. Other-

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wise the exercise is sterile. On the other hand, if we say such combinations are permissible but then insist on firewalls that are so thick and so high as to negate the economics of the combination in the first place, the net economic result will also be sterile.

As with most things, the whole subject of firewalls has to be viewed in context. For example, in the context of an individual firm with very strong capital resources, presumably the case for firewalls is greatly diminished, if not eliminated. On the other hand, during a transition period in which financial structure is changing — especially if that process of change is accompanied by some consolidation — a conservative *interim* approach to firewalls may be quite appropriate. But even in those circumstances, I believe care is needed to ensure that we provide enough flexibility so that firewalls do not, in fact, become walls of fire.

Safety net arrangements

As I see it, any discussion of the federal safety net associated with the banking system and individual banking institutions must start with the fact that such institutions are subject to a higher degree of regulation and supervision than is the case for most other kinds of private enterprise. While the specific points of emphasis of such regulation will vary from time to time and place to place, the basic rationale for such arrangements rests on two elements: first, the unique nature of the fiduciary responsibilities of such institutions, and second, the unique elements of systemic risk present in banking and finance. While some bankers are not shy to complain about the burdens of some forms of regulation, all accept the premise as to why banks are regulated in the first instance. And most recognize that in exchange for carrying the burden of regulation, banking institutions enjoy certain benefits not normally accorded by markets or society to other classes of institutions. For example, the mere presence of the supervisory apparatus is one of the reasons that the marketplace allows banking and financial institutions to operate with a higher degree of leverage than most other classes of institutions — a result that is seen as economically and socially desirable because of its capacity to help mobilize savings and investment and thereby foster economic growth and rising standards of living.

In addition, and in further exchange for accepting the burden of regulation, society conveys to banking organizations certain other direct benefits: deposit insurance, access to the liquidity facilities of the central bank, and not least, access to the account and payment facilities of the central bank. The safety net must, therefore, be viewed as a package deal but one in which it is explicitly recognized that bankers — knowing that their business is essentially the business of public confidence — will conduct their affairs in a safe and prudent manner consistent with their fiduciary and societal responsibilities.

Looked at in that light, officially imposed prudential standards in such areas as capital adequacy, liquidity management, lending limits, and so forth — as well as the official examination process itself — are aimed in part at helping to establish an overall framework within which such institutions can compete and flourish but do so in a context that protects the safety and stability of the system as a whole. But — and this is a very large but — the first and foremost responsibility for the safe and prudent operation of individual institutions rests with the directors and management of those institutions — not with the authorities.

The safety net must, therefore, be viewed as a package deal but one in which it is explicitly recognized that bankers — knowing that their business is essentially the business of public confidence — will conduct their affairs in a safe and prudent manner consistent with their fiduciary and societal responsibilities.

Because the safety net by its very nature is a package deal, possible approaches aimed at improving the manner in which it functions must be viewed in that overall context. For that reason, we must be careful about approaches that focus largely or exclusively on any one aspect or feature of the safety net to the exclusion of others. For example, while there are opportunities to improve the workings of the deposit insurance system, the deposit insurance system can only be as effective — and as cost effective — as the safety net as a whole, especially its supervisory components. Indeed, at the end of the day, I would argue that the broad approach to supervisory policy — including the examination process itself — is the foundation upon which an effective deposit insurance system must rest.

In the current setting, much of the debate about the safety net in general, and the deposit insurance system in particular, centers on wholly understandable concerns about the cost of bailing out troubled depository institutions. Within that context, there is a particularly sharp edge of debate about the school of thought that focuses on the suggestion that some institutions are too big to fail and the implications of that for the so-

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called moral hazard problem. In other words, how do we secure the right balance between market discipline on the one hand and protections against severe — if not systemic — disruption and dangers on the other, especially in a setting in which the business of banking and finance is subject to the enormous competitive and external challenges described earlier in this statement?

To my way of thinking, the most essential part of the answer to that question lies in the combination of private actions and supervisory policies that will strengthen the financial and capital positions of individual institutions, perhaps especially those institutions that by their size or character present the greatest risks to the stability and well-being of the system as a whole. In this regard, it is perhaps worth noting that over the past decade we have, in fact, seen a material strengthening of the financial position of the largest banking organizations here in the United States.

To illustrate this, I have included in the appendixes to this statement a series of charts depicting key indicators of the performance of the ten largest banking organizations in the United States over the past decade. In providing these data, I am mindful of the problem of having picked the ten largest as opposed to the twelve largest or the five largest or the twenty-five largest. I assure you, Mr. Chairman, the number ten was chosen only because it is a nice round number. Beyond that, it has no significance whatsoever. And if a different number were used, the results would not be affected in any material way.

Taken as a whole, these charts capture rather well both the problems and the progress these institutions and the industry at large have experienced over the last ten years. They also capture the radically changed character of the banking business over the decade. But perhaps more than anything else, they capture the very sizable *and very necessary* buildup in capital resources over the period. To cite just two examples:

I would argue that in the current environment, in which the domestic and international marketplace rewards strength, the competitive position of internationally active U.S. banking organizations would be improved as they move toward, and hopefully to the top of, the ladder in terms of their comparative capital strength.

— Since 1979, the absolute level of primary capital of these institutions has about quadrupled, reaching almost $80 billion at year-end 1989, while the primary capital ratios have about doubled.

— As of year-end 1989, the BIS tier-one risk-based capital ratios of these institutions are already well above the 1992 minimums, *using the more stringent 1992 definitions* of capital.

In pointing to these data, I do not want to leave the impression that I am satisfied that all that needs to be done in strengthening the financial position of these and other institutions has been done, for it has not. Indeed, in the current environment, all institutions should be working toward overall capital positions that are considerably in excess of regulatory minimums. Indeed, I would argue that in the current environment, in which the domestic and international marketplace rewards strength, the competitive position of internationally active U.S. banking organizations would be improved as they move toward, and hopefully to the top of, the ladder in terms of their comparative capital strength.

Within the context of public and private initiatives that will continue to improve balance sheet and capital strength, the task of possible reforms of the deposit insurance system becomes far less formidable. Since the Treasury and the Federal Reserve are both looking into the subject of deposit insurance reform, I do not want to muddy the waters by getting into a bill of particulars on deposit insurance reform on this occasion. However, I will say that in my estimation the single most serious abuse of the deposit insurance system has been the misuse of brokered deposits. As a practical matter, fixing this problem without destroying the legitimate business of money and deposit brokerage will not be easy. In principle, however, what we should be striving for is a system in which the $100,000 deposit insurance limit should apply per individual or per entity. In mentioning this particular area of concern, I do not want to leave the impression that I am of the view that there may not be other constructive areas in which reforms might be considered. That is not my view. But as I have stressed earlier, the first line of defense regarding the workings and integrity of the deposit insurance system lies in strong, well-diversified, competitive, and capital-rich depository institutions and in a strong, professionally staffed, and politically independent supervisory apparatus.

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In this connection, we must also guard against the seductive appeal of "cookbook" approaches to problem institutions. With any troubled financial institution, but especially in the case of large institutions, I believe that the workings of both the safety net and market discipline will be better served in a context in which the authorities maintain a policy of what I like to call "constructive ambiguity" as to what they will do, how they will do it, and when they will do it. In saying this, I recognize that financial market participants do not like uncertainty, but that is just the point! Moreover, while I fully understand the yearning in some quarters for the cookbook approach to problems in financial markets or institutions — large institutions especially — I regret to say that in my judgment such a cookbook does not and never will exist. The circumstances associated with a particular case, the setting in which it occurs, and the assessment of the relative costs and benefits of alternative courses of action will always have to be looked at case by case. But in no case should it be prudent for market participants to take for granted what actions the authorities will take and certainly in no case should owners and managers of troubled institutions — large or small — conclude that they will be protected from loss or failure.

Conclusions

Mr. Chairman, my statement and its appendixes have covered an enormous amount of ground. In the interest of your patience I will not attempt to summarize at this time. But in conclusion, allow me to briefly stress three points. First, while I can readily understand why the thrift industry problem may have dampened the enthusiasm of the Congress to tackle the issues I have discussed today, it seems to me that the thrift industry problem tells us rather clearly that the longer a problem festers, the worse it becomes. With or without progressive legislation, the period ahead in banking and finance will not be easy. But with progressive legislation, our prospects are so much better for consumers, for businesses, for competitiveness, and perhaps most of all for the stability and soundness of our financial markets and institutions.

With or without progressive legislation, the period ahead in banking and finance will not be easy. But with progressive legislation, our prospects are so much better for consumers, for businesses, for competitiveness, and perhaps most of all for the stability and soundness of our financial markets and institutions.

Second, over the course of my statement, I have deliberately stayed away from the subject of possible reforms in the structural arrangements associated with the supervisory system. I have done that because I firmly believe that such reforms should follow from reform of the banking and financial system — not precede it. But at the risk of appearing self-serving, I do want to repeat my utter conviction that when reform of the supervisory structure does occur, it should proceed in a manner that preserves a central — but by no means exclusive — role for the Federal Reserve. It seems to me that experience here and throughout much of the world tells us in rather certain terms that helping to ensure the safety and soundness of banking and financial markets and institutions and helping to stabilize such markets and institutions in the face of adversity are functions that relate directly to the very essence of central banks.

Finally, over the course of this statement, I have drawn heavily on experience and conditions in other countries. Having done that, I do not want to leave the impression that I feel any compelling case to duplicate precise arrangements in any other country or group of countries, because I do not. To be sure, we have some work to do in this country in adapting arrangements in a changing global setting; to be sure, we face some difficult transition problems in the period ahead; to be very sure, none of this will be easy. But as we face those challenges, let us not lose sight of our strengths: our financial markets are still the bellwether of world financial markets; our banks, investment banks, and insurance companies are still the leaders in constructive innovation; and our financial markets and institutions are still the world's safe harbor. Let us keep it that way!

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Event Risk Premia and Bond Market Incentives for Corporate Leverage

The growth of highly leveraged transactions during the 1980s had a profound effect on corporate shareholders and bondholders. Studies exploring the effects of the restructurings, mergers, leveraged buyouts, and recapitalizations of the last decade have typically focused on the welfare of firms and agents directly involved in the transactions. Evidence suggests, however, that the repercussions of these activities have extended to a much broader circle of corporations and individuals.

This article introduces and explores the hypothesis that the threat of leveraging from such events has worked to raise the risk premia paid on the debt of all but the most leveraged firms. In addition, it argues that the increase in the cost of debt has been greater for less leveraged firms. The penalty for low leverage creates incentives for debt financing, thereby compounding existing distortions created by tax laws and limited shareholder liability. In effect, the growth of an active market for corporate control has embedded in bond prices the possibility that firms will either leverage themselves or be leveraged in a change of ownership. As a result, the marginal incentive to leverage increases. A related implication is that it no longer appears as feasible as it once was for a firm to hold down its marginal cost of debt capital by keeping a very large equity cushion.

The article begins with a more precise exposition of the hypothesis. Subsequent sections provide empirical support and estimate the extent to which the leverage threat affects the schedule of borrowing rates faced by U.S. firms. The relevance of the hypothesis to the observed increase in U.S. corporations' dependence on debt is also considered. In the closing sections, the article reviews the implications of the empirical results for the cost of capital to U.S. corporations in the 1980s and the relationship of these findings to policy measures aimed at limiting corporate debt.

Effects of event risk premia

Our hypothesis posits that during the 1980s the threat of unanticipated leverage increased the risk premia paid by U.S. corporations on their debt and that this increase was greater for the debt of less leveraged firms. The hypothesis is based on two observations. First, a firm's existing bondholders face substantial losses from unanticipated increases in the firm's leverage. Second, the risk is greater for less leveraged firms because they are better candidates for increased debt and because their bondholders face greater potential losses from the increase in debt. A fuller understanding of this hypothesis requires familiarity with the concepts of the risk premium curve and the event risk premium.

The risk premium curve

The risk premium is the sum a corporation must pay on its debt beyond the riskless interest rate in order to compensate bondholders for the possibility of default. The most obvious determinant of the firm's risk premium is its leverage, although factors such as volatility of cash flow, access to credit markets, asset liquidity, firm size, and diversity of revenue sources also play a role.

The risk premium increases with leverage. The lower curve in Chart 1 depicts the risk premium as a function of a measure of leverage—the debt ratio. The debt

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ratio is defined as the market value of a firm's debt divided by the total value (market value of equity plus market value of debt) of the firm. The chart shows the risk premium curve as rising more than proportionally with the debt ratio. This representation of the curve is in the literature and, as demonstrated below, empirically verifiable.

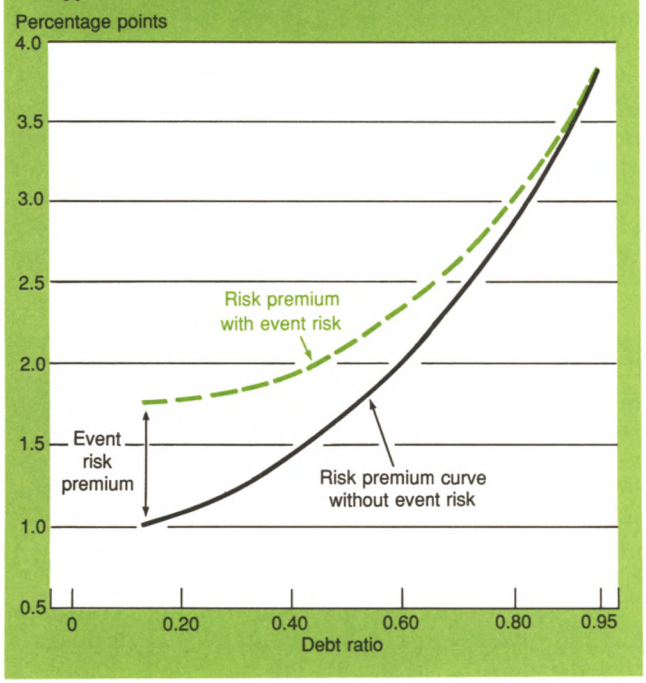
Event risk

Event risk will be defined as the risk of any significant unanticipated increase in the debt share of a firm. Such increases may result from leveraged buyouts, share repurchases, extraordinary dividends, and other leveraging tactics. The tactics include leverage both by outsiders who gain control and by current managers who adopt defensive measures.

The existence of event risk will prompt bondholders to require a risk premium in excess of that which would be demanded of a firm without such risk. The size of this additional premium will largely be a function of the debt ratio, although factors such as industry cyclicality and cash flow volatility may also play a part. As noted earlier, a firm with a low debt ratio will tend to pay a higher event risk premium because it is a more likely candidate for additional leverage and because the bondholders have more to lose from the additional leveraging. The event risk premium thus acts as a penalty that decreases with leverage, as shown by the two curves in Chart 1. This chart illustrates the two basic effects of event risk. First, event risk raises the risk premium schedule, ratcheting up borrowing costs over a wide range of leverage. This effect may be termed "raising the intercept of the risk premium curve." Second, event risk flattens the risk premium curve. This lowers the marginal cost of additional leveraging: for a given increase in leverage, the firm is facing a smaller increase in the risk premium. In effect, bond buyers respond to event risk by making firms pay for leverage whether they are leveraged or not, thus making it desirable for firms to leverage up and reap the benefits of additional debt. Even firms that are not otherwise inclined to take on new debt may be encouraged, if not compelled, to do so by event risk premia.

Chart 1

Hypothetical Risk Premium Curves



Role of bond covenants

Event risk premia may not capture the total event risk penalty paid by firms since they do not reflect the implicit costs of bond covenants. By issuing debt with strong covenants, a firm may eliminate a great deal of event risk and its accompanying premia. But while the firm is no longer paying an explicit event risk premium, it nevertheless may bear other costs in honoring the covenant. Because covenants typically entail substantial indirect costs,[1] including loss of flexibility in decision making, they may not provide a way to reduce overall costs.

Empirical estimation of event risk

This section assesses the extent to which event risk premia have grown. The hypothesis that leverage risk premia were smaller before the mid-1980s implies that differences in risk premia between high-leverage and low-leverage firms should have narrowed over the course of the decade.

Chart 2 provides casual empirical evidence for the hypothesis. Note that since 1984 (roughly the start of the takeover boom), the spread between Aaa corporate and Treasury rates has grown relative to the spread between Baa corporate and Treasury rates. This result suggests a change in the perception of Aaa corporate debt: once regarded as a near substitute for riskless debt, Aaa corporate debt is now an intermediate between Baa and riskless debt. This shift is consistent with the flattening of the risk premium curve caused by a rise in the risk premium on high-grade debt.

It should be remembered that both rate spreads tend to widen during downturns, as Chart 2 suggests for the

[1]Clifford W. Smith, Jr., and Jerold B. Warner, "On Financial Contracting: An Analysis of Bond Covenants," *Journal of Financial Economics*, June 1979.

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period corresponding to the 1981-82 recession. During the prolonged recovery period, however, the Aaa/Treasury spread has remained high, generally exceeding 1982 levels. In contrast, during the 1975-79 expansion, Aaa/Treasury spreads were smaller, absolutely as well as relative to Baa/Treasury spreads. The persistence of the increased Aaa/Treasury spread during the 1980s makes it unlikely that this change reflects fluctuations in market liquidity conditions. Indeed, the massive supply increase of Treasury debt over this period, combined with weak issuance of Aaa corporate debt,[2] makes the growing disparity especially impressive. These considerations further support the contention that since the mid-1980s, event risk premia have risen for high-grade debt in particular.

Analysis of individual firms

Chart 2 gives only partial evidence of the flattening of the risk premium curve since it ignores changes in the composition of the firms in each rating category. A regression analysis of individual firms will provide more complete evidence of this development.

To this end, a sample of forty-seven firms (Table 1) is selected to cover all industry classifications except banking, financial services, and certain utilities (see Table A1 in Appendix A for characteristics of sample firms). Electronics, vehicles, oil, and chemicals are overrepresented in the sample because of data availability. All firms in the sample pool have been in continuous operation since at least 1976, and most have a large share of publicly traded debt, particularly multiple issues. Firms whose bonds contain call provisions that are especially difficult to price are eliminated from the sample. To be comparable, bond yields should be adjusted to remove the effects of such call options, but the valuation can be problematic (see Appendix A).

Although representative size distribution is sought in the sample, the selection criteria bias the sample heavily toward large firms. If event risk premia are smaller for very large firms because such firms make more difficult takeover targets, then the analysis actually underestimates the effects of event risk premia.

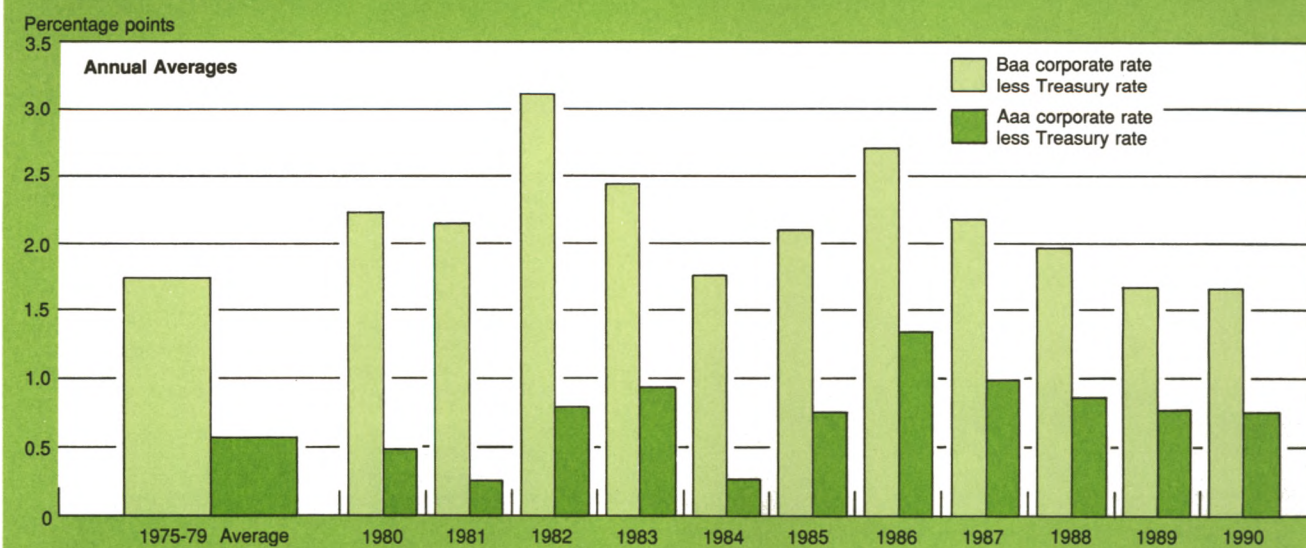
The sample dates chosen for the analysis are the last business day in June for the years 1980, 1988, and 1989.[3] The dates have the advantage of spanning the leverage boom and of representing periods in which

[2]Edward I. Altman, "Measuring Corporate Bond Mortality and Performance," working paper, February 1988, Table 6, p. 16.

[3]Data from 1982 gave results similar to those from 1980 data, while data from 1984 gave results that were between 1980 and 1988 results. The data from 1982 and 1984 may not be directly comparable with those from other years, however, because of significantly higher nominal interest rates in these periods.

Chart 2

Credit Quality Spreads



Source: Moody's Bond Survey.

Note: Chart shows yield to maturity on seasoned corporate and Treasury debt with ten years to maturity. The 1990 yield is a first quarter average.

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nominal interest rates were roughly equal (see Appendix A). In addition, interest rate volatility around the observation periods was low, a condition which ensures more reliable estimates of risk premia.

The first step in the analysis is to compare the leverage of sample firms with the observed spread of their bond yields over Treasury yields. The measure of leverage used is market value of debt as a share of total firm market value — the debt ratio defined above. To calculate the market value of debt, the firm's publicly traded debt is repriced at the prevailing market price. All other debt is left at book value. The total value of the firm is the sum of this market value of debt and the market value of outstanding equity.[4]

The risk premium used is the average of the differences in yield to maturity between the firm's publicly traded bonds and riskless debt of comparable maturity and coupon characteristics.[5] One problem with this measure is the timing of the yield quotes.[6] The prevailing yield on a corporate bond reflects the most recent transaction, which may have occurred several days earlier. Although such lags do not systematically bias the slope of the estimated curve relating risk premia to leverage, they can systematically bias the intercept.[7] Nevertheless, steady interest rates in the period immediately preceding the sample dates make substantial bias unlikely, as do the active markets in high-grade bonds, the debt most affected by event risk premia.

Other potential problems associated with the measure include intertemporal biases induced by systematic changes in the maturity structure of outstanding corporate debt or by changes in the relation of the maturity and seniority of traded and nontraded debt. These problems do not appear serious, however (see Appendix A).

Table 1

Firms in Sample by Industry Classification

Firm	Industry Classification†
Aluminum Company of America	Metal refining
American Telephone and Telegraph	Communications
Amoco	Petroleum refining
Armco	Steel refining
Ashland Oil	Petroleum refining
Brunswick Corporation	Miscellaneous manufacturing
Cabot Corporation	Chemicals and pharmaceuticals
CBS	Communications
Centel	Communications
Chevron	Petroleum refining
Chrysler Corporation	Vehicles
Coastal Corporation	Fuel exploration
Colt Industries	Vehicles
Combustion Engineering	Machinery
Contel	Communications
Corning	Glass and concrete
CSX Corporation	Transportation
Cummins Engine	Vehicles
Delta Air Lines	Transportation
Dow Chemical	Chemicals and pharmaceuticals
Dupont	Chemicals and pharmaceuticals
Exxon	Petroleum refining
Fairchild	Vehicles and electronics
Ford Motor Corporation	Vehicles
General Electric	Electronics
Goodyear Tire and Rubber	Rubber and plastics
GTE	Communications
Honeywell	Laboratory equipment
International Business Machines	Machinery
ITEL	Wholesale
Kroger	Retail
Martin Marietta	Vehicles
McDonnell Douglas	Vehicles
Minnesota Mining and Manufacturing	Miscellaneous manufacturing
Panhandle East	Natural gas and coal
PepsiCo Incorporated	Food and tobacco
Pitney Bowes	Machinery
Procter and Gamble	Chemicals and pharmaceuticals
Sara Lee	Food and tobacco
Teledyne	Vehicles
Texaco	Petroleum refining
Tosco Corporation	Petroleum refining
Trinova	Vehicles
United Telecom	Communications
Weyerhauser	Wood products
Whirlpool	Electronics
Williams Company	Fertilizer, energy, and materials

†Industry classifications are based on a scheme developed in William Lee, "Corporate Leverage and the Consequences of Macroeconomic Instability," Federal Reserve Bank of New York, unpublished working paper, 1989.

[4]Book value of debt and market value of equity are taken from the COMPUSTAT data base. Market price of outstanding bonds is taken from Standard and Poor's *Bond Guide* (July 1980, July 1988, and July 1989).

[5]The risk premium is mathematically defined as follows:

$$\sum_{i=1}^{k} w_i * (r_i^c - r_i^f),$$

where k = number of publicly traded bond issues
w_i = par value bond i / total par value of publicly traded debt
r_i^c = yield to maturity of corporate bond i, adjusted for callability
r_i^f = yield to maturity on riskless debt corresponding to bond i.

[6]Corporate bond yields are taken from Standard and Poor's *Bond Guide* (July 1980, July 1988, and July 1989) and represent closing quotes from the last business day in June. Government bond yields are from the *Wall Street Journal* for corresponding days.

[7]Consider the following example: Interest rates are rising in a market where the riskless debt is more heavily traded than the corporate debt. Since the price quotes on the corporate debt are necessarily older, their yields will be biased downward relative to the riskless debt. The risk premia on the corporate debt will not be biased relative to each other, however, although there will be more noise around the "true" risk premia.

In calculations of risk premia, an effort is made to minimize the quote lag problem by taking quotes during weeks in which there was little interest rate movement and by relying on the more heavily traded corporate bonds.

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The next step is to calculate the volatility of total cash flow (pretax profit plus depreciation plus interest paid) over book value for each of the firms.[8] All other things equal, the firm with lower cash flow volatility will be less likely to default and should therefore pay a lower risk premium. Cash flow volatility will serve as an additional independent variable in some of the regressions performed below.

The risk premium is then modeled as a function of the debt ratio. As noted earlier, risk premia increase with leverage, although the exact relation is an empirical question. Risk premia are first modeled as a linear function of leverage: risk premium $= a + b *$ debt ratio. This relation works, but better results are achieved with nonlinear models (see Appendix B for a complete list of test results). The best overall results are obtained with the following relation: risk premium $= a + b *$ (debt ratio)$^{2.6}$.

The first part of Table 2 shows the results obtained by regressing risk premia solely on debt ratios. Note that the zero-leverage intercept has risen in each of the periods while the slope of the line has fallen. Statistical tests on the regressions indicate that the slope of the line in 1980 is significantly different from the slopes of the lines in 1988 and 1989, particularly when cash flow volatility is included as an independent variable in the regression.[9]

The flattening can be seen more clearly in Chart 3, which plots the curves generated by the regression results from Table 2. The risk premium curves for 1988 and 1989 are actually below the 1980 curve for high debt ratios. There are three possible explanations for this finding. First, as explained in greater detail below, changes in general liquidity conditions in fixed income markets contributed to an upward bias in the 1980 risk premium curve. Second, because of the low number of observations for debt ratios above 0.80, the 1988 and 1989 curves are probably estimated as being more linear than they actually are.[10] The true curve for these

[8]Cash flow volatility is measured as a twelve-quarter rolling variance of quarterly cash flow rates:

$$\text{Volatility} = \sum_{i=t-11}^{t} (C_i - \overline{C}_t)^2 / 12,$$

where

$$C_i = \frac{\text{pretax profits + depreciation + interest paid in quarter } i}{\text{book value of firm at end of quarter } i}$$

$$\overline{C}_t = 1/12 * \sum_{i=t-11}^{t} C_i.$$

[9]*F*-tests are performed to test the significance of the difference in the coefficient on the debt ratios between the 1980 and 1988 regressions and the 1980 and 1989 regressions. The results are as follows:

Regression: PRE $= a + b *$ LEV

	F-	Degrees of Freedom		
Comparison	Statistic	Numerator	Denominator	Significance
1980 vs. 1988	4.76	1	77	0.95+
1980 vs. 1989	3.83	1	77	0.95−

Regression: PRE $= a + b_1 *$ LEV $+ b_2 *$ VOL

	F-	Degrees of Freedom		
Comparison	Statistic	Numerator	Denominator	Significance
1980 vs. 1988	9.10	1	76	0.995+
1980 vs. 1989	7.00	1	76	0.99+

where
PRE = required risk premium
LEV = debt ratio
VOL = variance of cash earnings (see footnote 8).

[10]Firms with debt ratios over 0.90 are excluded from the sample, partially because the exponential curve underestimates these values

Table 2

Required Risk Premium as a Function of Leverage

Regression Equation: PRE $= a_0 + b*\text{LEV}^{2.6}$

	a_0	b	Standard Error of b	Adjusted R^2	Degrees of Freedom
1980	0.032	5.046	0.996	0.428	32
1988	0.366	2.710	0.566	0.323	45
1989	0.579	2.288	0.650	0.198	45

Required Risk Premium as Function of Leverage and Cash Flow Volatility

Regression Equation: PRE $= a_0 + b_1*\text{LEV}^{2.6} + b_2*\text{VOL}$

	a_0	b_1	b_2	Standard Error of b_1	Standard Error of b_2	Adjusted R^2	Degrees of Freedom
1980	−0.23	4.65	31.30	1.01	21.27	0.448	31
1988	0.13	2.26	18.01	0.53	5.41	0.447	44
1989	0.17	2.17	22.99	0.61	8.11	0.306	44

Notes: PRE = risk premium over riskless rate for debt issues of individual corporations; LEV = debt ratio = market value of debt over total (debt plus equity) firm market value; and VOL = variance of earnings before interest and tax payments.

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years should probably be flatter for debt ratios below 0.70 and steeper for debt ratios beyond that. Third, as markets for lower quality debt have improved in the 1980s, the yield on debt of more leveraged firms has actually fallen (although recent experience indicates that this trend may be reversing).

The second part of Table 2 presents the regression results obtained with the addition of cash flow volatility as an independent variable. In each case the regression fit is improved without a substantial change in the coefficient on leverage.

The coefficient on cash flow volatility falls sharply between the 1980 sample and the 1988 and 1989 samples, dropping from 31.3 in 1980 to 18.0 in 1988 and 23.0 in 1989. This effect is consistent with the results for the coefficient on leverage: low cash flow volatility no longer guarantees the firm cheap debt financing; the market assumes that firms with low cash flow volatility will be leveraged up.

Liquidity conditions and the risk premium curve

The difference between corporate and Treasury yields reflects not only the risklessness of government bonds, but also their higher liquidity. Evidence suggests that the liquidity premium paid by corporate issuers over Treasury debt was higher in 1980 than in 1988 or 1989, biasing the 1980 risk premium curve upward relative to the 1988 and 1989 curves.

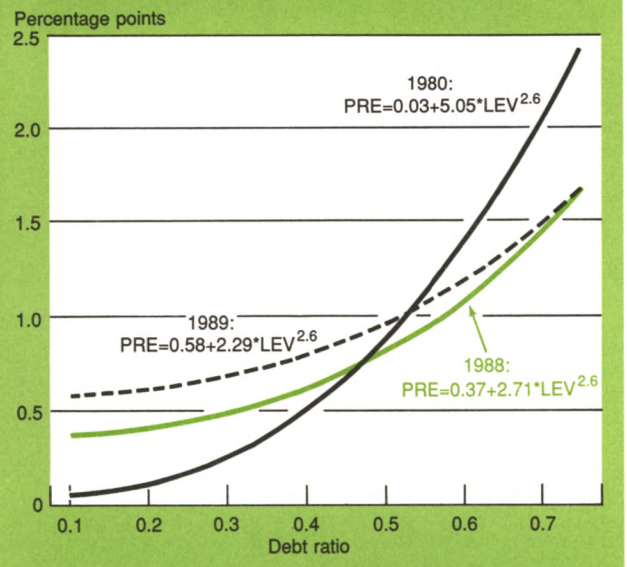
To obtain this finding, a proxy for the fixed-income liquidity premium in each of the years was estimated by comparing Treasury debt yields with yields on comparable World Bank debt and Federal National Mortgage Association debt (the procedure is described in Appendix A). The liquidity premium paid over Treasury debt by such issuers was about 25 basis points higher in 1980 than in 1988 and 1989.

Adjusting for the change in liquidity premia would shift the 1988 and 1989 curves in Chart 3 up by 25 basis points relative to the 1980 curve. Such an adjustment would suggest, for example, that the required premium on a firm with a 40 percent debt ratio is about 45 basis points higher in 1988 or 1989 than in 1980 owing to event risk.

Footnote 10 continued
and partially because the illiquidity of high-yield debt — particularly in 1980 — makes comparisons unreliable.

Chart 3

Required Risk Premia on Corporate Bonds as a Function of Debt Ratio



Note: PRE=required risk premium; LEV=debt ratio.

Quantifying the debt costs of event risk premia

The long-run increase in debt costs from event risk can be quantified. If the upshift in the risk premium curve is about 15 basis points on average,[11] then U.S. corporations eventually stand to pay an additional $1.33 billion (15 basis points on $885 billion corporate bonds outstanding in 1988[12]) annually on their notes and bonds alone. Initially, bond investors take the loss, but corporations must pay as maturing bonds are refinanced.

Most studies of event risk proceed by measuring the losses incurred by bondholders of buyout targets and weighing the losses against the gains realized by the target's stockholders. One of the largest estimates of lost bondholder wealth has been advanced by Asquith and Wizman, who calculate that, on average, bondholders lose 2.5 percent of bond value from a buyout, with greater losses for bondholders lacking covenant protection.[13] Asquith and Wizman note that even if the losses are applied to all target firms' debt, bondholder

[11] The model gives this figure as the direct increase to an average (debt ratio = 0.50) corporate bond issuer over the period 1980 to 1989 without an adjustment for liquidity. Such an adjustment would add another 25 basis points.

[12] Board of Governors of the Federal Reserve System, *Flow of Funds Accounts: Financial Assets and Liabilities, Year-End, 1965-1988*, September 1989.

[13] Paul Asquith and Thierry A. Wizman, "Event Risk, Wealth Redistribution and the Return to Existing Bondholders in Corporate Buyouts," *Journal of Financial Economics*, forthcoming. The losses reported represent abnormal returns over the period from month-end two months before the determination of buyout until month-end two months after the announcement of outcome. The sample is taken from sixty-five large completed buyouts.

Asquith and Wizman calculate losses of 5.4 percent for bondholders with no covenant protection and losses of 2.8 percent for bondholders with weak covenant protection, while bondholders with strong covenant protection experience gains of 2.3 percent.

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Box: Event Risk Premia and Additional Incentives for Leveraging

The reduction in leverage disincentives brought about by event risk can be measured more precisely by calculating the marginal increase in debt cost resulting from additional leverage. Specifically, one can calculate the increase in total risk premiums paid as a result of a 1 percentage point increase in the debt ratio (total risk premiums paid at [x + 1] percent debt ratio less total risk premiums paid at x percent debt ratio). Mathematically, this can be expressed as follows:

$$TRP = LEV * PRE = LEV * \{ a + b * (LEV^{2.6})\},$$

where TRP = total risk premium as percentage of firm value
LEV = debt ratio
PRE = required risk premium.

The relation can be expressed as follows:

$$\text{Marginal cost of leveraging} = \frac{dTRP}{d\ LEV} = a + (3.6b * LEV^{2.6}).$$

The marginal increase in total risk premia associated with a percentage point increase in the debt ratio is shown as the marginal cost curve in the chart. Note that this marginal increase is on average about 40 percent lower for 1988 than for 1980 (the 1989 curve is omitted for readability). Put another way, the marginal penalty for leveraging exacted by the bond market has, on average, fallen by about 40 percent because of event risk.

Let us now compare the marginal risk premia cost of leverage with the marginal tax benefits of leverage. The marginal tax benefit of leverage is defined as the increase in the total tax shield resulting from a 1 percent increase in the debt ratio.

The total tax shield can be expressed as:

$$t_c * \{ LEV * [r_f + PRE]\} = t_c * \{ LEV * [r_f + (a + b * LEV^{2.6}]\},$$

where t_c = top bracket corporate tax rate
r_f = risk-free interest rate.

The marginal change in the total tax shield with respect to leverage is then:

$$t_c * \{ r_f + a + (3.6b * LEV^{2.6})\}.$$

If there were no risk premia, then the marginal tax benefit function would be a flat line equal to the riskless rate multiplied by the corporate tax rate. Since risk premia are increasing, however, marginal tax benefits are an increasing function of leverage.

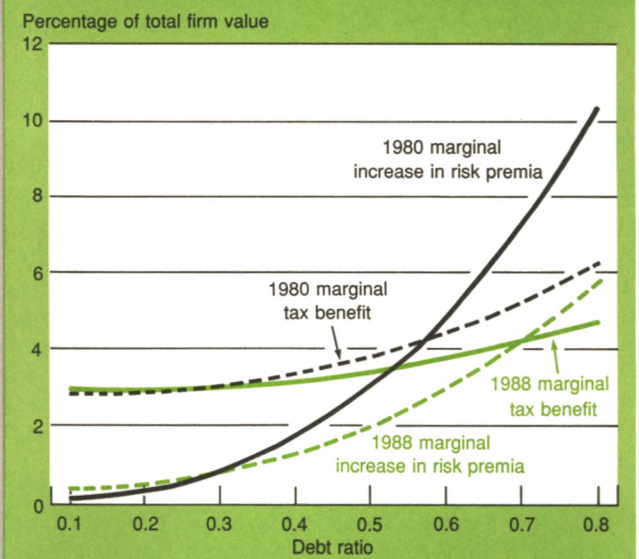
The marginal tax benefit curve is calculated using 1989 tax rates (34 percent, state and local rates not considered) in each of the years. This step is taken in order to isolate the event risk premia effects from tax effects that occurred over the same period, since a shift in corporate tax rates can move the marginal benefit curve in a way that amplifies or dampens the effect of the event risk–induced shift of the marginal cost curve.

The chart shows the marginal risk premia cost curves against marginal tax benefit curves for the 1980 and 1988 samples. Note that the marginal tax benefits of leveraging are slightly higher in the 1980 case because of the steeper risk premium schedule. For the comparison we use a riskless interest rate of 8 percent, roughly the rate prevailing in the three time periods.

The "optimal" debt ratio is reached at the point where the marginal cost and benefit curves intersect, although factors such as strategic incentives for debt are not reflected in the ratio. It is still worth noting, however, that the "equilibrium" debt ratio suggested by the model rises from 0.56 in 1980 to 0.69 in 1988, and to 0.72 in 1989 (not shown on chart). The 1980 value is a reference point, not an actual historical estimate, because it is calculated using 1989 tax rates.

Note that the optimal debt ratio also depends on the interaction of equity costs and the debt ratio. Appendix B develops a model of this relation that suggests that the optimal debt ratio is almost completely determined by the equation of the marginal costs and benefits of debt.

Marginal Tax Benefits versus Marginal Increases in Total Risk Premia



Note: Calculations assume an 8 percent riskless interest rate.

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losses are less than 8 percent of stockholder gains.

Event studies, however, measure only part of the bondholder loss from buyouts since they only consider the impact upon directly affected bondholders. Costs of event risk that follow the upshift in the risk premium curve are incurred by firms not involved in buyouts — to the extent that they have to refinance at higher interest rates — and by the bondholders of these firms — to the extent that the value of their longer term debt holdings is eroded by unexpected rises in event risk. These losses should be added to the losses of bondholders of the involved firms. Our conservative estimate of a 15 basis point upshift in the risk premium curve represents (at a 10 percent capitalization rate) a 1.5 percent discount in the value of bonds issued by uninvolved firms. Again, this loss applies to all bond-issuing firms, not just those involved in buyouts. It appears, therefore, that indirect bondholder and issuer losses from event risk are far greater than the direct losses borne by bondholders of buyout targets.

Implications of event risk premia

The advent of event risk premia has had several implications for corporations. First, firms now find it much less attractive to finance themselves largely through equity. Thus financial market developments which would appear to have increased the range of options for corporate treasurers by making high leverage more feasible may have actually narrowed the range by making the choice of low to moderate leverage more expensive. Second, the increase in the cost of debt for firms of low to moderate leverage raises the possibility that the corporate cost of capital has risen. Third, event risk premia tend to amplify the effects of tax measures aimed at decreasing corporate leverage. Each of these implications is examined in greater detail below.

Incentives for leveraging

Having learned the hard lesson that the strong can abruptly become the weak, investors in the bond market tend to discount the bonds of financially strong firms. As a result, firms of low and moderate leverage find themselves already paying for a portion of any increase in leverage they may be contemplating. In other words, the change in the market environment has moderated the increase in the interest rate associated with an increase in leverage.

The Box calculates a measure of the incentives to shift to debt finance created by event risk premia. The estimated marginal costs of leverage resulting from increased risk premia are compared to an estimate of the marginal tax benefits of leverage resulting from the deductibility of interest. The calculation in the example implies that, when all other factors are held constant, the debt ratio balancing tax benefits and escalating debt costs rises by 16 percentage points over the period 1980-89. Although the impact of this change must be considered in conjunction with other influences on capital structure, these calculations suggest that event risk premia may have been responsible for inducing sizable increases in debt during the 1980s.

Event risk premia and the cost of capital

The risk that well-capitalized firms might be leveraged up raises the cost of debt by increasing the risk premium paid by all but the most leveraged borrowers. In turn, the rising cost of debt could conceivably entail an increase in the overall cost of capital.[14]

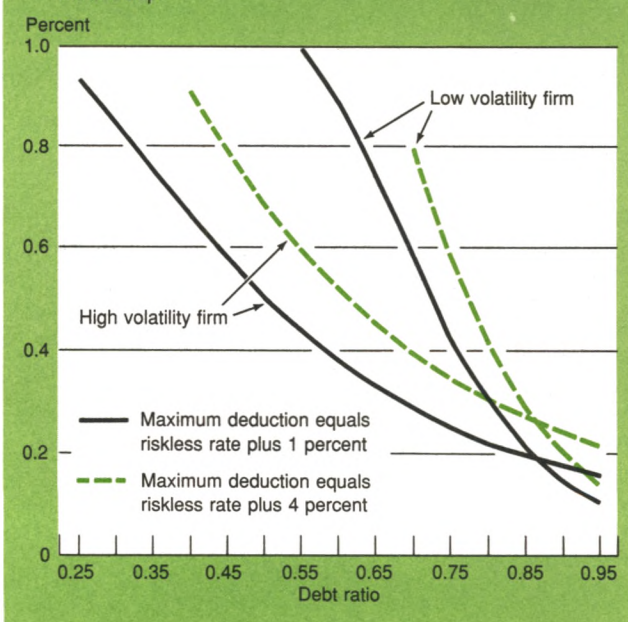
One can argue to the contrary that if share prices rise to reflect the potential for substantial gains to shareholders from leveraging transactions, the higher cost of debt might be offset. But while this argument is attractive in the abstract, practical considerations

[14] Albert Ando and Alan L. Auerbach, "The Cost of Capital in the U.S. and Japan: A Comparison," *Journal of Japanese and International Economics*, vol. 2 (1988), pp. 134-58; and Robert N. McCauley and Steven A. Zimmer, "Explaining International Differences in the Cost of Capital," this *Quarterly Review*, Summer 1989, pp. 7-28.

Chart 4

Incentives for Debt Financing under an Interest Deduction Cap

Marginal Change in Total Interest Deduction:
Ratio of Change with Interest Deduction Cap to Change without Cap



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weigh against it. Consider the position of a treasurer in a well-capitalized firm who watched in the 1980s as debt-financed takeovers drove up the yields on prime corporate debt relative to Treasury yields. Would that treasurer be easily persuaded that the measurable costs of event risk premia could be offset by the much less tangible benefits of lower equity costs?

Tax policy

Tax policies to limit corporate leverage are more effective in the presence of event risk premia. Any weakening in the tax incentives for debt financing as opposed to equity financing will tend to mitigate event risk. Therefore, in addition to its direct effect on leverage incentives, a reduced tax incentive for debt finance will work to steepen the risk premium schedule. Even policies aimed at reducing extreme leverage will raise the marginal cost of debt for firms with low or moderate leverage. As an example, consider the elimination of deductibility for corporate interest payments paid at a rate above some specified spread over Treasury yields. A cap on interest deductibility reduces the incentive for leverage over a surprisingly wide range of leverage. The effect of such a cap may be measured as the ratio of the marginal increase in the value of the interest deduction with the cap to the value of the interest deduction without the cap (Chart 4; Appendix 2 provides the complete derivation). For instance, even a 4 percent cap reduces the marginal tax benefit by over one-half for a low-volatility firm with a debt ratio of 80 percent. A cap becomes effective at lower leverage for a firm with a more volatile cash flow because bondholders demand compensation for the greater risk of debt service difficulties entailed by such a cash flow.

By sharply reducing the worst risks to bondholders and thereby steepening the risk premium schedule, even caps set quite high can work indirectly to discourage additional debt over the entire range of leverage. This observation does not constitute a case for such a policy, which would affect firms that are risky for reasons other than high leverage and which might pose administrative challenges. But factoring individual changes in risk premia into the assessment of tax policy can show it to have greater potency than has been acknowledged in the past.

Conclusion

Analysis of U.S. corporate bond yields demonstrates that investors learned to demand a higher premium over U.S. Treasury yields in the course of the 1980s. This rise in the risk premium schedule resulted from mergers and acquisitions activity that made maintaining a given firm's credit standing more uncertain. Debt-financed changes in corporate control changed the bond market environment for less leveraged firms and made it more difficult for those firms to keep debt costs low by maintaining a comfortable equity cushion.

The least leveraged firms experienced the largest increase in borrowing costs relative to Treasury yields. Consequently, the marginal cost of leverage declined enough to induce firms, according to one calculation, to increase the debt fraction of total financing by 16 percentage points.

The rise in the cost of debt has been significant. The fear of debt-financed takeover activity has caused a percentage reduction in the value of all U.S. corporate bonds that is comparable to the percentage reduction in the value of bonds immediately affected by takeover events. The effect of event risk premia on the cost of capital, however, is ambiguous. The demonstrated rise in debt costs for less leveraged firms must be balanced against the effect of takeover premia in cheapening the cost of equity.

The analysis suggests that tax policy can exert a particularly powerful effect in the presence of event risk premia. Any reduction in the tax benefits of leveraging, even narrowly drawn reductions, can indirectly discourage leveraging across the spectrum of firms.

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Appendix A: Characteristics of Sample Firms

Callable bonds

The yields of the corporate bonds in the sample are not fully comparable with Treasury yields because most of them reflect some type of call provision. To make the yields on different corporate bonds comparable, it is necessary to make price adjustments for the callability of certain issues.

The call option on corporate bonds can be priced using contingent claims theory if certain assumptions are made about adjustment to a "natural" interest rate. We elect not to use this method, however, because it generally yields poor results.† The method's basic weaknesses are compounded by heterogeneous perceptions of "natural" interest rates and debt issuance costs, which drive a wedge between holder and issuer call valuation.

To get around the call valuation problem, we use noncallable debt whenever possible. If forced to value a call option, we try to use debt with call valuations that are deeply out of the money, although in some cases we use yield to call on debt that is clearly going to be called.

In valuing calls, we follow a conservative application of the call value techniques of Kim, Ramaswamy, and Sundaresan and of Gastineau.‡

†The best attempt to value debt through a contingent claims analysis is probably E. Phillip Jones, Scott P. Mason, and Eric Rosenfeld, "Contingent Claims Valuation of Corporate Liabilities: Theory and Empirical Tests," National Bureau of Economic Research, Working Paper no. 1143, June 1983.

The debt pricing in this study returns an average absolute error of 6.05 percent on market value of debt, although the estimates with an average prediction error of 0.64 percent, are relatively unbiased.

‡Joon Kim, Krishna Ramaswamy, and Suresh Sundaresan, "Valuation of Corporate Fixed Income Securities," working paper, December 1986; and Gary L. Gastineau, *The Options Manual* (New York: McGraw Hill, 1988), pp. 347-64.

Maturity of bonds in sample

The regression results are potentially sensitive to the maturity of the bonds used to determine the risk premium. In particular, the maturity of the bonds in the sample can affect the slope of the curve relating risk premia to leverage.

If the risk premium is a function of the time to maturity, then any systematic relationship between time to maturity and leverage will bias the slope of the risk premium curve. For example, consider a situation in which low-debt firms in one sample year tend to have shorter maturity debt than their more leveraged counterparts. If risk premia are an increasing function of time to maturity, then the risk premia of the less leveraged firms will be biased downward relative to the risk premia of the more leveraged firms, steepening the apparent slope of the risk premium schedule.

Ideally, the risk premia in our sample should be independent of time to maturity. Table A1 shows the results obtained by regressing time to maturity on leverage in each of the sample years. The coefficient on time to maturity is negative in each of the regressions. The coefficients for the 1988 and 1989 cases are of much greater magnitude than the coefficient for the 1980 case, which is not significantly different from 0.

The importance of these results depends upon the relationship between time to maturity and the required risk premium. Theoretical work by Merton and by Pitts and Selby concludes that for investment grade bonds, the required risk premium rises with time to maturity out to one year and then declines very slowly afterward.§ The required risk premium on lower grade debt declines asymptotically with time to maturity. Later work by Sarig and Warga provides strong empirical support for these

§Robert C. Merton, "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," *Journal of Finance*, vol. 29 (1974).

Table A1

Characteristics of Sample Groups

	1980	1988	1989
Average debt ratio	0.540	0.529	0.562
Average risk premium	1.220	0.983	1.190
Average earnings rate variance	0.012	0.019	0.019
Average time to maturity of debt	14.25	11.36	9.62

Table A2

Regressions of Leverage on Time to Maturity

Debt ratio = $a + b \cdot$ (time to maturity of debt)

	1980	1988	1989
a	0.5551	0.6556	0.6307
b	−0.00003	−0.01113	−0.00714
error of b	0.00004	0.00456	0.00481
R^2	0.0267	0.1171	0.0466

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Appendix A: Characteristics of Sample Firms *(continued)*

theories about the time pattern of the premia.‖

Since the average time to maturity of bonds in our sample is roughly ten years (Table A2), we can treat the risk premium as a downward sloping function of time to maturity. Since the coefficient on time to maturity is negative in each sample period, we know from our earlier argument that the slope of the risk premia curves in each of the sample periods is biased upward. Further, this bias is stronger for the 1988 and 1989 samples, suggesting that we underestimate the actual extent of the flattening of the risk premium curve.

Timing of rate quotations

As noted in the article, shifts in interest rates around the sampling period can bias the estimated intercept of the risk premium curve. This occurs because Treasury debt is more heavily traded than corporate debt, with the result that the observed yields on corporate securities are less current than those on government securities.

Examination of interest rate movements immediately before the observation period helps to determine the direction of the bias — if interest rates are falling in the period before the observation, then the intercept will be biased upward. The patterns of interest rate movements in the period preceding the sample date have additional significance because the spread errors induced by them will depend upon how recently the issue was traded and will therefore vary across debt issues. This does not bias the slope of the risk premia curve, but it does increase the variance of the individual observations around the curve and is a potential source of estimation error.

Chart A1 traces the path of changes in the yield to maturity of the benchmark five-year government bond (noncallable, five years to maturity, closest to par coupon) over the week ending in the observation date. Note that in 1980, 1988, and 1989 the Treasury yields are similar and are relatively steady for the week preceding the sample period. The rate rises somewhat in 1980, suggesting an underestimation of the risk intercept, and falls in 1989, suggesting an overestimation. The rate is steady in 1988. As a rough estimation of the intercept bias introduced by the rate movement, we take the average of the rate observations prevailing in the week before the observation date and compare it to the rate prevailing on the observation date:

	Five-Year Rate	
Year	Last Week Average	Observation Date
1980	9.19	9.32
1988	8.47	8.46
1989	8.24	8.13

The difference between the average of the week's observations and the final observation may be taken as a rough measure of the intercept bias on the risk premium curve. The 1980 curve is therefore biased downward roughly 14 basis points relative to the 1988 curve, and 24 basis points relative to the 1989 curve.

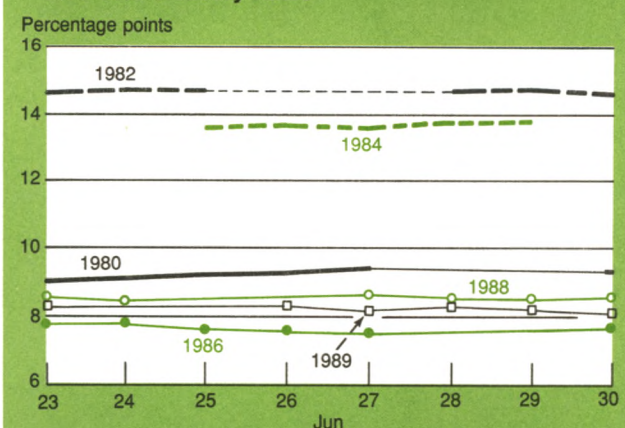
Liquidity premia

The yield difference between Treasury debt and certain government agency debt can be used as a measure of liquidity since some agency debt is essentially riskless, but less liquid than Treasury debt. The best agency for this calculation is probably the Federal National Mortgage Association (FNMA), which has large issues of nearly riskless straight debt with coupon values similar to Treasury debt. FNMA debt does pose two problems, however: First, its credit quality is thought to have improved slightly between 1980 and 1988, biasing the observed liquidity spread down slightly. Second, FNMA debt, unlike Treasury debt, is not deductible at the state

‖C.G.C. Pitts and M.J.P. Selby, "The Pricing of Corporate Debt: A Further Note," *Journal of Finance*, vol. 38 (1983); and Oded Sarig and Arthur Warga, "Some Empirical Estimates of the Risk Structure of Interest Rates," *Journal of Finance*, December 1989.

Chart A1

Five-Year Treasury Rates



Note: Rates are yield to maturity on par coupon Treasury debt with five years to maturity.

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Appendix A: Characteristics of Sample Firms *(continued)*

and local level. Because federal personal income tax rates have fallen since the early 1980s, the effective tax on FNMA debt has risen relative to Treasury debt, biasing the observed liquidity premium upward.# Nevertheless, since the two potential sources of error appear small and work in opposite directions, we will assume that they can be ignored.

Chart A2 shows the FNMA/Treasury spread for comparable ten-year debt* over the last two weeks of June in each of the years. The observed liquidity premium is clearly higher for 1980 than for 1988 or 1989. Over the final week of June, the spread averaged 52 basis points in 1980 as against 33 basis points in 1988 and 26 basis points in 1989.

The liquidity spreads on FNMA debt are consistent with our observations of liquidity spreads on World Bank debt. World Bank debt is comparable to FNMA debt but is characterized by lower issue volume and liquidity, particularly for longer maturities.

At the end of June 1980, five-year World Bank bonds were yielding 81 basis points more than comparable Treasuries.†† This difference fell to 47 basis points in 1988 and 63 basis points in 1989. This drop again represents a downward shift of about 25 basis points in the liquidity premium between the earlier and later periods.

#The tax rate on FNMA debt exceeds the tax paid on Treasury debt by the effective state and local tax rates. This difference varies with the tax status of the holder. We can express the effective state and local rate for a given tax bracket as $t_s * (1 - t_f)$, where t_s is the combined state and local tax rate and t_f is the federal tax rate. The subtraction of the federal rate reflects the deductibility of federal taxes from state and local taxes. Since the top bracket personal federal tax rate has fallen from 70 percent to 34 percent in the period between the early and late sample periods, we may assume that federal rates have fallen more than statutory state and local rates and that the effective state and local rate has therefore risen.

*The yield to maturity is for debt with similar coupons that matures in ten years from the observation date.

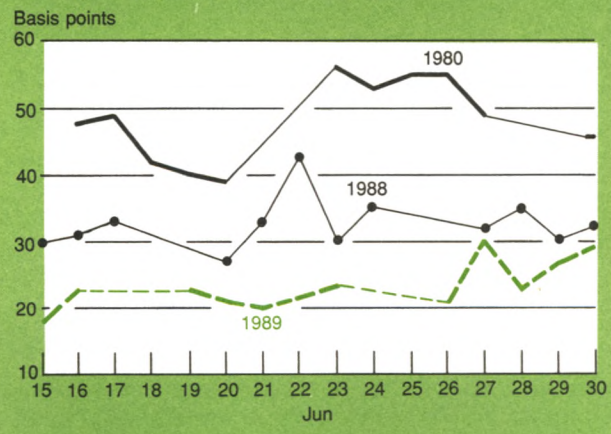
††Rate comparisons use yields on World Bank debt for the last day in June on which the issue traded. The Treasury rate is taken as the yield to maturity on comparable (five years to maturity, similar coupon characteristics) Treasury debt using the average of several observations from the day of World Bank debt observation:

Date	Treasury Yield	World Bank Yield	Spread
6-24-80	8.91	9.72	0.81
6-29-88	8.44	8.91	0.47
6-28-89	8.25	8.88	0.63

Chart A2

Liquidity Premia

Yield on Ten-Year Federal National Mortgage Association Debt less Yield on Ten-Year Treasury Debt



Note: Rates are yields on comparable bonds with ten years to maturity.

Appendix B: The Risk Premium Curve and the Optimal Debt Ratio

The cost of equity and the optimal debt ratio

We define the cost of capital as the weighted average of debt and equity costs. The firm determines the optimal debt ratio as the debt ratio that minimizes CK, the cost of capital (more properly, the "cost of funds"):

$$CK = (LEV * D) + \{(1 - LEV) * E\},$$

where LEV is the debt ratio, D is the real after-tax cost of debt, and E is the average cost of equity.

The firm solves:

$$\frac{d\,CK}{d\,LEV} = (D - E) + \left(LEV * \frac{d\,D}{d\,LEV}\right) + \left((1 - LEV) * \frac{d\,E}{d\,LEV}\right) = 0.$$

The first term represents the simple substitution of a unit of equity for a unit of debt. The second term represents the resulting change in average debt costs multi-

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Appendix B: The Risk Premium Curve and the Optimal Debt Ratio *(continued)*

plied by the size of the debt share (the term $\frac{d\,D}{d\,\mathrm{LEV}}$ is simply the slope of the risk premium curve on an after-tax basis), and the third term represents the resulting change in average equity costs multiplied by the size of the equity share.

We can prove that the equilibrium debt ratio used in the text satisfies the above equation if we make certain assumptions about a CAPM model. The first step is to rewrite D, the real after-tax cost of debt, as $D = r_r - (t_c * i_r)$, where r_r is the real interest rate facing the firm, t_c is the corporate tax rate, and i_r is the nominal interest rate facing the firm. We can then rewrite our optimal leverage equation:

$$\frac{d\,CK}{d\,\mathrm{LEV}} = (r_r - E) + \left(-(t_c * i_r) + \mathrm{LEV} * \frac{d\,D}{d\,\mathrm{LEV}}\right) + \left((1 - \mathrm{LEV}) * \frac{d\,E}{d\,\mathrm{LEV}}\right) = 0.$$

The second term in the equation is now simply the difference between the marginal cost of leveraging and the marginal tax benefit. At the equilibrium point calculated in the text, these two values are equal, and consequently the second term disappears. We now have to show that the first and third terms are equal.

If we accept CAPM, we can write $E = r_f + \beta * (E_m - r_f)$, where r_f is the risk-free rate of interest and E_m is the

Table B1

Required Risk Premium as a Function of Leverage

Regression Equation	a_0	b	Standard Error of b	Adjusted R^2	Degrees of Freedom
$PRE = a_0 + b*LEV$					
1980	−1.281	4.700	1.193	0.306	32
1988	−0.448	2.701	0.580	0.311	45
1989	−0.325	2.700	0.785	0.190	45
$PRE = a_0 + b*LEV^{1.5}$					
1980	−0.585	4.478	1.045	0.345	32
1988	−0.025	2.528	0.528	0.322	45
1989	0.149	2.389	0.682	0.197	45
$PRE = a_0 + b*LEV^{2.0}$					
1980	−0.227	4.635	1.000	0.383	32
1988	0.199	2.561	0.530	0.327	45
1989	0.397	2.299	0.651	0.200	45
$PRE = a_0 + b*LEV^{2.2}$					
1980	−1.126	4.752	0.994	0.398	32
1988	0.263	2.601	0.539	0.326	45
1989	0.468	2.288	0.648	0.199	45
$PRE = a_0 + b*LEV^{2.4}$					
1980	−0.041	4.890	0.994	0.413	32
1988	0.318	2.652	0.551	0.325	45
1989	0.527	2.285	0.648	0.199	45
$PRE = a_0 + b*LEV^{2.6}$					
1980	0.032	5.046	0.996	0.428	32
1988	0.366	2.710	0.566	0.323	45
1989	0.579	2.288	0.650	0.198	45
$\log(PRE) = a_0 + b*\log(LEV)$					
1980	1.326	2.482	0.506	0.411	32
1988	0.625	1.262	0.225	0.399	45
1989	0.459	0.895	0.310	0.137	45

Notes: PRE = risk premium over riskless rate for debt issues of individual corporations; LEV = debt ratio = market value of debt over total (debt plus equity) firm market value.

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Appendix B: The Risk Premium Curve and the Optimal Debt Ratio *(continued)*

market equity return. The cost of equity then varies with leverage through the beta coefficient. The beta coefficient varies with the debt ratio as follows: $\frac{d\beta}{d\,LEV} = \frac{1}{1-LEV}$. Here we assume that the firm has systematic asset risk that is completely absorbed by the equity; hence the equity beta varies with the inverse of the equity ratio. In reality, we would expect the beta coefficient for a firm's debt to increase with leverage, accounting for some of the systematic asset risk, but bond betas tend to be very low and can be ignored for our purposes.

We can now write $\frac{dE}{d\,LEV} = \frac{(E_m - r_f)}{1-LEV}$. The third term of the optimum debt equation then becomes $(E_m - r_f)$. Setting the second term of the optimum leverage equation equal to zero, we obtain $\frac{d\,CK}{d\,LEV} = (E_m - E) + (r_r - r_f)$. For a market representation of firms we have $E_m = E$. The value then becomes $(r_r - r_f)$, a positive but very small number because it is taken over a differential change in leverage. Recall that our equation for $\frac{d\beta}{d\,LEV}$ overlooked the fact that not all of the systematic asset volatility would remain in equity as we leveraged. Adjusting for this omission would lower the value of the third term and move the sum of the first and third terms toward zero. In addition, the extent to which systematic asset volatility is not absorbed by equity is a positive function of leverage, just as $(r_f - r_m)$ is. This suggests that the relation between the first and third terms is

Table B2

Required Risk Premium as a Function of Leverage and Cash Flow Volatility

Regression Equation	a_0	b_1	b_2	Standard Error of b_1	Standard Error of b_2	Adjusted R^2	Degrees of Freedom
$PRE = a_0 + b_1 \cdot LEV + b_2 \cdot VOL$							
1980	−1.47	4.24	38.00	1.19	23.05	0.341	31
1988	−0.52	2.22	17.86	0.54	5.50	0.431	44
1989	−0.63	2.49	21.99	0.74	8.25	0.287	44
$PRE = a_0 + b_1 \cdot LEV^{1.5} + b_2 \cdot VOL$							
1980	−0.83	4.07	35.85	1.05	22.51	0.375	31
1988	−0.17	2.09	17.71	0.50	5.46	0.441	44
1989	−0.20	2.22	22.21	0.64	8.19	0.296	44
$PRE = a_0 + b_1 \cdot LEV^{2.0} + b_2 \cdot VOL$							
1980	−0.49	4.24	33.75	1.01	21.96	0.408	31
1988	0.00	2.12	17.75	0.50	5.42	0.446	44
1989	0.01	2.16	22.53	0.61	8.14	0.303	44
$PRE = a_0 + b_1 \cdot LEV^{2.2} + b_2 \cdot VOL$							
1980	−0.39	4.36	32.92	1.00	21.73	0.422	31
1988	0.05	2.16	17.82	0.51	5.42	0.447	44
1989	0.08	2.16	22.67	0.61	8.13	0.304	44
$PRE = a_0 + b_1 \cdot LEV^{2.4} + b_2 \cdot VOL$							
1980	−0.31	4.50	32.11	1.01	21.50	0.435	31
1988	0.10	2.20	17.90	0.52	5.41	0.447	44
1989	0.13	2.16	22.83	0.60	8.12	0.306	44
$PRE = a_0 + b_1 \cdot LEV^{2.6} + b_2 \cdot VOL$							
1980	−0.23	4.65	31.30	1.01	21.27	0.448	31
1988	0.13	2.26	18.01	0.53	5.41	0.447	44
1989	0.17	2.17	22.99	0.61	8.11	0.306	44
$\log(PRE) = a_0 + b_1 \cdot \log(LEV) + b_2 \cdot VOL$							
1980	2.31	2.48	0.21	0.51	0.24	0.407	31
1988	1.70	1.13	0.28	0.22	0.11	0.462	44
1989	1.47	0.86	0.25	0.31	0.15	0.166	44

Note: VOL = Variance of earnings before interest and tax payments.

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Appendix B: The Risk Premium Curve and the Optimal Debt Ratio *(continued)*

stable.

Even if one does not accept all of the assumptions of the CAPM model, it should be clear that the methods employed yield a fairly consistent estimate of the optimal debt ratio. Nevertheless, modelling equity costs as a function of leverage is a subject requiring further empirical work.

Generating a risk premium schedule

A schedule of risk premia is generated for help in determining the correct functional form to use in the risk premia regressions and for use in evaluating the effectiveness of an interest deduction cap.

The risk premium curve is calculated for a high-volatility firm (annualized standard deviation of total firm value = 0.310), a low-volatility firm (annualized standard deviation of total firm value = 0.220) and a very low (takeover target) volatility firm (annualized standard deviation of total firm value = 0.175).†

The calculations assume the following: 1) the standard deviation of total firm market value (debt plus equity) is constant over the life of the debt; 2) the riskless interest rate is 7 percent; and 3) the debt ratio is determined after solving for the required risk premium.‡

The model uses seven-year zero coupon debt to approximate the duration of ten-year coupon debt. The risk premia on the medium-term debt for the high- and low-volatility firms form risk premia curves similar to those estimated in the text.

Estimating the functional form of the risk premium curve

We perform the following regressions on the generated points: log (risk premium) = $a + b \cdot$ log (debt ratio). Some results are given below:

Volatility	Time to Maturity	a	b	R^2
0.175	3 years	−33.04	7.718	0.9954
0.220	7 years	−14.79	3.711	0.9991
0.310	7 years	− 8.80	2.490	0.9993

We then perform additional regressions on the generated points: risk premium = $a + b \cdot$ (debt ratio)^k, letting k take on different values. Some results for a firm with low volatility (0.220) and seven-year zero-coupon debt follow:

k	a	b	b error	R^2
1	−5.33	12.21	0.684	0.8886
1.5	−3.00	10.46	0.467	0.9263
2	−1.82	9.86	0.340	0.9546
2.4	−1.21	9.74	0.265	0.9712
2.6	−0.97	9.75	0.232	0.9780

The values generated by the Black-Scholes model are considered only over the debt ratio interval of 0.10 to 0.90. The exponential relationship with the generated points begins to break down with debt ratios greater than 0.90.

The results obtained from regressions on curves generated from the Black-Scholes model serve as a guide for regressions on the sample data. The shape of the risk premium curve is empirically estimated using various functional forms. Table B1 presents the results obtained by regressing the risk premium solely on the debt ratio, and Table B2 gives the results obtained by regressing the risk premium on the debt ratio and cash flow variance.

Estimating the effects of an interest deduction cap

To determine the effect of an interest deduction cap on the marginal tax incentive to leverage, we begin by estimating the risk premium schedule facing firms. Although a schedule of this kind was developed in the text, the estimation of the risk premium curves excluded the use of firms with debt ratios in excess of 90 percent. For this reason, and because the exponential form in the text tends to underestimate risk premia for debt ratios in excess of 90 percent, we will use the risk premium curve generated by a log/log regression on a curve generated by a Black-Scholes model, as calculated earlier in this appendix.

Next, we define the benchmark rate (i_b) as the highest coupon rate that the firm is allowed to deduct for interest expense. The nominal interest rate paid by the firm is i_r. The deductible interest rate (i_d) of a firm under the cap can be defined as:

$$i_d = i_r \quad \text{if } i_r < i_b$$
$$i_d = i_b \quad \text{if } i_r > i_b.$$

†Estimates of volatility of total firm value may be found in E. Phillip Jones, Scott P. Mason, and Eric Rosenfeld, "Contingent Claims Valuation of Corporate Liabilities: Theory and Empirical Tests," National Bureau of Economic Research, Working Paper no. 1143, June 1983.

‡Arbitrage pricing is done under the assumption that the current value of the firm equals 100. The value of equity is calculated as a call on total firm value; the value of debt is calculated as a residual. Different debt ratios are obtained by varying nominal redemption prices of debt. The risk premium is calculated as the yield required on the market value of debt in order for debt to reach redemption price, less the riskless rate. Mathematically, the risk premium must satisfy:

$$(1 + i_f + \text{PRE})^t \cdot \text{LEV} \doteq K,$$

where i_f is the riskless interest rate, PRE is the required risk premium, t is the life of debt, and K is the face value redemption price of debt.

Solving for PRE in continuous time, we obtain:

$$\text{PRE} = t^{-1} \cdot (\log K - \log \text{LEV}) - i_f.$$

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Appendix B: The Risk Premium Curve and the Optimal Debt Ratio *(continued)*

Without the cap, we always have $i_d = i_r$.

The annual tax savings from the debt shield is simply the deductible rate times the debt ratio of the firm, LEV:

$$i_d * \text{LEV} * t_c.$$

The marginal change in the total interest deduction with respect to a change in the debt ratio is:

$$\text{(B-1)} \qquad \left\{\left(\frac{d\, i_d}{d\, \text{LEV}} * \text{LEV}\right) + i_d\right\} * t_c.$$

Without the interest cap (the unrestricted case) we can substitute i_r for i_d, and $\frac{d\, i_d}{d\, \text{LEV}}$ in (B-1) will always be positive. With the interest cap (the restricted case), the value of (B-1) will equal that of the unrestricted case when $i_r < i_b$. If $i_r > i_b$, then in the restricted case the value for (B-1) becomes $(i_b * t_c)$. The values shown in Chart 4 in the text are simply the ratio of $(i_b * t_c)$ to the value calculated in (B-1) for the unrestricted case over the range for which $i_r > i_b$.

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Understanding International Differences in Leverage Trends

After a remarkable period of stability in the ratio of aggregate debt to economic activity in the United States, this ratio and various other measures of leverage rose in the 1980s. In earlier decades, trends in public and private sector debt had tended to offset each other; over the past several years, however, both forms of debt have increased.[1] Observers have responded to these developments with apprehension. Some worry that high leverage in the corporate sector would restrict the ability of firms to adjust to adverse developments and thus would heighten macroeconomic instability.[2] Others suggest that in a sharp downturn the higher levels of debt could lead first to a wave of bankruptcies and then to a general liquidity crisis.[3]

Researchers who follow international developments have noted that other major market economies have not experienced a similar rise in leverage.[4] Yet these economies have been riding the current business cycle roughly in tandem with the United States. Moreover, other factors that might influence leverage, such as interest rates and stock prices, have also been correlated across countries.

This article investigates why leverage trends in the United States have differed from those in other countries. Distinguishing the developments underlying the U.S. experience from developments abroad may help clarify the extent to which high leverage is a problem. If leverage has risen in the United States only because investment has so exceeded internal funds that much debt financing has been required, then the situation might not be cause for concern. As long as the funds have been invested well and no adverse shocks arise, the investment should generate cash flows in the future to bring leverage back down.

The data presented here show that declines in leverage abroad have tended to be associated with reductions of short-term debt. An analysis of firm-level data suggests that this pattern is consistent with the so-called pecking-order hypothesis, which links a decline in leverage to strong internal cash flows relative to investment. In Germany and France, leverage among large firms has fallen sharply, precisely because they have had very favorable cash flows. In Japan, aggregate leverage has declined because cash-rich firms have been scrupulously retiring debt. The puzzle is why leverage has risen for large U.S. firms, which have had reasonably strong cash flows relative to investment.

This article stresses the finding that much of the rise in U.S. leverage has been due to a buildup of long-term debt, particularly by firms that have been borrowing heavily in order to buy back their own common stock.

[1] Benjamin M. Friedman, "Increasing Indebtedness and Financial Stability in the United States," in *Debt, Financial Stability and Public Policy*, Federal Reserve Bank of Kansas City, 1986; E.P. Davis, *Rising Sectoral Debt/Income Ratios: A Cause for Concern?* BIS Economic Papers, no. 20, June 1987.

[2] See, for example, Henry Kaufman, "Debt: The Threat to Economic and Financial Stability," in *Debt, Financial Stability and Public Policy.*

[3] See, for example, Ben S. Bernanke and John Y. Campbell, "Is There a Corporate Debt Crisis?" *Brookings Papers on Economic Activity*, 1: 1988.

[4] See Claudio E.V. Borio, "Leverage and Financing of Nonfinancial Companies: An International Perspective," Paper presented at the Eighteenth MSG Conference on Financial Markets and Policy, Brasenose College, Oxford, September 19-21, 1989.

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Reacting, perhaps, to perceived threats of takeover, some firms have been raising their leverage sharply through stock buybacks.

The article begins with a fuller description of recent international trends in leverage. The next section provides a brief discussion of existing theories of leverage. The third section presents estimates of leverage-target behavior to assess the degree to which taxes, interest rates, or stock prices can explain the recent trends. A direct test of the pecking-order hypothesis follows; the object of this section is to evaluate whether strength of cash flows can account for the differences in leverage trends. The article concludes with a brief interpretation of the results.

Global patterns of leverage

The familiar ratios

Table 1 reports book-value debt-to-asset ratios familiar to researchers who have tried to compare leverage in different countries.[5] The ratios reported here are based on data from the Banque de Comptes Harmonisées (BACH) database maintained by the European Commission in Brussels, but they tend to be very close to ratios based on the usual OECD financial statistics and the various official flow-of-funds statistics.[6] The computation of these ratios follows OECD convention in including accounts payable in the definition of debt, along with short-term and long-term debt. The argument for this inclusion is the importance of accounts payable on balance sheets in such countries as France, Italy, and Japan.[7]

The ratios confirm the common distinction between low-leverage and high-leverage countries. France, Germany, Italy, and Japan have higher leverage, while the United Kingdom and the United States have lower leverage. The Netherlands seems to belong in the middle. These differences appear to be due to differences in financial practices, not to differences in the mix of industries within a country.[8]

Of greater interest, however, are the trends in leverage and, in particular, the emergence of the United States as the only country with consistently rising leverage. Leverage in France was initially rising but has been declining since 1984. Leverage in the United Kingdom has stayed within a fairly narrow range. In Germany, Italy, Japan, and the Netherlands, leverage has clearly been falling. The trends indicate some convergence between high-leverage and low-leverage countries. However, while Japan, Italy, and France have had the highest leverage ratios, Germany's ratio has declined the fastest.

Publicly traded industrial companies

The representation of leverage trends in Chart 1 is based on Global Vantage data on publicly traded

[5]The analysis here explains leverage in terms of the book values of debt and assets instead of market values. This approach is justified on two counts. First, survey evidence shows that most corporate financial executives use book values for setting leverage targets: see A. Stonehill and others, "Financial Goals and Debt Ratio Determinants: A Survey of Practice in Five Countries," *Financial Management*, Autumn 1977, pp. 27-41. Second, other researchers have found that it makes little difference whether market or book values are used: see Paul Marsh, "The Choice Between Equity and Debt: An Empirical Study," *Journal of Finance*, March 1982, pp. 121-44; and Robert A. Taggart, "A Model of Corporate Financing Decisions," *Journal of Finance*, December 1977, pp. 1467-84.

[6]See, for example, Janette Rutterford, "An International Perspective on the Capital Structure Puzzle," in J.M. Stern and D.H. Chew, eds., *New Developments in Corporate Finance* (Oxford: Basil Blackwell, 1988), pp. 194-207.

[7]For this sample of companies, accounts payable are on the order of 30 percent of assets for France, Italy, and Japan. In the sample of larger companies represented in Chart 1, accounts payable on average amount to 15 percent of assets for France and 20 percent for Japan.

[8]For a discussion of differences in financial systems, see Robert N. McCauley and Steven Zimmer, "Explaining International Differences in the Cost of Capital," Federal Reserve Bank of New York *Quarterly Review*, Summer 1989, pp. 7-28. For a study showing that differences in leverage are not due to differences in industrial mix, see Joëlle Laudy and Daniel Szpiro, "Des Entreprises Industrielles Plus Endettées en France que dans les Autres Pays Européens," *Economie et Statistique*, no. 217/218 (1989).

Table 1

Book-Value Debt-Asset Ratios of Nonfinancial Firms

(Percent)

	1982	1983	1984	1985	1986	1987
France	69.2	70.7	76.6	73.3	71.0	70.2
Germany	62.0	60.9	59.7	58.6	57.1	
Italy	70.4	68.2	67.5	67.0	67.3	66.9
Japan	73.4	73.2	72.6	71.5	70.5	70.1
Netherlands	55.4	55.2	53.9	54.3	52.4	52.3
United Kingdom	47.9	47.6	48.1	47.6	46.6	
United States		39.4	40.6	42.2	43.3	44.3

Source: Banque de Comptes Harmonisées (data collected by the European Commission from official sources and "harmonized" to correct for differences in data collection and to make comparisons possible).

Note: The composition of each country's sample is as follows:
France — Firms with 500 or more employees, unconsolidated.
Germany — Over 70,000 corporations, sole proprietorships, and partnerships; unconsolidated.
Italy — Mostly industrial firms and a few construction firms, unconsolidated.
Japan — All nonfinancial firms, unconsolidated.
Netherlands — Nonfinancial firms, consolidated.
United Kingdom — Large firms, consolidated.
United States — All nonfinancial firms, excluding construction and services, consolidated.

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industrial companies.[9] The analyses below rely on these data for information at the firm level. Use of these data, instead of the official flow-of-funds statistics, makes it possible to focus on larger firms, which can be more readily compared across countries because of their similar degree of access to capital markets. The leverage ratios shown in the chart are computed with accounts payable included in the definition of debt, as in Table 1, but also with provisions for pension liabilities subtracted from assets, because these provisions are not reported on balance sheets in the United States.[10] The firms selected for analysis are limited to those for which a complete set of observations is available to construct the cash flow estimates used later, although use of larger samples from Global Vantage will produce the same leverage patterns.

A comparison of the figures in Table 1 with those in Chart 1 shows substantial differences in leverage levels between samples, but the trends in leverage remain basically the same. The generally lower leverage ratios in Chart 1 suggest that large firms are much less

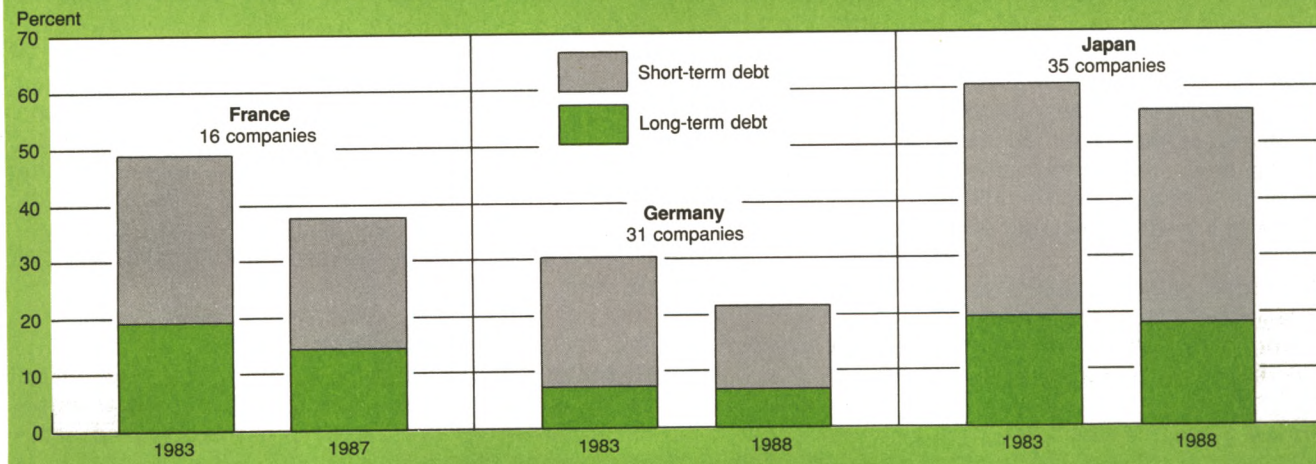
[9]Global Vantage (Standard and Poor's international version of Compustat) draws data from financial statements of publicly traded industrial companies.

[10]Provisions for pension liabilities are most significant for German firms: the item amounts to an average of 15 percent of firm assets.

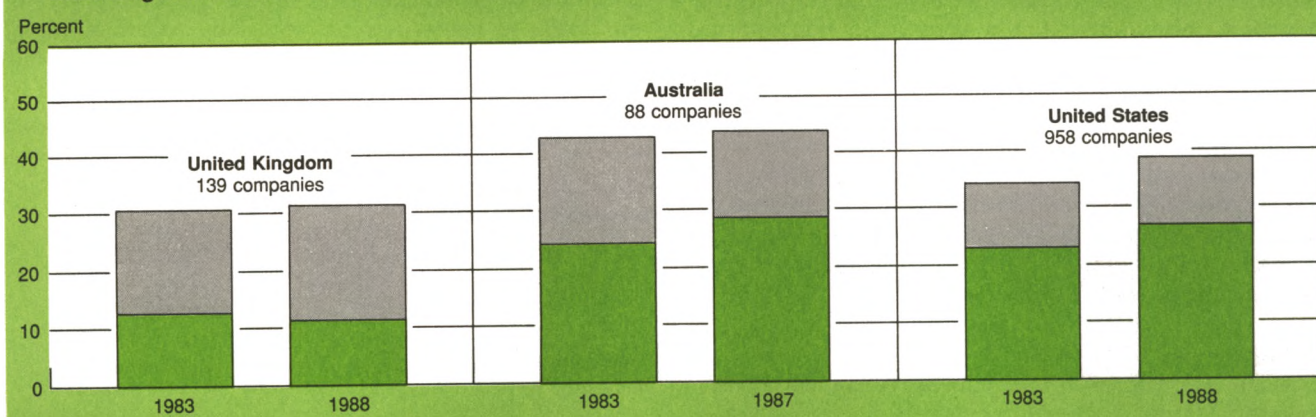
Chart 1

Ratios of Debt to Assets for Publicly Traded Industrial Companies

Short-term debt has accounted for much of the decline in leverage in some countries, . . .



while long-term debt has accounted for much of the rise in leverage in Australia and the United States.



Source: Basic data are drawn from Standard and Poor's Global Vantage.

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leveraged than small firms in a given country. Indeed, the Global Vantage data now show large German firms to have lower leverage ratios than large U.S. firms. The chart includes leverage ratios for Australia, and these show higher leverage than the ratios for France or Germany. In spite of the differences between the two data sets, the trends persist and in fact become more striking with the Global Vantage data. The United Kingdom and Australia both show a slight rise in leverage, but the United States still stands apart because of the marked rise in its leverage. Note that this rise in U.S. leverage cannot be attributed directly to leveraged buyouts (LBOs), since Global Vantage data include only firms that have remained public. France and Germany show sharper declines in leverage than before.

Short-term and long-term debt

Chart 1 also divides the leverage ratios into short-term debt and long-term debt components. In France and Germany, large firms have achieved a sharp decline in total leverage mainly by reducing short-term debt as a ratio to assets. In Japan, the decline in total leverage has been more modest, but the reduction in short-term debt has been just as apparent. In the United Kingdom, total leverage has remained essentially unchanged, while the ratio of short-term debt to assets has risen slightly. In Australia and the United States, a rise in leverage has been associated with a rise in long-term debt.

The broad pattern appears to be that in countries with falling leverage, the decline can be attributed to short-term debt, while in countries with rising leverage, the increase can be traced to long-term debt.

Theories of capital structure

Can existing theories of capital structure explain differences in leverage behavior across countries? Can the theories explain the association of falling leverage with short-term debt and rising leverage with long-term debt? It is useful to distinguish two approaches to analyzing how firms determine leverage. One approach sees firms as trying to achieve a leverage target or an optimal capital structure. The other approach sees a firm's capital structure as a byproduct of a history of financing decisions, in which the firm has in every period matched its uses of funds with the cheapest sources it could find. The two approaches are discussed in greater detail below.

The leverage-target approach

Under the first approach, the optimal capital structure or leverage target depends on such factors as conditions in capital and credit markets, the tax treatment of returns on different assets, the riskiness of the firm's earnings, the costs of financial distress, and various agency problems associated with debt and equity.[11] The costs of financial distress include the loss of flexibility experienced by a firm having difficulty servicing its debt, as well as the trustee and legal fees and reorganization costs incurred if the situation deteriorates into bankruptcy. Agency problems with debt arise when firms have an incentive to choose riskier projects against the interest of creditors, while agency problems with equity occur when firms have an incentive to spend on managerial perquisites against the interest of shareholders.

Indirect evidence for the existence of leverage targets is provided by the finding that average leverage ratios for broad industry groups tend to be consistent over time.[12] Direct evidence for particular models remains hard to find, however, perhaps because unobservable agency costs are critical explanatory variables.[13] For example, efforts to explain differences in leverage across countries in terms of tax differences alone have largely failed. In general, there is little correlation between the ranking of countries according to the relative tax advantage of debt over equity and their ranking according to leverage.[14] Hence explanations often turn to special institutional factors — for example, the system of universal banking in Germany or the organization of *keiretsus* (groups of companies with cross-holding of shares) in Japan — which somehow provide more effective ways of dealing with financial distress or agency problems of debt.

The pecking-order approach

Under the second approach, the determination of leverage hinges on the strength of cash flows. The formal statement of this approach is the so-called pecking-order hypothesis developed by Myers and Majluf.[15] The theory assumes that managers know more about the firm than do outside investors. Since managers are less likely to issue new stock if they regard existing shares as undervalued than if they regard the shares

[11]For a summary of this literature, see Colin Mayer, "New Issues in Corporate Finance," *European Economic Review*, vol. 32 (1988), pp. 1167-89.

[12]Ezra Solomon, *The Theory of Financial Management* (New York: Columbia University Press, 1963), pp. 91-106.

[13]This lack of evidence led Stewart Myers to the subject of his presidential address to the American Finance Association, "The Capital Structure Puzzle," *Journal of Finance*, vol. 39 (July 1984), pp. 575-92.

[14]See Mayer, "New Issues"; Rutterford, "An International Perspective"; and Borio, "Leverage and Financing."

[15]Stewart C. Myers and Nicholas S. Majluf, "Corporate Financing and Investment Decisions When Firms Have Information Investors Do Not Have," *Journal of Financial Economics*, vol. 13 (1984), pp. 187-221.

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as overpriced, investors will regard a decision to issue stock as a sign of possible "bad" news. Thus, firms can only issue equity at a discount, and cash flows will normally be a cheaper source of funds than external equity. The asymmetry of information will also make debt financing cheaper than external equity, simply because debt contracts are safer in that they limit the possible ways by which holders could lose. Hence, to finance investment, firms will first use cash flows as the cheapest source, then debt financing, and finally outside equity financing (see Box 1 for an illustration). In short, the stronger the cash flows relative to investment, the less likely the firms will turn to debt and the more likely leverage will fall.

Thus far the evidence for the pecking-order theory, like the evidence for leverage targets, has been indirect only. For example, the finding that cash flow is a significant determinant of investment indicates that there is indeed an important distinction between internal and external finance.[16] Another form of indirect evidence is the strong inverse correlation between profitability and leverage.[17] If profitability is correlated with cash flow, then this result indicates that firms with strong cash flow avoid borrowing, consistent with pecking-order behavior.

The two approaches together

In practice, firms must decide on capital structure and financing at the same time. One can imagine firms to be constantly seeking their optimal capital structure but often finding themselves bumped away by shocks to cash flow. Unexpectedly good earnings would put a firm below its leverage target, and the firm would then try to raise its debt ratio over time, perhaps by making investment plans that would require much debt financing. An adverse shock to cash flow would put the firm above its target; to reduce leverage, the firm might then postpone large investments.

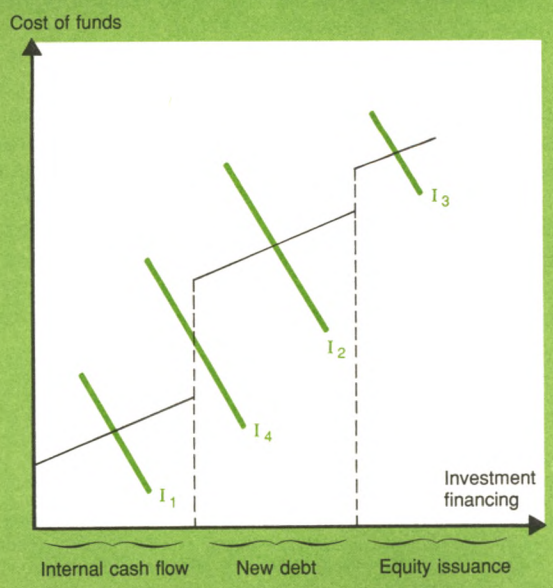
The empirical results reported in the next two sections suggest somewhat more subtle behavior. Analysis of Global Vantage data for four major countries in the 1980s indicates that leverage-target considerations determine the ratio of long-term debt to assets, while pecking-order considerations determine the ratio of total debt to assets.[18] Together, these results mean that firms manage their long-term debt to achieve an opti-

Box 1: A Graphical Exposition

The chart below illustrates pecking-order behavior for different levels of investment demand. Abstracting from dividend payments, a firm with the weak investment demand I_1 would finance investment entirely with internal funds and use the remaining cash flow to retire debt. With the stronger investment demand I_2, the firm would invest all its cash flow and then turn to debt financing. With the still stronger investment demand I_3, the firm would use internal funds, debt financing, and outside equity, although the cases in which firms actually turn to outside equity are considered relatively uncommon. The interesting case occurs when investment demand happens to be I_4, falling in the gap between the costs of internal and external finance. In this case investment would be constrained by cash flow. While the return to investment would be high enough to justify further cash flow financing, it would fall short of the hurdle rate for any borrowing.

Pecking-Order Behavior

The Cost of Funds for Varying Investment Demands



[16] See Steven M. Fazzari, R. Glenn Hubbard, and Bruce C. Petersen, "Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity*, 1: 1988, pp. 141-206. See also Richard Cantor, "A Panel Study of the Effects of Leverage on Investment and Employment," in *Studies on Financial Changes and the Transmission of Monetary Policy*, Federal Reserve Bank of New York, May 1990.

[17] W. Carl Kester, "Capital and Ownership Structure: A Comparison of United States and Japanese Corporations," *Financial Management*, Spring 1986, pp. 5-16; and John Baskin, "An Empirical Investigation of the Pecking Order Hypothesis," *Financial Management*, Spring 1989, pp. 26-35.

[18] Firms may have leverage targets for total debt as well, but the adjustment may happen too slowly to be detected.

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mal capital structure while they adjust short-term debt to accommodate cash-flow shocks. The link between cash flows and short-term debt makes sense to the extent that shocks to cash flow are transitory, since the transactions costs for both issuing and retiring debt are much lower for short-term debt than for long-term debt.

This pattern of behavior implies that in France, Germany, and Japan, where major firms have been reducing primarily short-term debt, strong cash flows would explain the decline in leverage. In Australia and the United States, where corporations have been taking on largely long-term debt, something other than weak cash flows would be needed to explain the rise in leverage.

Leverage-target behavior

To evaluate the extent to which interest rates and stock prices can explain recent trends in leverage, this section presents estimates of leverage-target behavior. Leverage is specified in terms of both total debt and long-term debt. The leverage target is specified to depend on the observable costs of debt and equity and on a proxy for the costs of financial distress. Overall, the empirical results for leverage-target behavior are less than impressive for explaining the trends in leverage. To the extent that observable cost factors can explain such behavior in the 1980s, however, they appear to work better when leverage is measured in terms of long-term debt than when leverage is measured in terms of total debt.[19]

The estimating equations assume gradual adjustment by firms to the leverage target. Formally, the adjustment is described by $\Delta d = \lambda(d^* - d_{-1})$, where d is the ratio of debt to assets, d^* is the desired ratio, d_{-1} is the previous period's debt-asset ratio, and λ is the adjustment coefficient, with $\lambda = 1$ implying complete adjustment in a fiscal year. Here the amount of adjustment is proportional to the difference between desired and actual leverage. The desired ratio is then specified as a function, $d^* = f(c^D, c^E, c^{FD})$, where c^D, c^E, and c^{FD} are the costs of debt, equity, and financial distress, respectively. Since Δd is $d - d_{-1}$, the estimating equation can be written as $d = \lambda f(c^D, c^E, c^{FD}) + (1 - \lambda)d_{-1}$. The cost of debt would have a negative effect on leverage, the cost of equity a positive effect, and the costs of financial distress a negative effect.

The equations are estimated for Germany, Japan, the United Kingdom, and the United States for the period covering the fiscal years from 1983 to 1988. The estimates are based on panel data from Global Vantage and use the same sample of firms used for the leverage ratios in Chart 1. The cost of debt is measured as the real interest rate on corporate bonds minus the product of the corporate tax rate and the nominal interest rate.[20] The cost of equity is measured as the ratio of cash flow per share to the stock price for each firm. The results tend not to be sensitive to the way in which the costs of debt and equity are measured. For the costs of financial distress, the equations use the ratio of fixed assets to total assets as a proxy negatively related to these costs.[21]

Total debt

Table 2A reports the leverage-target equations for total debt. The costs of debt and equity for Germany, Japan, and the United Kingdom show signs contrary to those predicted by theory. Given that the cost of equity is measured as the ratio of cash flow to stock price, the minus sign on this variable may in fact be picking up pecking-order behavior, with strong cash flows tending to reduce leverage. The equation for the United States gives the theoretically correct signs, but the coefficient is significant only for the cost of equity. In all cases, the equations show the wrong sign for the ratio of fixed assets to total assets, a variable which should have a positive effect on leverage if it is an inverse proxy for the costs of financial distress. The final disappointment is that the coefficients on the lagged debt-asset ratio for German, Japanese, and U.K. firms are not significantly different from one, implying no discernible adjustment towards a leverage target.

Long-term debt

On the whole, estimates of leverage-target behavior in terms of long-term debt yield modestly more favorable results than estimates in terms of total debt. For the United States, however, it seems to make a difference whether firms buying back their stock are included in the sample. Table 2B reports a second set of estimates for the United States that excludes cash-rich U.S. firms using long-term debt to finance stock buybacks.[22]

[19]This result is consistent with Donaldson's finding that the most common measure of debt capacity used by U.S. corporations is the ratio of long-term debt to capitalization. See Gordon Donaldson, *Corporate Debt Capacity*, Harvard Business School Division of Research, 1961.

[20]For a fuller explanation of the variables, see Eli M. Remolona, "Why International Trends in Leverage Have Been So Different," Federal Reserve Bank of New York, Working Paper no. 9002, February 1990.

[21]In justifying this proxy as a measure of the value of tangible assets available for liquidation in case of bankruptcy, Long and Malitz argue that the costs of financial distress are associated largely with the loss of intangible assets. See Michael S. Long and Ileen B. Malitz, "Investment Patterns and Financial Leverage," in Benjamin Friedman, ed., *Corporate Capital Structure in the United States* (Chicago: University of Chicago Press, 1985), pp. 325-48.

[22]This study defines "cash-rich" firms as those whose measured cash flows exceed predicted investment and dividends, with the prediction based on sales and lagged dividends.

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Stock buybacks have become an important U.S. phenomenon, and it would be of interest to know whether they represent a separate kind of leveraging behavior. When even cash-rich firms go deeper into debt to finance buybacks, such behavior may reflect an effort to leverage up and not just to substitute for dividends.[23] The exclusion of these buyback firms from the U.S. sample reduces the explanatory power of the costs of debt and equity in the leverage-target equations.

With leverage measured in terms of long-term debt, the estimated effects of the cost of debt for Japan, the United Kingdom, and both U.S. samples now have the correct sign, although in no case is the effect statistically significant. The estimated effects of the cost of equity have the right sign for Japan and the U.S. full sample (with statistical significance in the case of the latter), but the sign is reversed when the buyback firms

[23] Bagwell and Shoven view stock buybacks as a substitute for dividend payments. See Laurie S. Bagwell and John B. Shoven, "Cash Distributions to Shareholders," *Journal of Economic Perspectives*, vol. 3 (Summer 1989), pp. 129-40.

Table 2A

Leverage-Target Equations for Total Debt

Dependent Variable Is the Ratio of Total Debt to Assets

Explanatory Variable	Germany	Japan	United Kingdom	United States
Constant	0.0254 (1.6076)	0.0658 (2.0184)	0.1045 (3.2453)	0.1993 (12.7756)
Cost of debt	1.3425 (1.6388)	0.4784 (0.3489)	1.4295 (1.9813)	−0.2964 (−0.4984)
Cost of equity	−0.0021 (−0.8750)	−0.1183 (−3.4794)	−0.1308 (−6.5729)	0.0371* (3.0917)
Lagged fixed to total assets	−0.0323 (−0.7341)	−0.1448 (−2.5134)	−0.522 (−1.2429)	−0.0377 (−1.7700)
Lagged long-term debt to assets	0.9524 (−1.4783)	1.0517 (1.5029)	0.9712 (−0.5125)	0.6458* (−16.6291)
F	1.547	4.874	13.622	79.579
Adjusted R2	0.012	0.082	0.022	0.052
n	185	173	2,291	5,777

Notes: The t-values for the null hypotheses are in parentheses. An asterisk indicates correct sign and significance at the 5 percent level.

Table 2B

Leverage-Target Equations for Long-Term Debt

Dependent Variable Is the Ratio of Long-Term Debt to Assets

				United States	
Explanatory Variable	Germany	Japan	United Kingdom	Full Sample	Without Buyback Firms
Constant	0.0072 (1.2632)	0.0287 (2.0648)	0.0127 (4.2333)	0.0548 (10.1481)	0.0297 (6.1875)
Cost of debt	0.1677 (0.4712)	−0.2196 (−0.3402)	−0.0830 (−0.8755)	−0.2188 (−1.0069)	−0.1899 (−1.0544)
Cost of equity	−0.0004 (−0.4000)	0.0078 (0.4937)	−0.0003 (−0.1154)	0.0103* (2.3409)	−0.0178 (−4.3415)
Lagged fixed to total assets	0.0060 (0.2985)	−0.0267 (−0.9744)	0.0184* (3.4074)	0.1481* (18.5125)	0.0564* (7.7260)
Lagged long-term debt to assets	0.8806* (−2.9337)	0.8836* (−3.1290)	0.7912* (16.5714)	0.4436* (−65.4588)	0.7943* (−21.2062)
F	2.382	3.200	69.044	1,061.232	124.294
Adjusted R2	0.029	0.048	0.106	0.423	0.101
n	185	173	2,291	5,777	5,485

Notes: The t-values for the null hypotheses are in parentheses. An asterisk indicates correct sign and significance at the 5 percent level.

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are excluded for the United States. This time the ratio of fixed assets to total assets works as a negative proxy for the costs of financial distress for the United Kingdom and both U.S. samples.[24] The coefficients on the lagged debt-asset ratio now indicate significant adjustment towards a leverage target, whether or not the sample shows rising leverage over the period. The coefficients suggest that German and Japanese firms adjust their capital structures about 12 percent a year towards their leverage targets, British firms adjust 21 percent a year, and American firms adjust about 56 percent a year.

The sample period may have been too short to allow enough variation in interest rates and stock prices to show marked effects on leverage trends.[25] Nonetheless, the fact that the long-term debt equations work better than the total debt equations suggests that long-term debt is probably what is determined by leverage-target behavior.

Pecking-order behavior

The pecking-order hypothesis explains why firms might rationally let cash flows determine leverage. If managers are seen as having an informational advantage, outside investors will demand a return premium that will make internal cash flows a cheaper source of financing than external funds. Thus firms will use up their cash flow before they turn to debt, so that strong cash flows relative to investment will tend to lead to a decline in leverage.

Aggregate data on cash flows and financing

Table 3 shows how large corporations in six countries actually matched their sources and uses of funds in the 1980s. The sources are internal cash flow and external finance. The uses are investment and dividends. A negative residual suggests that total identified financing is short of total known uses.[26] The negative residuals indicate that it is easier to underestimate cash flow than to overestimate it (see Box 2 for the measurement of cash flow).

In most cases, relatively strong cash flows in the aggregate seem to accompany declines in leverage, a finding which is consistent with the pecking-order hypothesis. In the case of Australian firms, even counting the large negative residual as unidentified additional cash flow would result in cash flows weak enough to be somewhat consistent with the modest rise in their total leverage during the period. By contrast, cash flows were so strong among French and German firms that it is easy to see why they had a sharp decline in leverage.[27] Significantly, much of this cash flow went into reducing short-term debt. One

[24] In *Corporate Debt Capacity,* Donaldson finds that debt contracts often limit new long-term borrowing to a percentage of tangible assets.

[25] To reduce multicollinearity, the costs of debt and equity were combined in a single ratio, but the results were not substantially better. Logarithmic transformations also failed to improve results.

[26] Sources and uses do not always balance because most of the figures are constructed from income statements and balance sheets, not from flow of funds statements.

[27] In France, the large societies apparently enjoyed strong cash flows in part because of government policies to restrain wages in the early 1980s.

Table 3

Sources and Uses of Funds in Six Countries

(Averages over the Period, Percent of Total Sources)

	Australia 1984-87	France 1983-87	Germany 1983-87	Japan 1984-88	United Kingdom 1983-88	United States 1983-88
Sources						
Internal cash flow	34.6	88.7	104.6	63.2	82.5	77.7
External finance	65.4	11.3	−4.6	36.8	17.5	22.3
Short-term debt	16.5	6.6	−9.4	22.2	−9.3	5.3
Long-term debt	39.0	1.4	2.3	10.7	9.4	15.4
Equity	9.8	3.3	2.6	3.9	17.4	1.9
Uses						
Investment	121.4	105.2	92.6	99.3	83.3	73.8
Dividends	13.1	9.1	9.5	6.2	15.3	23.5
Residual	−34.4	−14.2	−2.1	−5.5	1.4	2.7

Source of basic data: Standard and Poor's Global Vantage.
Notes: The sample of companies corresponds to that in Chart 1. Short-term debt includes accounts payable. Investment includes fixed capital, inventory stocks, acquisitions, and financial assets. See Box 2 for the components of cash flow.

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seeming inconsistency is that Japanese firms apparently suffered weaker cash flows than U.S. firms without seeing the rise in leverage that characterized U.S. firms during the period.[28] But Japanese firms also paid much smaller dividends than American firms.

Although these aggregate ex post financing patterns are suggestive, they do not provide a convincing test of pecking-order behavior. The patterns do not reveal whether the firms reducing debt were also the ones with excess cash flow or whether the firms borrowing heavily were also the ones with strong investment demands. Moreover, if firms with strong cash flows were investing the excess cash instead of retiring debt, then investment would appear strong ex post and it would be difficult to verify pecking-order behavior.

Testing for pecking-order behavior

Estimates of cash flow and investment demand at the firm level allow a more direct test of the pecking-order hypothesis. The test compares borrowing behavior of firms with different strengths of cash flow relative to investment demand to determine whether differences in such behavior seem to reflect the existence of a gap between the costs of internal and external finance.

The strength of investment demand relative to cash flow is measured in terms of the *predicted* external financing need (PEF), which in turn is specified as the difference between *predicted* investment and dividends (PID) and *actual* measured cash flow (CF), that is, PEF = PID − CF.[29] For PID, an ex ante concept of

[28] If the figures are accurate, financing patterns would necessarily be consistent with leverage trends. When the ratio of new debt to net investment is lower than the initial leverage ratio, leverage must decline. In the case of Japan, for example, investment net of depreciation and amortization was 61 percent of funds from all sources. Given that new debt was 33 percent of all funding, leveraging at the margin was 54 percent (33 divided by 61). With an initial leverage ratio of 60 percent at end-1983, the 54 percent debt financing over the period reduced the leverage ratio to 56 percent at end-1988.

[29] Clearly, it will not do to use *actual* external financing or *actual* investment and dividends. Given the amount of cash flow, the accounting balance between sources and uses of funds will ensure that changes in debt and equity always match actual investment and dividends. Such data will preclude detection of any gap between the costs of internal and external financing.

Box 2: Measurement of Cash Flows

Financial statement data from Global Vantage allow the estimation of cash flows by a procedure suggested by Cottle, Murray, and Block.† This procedure adds back to reported after-tax earnings those reported expenses that drain no cash — expenses such as depreciation of fixed assets, amortization of intangibles, increases in deferred taxes, and additions to provisions and reserves. The reason for this adjustment is that reported earnings alone are not always an adequate measure of cash flow. As the table below shows, for most of the countries, and especially for France and Germany, charges to depreciation of fixed assets and amortization of intangibles are a more important source of cash flow than earnings. In the case of Germany, additions to provisions and reserves represent nearly twice as much cash flow as earnings. Moreover, increases in deferred taxes, although not nearly as important as earnings, can also be a significant component of cash flow.

†Sidney Cottle, Roger F. Murray, and Frank E. Block, *Security Analysis*, 5th ed. (New York: McGraw-Hill, 1988), pp. 237-62.

Components of Measured Cash Flow
(Percent of Measured Cash Flow)

	Australia 1984-87	France 1983-87	Germany 1983-87	Japan 1984-88	United Kingdom 1983-88	United States 1983-88
Earnings after taxes†	79.2	37.8	16.6	48.7	80.8	47.6
Depreciation and amortization	51.2	59.5	59.8	62.3	32.5	52.5
Provisions and reserves	2.3	9.7	31.0	4.0	0.6	—
Deferred taxes	9.8	7.9	0.8	0.8	1.0	7.2
Accounts receivable	−42.5	−14.9	−8.3	−15.8	−15.0	−7.3

†Earnings include extraordinary items.

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investment is obtained by taking fitted values from a regression of the sum of investment and dividends on the change in sales and the first lag in dividends (all variables normalized by firm asset size), since accelerator models of investment tend to work well and dividends tend to adjust slowly.

Subtracting actual cash flow from PID yields the PEF for each firm in a given year. The observations are then divided into three groups:

(1) cash-rich firms with negative PEFs (corresponding to firms with investment demands such as I_1 in Box 1);
(2) a middle group with positive but relatively small PEFs (corresponding to cash-constrained firms with investment demands such as I_4, as well as firms with demands such as I_2 in Box 1); and
(3) cash-poor firms with relatively large PEFs (corresponding mainly to firms with investment demands such as I_2 in Box 1).

The precise separation of firms into the middle and cash-poor groups is determined through an iterative maximum-likelihood procedure, which finds the division that produces the best combined fit for regression estimates.[30] The idea of the test is to try to detect in the middle group borrowing behavior that reflects a cash constraint.

For each group, we estimate the equation $\Delta D/A = a + b$ (PEF/A), where ΔD is net borrowing in terms of the change in total debt, A is total firm assets, a is the constant term, and b is the pecking-order coefficient. The variables are divided by assets to avoid problems of heteroskedasticity related to firm size. Under the pecking-order hypothesis, the pecking-order coefficient for the cash-rich group would be close to one. This result would reflect the use of excess cash flow to retire debt, with the amount retired varying one-to-one with investment demand across firms. Within the middle group, the coefficient would be less than one, reflecting the presence in the group of at least some cash-constrained firms for which debt would be unaffected by the strength of investment demand. Finally, within the cash-poor group, the coefficient would again be close to one, reflecting amounts of borrowing that varied one-to-one with investment demand. (The presumption is that relatively few firms actually resort to external equity financing.)

[30] Steve Peristiani wrote an algorithm for seeking a maximum for the concentrated log-likelihood of a bivariate switching regression model. The log-likelihood is from Stephen M. Goldfeld and Richard E. Quandt, "The Estimation of Structural Shifts by Switching Regressions," *Annals of Economic and Social Measurement*, vol. 2 (1973), pp. 475-85.

Table 4

Pecking-Order Equations

Dependent Variable Is $\frac{\Delta D}{A}$

Explanatory Variable	Germany	Japan	United Kingdom	United States	
				Full Sample	Without Buyback Firms
Cash-rich group	n=74	n=11	n=229	n=918	n=626
Constant	−0.0166	0.0285	−0.0109	0.0577	−0.0209
PEF/A	0.2252	1.0657**	−0.0382	0.7855	0.9238*
	(−9.3462)	(0.0674)	(−15.2006)	(−3.8718)	(−1.6710)
Middle group	n=54	n=66	n=1,190	n=3,375	
Constant	0.0028	−0.0062	0.0030	0.0082	
PEF/A	0.1384**	0.6132**	0.4149**	0.4472**	
	(0.4878)	(1.4819)	(−8.9877)	(−11.7617)	
Cash-poor group	n=27	n=68	n=491	n=522	
Constant	−0.0424	−0.0267	−0.1897	−0.2306	
PEF/A	0.8515**	0.8204**	1.0461**	1.2776	
	(−0.4914)	(−0.5390)	(1.3599)	(4.7130)	

Notes: The t-values under the null hypotheses are in parentheses. One asterisk indicates failure to reject the pecking-order hypotheses at the 5 percent level, and two asterisks, failure to reject at the 10 percent level. The null hypotheses are b=1 for the cash-rich and cash-poor groups and b=0 for the middle group, where b is the coefficient on PEF/A. In the case of the middle groups for the United Kingdom and the United States, however, the asterisks indicate rejection of the null hypothesis that b=1.

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Test results

Table 4 reports the regression estimates for Germany, Japan, the United Kingdom, and the United States for the same large firms as before. The change in total debt is used for the dependent variable.[31] For the cash-rich groups in the United States, two sets of estimates are reported, one for the full sample and one for the sample excluding firms that were buying back stock and engaging in net long-term borrowing at the same time.

The results are broadly in accord with pecking-order behavior. Nine of the thirteen estimated pecking-order coefficients are consistent with the hypothesis. The most telling result in favor of the pecking-order hypothesis is the difference between the estimated coefficients for the cash-poor and the middle groups, particularly in the case of German and British firms. The much lower propensity for debt financing by firms in the middle groups suggests the presence among them of cash-constrained firms with investment demands caught in a gap between the costs of internal and external finance.[32] In the case of the full sample of U.S. firms, only the coefficient for the middle group is consistent, but when the buyback firms are excluded, the coefficient for the cash-rich group becomes consistent with pecking-order behavior.

Aberrant behavior

The deviations from pecking-order behavior are noteworthy. It is the cash-rich firms that tend to depart from pecking-order behavior. In theory, these firms should have been using all their excess cash flow to retire debt in order to create slack for possible future borrowing needs. It appears, however, that only the cash-rich firms in Japan were behaving according to the pecking-order hypothesis, conscientiously using excess cash flow to retire debt.[33] In Germany and the United Kingdom, the firms were putting their excess cash flow into financial assets, including stock to acquire other firms; a few British firms were even borrowing for this purpose. The German firms may have been averse to retiring debt because of their close relationship to their banks. In spite of this reluctance to retire debt, many German firms were so cash-rich that aggregate debt retirement was sufficient to cause leverage to fall sharply. The British firms appear to have been simply taking advantage of unusually favorable credit conditions in the United Kingdom at a time of government budget surpluses. Indeed some large British firms were

[31] Similar equations were estimated for long-term debt by combining net short-term borrowing with cash flow, but the results were not nearly as favorable.

[32] The large relative sizes of the middle groups, especially for the United Kingdom and the United States, indicate that these groups probably include many firms that were not cash-constrained. The algorithm for dividing the sample between the middle and cash-poor groups tended not to be very effective because the shape of the concentrated log-likelihood function was quite flat for wide ranges.

Table 5

Stock Buybacks and Long-Term Borrowing by Cash-Rich U.S. Firms

(Millions of Dollars)

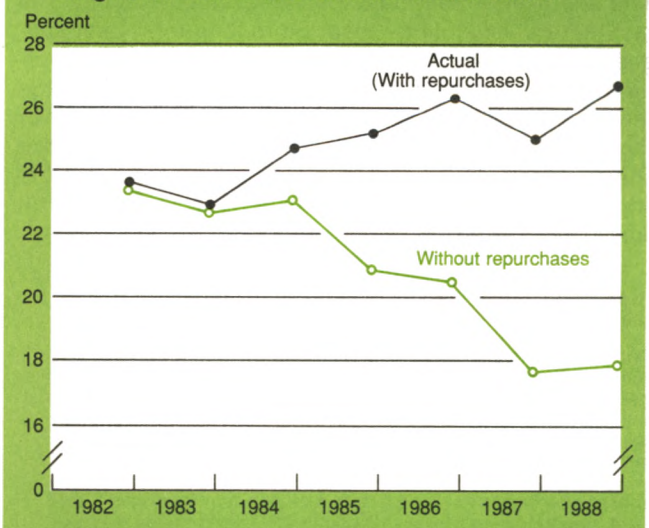
Year	Number of Firms	Amount of Buyback (Net)	Long-Term Borrowing (Net)
1983	20	628.2	557.4
1984	37	2,462.8	2,019.6
1985	64	11,491.2	14,474.8
1986	51	3,275.2	6,907.4
1987	62	4,791.0	5,542.4
1988	58	5,638.3	9,028.8
Total	292	28,286.7	38,530.4

Source: Global Vantage

Notes: Cash-rich firms are selected on the basis of the difference between predicted investment and dividends, on the one hand, and on the other, actual measured cash flow.

Chart 2

Effect of Stock Repurchases on the Ratio of Long-Term Debt to Assets in the United States



Source: Standard and Poor's Global Vantage.

Note: Interest expense due to cumulative stock repurchases since 1982 is calculated using LIBOR.

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also providing trade credit liberally to other firms while paying off their own trade debt. In effect, these British and German industrial firms were engaging in some financial intermediation of their own.

U.S. stock buybacks

Unlike firms in other countries, firms in the United States may buy back their stock with little restriction.[34] indeed, while many cash-rich U.S. firms were exhibiting good pecking-order behavior by retiring debt, nearly a third of their number at a given time were returning cash to their stockholders not only by paying generous dividends but also by borrowing heavily to buy back their own common stock. For the sample used here, 292 of 918 observations on cash-rich U.S. firms were on firms engaged in stock buybacks financed with long-term debt. Table 5 shows the amounts of buybacks and long-term borrowing by these firms. In the 1980s, stock repurchases were the difference between rising leverage and falling leverage in terms of long-term debt in the United States. Chart 2 shows that in the absence of the repurchases, the ratio of long-term debt to assets for the sample would have been about 18 percent in 1988 instead of 27 percent.

Significantly, nearly all the new debt used to finance the U.S. buybacks was long term, and in some cases short-term debt was reduced. If the firms were seeking merely to put cash in the hands of stockholders through some method other than dividends, then they could have accomplished their goal using more modest amounts drawn from the available cash flow or financed with short-term debt that could be promptly repaid. The fact that cash-rich firms resorted to long-term debt suggests that a lasting change in leverage was an important motive. Some firms may have raised their leverage ratios to defend themselves against perceived takeover threats, others to support the market value of their shares.[35] But whatever the motive, it appears that the capital restructuring in the form it took would be difficult to reverse in the short run.[36]

[34]In the United Kingdom, the power of a company to buy back its own stock must be granted by a shareholder vote, but even the firms already granted the power have rarely exercised it.

[35]Financial innovations such as junk bonds, strip financing, and blind-pool buyout funds may have made takeover threats more credible in the 1980s than before. Bagwell finds that share repurchases make a potential target more expensive to acquire. See Laurie S. Bagwell, "Share Repurchase and Takeover Deterrence," Northwestern University Department of Finance, Working Paper no. 53, 1989.

[36]In Australia, where leverage in terms of long-term debt has also risen, developments similar to those in the United States may be taking place.

Conclusion

The international evidence examined here suggests that two distinct types of company behavior have accounted for the differences in leverage trends across countries. For the most part, declines in leverage abroad and among many U.S. corporations have resulted from a type of behavior in which firms enjoying strong cash flows have retired debt or reduced their use of debt for financing investment. In contrast, much of the rise in leverage in the United States has been a consequence of a strikingly different type of behavior, in which some cash-rich U.S. firms have actually borrowed heavily, not to invest, but to repurchase their stocks.

Although both types of behavior can be found among U.S. firms, the U.S. trend in the aggregate differs from trends elsewhere because of the large number of firms buying back their stock. The precise reasons for the buybacks are not well understood, but the use of long-term debt to finance the buybacks suggests a lasting change in attitudes towards leverage.

Where aggregate trends show that declining leverage accompanied strong cash flows, disaggregate data reveal the firm-level behavior underlying the trends: companies were acting as if external funds were substantially more costly than internal funds, a behavior consistent with the so-called pecking-order hypothesis. Moreover, the finding that the declines in leverage were achieved largely through reductions in short-term debt indicates that firms were treating favorable cash flows as transitory shocks and that the declines in leverage were a cyclical phenomenon.

Some countries, of course, have had stronger cash flows than others. The large German companies and French societies appear to have enjoyed the strongest cash flows and thus have seen the sharpest declines in leverage. British firms have also had impressive cash flows, but their investment in financial assets and acquisitions has kept their leverage from falling. Japanese corporations as a group have had relatively modest cash flows, but those firms with excess funds have been scrupulously retiring their debt, so that leverage on the whole has declined. American corporations have actually had somewhat strong cash flows, but the debt-financed stock buybacks have caused aggregate leverage to rise.

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Monetary Policy and Open Market Operations during 1989

Overview

Monetary policy in 1989 sought to sustain the ongoing expansion of the economy at a moderate pace while at the same time fostering price stability. Concerned by signs of escalating inflation, the Federal Open Market Committee (FOMC) pursued a gradual firming of reserve pressures in the early months of 1989, as it had during most of 1988. By late spring, however, indications of a slowdown in the economic expansion led the Committee to move gradually to a more accommodative posture.

Following its December 1988 meeting, the Committee directed the Desk to institute a two-stage firming of reserve pressures in light of evidence indicating that the economy was expanding at a vigorous pace and that inflation might intensify. The initial move was implemented on December 15, and the second step was taken in early January. As incoming data signaled mounting inflationary pressures, another tightening move was made in February. Moreover, the Board of Governors approved a ½ percentage point increase in the discount rate, to 7 percent, on February 24.

By May, however, the FOMC saw the risks to the economy of higher inflation and a substantial shortfall in economic growth as being more evenly weighted. Then, in early June, with new evidence pointing to a slowdown in economic activity and with some indicators suggesting that a gradual reduction of inflation was likely, the FOMC began moving toward a more accommodative reserve posture. In July, additional data reinforced perceptions that economic activity was moderating, and reserve pressures were reduced twice in that month. Amid further signs of weakening in the expansion during the final months of the year, reserve pressures were eased again in October, November, and December.

Although the longest recorded economic expansion in U.S. peacetime history continued in 1989, the pace of that expansion slowed considerably. Real GNP advanced 2.6 percent (fourth quarter over fourth quarter), or 2.0 percent after adjusting for the impact of the 1988 drought. Consumer spending, investment in producers' durable equipment, and net exports accounted for most of the expansion in real GNP, although growth of all three components was more subdued than in the previous year. The reduced pace of economic activity was reflected in smaller job gains in 1989. Nonetheless, the civilian unemployment rate in the fourth quarter was unchanged from its year-earlier level. Meanwhile, most broad inflation measures advanced at roughly the same pace as in 1988, although pressures abated somewhat in the second half of the year.

Yields on investment-grade fixed-income securities fell on balance in 1989. They rose over the first three months of the year amid indications of economic strength and rising inflation. Yields fell considerably from late March to early August as the market sensed

Adapted from a report submitted to the Federal Open Market Committee by Peter D. Sternlight, Executive Vice President of the Bank and Manager for Domestic Operations of the System Open Market Account. Cheryl Edwards, Senior Economist, Open Market Analysis Division, and R. Spence Hilton, Senior Economist, Open Market Analysis Division, were primarily responsible for the preparation of this report under the guidance of Ann-Marie Meulendyke, Manager, Open Market Operations Department. Other members of the Open Market Analysis Division assisting in the preparation were Robert Van Wicklen, John Krafcheck, Theodore Tulpan, and Geraldine Velazquez.

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a softening economy and the Federal Reserve shift to accommodation. Over the balance of the year, yields backed and filled but showed no trend. Yields backed up in August and September in response to stronger than anticipated economic activity and uncertainties about how much further the Fed would ease. Later, yields fell a bit as new data suggested weaker economic expansion and market participants came to expect that the Federal Reserve would continue easing its policy.

In contrast, yields on below-investment-grade bonds, known as "high-yield" or "junk" bonds, rose sharply. This sector was buffeted by large defaults and bankruptcy threats, especially during the latter part of the year. These events focused attention on the risks associated with highly leveraged companies, causing spreads to widen between the companies' debt and investment-quality instruments. Trading and issuance thinned, and investors became increasingly sensitive to the characteristics of specific issues.

Credit worries also remained a problem in the thrift industry, where large losses and insolvencies at a number of institutions continued to place strains on the financial system. The need to finance the restructuring and rescue operations was addressed by legislation passed in August. The Financial Institutions Reform, Recovery and Enforcement Act of 1989 provided for $18.8 billion of "on-budget" federal financing in fiscal 1989. In addition, the act established a new agency, the Resolution Funding Corporation, with the authority to borrow $30 billion before October 1991. The agency auctioned its first offering of bonds late in the year.

Money and debt growth decelerated in 1989. M2 advanced at a 4.6 percent rate (fourth quarter over fourth quarter) and finished the year well within its target range, while M3 expanded at a 3.2 percent rate and ended just below the lower bound of its growth cone.[1] For the year as a whole, M1 grew a meager 0.6 percent. Total nonfinancial debt expanded at an 8.0 percent rate, which placed debt below the midpoint of its monitoring range. M2 and M3 grew slowly over the first half of the year, while M1 fell.[2] In contrast, M1 and M2 growth accelerated sharply over the second half of the year as the opportunity cost of holding money fell. M3 growth initially picked up a bit, along with growth in the narrower measures, but then weakened when managed liabilities at thrifts contracted as part of the restructuring of the thrift industry.

The Trading Desk's reserve management procedures, which depend upon a reasonably predictable relationship between borrowing and the spread between the federal funds rate and the discount rate, were again complicated by shifts — mostly downward — in the willingness of depository institutions to borrow from the discount window under the adjustment credit program. As a result, the relationship between the amount of borrowing undertaken for both adjustment and seasonal purposes and the degree of money market firmness was somewhat uncertain. The Desk therefore pursued the borrowing objective flexibly in order to achieve the degree of restraint desired by the FOMC. With adjustment credit running light in 1989, the behavior of seasonal borrowing dominated the movements in the series "adjustment plus seasonal borrowing." Seasonal borrowing tends to be high in the summer and low in the winter; a number of technical adjustments were made to the borrowing allowance during the year in order to accommodate this tendency and leave reserve pressures unaffected.

Record purchases of foreign currency by U.S. monetary authorities altered the nature and timing of the Desk's open market operations in 1989. As a consequence, the growth of the System's holdings of foreign currency provided more than enough reserves to cover the drain on reserves from the rise in currency — a rise that was in itself below average. Furthermore, in the face of weakness in reservable deposits that held down required reserves, nonborrowed reserves were permitted to grow only modestly. The Desk reduced the size of the System portfolio (on a year-over-year basis) for the first time since 1957. This reduction was accomplished through redemptions of maturing Treasury securities and through sales of Treasury issues in the market and to foreign customer accounts.

The economy and domestic financial markets

The economy

The economy expanded less vigorously in its seventh consecutive year of growth. Real GNP grew 2.6 percent in 1989, down from 3.4 percent in the preceding year.[3] The U.S. Department of Commerce estimates

[1] All money and debt growth rates cited in this report are based on the data available on March 15, 1990. The money data incorporate the February 1990 benchmark and seasonal revisions, subsequent revisions, and the redefinition of M2. Under the new definition, M2 incorporates thrift overnight repurchase agreements. Over the four quarters of 1989, these revisions increased the growth rates of M1 and M2 by 0.1 percentage point and lowered the growth rate of M3 by 0.1 percentage point.

[2] February and March 1990 revisions elevated money growth in the first half of the year (H1) and lowered growth in the second (H2). The growth of M2 was raised by 0.5 percentage point in H1 and lowered by 0.3 percentage point in H2. M3 growth was increased by 0.5 percentage point in H1 and decreased by 0.5 percentage point

Footnote 2 continued
in H2. M1 fell 0.7 percentage point less than originally reported in H1, and its growth was 0.6 percentage point lower in H2.

[3] All references to annual growth rates in this section are on a fourth

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that real GNP growth, excluding the effects of the 1988 drought, was 2.0 percent in 1989, about half of the 1988 drought-adjusted rate of expansion. Slower growth in consumer spending and exports as well as a sharp drop in residential construction more than accounted for the deceleration in economic activity. The pace of nonfarm business inventory accumulation fell for a second consecutive year in 1989, but not as much as in 1988. Real final sales increased 2.5 percent, compared with 4.4 percent in 1988.[4] Employment gains in 1989 were also below the previous year's pace; nonfarm payroll employment was up 2.4 percent, compared with 3.2 percent in 1988. The civilian unemployment rate was mostly steady during the year and stood at 5.3 percent in the final quarter of 1989, unchanged from its year-earlier level.

Over the year as a whole, growth was primarily sustained by consumer and investment expenditures. Consumer spending grew 2.5 percent over the four quarters of 1989, an increase considerably below the nearly 4 percent advance of 1988. Most of this slippage reflected some retrenchment in purchases of motor vehicles.[5] Supporting the growth in consumer spending over the year was a 3.6 percent pickup in real disposable income, which was only moderately below its 1988 rate of increase. Heavy purchases of computer-related equipment encouraged the healthy growth of business investment in producers' durable equipment. In contrast, housing construction slid under the weight of weak real estate markets, and nonresidential construction remained sluggish in the face of high vacancy rates.

Economic activity showed signs of losing strength as the year progressed. Real fixed investment in the second half of the year was nearly unchanged from its average level in the first half. Following strong gains in the first quarter, real net exports only improved a bit, on balance, over the remainder of the year as slower export growth was accompanied by an upswing in imports. In the final quarter, total GNP growth fell to a 1.1 percent annual rate, although the slowdown was partly a result of the California earthquake and the strike at the Boeing Company. Meanwhile, employment growth declined in each quarter from a peak rate of over 3 percent in the first quarter to under 2 percent in the fourth quarter of 1989.

The slowing pace of economic activity was most evident in the manufacturing sector. Manufacturing employment edged a bit lower in 1989, after having risen almost 2 percent in 1988. Sizable manufacturing job losses occurred in each of the last four months of 1989. These losses stemmed in part from the slackening pace of industrial production over the second half of the year. Meantime, the capacity utilization rate also declined modestly over the final two quarters. It began the year at its 1989 high of 84.3 percent — the peak level for the current expansion — and closed the year at 83.0 percent.

By most broad measures, prices in 1989 continued to rise at roughly the pace set in 1988. Led by surging food and energy costs, price pressures appeared to be mounting in the first half of the year, but inflation subsided later when energy costs declined. The consumer price index rose 4.6 percent in 1989 (December over December), or 4.4 percent when the index's volatile food and energy components are excluded. These rates of increase are roughly the same as those recorded in 1988. The fixed-weighted price index advanced 4.1 percent, down from 4.5 percent in 1988. Price pressures were somewhat stronger at the early stages of production: the producer price index (PPI), largely reflecting higher food and energy costs, increased 4.8 percent, up sharply from 4.0 percent in 1988. (Excluding these costs, the PPI advanced at about its 1988 pace.) Wage pressures showed no signs of abating. The employment cost index in December 1989 was 4.8 percent above its year-earlier level, a rate of increase virtually identical to that in 1988, indicating little change in underlying wage pressures. Indeed, unit labor costs rose 5 percent in 1989, compared with 3 percent in the previous year, reflecting higher compensation costs and a decline in productivity growth.

Solid gains were made in reducing the merchandise trade deficit early in 1989, but progress stalled around midyear. Measured in current dollars, the average annual trade deficit for the year narrowed by $16 billion to $111 billion; the real trade deficit diminished by a similar amount and averaged $108 billion. By both measures, the reduction in the trade deficit was about half the improvement achieved in 1988. A strong export performance was again registered in the first half of 1989, extending the pattern set in the preceding two years, but export growth decelerated markedly in the final two quarters of the year. Meanwhile, import growth continued at its 1988 rate. The slowing pace of improvement in the trade balance largely reflected the waning impact of the dollar's steep 1985-87 decline. In

Footnote 3 continued
quarter over fourth quarter basis unless specified otherwise. Quarterly rates are seasonally annualized changes from the preceding quarter.

[4]These increases are not drought-adjusted. The slowdown in final sales growth would be even more pronounced if the impact of the drought were excluded.

[5]In addition, growth in 1988 had been boosted by a low level of consumer outlays at the end of 1987. Late 1987 consumption was dampened by the expiration of auto sales incentives and by some consumer caution in the aftermath of the October 1987 stock market break.

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1989, the trade-weighted value of the dollar rose sharply in the first half of the year but then skidded to finish the year close to its year-end 1988 level.[6]

Fiscal restraint at the federal level left total government purchases of goods and services, measured in real terms, virtually unchanged in 1989. Purchases by the federal government fell for a second consecutive year, while growth in state and local government purchases eased slightly. At the federal level, both defense and nondefense spending declined (either including or excluding purchases by the Commodity Credit Corporation). The federal budget deficit in fiscal year 1989 was $152 billion on a unified basis, close to its level in each of the preceding two fiscal years. Continued economic expansion lifted revenues during the fiscal year, but sizable increases in net interest payments and spending to liquidate insolvent thrifts boosted growth in total outlays, despite restraint exercised in other spending categories.[7]

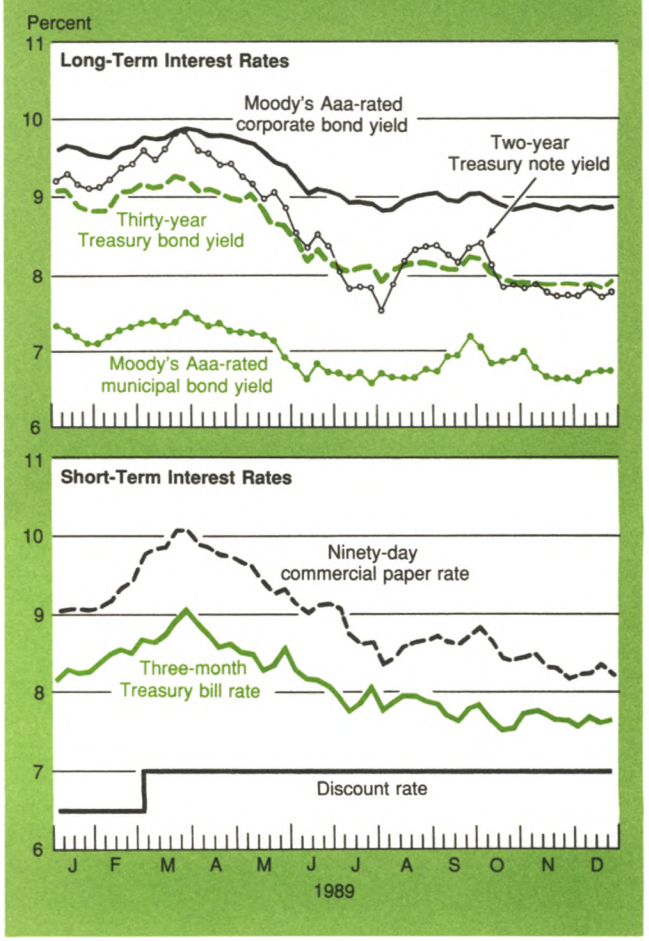
Domestic financial markets

Yields on investment-grade fixed-income securities fell in 1989 (Chart 1). In sharp contrast, yields on many below-investment-grade corporate securities finished the year markedly higher because major defaults and bankruptcies in the latter half of the year upset investor confidence in this sector. In areas not plagued by credit quality worries, shorter dated issues led the move to higher yields over the first three months of the year. After peaking in late March, yields fell considerably through early August. Over the rest of the year, yields moved in a narrow range and finished modestly above their midsummer lows.

The principal influences on financial markets in 1989 were the prospects for real economic growth and inflation and the outlook for Federal Reserve policy. A number of economic releases, believed to offer insight into the underlying strength of economic activity and price pressures, were routinely monitored. They helped to shape investors' expectations about economic growth, inflation, and the direction of System policy. Market participants paid particular attention to the monthly nonfarm payroll employment data, a timely and relatively comprehensive measure of economic performance. The monthly national purchasing managers' report was also closely scrutinized for early signs of developments in the manufacturing sector. Several price series were watched to keep abreast of the latest inflation trends; foremost among these was the PPI. The behavior of the dollar on foreign exchange markets also influenced yields at times. This effect was achieved partly through the dollar's impact on expected future inflation rates: a strong dollar placed downward pressure on import prices and thereby lessened fears of higher inflation. In addition, a strengthening dollar was seen as encouraging investment inflows from abroad, inflows which would tend to boost the value of dollar-denominated instruments. Throughout the year, yields often moved whenever market participants thought that an imminent change in System policy was likely. At these times, participants closely followed

Chart 1

Long-Term and Short-Term Interest Rates



[6]The dollar fell 4.6 percent against the West German mark over the year, while it rose 15.3 percent against the Japanese yen.

[7]In fiscal year 1989, net budget outlays aimed at resolving the thrift crisis more than doubled, rising from $8 billion in 1988 to $18 billion. In 1989, roughly half of the net outlays were made by the now-defunct Federal Savings and Loan Insurance Corporation (FSLIC), while the remainder were made by the Resolution Trust Corporation — created by legislation passed in August. Previously, almost all such outlays had been undertaken by the FSLIC. Expenditures for this purpose are widely seen as having a minimal impact on economic activity.

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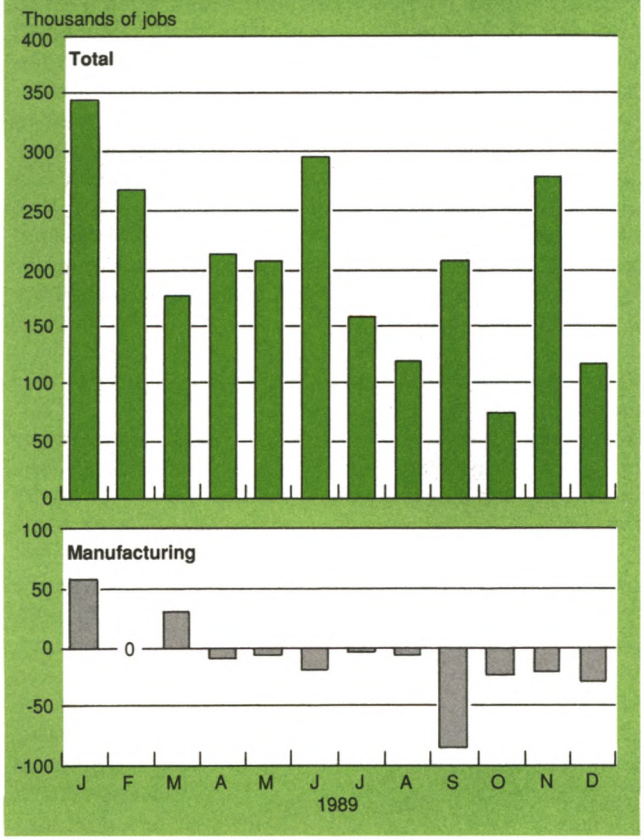
movements in the federal funds rate to gauge the stance of policy.

Yields on investment-grade securities rose over the first three months of the year, in part reflecting System moves to increase reserve pressures. Short-term yields moved up early in January following the System's move to firm reserve pressures, but long-term yields declined modestly as inflation fears eased. Along with the firming action, a strong dollar in foreign exchange markets and Chairman Greenspan's mid-January congressional testimony reiterating the System's commitment to controlling inflation dampened inflation expectations. The market's inflation psychology shifted sharply in early February, however, and remained pessimistic through March because economic statistics pointed to a pattern of robust economic growth coupled with accelerating inflation. Payroll employment data for January and February showed strong job gains (Chart 2), while the producer price indexes for these months recorded sharp advances. Rising oil prices also aggravated the negative inflation prospects. Yields on shorter term issues rose more than those on longer term issues in response to prospective and actual policy actions aimed at combating these price trends, including the discount rate hike in February.[8]

Chart 2

Changes in Nonfarm Payroll Employment



Evidence that the economy was losing some momentum while inflation was stabilizing led to a period of declining interest rates that lasted from early April until midsummer. Reports that the purchasing managers' index had tumbled and nonfarm payrolls had shown only a small gain for March supported some earlier signs of a slowdown, such as a decline in February retail sales. Meanwhile, producer prices for March advanced more modestly than in the previous two months. Together, these developments helped to dispel expectations that monetary policy would be firmed again, and yields edged off the levels reached late in March. As May progressed and incoming data suggested a further slowing in economic activity, the market began to anticipate an easing in the policy stance. A dollar that showed strength against major foreign currencies also exerted downward pressure on yields. Yields tumbled in mid-May after the release of the April PPI, which showed a slight decline when the volatile food and energy components were excluded. These developments were reinforced in early June by the report of weak job gains in May. Moreover, the purchasing managers' index dropped to 49.7 percent, the first reading below 50 percent in thirty-three months. (A reading below 50 percent implies that activity in the manufacturing sector is contracting.) Chairman Greenspan's concerns about weakness in the economy, expressed during his July 20 Humphrey-Hawkins testimony, briefly added support to the markets. Also in July, the yield on the two-year note fell below that on the thirty-year bond, and the yield curve took on a positive slope for maturities between two and thirty years.

In August and September, economic activity showed some signs of vigor, but growth was not expected to exacerbate inflationary pressures. In this environment, policy was expected to remain steady, and yields moved slightly higher because several easing moves had already been incorporated into the yield structure. News of sizable job gains in July, along with a substantial upward revision to June's employment rise, pressured yields higher in early August. Uncertainties about financing provisions of the thrift legislation and about the Treasury's debt ceiling added briefly to the pressures, particularly in the Treasury sector. (In early August, the Treasury obtained a temporary increase in the ceiling that lasted until October 31.) There followed

[8]One outgrowth of the higher yields on shorter dated Treasury issues in the early months of the year was a surge in noncompetitive tenders, a measure of individual investor interest, at auctions of Treasury bills and short-dated notes.

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a series of mixed economic reports that, on balance, supported the perception of a moderate pace of economic activity. The producer and consumer price indexes reported during this time generally suggested lower inflation than earlier in the year.

Yields moved lower on balance over the final three months of the year, based in part on expectations that the signs of sluggish economic activity would lead to additional moves to ease policy. Market participants increasingly focused on the performance of the manufacturing sector, which appeared to be contracting at the same time that other sectors of the economy were showing signs of continued growth. Each of the final three employment reports released during 1989 showed a marked fall in manufacturing employment.

Further evidence of a manufacturing slowdown was found in the purchasing managers' index and the industrial production index. Meantime, prices seemed to be rising at a slower pace than in the early months of the year. Yield declines, especially on short-term issues, were fostered by prospective and actual System moves to ease policy. Indeed, the System reduced reserve pressures on three more occasions before year-end. (However, yields responded only briefly to the December easing move because the easing had been anticipated and was already almost fully reflected in yields.)

U.S. Treasury securities

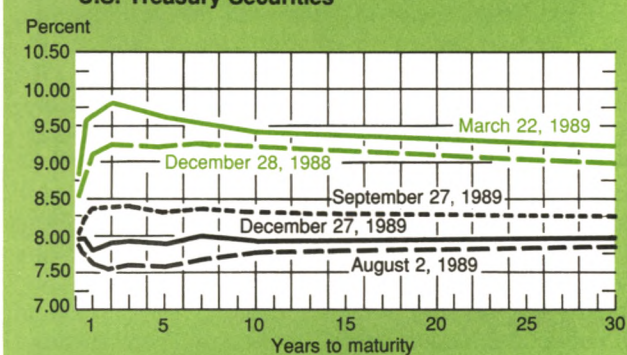
The Treasury yield curve was hump-shaped from the beginning of the year until early July and again from mid-August to mid-October (Chart 3). Yields on Treasury bills were generally below those on short-dated coupon issues, which in turn mostly exceeded the yields on the thirty-year bond. During the remainder of the year, the yield curve was relatively flat, although bill yields frequently exceeded those on short coupon issues. On balance, yields on Treasury coupon securities, as measured by the constant maturity series, declined between 110 and 140 basis points in 1989, with smaller reductions on the longer maturities. Treasury bill rates fell 60 to 120 basis points, with the largest decline recorded for fifty-two week bills.

From time to time during the year, yields on Treasury issues were pushed lower when market disturbances elsewhere set off "flight-to-quality" demand. The most dramatic example occurred in mid-October. Yields fell on October 13 in response to the late-afternoon, 190-point plunge in the Dow Jones industrial average. The sell-off in stocks was sparked by the failure of a bidding group to arrange financing for its proposed takeover of UAL Corporation. The stock market sell-off led investors to seek the safe haven of Treasury issues. The yield declines were partially retraced the next trading day as stock prices recovered, but yields remained below their prior levels, partly because of the soft federal funds rate.

Debt ceiling limitations complicated Treasury financing toward the end of October and briefly affected yields. Bill rates jumped when the Treasury announced an earlier than usual settlement date for its October 30 bill auctions. The Treasury adopted the earlier settlement in order to raise as much cash as possible under the enlarged temporary debt ceiling before the ceiling expired on October 31. The start of the Treasury's midquarter refunding auctions and a regular weekly bill auction were postponed until after a new $3.12 trillion debt ceiling was enacted on November 8. Potential upward pressures on coupon yields from the compressed financing schedule were offset by expectations of a falling rate pattern.

Chart 3

Yield Curves for Selected U.S. Treasury Securities



Note: Treasury bill yields are on a bond-equivalent basis. Coupon yields are constant maturity values.

Thrift legislation and its impact on Treasury and agency borrowing

The federal government's efforts to raise cash to manage the closing or merger of insolvent thrift institutions had a significant impact on borrowing by the Treasury and by U.S. government-sponsored agencies in 1989. The Financial Institutions Reform, Recovery and Enforcement Act of 1989 (FIRREA), originally proposed by President Bush in February and enacted on August 9, set forth the framework within which the thrift industry problems were to be resolved. The legislation was also aimed at overhauling the institutional structure and the rules for supervising and regulating the entire industry. One provision created the Resolution Trust Corporation (RTC), which was empowered to take possession and dispose of the assets of failed thrifts over the next sev-

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eral years. It inherited this role from the Federal Savings and Loan Insurance Corporation (FSLIC), which discontinued its operations.

The RTC was authorized to spend a net total of $50 billion to resolve the problems of insolvent thrifts. The legislation stipulated that $18.8 billion of the outlays were to be financed out of general revenues, and Congress appropriated the funds in fiscal 1989. About half of the appropriated funds had been spent by the end of the 1989 fiscal year, and it was expected that the remaining portion would be used over the following two years. The RTC was to acquire the other $31.2 billion through the sale of capital certificates to the Resolution Funding Corporation (REFCORP), a new agency established by FIRREA.[9] To finance its purchase of RTC capital certificates, REFCORP was authorized to sell $30 billion of long-term bonds in fiscal years 1990 and 1991, while the Federal Home Loan Banks contributed another $1.2 billion in fiscal year 1989. Although REFCORP bonds are not obligations of, nor is their principal guaranteed by, the U.S. government, they have strong federal backing. Before each bond issue, REFCORP, using thrift industry funds, purchases directly from the Treasury zero-coupon securities with a principal amount and maturity date that match the REFCORP obligation, thus defeasing the principal. Furthermore, interest on REFCORP borrowing is to be paid out of Treasury and thrift industry funds, with the Treasury guaranteeing all interest payments.

The Treasury's borrowing operations during the year were affected by these efforts to meet the U.S. government's liabilities to thrift depositors. The Treasury raised part of the $18.8 billion appropriated by the Congress by increasing Treasury bill issuance. In anticipation, bill rates moved higher as the passage of FIRREA neared. The Treasury expanded the sizes of the regular weekly bill auctions and of the fifty-two week bill auctioned on August 24 and raised an additional $5 billion through a 247-day cash management bill auctioned on August 10. Subsequently, the prospect of the sale of REFCORP bonds placed some upward pressure on yields of longer dated Treasury securities. Nonetheless, the added borrowing undertaken to fund RTC's expenditures appeared to have little lasting impact on interest rates in the Treasury market in 1989.

REFCORP entered the public debt market for the first time on October 25 and auctioned $4.52 billion of thirty-year bonds—the agency's only offering in 1989. Dealers approached the issue cautiously. Having no experience with such issues, they were uncertain how actively the bonds would trade in the secondary market. The auction went well, with the average yield about 28 basis points above the yield on the Treasury's thirty-year bond. The spread remained near this level in subsequent trading during the balance of the year, although actual trading was generally light. Through the end of 1989, just over one-quarter of the issue was stripped to satisfy demand for zero-coupon instruments. As required by FIRREA, before the settlement of the issue, REFCORP purchased the zero-coupon Treasury bonds needed to ensure repayment of the principal, at a cost of about $400 million.

In related agency borrowing, the Financing Corporation (FICO) issued a total of $2.3 billion of thirty-year bonds during the year and used up much of its remaining borrowing authority. FICO was created in 1987 as a subsidiary of the Federal Home Loan Bank Board (FHLBB) and was authorized to borrow up to $10.8 billion to help recapitalize FSLIC, which at the time was under the supervision of the FHLBB.

Other U.S. government agency securities

The Tennessee Valley Authority (TVA) returned to the public debt market for the first time in fifteen years by selling $4 billion of bonds in October and again in November. The proceeds of these sales were used primarily to refinance (through defeasance) roughly $7 billion in high-coupon debt held by the Federal Financing Bank (FFB), the agency through which the TVA had previously arranged its financing. TVA officials estimated that the refinancing could save TVA as much as $100 million per year in interest expenses. Typically, an agency that borrows directly in the public market cannot borrow from the FFB; however, TVA obtained an alternative credit facility for $2 billion from the FFB for the next two years. Strong investor demand for the offerings materialized and their sizes were increased from their originally planned levels. The November issue included $2.5 billion of forty-year bonds, callable after ten years. These bonds were unusual because of their long maturity.[10] They were initially priced to yield 110 basis points over the thirty-year Treasury bond, which is fully protected against an early call, and the spread had narrowed somewhat by year-end.

Corporate bonds

Public debt issued by U.S. corporations in the domestic bond market declined for the third consecutive year in 1989; such issuance fell by 12 percent to $177.4 billion.[11] Total issuance was heaviest in the spring and

[9]Receipt of these funds by the RTC is scored as a negative outlay in the federal budget accounts, thereby offsetting positive outlays of an equivalent amount.

[10]Several telephone companies and foreign entities have offered callable forty-year debt in recent years.

[11]Data on corporate and municipal debt issuance were supplied by the Board of Governors of the Federal Reserve System.

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fall, when borrowers sought to take advantage of ebbing interest rate levels. The dropoff in total new offerings stemmed from a sharp cutback in issuance of mortgage-backed securities and a decline in issuance of below-investment-grade securities.[12] These decreases were partially offset by a modest increase in investment-grade offerings and by another jump in asset-backed securities that was likely prompted by continued efforts to restrain asset growth to meet capital standards. Mortgage-backed issuance fell because of slow activity in the housing market and because the relatively flat Treasury yield curve limited profit potential from the issuance of collateralized mortgage obligations.

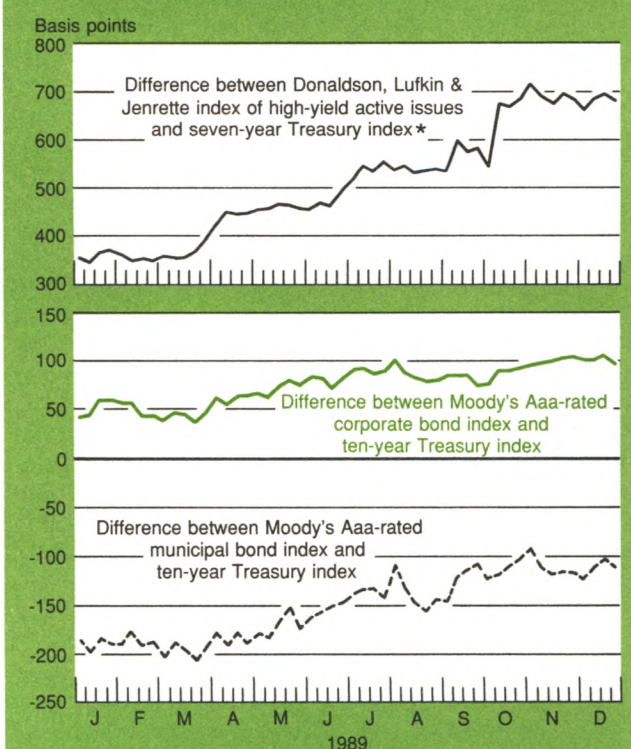
Yields on highly rated corporate bonds fell about 75 to 85 basis points, but Treasury yields dropped even more, so that spreads between yields on investment-grade corporate issues and yields on Treasury securities widened throughout the year (Chart 4). The wider spreads in part may have reflected investor concern about holding corporate bonds in a weakening economy. Spreads on debt of individual companies also depended on the companies' "event-risk" covenants. In 1988, the leveraged buyout of RJR Nabisco made clear that all but a few firms were subject to mergers, takeovers, or recapitalizations that could cause their outstanding bonds to lose their investment-grade status. Consequently, bondholders demanded higher yields to hold bonds that did not have protection against such occurrences. In 1989, more new issues carried event-risk protection. One such device, the "poison put," permits bondholders to resell their bonds to the issuer at a set price if specified events cause the bonds to lose their investment-grade status. Bonds with event-risk protection generally had lower yields than similarly rated issues lacking such protection. To address event-risk concerns, Standard and Poor's introduced in July a rating system that evaluates event-risk covenants. The covenant rankings assess the degree of protection provided in bond indentures against a sudden and dramatic decline in credit quality resulting from a takeover bid, recapitalization, or similar restructuring. E-1 represents the highest level of protection, and E-5 indicates the lowest level.

Some bank holding company (BHC) debt was affected by problem loans to domestic real estate ventures late in the year. As real estate markets weakened, especially in the Northeast, some BHCs had to increase their loan-loss reserves to account for problems with their real estate portfolios, a move which resulted in depressed earnings. Yield spreads on BHC debt over Treasury issues widened, and the ratings of some BHC debt were lowered.

In other developments affecting the operations of BHCs, the Federal Reserve Board in January granted approval to five BHCs to underwrite corporate debt, contingent upon the Board's acceptance of the individual BHC's plan to capitalize its debt-underwriting operations. The Board ruled that such underwriting must be conducted by a separate subsidiary that does not generate more than 5 percent of its total gross revenue from underwriting corporate debt and certain other securities. (This limit was raised to 10 percent in September.) In addition, with limited exceptions, federally insured banks and thrifts cannot provide loans to their affiliated underwriting subsidiaries. In July, J.P. Morgan Securities, a subsidiary of J.P. Morgan Bank Corporation, became the first subsidiary of a BHC to participate in a syndicated underwriting of corporate securities since the passage of the Glass-Steagall Act in 1933, and later became the first bank subsidiary since that time to act as the lead underwriter for a cor-

Chart 4

Yield Spreads



*High-yield index provided by Donaldson, Lufkin & Jenrette.

[12] Below-investment-grade bonds are those rated lower than Baa by Moody's or, if not rated by Moody's, below BBB by Standard and Poor's.

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porate bond offering.

Yields on below-investment-grade or "junk" bonds rose sharply during 1989 as investor wariness about holding such securities intensified in the face of a slowdown in economic activity and the financial difficulties of several major issuers. The spread between yields on junk bonds and those on Treasury securities began to widen in the spring and summer as market expectations of an economic slowdown took hold and raised doubts about the ability of many issuers of junk bonds to repay their debts. These doubts were underscored in mid-June when Integrated Resources, a real estate partnership syndicate, declared its inability to make a pending interest payment because of short-term funding problems.[13]

Yields on junk bonds were boosted even further over the second half of the year. In mid-September, Campeau Corporation, the Canadian-based owner of Allied Stores and Federated Department Stores, announced that it did not have funds to make interest payments on outstanding bonds of Allied Stores. The value of bonds sold by both Campeau units tumbled, as did prices on outstanding issues of other retail establishments. Even though Campeau received a cash infusion from Olympia and York that enabled it to meet its immediate interest obligations, prices on Allied and Federated debt remained depressed as the company's funding problems persisted.[14] The episode increased sensitivity to the characteristics of specific issues in the junk bond market. Over the remainder of the year, a nervous undertone lingered in the market, sustained by rumored or actual adverse developments at many companies. "High-quality" junk bonds held their value better than "low-quality" junk bonds. Trading was periodically volatile, and it ground to a virtual halt for a few days after the stock market declined precipitously on October 13. By year-end, the spread between the Donaldson, Lufkin and Jenrette index of yields on actively traded junk bonds and their index of yields on Treasury securities with seven years to maturity had almost doubled from its level at the start of the year (Chart 4).

Because of the growing problems experienced in this sector, total issuance of junk bonds during the year fell to $28.7 billion, about 8 percent below the previous year's level. The pace of new offerings dropped off considerably in the second half of the year in light of the unsettled market conditions. Included in the year's total issuance was an offering of $4 billion of RJR Holdings Capital Corporation securities in May—the largest corporate offering ever. The proceeds were used to repay short-term loans arranged as part of the $25 billion leveraged buyout of RJR Nabisco by Kohlberg Kravis Roberts and Company that was completed in February.

Several other developments during the year also affected the demand for junk bonds. The August thrift rescue legislation required savings and loans institutions to divest their holdings of low-rated bonds by 1994, although separately capitalized affiliates were still permitted to invest in such debt; over the remainder of the year, sizable thrift selling was noted at times. In November, as part of its budget legislation, Congress imposed limits on the deductibility of interest payments on certain securities that have a maturity greater than five years, that defer interest payments, and that have a yield to maturity more than 5 percentage points above the Applicable Federal Rate, as defined by the Internal Revenue Service. Both legislative changes had been widely anticipated and had little immediate impact on the market for low-rated securities, but they underscored growing congressional concern about the issuance of such debt, especially to finance corporate takeovers.

Municipal bonds

The municipal bond market remained relatively quiet in 1989. Total issuance for the year was $113.6 billion, close to the $114.5 billion issued in 1988. New-money issues posted a 5.5 percent increase, rising to $84 billion, while refunding issues declined 15 percent to $29.6 billion. The pace of new issuance was somewhat faster over the second half of the year, when municipalities took advantage of lower interest rates.

Yields on highly rated municipal bonds declined 55 to 65 basis points. Movements in municipal bond yields roughly followed those on Treasury securities, although the spread between yields on municipal bonds and those on Treasury securities narrowed somewhat over the year (Chart 4). The smaller spread over the second half of the year in part reflected the increased pace of new issuance at that time. Two other factors also contributed. Sizable additions to loan-loss reserves during the second half of the year reduced many commercial banks' needs for tax-exempt income and decreased their demand for municipals. In addition, some tax benefits of holding municipal issues expired at the end of the year, thus prompting some institutional selling.

A notable development in the municipal bond market during the year was the reentry of the Washington Public Power Supply System (WPPSS) in September, when it sold $721 million of refunding revenue bonds backed by projects 1, 2, and 3. The bonds were rated A by

[13] Integrated Resources adopted a restructuring plan later in 1989 but was forced into bankruptcy in February 1990.

[14] Allied Stores and Federated Department Stores ultimately filed for protection under Chapter 11 of the bankruptcy code in January 1990.

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Moody's and AA– by Standard and Poor's. This offering marked the first time that WPPSS issued municipal bonds since it defaulted on $2.25 billion of projects 4 and 5 bonds in 1983—the largest default in the municipal market to date. After some delay because of legal complications, the offering went smoothly. Strong investor demand enabled WPPSS to increase the size of the new issue from its originally planned level of $450 million, although yields were about 25 basis points above those on similarly rated long revenue bonds. WPPSS sold an additional $738 million of bonds in December.

Monetary aggregates

Growth of all three monetary aggregates and total domestic nonfinancial debt decelerated in 1989 (Chart 5). After having slowed in the latter half of 1988, M2 and M3 growth rates were even more sluggish over the first half of 1989, while M1 actually contracted. Growth of M1 and M2 rebounded sharply over the final two quarters of the year. Despite this rebound in M2 growth and a modest pickup in bank credit expansion, M3 growth decelerated further because of factors associated with the restructuring of the thrift industry. Debt expansion was a bit greater in the first half of the year than in the second. Overall, M2 and M3 grew 4.6 and 3.2 percent, respectively, from the fourth quarter of 1988 to the fourth quarter of 1989. M1 eked out a gain of 0.6 percent; total nonfinancial debt expanded at an 8.0 percent rate. These rates of expansion placed fourth-quarter M2 slightly below the midpoint of the FOMC's growth cone and placed M3 just below its cone. The debt measure finished the year slightly below the midpoint of its monitoring range.

In February, the FOMC reaffirmed the 1989 growth ranges for M2 and M3 that it had tentatively established the preceding June. These ranges called for growth of 3 to 7 percent for M2 and 3½ to 7½ percent for M3, compared with a range of 4 to 8 percent for both M2 and M3 in 1988. The reduction of the growth ranges for 1989 was considered to be consistent with progress towards price level stability and underscored the Committee's commitment to an anti-inflationary policy. The width of these ranges was maintained at 4 percentage points in recognition of the degree to which the relationship between the monetary aggregates and economic performance has varied in recent years. M2 in particular has become very sensitive to fluctuations in interest rates. Consequently, the Committee agreed to evaluate money growth in light of other indicators, including inflationary pressures, the strength of the business expansion, and developments in domestic financial and foreign exchange markets.

The FOMC also reaffirmed the tentative monitoring range for total domestic nonfinancial debt that it had established in June 1988, and again decided not to specify a target range for M1 growth. It adopted a monitoring range for debt growth of 6½ to 10½ percent, compared with the range of 7 to 11 percent for 1988. In deciding not to set a target range for M1 growth, the Committee continued to view the relationship between M1 and economic activity as too unpredictable to warrant reliance on this measure as a guide for the conduct of monetary policy.

Most of the short-term variation in the demand for M2 around its trend can be explained by the movement of the spread between a market interest rate, such as the three-month Treasury bill rate, and the average rate paid on M2 deposits; this spread can be interpreted as the opportunity cost of holding M2 deposits.[15] The rate of growth of M2 is likely to decline, usually with a lag, as the opportunity cost of holding M2 assets rises. Short-term variations in M2's opportunity cost arise because the rates offered on most M2 deposits respond sluggishly to movements in market rates. When holders of M2 deposits observe that the rates paid on these deposits are not keeping pace with the increases in market rates, they will redeploy some of their M2 holdings into higher yielding money market instruments and thus depress M2 growth. Gradually, as market rates stabilize, rates offered on most M2 deposits tend to catch up with the adjustment in market rates, and the opportunity cost of holding M2 moves back toward its usual level. As this happens, people readjust the proportion of their financial assets in M2 toward the earlier ratio, speeding up the growth of M2 in the process.

The impact of a change in market interest rates on the growth of individual components of M2 depends on the speed at which the average offering rate for that component is adjusted. Banks typically adjust the offering rates on NOW accounts, money market deposit accounts (MMDAs), and savings accounts relatively slowly. Demand deposits pay no explicit interest by law, and implicit returns are altered gradually through adjustments to charges and services associated with the account. Rates on money market mutual funds and small time deposits respond much more quickly to changes in market rates.

The deceleration of M2 growth over the first two quarters of 1989 largely resulted from changes in the opportunity cost of holding money and from the unexpectedly large tax liabilities faced by individuals in April. The average spread between market rates and those on M2 deposits widened in the first quarter; how-

[15] See David H. Small and Richard D. Porter, "Understanding the Behavior of M2 and V2," *Federal Reserve Bulletin*, April 1989, pp. 244-54.

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Chart 5A

M2: Levels and Target Ranges

Cones and Tunnels

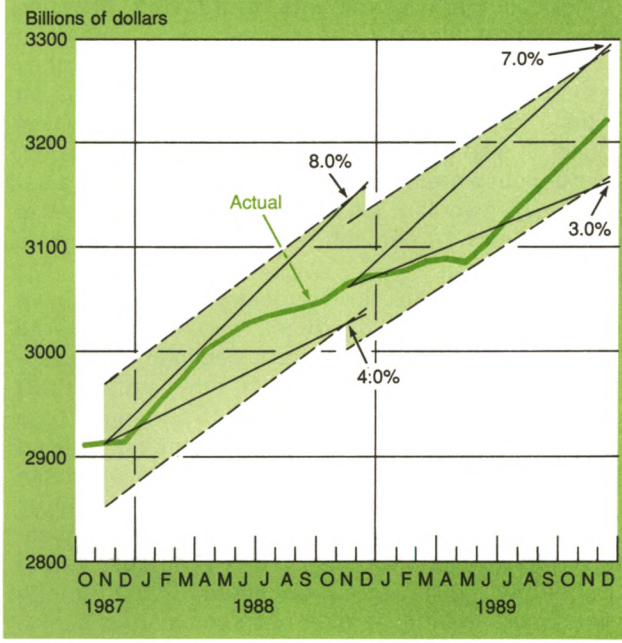


Chart 5B

M3: Levels and Target Ranges

Cones and Tunnels

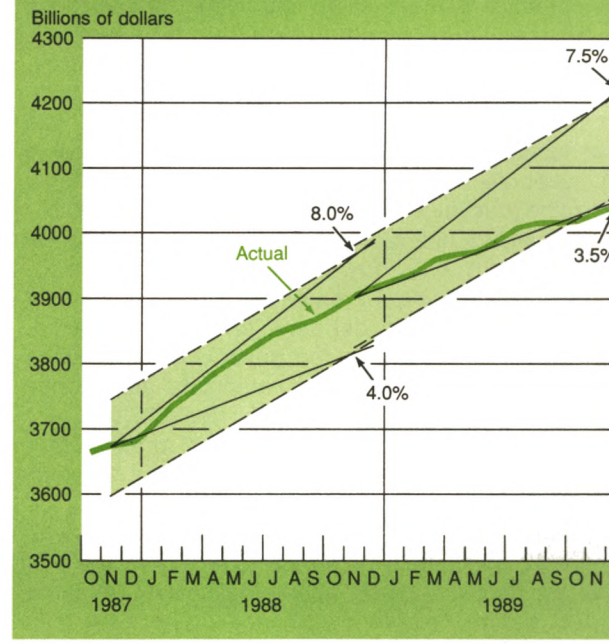


Chart 5C

Total Domestic Nonfinancial Debt Levels and Monitoring Ranges

Cones and Tunnels

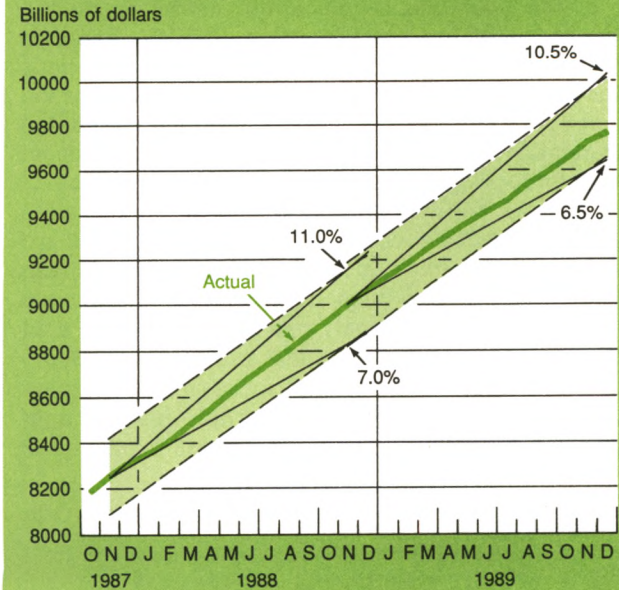
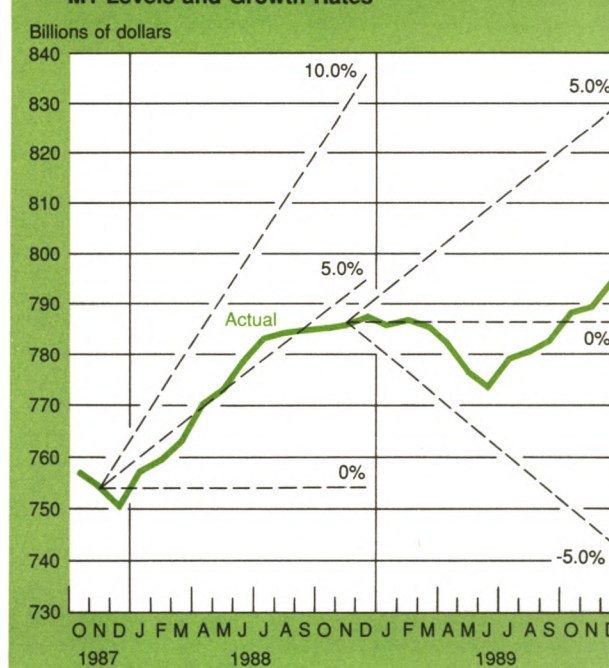


Chart 5D

M1 Levels and Growth Rates



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ever, it began to narrow in the second quarter as market rates fell from their highs and deposit rates lagged behind. Funds may have been funneled into taxes or nonmonetary assets rather than into M2 deposits—noncompetitive tenders at Treasury security auctions were already quite large during the first quarter. Deposits whose rates adjust slowly contracted markedly during the first two quarters, with especially pronounced outflows in April and May, when individuals appear to have drawn down their existing balances in these accounts to meet unanticipated tax obligations. The sizable declines in demand and other checkable deposits over the first half of the year caused M1 to fall sharply. Within M2, however, the contraction of deposits with relatively unresponsive rates was offset by gains in small time deposits and money market mutual funds, especially in the second quarter, when the average rates on small time deposits and money funds exceeded those on six-month Treasury bills. On balance, M2 expanded at an anemic 2.0 percent rate over the first two quarters, while M1 fell at a 2.3 percent annual rate.

The weak expansion of M2 depressed M3 growth. The non-M2 component of M3 grew briskly in the first quarter as banks stepped up their issuance of large time deposits to help fund the modest pace of loan expansion. The growth of these managed liabilities moderated in the second quarter because banks were able to fund credit expansion, which remained modest, with tax-swollen Treasury tax and loan account balances. Thrift issuance of managed liabilities slowed from its pace in the latter half of 1988, perhaps reflecting heavier reliance on Federal Home Loan Bank advances to fund credit expansion. On net, M3 grew at a 3.6 percent rate over the first two quarters of the year.

At the time of the FOMC's midyear review of the growth of the aggregates, M2 was about 1 percentage point below the lower bound of its growth cone, while M3 was at its lower bound. Total financial debt stood in the middle of its monitoring range. M1, meanwhile, was considerably below the level it had attained on average during the fourth quarter of 1988. M2 and M3 were expected to show stronger growth in the second half of the year in light of the recent declines in market interest rates. Furthermore, these aggregates were expected to finish the year well within their target ranges. Against this background, the Committee reaffirmed the 1989 target and monitoring ranges.

Over the second half of the year, M2 growth accelerated markedly as the opportunity cost of holding deposits narrowed. Deposits with relatively unresponsive rates expanded considerably and nearly recovered the outflows of the first half of the year. Money market mutual funds showed sizable monthly increases, despite the narrowing spread of their offering rates over market rates. The strong inflows into these funds likely reflected the fact that their rates exceeded those on other monetary instruments. In addition, because money market funds are perceived as a means of avoiding the volatility of bond and equity funds, they may also have benefited from the mounting losses on junk bond funds and the sharp drop of stock prices on October 13. The growth of small time deposits slowed, in part because their rate advantage over some market rates eroded markedly. On balance, M1 and M2 grew at rates of 3.5 and 7.1 percent, respectively, over the final two quarters.

The troubles of the thrift industry appear to have affected the composition of M2 but not its overall growth. Thrift small time deposits declined from September through December, while other retail thrift deposits grew slowly. The fall in thrift small time deposits probably reflected the shrinking spread between thrift and commercial bank rates on these deposits. With regulators actively discouraging thrifts from offering unduly high rates and with troubled institutions (which generally offered the highest rates) being seized, thrift rates on small time deposits declined more than those offered by commercial banks. The shrinkage in thrift small time deposits, together with the modest growth of other thrift M2 deposits, appears to have been offset by flows into commercial bank deposits and money market mutual funds. Consequently, commercial banks held a greater share of M2 deposits at the end of the year than at the beginning.

Unlike M2 growth, the growth of M3 in the second half of the year was significantly restrained by the restructuring of the thrift industry. FIRREA imposed strict capital requirements on thrifts, placed limitations on the structure of their portfolios, and provided for the use of RTC funds to pay off depositors at liquidated institutions. FIRREA had its most pronounced impact on M3 through its effect on the funding practices of inadequately capitalized thrifts. These thrifts were required to reduce their balance sheets, and they did so by restricting their issuance of term repurchase agreements and large time deposits over the second half of the year.[16] Together, these liabilities fell at a 34 percent annual rate over the final two quarters. Meantime, banks funded the modest pickup in credit expansion with M2 deposits so that their issuance of managed liabilities was weak. On net, M3 expanded at

[16] Thrifts also reduced their issuance of overnight RPs, which were added to M2 in the 1990 redefinition of that aggregate. From June to December 1989, overnight thrift RPs shrank by $1.1 billion; they stood at $2.5 billion in December. Although the decline was sharp, the RPs represent such a small share of the broader aggregates that the impact on M2 and M3 growth was minor.

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a modest 2.9 percent rate over the final half of the year.

The income velocities of the monetary aggregates all grew faster than their 1982-88 average rates of growth (Chart 6).[17] The velocity of M2 increased at a 1.8 percent rate in 1989, compared with a 2.1 percent rate in 1988. The velocities of M3 and M1 advanced far more quickly than in 1988. M3 velocity grew 3 percent, while M1 velocity grew 5.8 percent. They had advanced 1.2 and 3.1 percent, respectively, in 1988. The velocity of nonfinancial debt fell 1.5 percent, a slightly greater rate of decline than in the previous year.

Policy implementation

In 1989, the FOMC expressed its desired policy stance in terms of the degree of reserve pressure, a practice it has followed, with some modifications, since 1983. The intended degree of reserve pressure is described as a designated amount of adjustment and seasonal borrowing at the discount window. The Trading Desk uses this indicated amount of borrowing to derive the objective for nonborrowed reserves for the two-week reserve maintenance period. The nonborrowed reserve objective is obtained by estimating the demand for total reserves, constructed by projecting required reserves and desired excess reserves, and then subtracting from that estimate the intended level of discount window borrowing. Revisions are made to the objective during the maintenance period when new information suggests modifications to the estimated demand for total reserves. To achieve the nonborrowed reserve objective, the Desk conducts open market operations to increase or decrease the supply of nonborrowed reserves; however, the supply of nonborrowed reserves in the banking system is also influenced by the movements of various "operating factors" over which the Desk has little control. As a result, when the Desk undertakes its operations, it faces uncertainties both about reserve demand and about the amount of reserves supplied by the operating factors.

For a given level of the discount rate, higher levels of borrowing have typically been associated with firmer money market rates because limitations are placed on access to the discount window. When higher amounts of borrowing are desired, fewer nonborrowed reserves are supplied for a given level of demand for total reserves. With nonborrowed reserves less plentiful and with frequent or heavy use of the discount window discouraged, depository institutions bid more aggressively for reserves in the money market and ultimately cut back on their lending and investing. In this process, short-term interest rates rise.[18]

During 1989, however, as in some previous years, the relationship between the amount of borrowing and the degree of money market firmness, as measured by the spread between the federal funds rate and the discount rate, was somewhat unreliable. For the most part, banks appeared less inclined to borrow adjustment credit than in earlier years. The unusual reluctance of banks to borrow from the discount window complicated the Desk's implementation of policy through use of the borrowed reserve procedure throughout 1989 and encouraged a flexible interpretation of the objectives for nonborrowed and borrowed reserves.

As the 1988 report on open market operations related more fully, banks have shown particular reluctance to borrow on a number of other occasions in the 1980s.[19] In late 1988, the relationship between borrowing and the federal funds–discount rate spread appeared to shift once more. Banks became even less disposed to borrow adjustment credit than they had been earlier in the year; thus, a much larger spread between the federal funds rate and the discount rate was needed in order to induce banks (in the aggregate) to borrow the same amount that they would have before the shift. As a consequence, strict adherence to the nonborrowed reserve objective implied by a given level of assumed borrowing would often have forced federal funds to trade persistently at rates that were higher than those anticipated by the FOMC. In both 1988 and 1989, the Committee responded to these shifts by taking account of the observed degree of reluctance to borrow when it chose the borrowing allowances. However, it recognized the persisting uncertainty about the relationship between borrowing and the federal funds rate and thus encouraged the Desk to view the assumed levels of borrowing flexibly in order to achieve the desired degree of restraint. (Notes on the FOMC directives and the borrowing assumptions used to construct the reserve paths are in Table 1.) The Desk exhibited flexibility by accepting deviations of borrowing from its assumed level when the deviations were consistent with holding to the money market conditions anticipated by the FOMC.

Adjustment and seasonal borrowing fell short of the desired level in four of the first five maintenance periods of the year. (Actual reserve data appear in Table 2.) Consequently, a decision was made to allow

[17] The income velocity of an aggregate is the ratio of nominal GNP to the level of the aggregate.

[18] For a more detailed description of the borrowed reserve procedure, see Brian F. Madigan and Warren T. Trepeta, "Implementation of U.S. Monetary Policy," in *Changes in Money-Market Instruments and Procedures: Objectives and Implications*, Bank for International Settlements, March 1986.

[19] "Monetary Policy and Open Market Operations during 1988," Federal Reserve Bank of New York *Quarterly Review*, Winter-Spring 1989, pp. 83-102.

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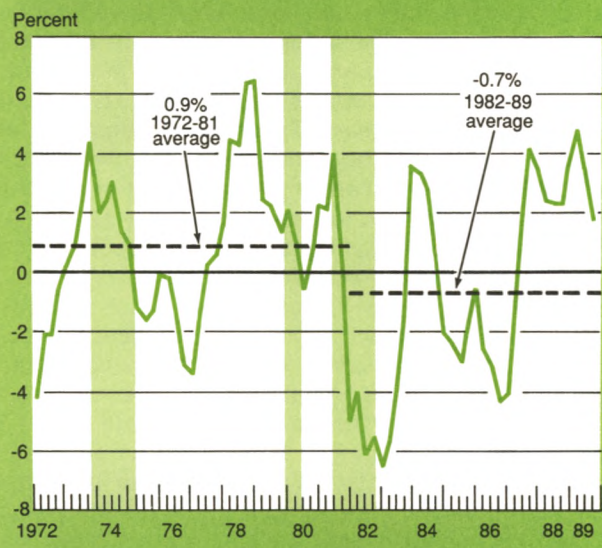
Chart 6A

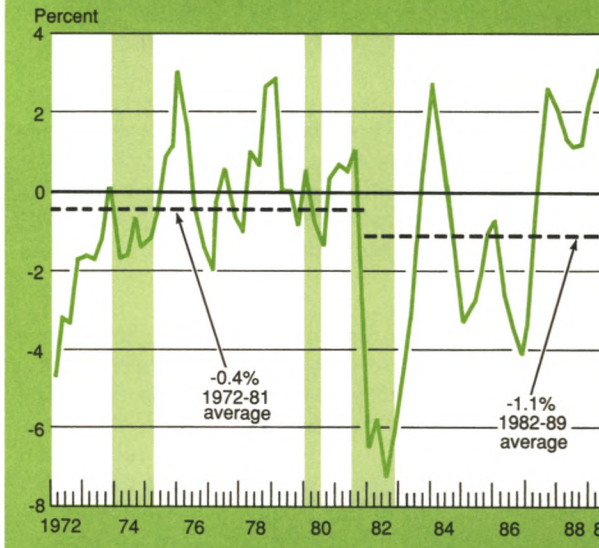
M2 Velocity Growth



Notes: Velocity growth is measured from four quarters earlier. Shaded areas represent periods of recession as defined by the National Bureau of Economic Research.

Chart 6B

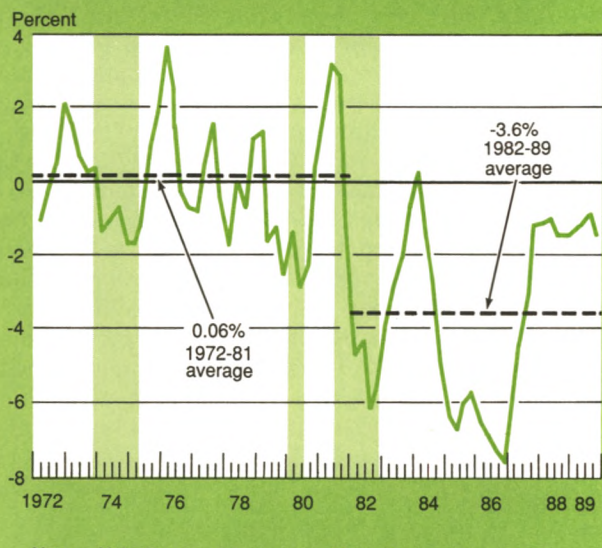
M3 Velocity Growth



Notes: Velocity growth is measured from four quarters earlier. Shaded areas represent periods of recession as defined by the National Bureau of Economic Research.

Chart 6C

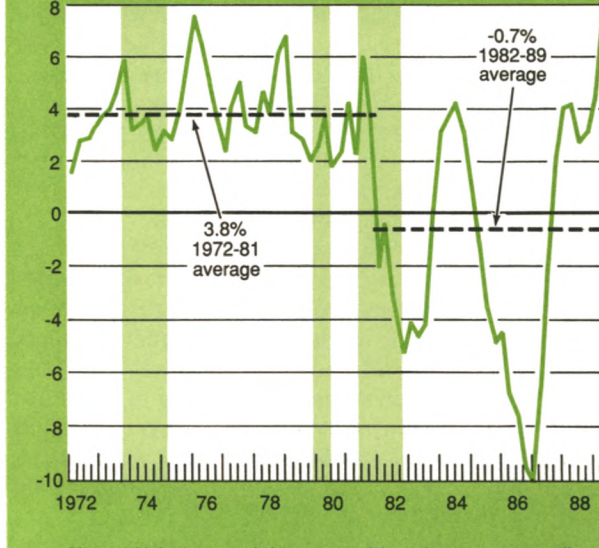
Total Domestic Nonfinancial Debt Velocity Growth



Notes: Velocity growth is measured from four quarters earlier. Shaded areas represent periods of recession as defined by the National Bureau of Economic Research.

Chart 6D

M1 Velocity Growth



Notes: Velocity growth is measured from four quarters earlier. Shaded areas represent periods of recession as defined by the National Bureau of Economic Research.

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for the increased reluctance of banks to approach the discount window by reducing the borrowing allowance, on March 9, to a level that was in line with actual experience and that would maintain the existing policy stance. (Policy had been firmed in January and February.) This diminished desire by banks for adjustment credit persisted for the remainder of the year. With adjustment borrowing generally running at low levels, swings in seasonal credit tended to dominate movements in the series "adjustment plus seasonal borrowing."

Adjustment borrowing was particularly light over the last half of the year, when the funds rate generally exceeded the discount rate by smaller amounts than in the first half of the year. Adjustment credit was frequently quite low until the final day of a maintenance period, when borrowing sometimes rose in the face of settlement-day pressures. As the FOMC eased reserve pressures over the second half of the year, adjustment borrowing tailed off to average about $165 million over the final thirteen maintenance periods of the year, and even this average was lifted by intervals of somewhat heavier borrowing associated with natural disasters and year-end pressures. Adjustment credit averaged less than $50 million during the September 6, November 1, and December 13 periods. In the September 6

Table 1

Specifications for Directives of the Federal Open Market Committee and Related Information

Date of Meeting	Specified Short-Term Growth Rates M2	Specified Short-Term Growth Rates M3	Borrowing Assumption for Deriving NBR Path	Discount Rate	Committee Preference	Prospective Reserve Restraint Modifications: Guidelines for Modifying Reserve Pressure	Factors to Consider for Modifications (In Order Listed) 1	2	3	4
	(Percent)		(Millions of Dollars)	(Percent)						
12/13 to 12/14/88	November to March 3	6½	400 500 on 12/15 600 on 1/5	6.50	Sought to increase somewhat the degree of pressure on reserve positions	A somewhat greater degree would be acceptable. A slightly lesser degree might be acceptable	Indications of inflationary pressure	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets
2/7 to 2/8/89	December to March 2	3½	600 700 on 2/14† 500 on 3/9‡	6.50 7.00 on 2/24	Sought to maintain the existing degree of pressure on reserve positions	A somewhat greater degree would be acceptable. A slightly lesser degree might be acceptable	Indications of inflationary pressure	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets
3/28/89	March to June 3	5	500	7.00	Sought to maintain the existing degree of pressure on reserve positions	A somewhat greater degree would be acceptable. A slightly lesser degree might be acceptable	Indications of inflationary pressure	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets
5/16/89	March to June 1½	4	500 600 on 5/17‡ 500 on 6/6	7.00	Sought to maintain the existing degree of pressure on reserve positions	A somewhat greater or somewhat lesser degree would be acceptable	Indications of inflationary pressure	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets
7/5 to 7/6/89	June to September 7	7	500 600 on 7/7§ 550 on 7/27	7.00	Sought to decrease slightly the degree of pressure on reserve positions	A somewhat greater or somewhat lesser degree would be acceptable	Indications of inflationary pressure	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets

†On February 23, the borrowing assumption was increased to $800 million, but it was returned to $700 million on the next day when the discount rate was raised.
‡Borrowing assumption changed for technical reasons.
§Change in borrowing assumption reflected a technical adjustment and a change in reserve pressures.

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period, when the spread between the funds and discount rates was 193 basis points, adjustment borrowing averaged a skimpy $31 million. This level was the lowest since July 1980, when the funds rate was below the discount rate. For the year, adjustment credit averaged $243 million per day, while the funds–discount rate spread averaged 228 basis points (Chart 7). Comparable figures for 1988 and 1987 were $293 million per day at an average spread of 137 basis points, and $286 million with an average spread of 100 basis points.

The rise and fall of seasonal borrowing more or less followed its normal cyclical pattern over the year (Chart 8), although record high levels were attained during the summer, somewhat earlier than in 1988. These movements were accommodated through eight technical adjustments to the borrowing allowance between May and the year-end, two of which were accompanied by policy-induced changes. With seasonal credit climbing in the late spring and early summer, the assumed level of borrowing was raised in the May 17 and July 12 maintenance periods. While the May move was purely technical, the July increase was associated with a reduction of reserve pressures. This seemingly contradictory step reflected the preceding surge in seasonal borrowing, which necessitated an upward adjustment to the assumed level in order to leave reserve pressures unchanged. Since only a portion of the technical adjustment was offset by the FOMC's decision to reduce reserve pressures, the assumed borrowing level was higher following the easing move. After seasonal borrowing peaked in the July 26 maintenance period at an average $509 million per day, an all-time high, it fluctuated in a range of $485 million to $500 million over the three succeeding periods. The peak-period average in 1988 was $433 million (October 5 period), a previous record high. In 1987, when spreads

Table 1

Specifications for Directives of the Federal Open Market Committee and Related Information
(Continued)

						Prospective Reserve Restraint Modifications			
						Factors to Consider for Modifications (In Order Listed)			
Date of Meeting	Specified Short-Term Growth Rates M2	M3	Borrowing Assumption for Deriving NBR Path	Discount Rate	Committee Preference	Guidelines for Modifying Reserve Pressure	1	2	3	4
	(Percent)		(Millions of Dollars)	(Percent)						
8/22/89	June to September 9	7	550	7.00	Sought to maintain the existing degree of pressure on reserve positions	A slightly greater degree might be acceptable. A slightly lesser degree would be acceptable	Progress toward price stability	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets
10/3/89	September to December 6½	4½	550 500 on 10/5‡ 400 on 10/19§ 350 on 11/2‡ 300 on 11/6 250 on 11/9‡	7.00	Sought to maintain existing degree of pressure on reserve positions	A slightly greater degree might be acceptable. A slightly lesser degree would be acceptable	Progress toward price stability	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets
11/14/89	September to December 7½	4½	250 200 on 11/15‡ 150 on 12/11‡	7.00	Sought to maintain existing degree of pressure on reserve positions	A slightly greater degree might be acceptable. A slightly lesser degree would be acceptable	Progress toward price stability	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets
12/18 to 12/19/89	November to March 8½	5½	150 125 on 12/20	7.00	Sought to decrease slightly the existing degree of pressure on reserve positions	A slightly greater or slightly lesser degree would be acceptable	Progress toward price stability	Strength of the business expansion	Behavior of the monetary aggregates	Developments in foreign exchange and domestic financial markets

†On February 23, the borrowing assumption was increased to $800 million, but it was returned to $700 million on the next day when the discount rate was raised.
‡Borrowing assumption changed for technical reasons.
§Change in borrowing assumption reflected a technical adjustment and a change in reserve pressures.

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between the federal funds rate and the discount rate were lower, the peak-period figure was $298 million (July 1 period).[20] As seasonal credit declined in the early fall, downward technical adjustments were made at the October 3 meeting and during the November 15 maintenance period (three times) and the December 13 maintenance period. In the November 1 period, the borrowing allowance was reduced both to lower reserve pressures and to account for the decline in the use of the seasonal borrowing privilege. For the year as a whole, seasonal borrowing averaged $275 million per day, compared with $235 million in 1988 and $164 million in 1987.

[20]Seasonal borrowing tends to increase as the federal funds–discount rate spread rises, although traditionally it has not been as responsive to spread changes as adjustment borrowing.

Open market operations and reserve management

In seeking to bring nonborrowed reserves into line with the objective, the Desk takes account of both the expected duration and day-to-day pattern of reserve needs (or surpluses) in determining the timing and size of its open market operations. Projected reserve supplies are compared with the projected nonborrowed reserve objectives for the current maintenance period and a few subsequent periods. In choosing between permanent and temporary operations, the Desk considers whether the projected need to add (or drain) reserves is expected to persist for several consecutive maintenance periods. If so, the Desk typically opts to address a portion of the need (or surplus) with outright purchases (or sales) of securities.

The Desk's 1989 open market operations, in both their nature and their timing, differed substantially from

Table 2

1989 Reserve Levels

(In Millions of Dollars, Not Seasonally Adjusted)

Period Ended	Required Reserves (Current)	Required Reserves (First Published)	Excess Reserves (Current)	Excess Reserves (First Published)	Total Reserves	Adjustment and Seasonal Borrowed Reserves	Nonborrowed Reserves plus Extended Credit Borrowed Reserves (Current)	Nonborrowed Reserves plus Extended Credit Borrowed Reserves (First Published)	Nonborrowed Reserves Interim Objective†	Extended Credit Borrowed Reserves
Jan. 11	64,256	64,397	1,147	991	65,403	840	64,563	64,548	64,793	1,208
25	61,786	61,735	972	1,070	62,757	499	62,258	62,307	62,116	1,028
Feb. 8	60,035	60,138	1,543	1,504	61,578	478	61,100	61,162	60,743	792
22	59,278	59,269	1,016	1,036	60,293	366	59,928	59,939	59,464	1,111
Mar. 8	59,490	59,533	957	915	60,446	550	59,897	59,898	59,774	1,250
22	59,299	59,305	735	805	60,034	422	59,612	59,689	59,754	1,164
Apr. 5	58,977	58,924	1,305	1,550	60,282	502	59,781	59,973	59,376	1,675
19	61,190	61,107	223	289	61,413	612	60,801	60,785	61,549	1,970
May 3	60,345	60,339	1,241	1,301	61,586	581	61,005	61,059	60,742	1,387
17	58,357	58,382	859	960	59,216	533	58,683	58,809	58,677	1,206
31	56,877	56,923	1,158	1,139	58,034	501	57,534	57,563	57,269	1,148
June 14	59,012	59,187	897	817	59,909	469	59,440	59,537	59,670	1,657
28	58,154	58,069	901	976	59,054	678	58,376	58,366	58,548	287
July 12	60,067	60,060	990	953	61,057	571	60,486	60,442	60,409	146
26	58,807	58,883	1,035	915	59,842	591	59,251	59,206	59,232	90
Aug. 9	58,766	58,659	715	812	59,481	621	58,860	58,851	59,058	55
23	58,859	58,737	951	1,104	59,810	709	59,102	59,132	59,137	44
Sept. 6	58,247	58,153	959	1,051	59,206	516	58,691	58,689	58,725	22
20	60,195	60,000	888	1,079	61,083	593	60,491	60,487	60,400	21
Oct. 4	58,343	58,117	996	1,160	59,338	873	58,466	58,404	58,518	25
18	60,186	60,110	926	1,045	61,112	634	60,478	60,521	60,560	19
Nov. 1	58,827	58,857	1,128	1,166	59,955	322	59,633	59,701	59,447	23
15	60,139	60,279	881	763	61,020	252	60,768	60,790	61,029	20
29	59,958	60,073	1,009	868	60,968	418	60,550	60,523	60,823	23
Dec. 13	61,149	61,253	759	666	61,908	129	61,779	61,789	62,024	22
27	62,015	62,019	1,018	1,022	63,033	332	62,701	62,708	62,708	19

†As of final Wednesday of reserve period.

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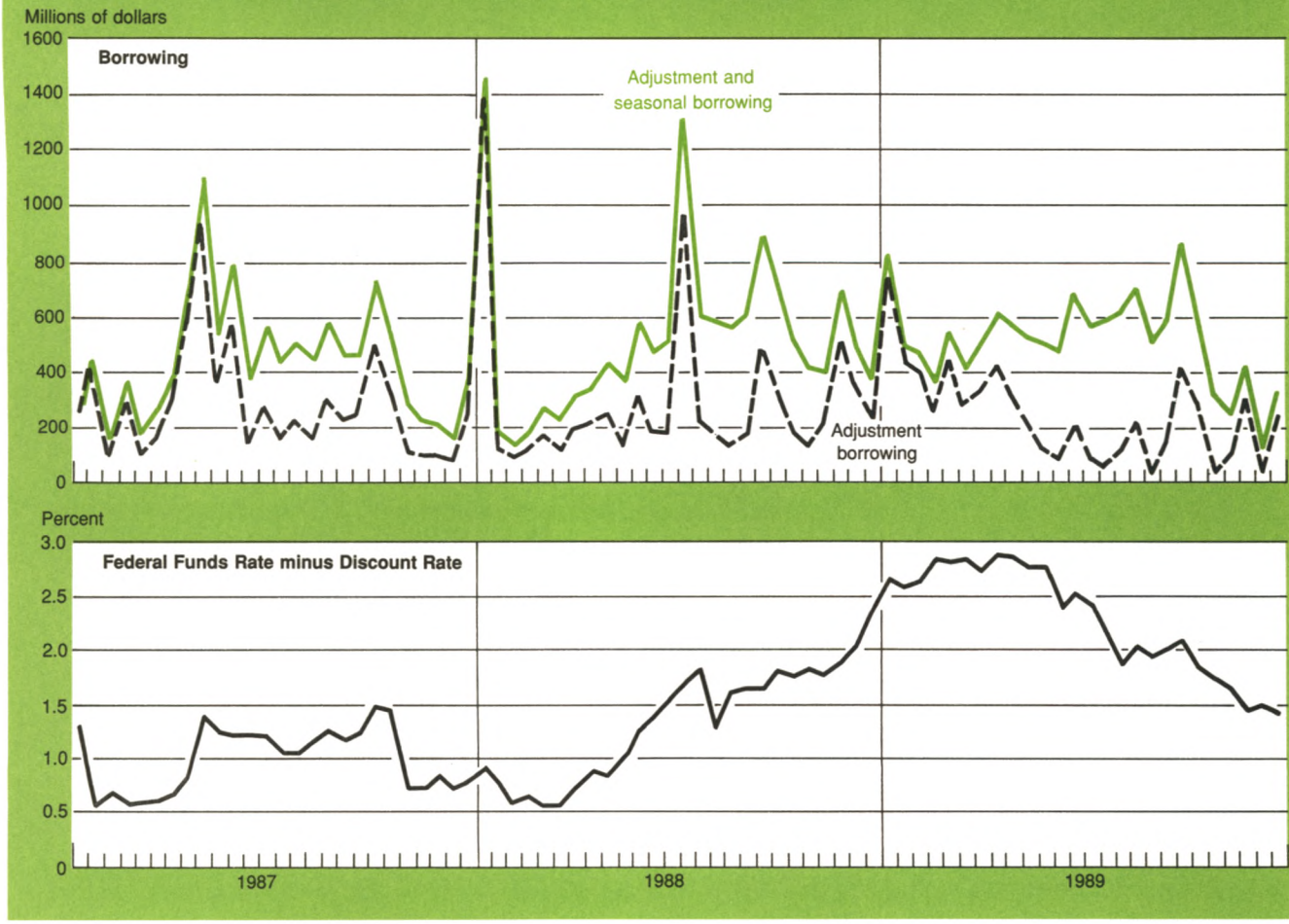
those of earlier years. Heavy purchases of foreign currencies in foreign exchange markets by U.S. monetary authorities added considerably to nonborrowed reserves. All intervention took the form of dollar sales (that is, purchases of foreign currency) and totaled an unprecedented $22 billion on behalf of both the Federal Reserve and the Treasury. The intervention was most heavily concentrated in the May-to-July period, when these sales totaled $11.9 billion — the largest U.S. intervention for any three-month reporting period. Another $5.9 billion was sold in the August-to-October interval.

The reserve impact of the 1989 dollar sales depended on how they were financed. In accord with typical practice, official U.S. intervention generally was shared equally by the U.S. Treasury, acting through the Exchange Stabilization Fund (ESF), and the Federal Reserve System. The Federal Reserve's share of the 1989 intervention created reserves because the intervention took the form of foreign currency purchases, paid for with reserve-creating dollars. In early 1989, as in most other years, the ESF's share of dollar sales had no reserve impact. The U.S. Treasury offset the reserve impact of the intervention by adjusting its balance at the Federal Reserve; it called in funds from its tax and loan accounts at depository institutions or reduced the size of a direct investment into those accounts. By March, however, the ESF had exhausted its supply of dollars to sell. Between mid-March and late May, it raised dollars by selling International Monetary Fund Special Drawing Rights (SDRs) to the Federal Reserve. Because the proceeds of the monetization were held in the ESF's account at the Fed until the funds were used by the ESF, the intervention

Chart 7

Borrowing and the Spread between Federal Funds and the Discount Rate



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financed by this method added reserves to the banking system at the time that the intervention settled. From mid-June to the end of the year, the Treasury funded its intervention operations by warehousing foreign currency with the Federal Reserve. Under this technique, the System buys foreign currency in a spot purchase from the ESF and simultaneously agrees to sell it back to the ESF at the same exchange rate at a future date. (Such warehousing operations have been executed from time to time since 1963.) A reserve injection occurs at the time that the warehousing transaction settles because the ESF invests the proceeds with the Treasury, which in turn deposits them into its tax and loan accounts at commercial banks or reduces the amount it otherwise would call in from these accounts.[21]

The rise in the System's holdings of foreign currency and SDRs provided a total of about $23 billion of reserves during 1989 (December over December). The increase in the System's foreign currency assets added $19.7 billion of reserves in 1989—compared with $2.1 billion in 1988—while the ESF's monetization of SDRs added $3.5 billion of reserves. The System's share of intervention operations accounted for about $11 billion of the total increase in its foreign currency holdings, while warehousing of foreign currency for the ESF totaled $7 billion. Of the remaining rise in the System's foreign currency holdings, roughly $750 million stemmed from its portion of a swap arrangement with the Bank of Mexico and about $1 billion from interest earned on its foreign currency holdings.

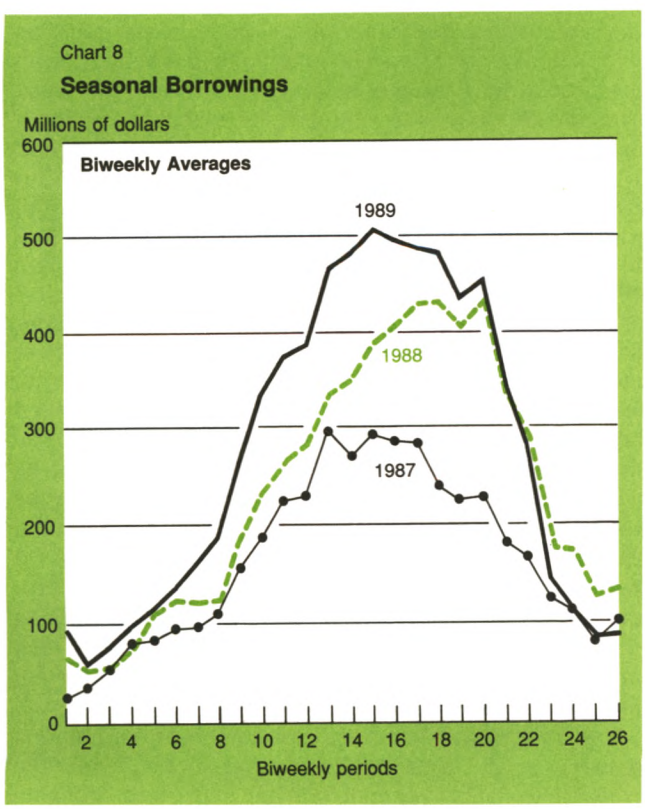
The reserve provision from foreign currency purchases and monetization of SDRs more than met the need for reserves for the year. The need to replenish the supply of nonborrowed reserves primarily arose from the $12.3 billion increase in currency outstanding. (This increase was only about three-quarters of the 1988 rise.) Reserves were also drained by the $1.2 billion decline in extended credit borrowing (ECB).[22] The major user of the program was taken over by the Federal Deposit Insurance Corporation (FDIC), and the FDIC paid off the user's borrowing in mid-June. On net, other operating factors added a modest amount of reserves. Meanwhile, required reserves showed their first decline since 1983, and excess reserves dropped modestly. Because the supply of nonborrowed reserves from operating factors (including foreign currency holdings and ECB) exceeded demand, the size of the System's portfolio was reduced over 1989 for the first time since 1957. The $10.2 billion decline in the portfolio left its year-end level at $235.6 billion.[23]

The reduction of the System's portfolio in 1989 was accomplished through redemptions of Treasury bills at auctions and through sales of Treasury securities in the market and to foreign customer accounts. Typically, the Desk exchanges its maturing holdings of Treasury securities for new securities at auction time. However, the Desk may choose to roll over only a portion of its holdings, as it did frequently in 1989, and thus drain reserves. The Desk redeemed a total of $13.2 billion of Treasury securities in 1989. (The figure includes a $3.5 billion forced redemption on November 2, discussed below.) The total includes $500 million of Treasury notes redeemed in late September—only the second time that the System has chosen to redeem coupon

[21] A more extensive discussion of Treasury tax and loan accounts appears below.

Chart 8

Seasonal Borrowings



[22] ECB is viewed by the Desk as nonborrowed reserves because institutions using the ECB program cannot easily replace funds obtained through the ECB facility with other types of funding; these institutions are under pressure to achieve improvements in their troubled funding situations.

[23] The total reflects the commitment to purchase $200 million of Treasury securities from customer accounts made on the last business day of 1989, for delivery on January 2, 1990. It excludes the temporary reduction of the portfolio from that day's matched sale-purchase transaction with foreign accounts; the sale included a commitment to repurchase the securities on January 2.

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issues.[24] The redemptions were heaviest in the May-to-July period, reflecting the need to offset foreign exchange intervention. This intervention also prompted the Desk to sell a record volume of bills in the market on July 12, an unusual action for that time of year. The $4.6 billion sale was the Desk's largest outright sale, exceeding the previous record by $1.5 billion. The Desk also sold Treasury bills in February, when the seasonal drop in currency and in required reserves produced a sizable need to drain reserves. Finally, the Desk drained $1.3 billion of reserves in 1989 through net sales of Treasury securities to foreign customer accounts. In 1988, it had made net purchases from these accounts that added $4.3 billion of reserves.

Nevertheless, the Desk at times arranged outright purchases of securities to address seasonal reserve needs, such as those that arose around tax dates and around year-end. The Desk favored Treasury bill purchases on these occasions to offset part of the decline in its bill holdings from redemptions and sales. The Desk purchased both coupon issues and bills in April and bills on two occasions in November. The April purchases were smaller than those of 1988 because foreign exchange intervention reduced projected reserve needs below the norm for late May. The Desk's purchase of bills in early November was prompted by its forced redemption of bills at the October 30 auction. The Treasury announced a settlement date for that auction of Tuesday, October 31, rather than Thursday, November 2, when the outstanding bills were to mature, because the debt ceiling was scheduled to drop on November 1. The Desk is not permitted to buy securities directly from the Treasury except in exchange for maturing issues. Consequently, the timing disparity forced the desk to redeem its $3.5 billion of maturing bills.

The net shrinkage in the System portfolio occurred in its bill holdings, which fell by $11.3 billion, in contrast with a rise of $5.4 billion in 1988. The Desk increased the System's holdings of coupon issues by $1.3 billion in 1989, compared with $9.7 billion in 1988. As a result, the average maturity of the System portfolio lengthened a bit in 1989. Redemptions reduced System holdings of federally sponsored agency securities by about $440 million, a decrease just slightly less than in the previous year.[25]

The Desk also met reserve needs through temporary transactions. When determining the timing of these operations, it took into account the intraperiod distribution of reserve needs (surpluses). The Desk sought to avoid extraordinary reserve deficiencies or surfeits on individual days because both could induce movements in the federal funds rate that might give misleading signals about the intent of policy. Moreover, a sizable daily reserve deficiency might leave the banking system with inadequate reserves for the purpose of clearing transactions, lead to extraordinary pressures in the reserve market, and force spikes in discount window borrowing that could preclude achieving the path level.

The Desk arranged about the same volume of temporary transactions in the market in 1989 as in 1988. Because of reserve injections associated with foreign exchange intervention, the Desk made much greater use of temporary transactions to withdraw reserves in 1989. The volume of matched sale-purchase transactions represented just over one-third of total temporary market transactions in 1989, in contrast to the smaller shares of previous years. The Desk arranged 69 rounds of matched sale-purchase agreements in the market for a total of $151 billion, compared with the 22 rounds for $63 billion that it had executed in 1988. Nearly two-thirds of these reserve draining operations spanned more than one business day.

A smaller volume of repurchase agreements (RPs) was executed in 1989 than in previous years because of the substantial reserve injections associated with foreign currency intervention. Over the year, the Desk arranged 28 rounds of System RP transactions for a total of $168 billion, and 61 rounds of customer-related RPs for a total of $108 billion. Comparable figures for 1988 were 51 rounds of System RPs for $210 billion, and 85 rounds of customer RPs for $143 billion. Although the Desk conducted fewer rounds of System RPs, the average daily volume of those RPs was $7.7 billion, or $3.7 billion greater than in 1988. The higher average volume stemmed partly from the decision to undertake a smaller volume of outright purchases of securities to meet the reserve needs arising around the April tax date. The Desk met these needs primarily through temporary operations rather than through its usual outright operations since the reserve shortages were not expected to extend over several periods (and since actual reserve needs exceeded projections). In the May 3 and 17 maintenance periods, the Desk preannounced term System RPs on three occasions to ensure adequate propositions. On May 4, the Desk arranged a record $15.8 billion of System RPs to meet part of the reserve needs.

The Desk frequently conducted temporary operations in response to large day-to-day variations in reserve availability. It also recognized that short-term transac-

[24] The Desk redeemed a very modest amount of coupon issues in 1987 because it purchased some maturing notes from foreign accounts between the time of the auction for the replacement issue and the settlement day for that auction.

[25] The Desk normally rolls over maturing federally sponsored agency issues. Its holdings decline when issues are called or when issues mature and no eligible replacement is available.

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tions might at times help provide clearer policy guidance to financial market participants. Market participants often judged whether the policy stance had changed by observing the Desk's use or eschewal of short-term transactions. However, they did not always interpret Desk actions correctly.

A technical reserve injection on the day before Thanksgiving was misinterpreted by market participants, and subsequent efforts by the Desk to correct the misimpression caused heavy borrowing in the November 29 maintenance period. On November 22, the Desk faced a fair-sized need to add reserves for the maintenance period then in progress, and large daily reserve deficiencies were projected for that day and for the remaining days of the period. During most of the morning of November 22, federal funds were trading at 8 7/16 percent, just slightly below the 8 1/2 percent rate that participants perceived to be consistent with the FOMC's desired degree of reserve restraint. It was anticipated that many market participants would be on vacation on Friday, the day after Thanksgiving, making for relatively inactive securities trading and financing activity. In these circumstances, the Desk was concerned that a delay in addressing the estimated reserve shortage could leave very large reserve needs toward the end of the period that might be difficult to meet. Hence, it decided to arrange five-day System RPs to meet the projected reserve shortage. Shortly before the Desk's regular time to enter the market, the funds rate slipped to 8 3/8 percent. Nonetheless, the Desk felt that its absence that day could lead to strains in the reserve market. When the Desk announced its operation, some market participants thought the action might be signaling a move to ease policy.

On the Friday after the holiday, these misimpressions were reinforced by an erroneous newspaper article that cited "government officials" as confirming an easing step. The Desk attempted to dispel these notions by temporarily draining reserves from the banking system that morning even though a reserve need remained. Federal funds were trading at 8 1/4 percent during most of the morning; however, the funds rate dipped to 8 3/16 percent just before the Desk acted. In that circumstance, many observers interpreted the operation as signaling the extent of the downward adjustment to the funds rate and as indicating the Committee's support for an 8 1/4 percent funds rate. The funds rate retained a soft tone over the afternoon (although it firmed a bit at the close), and the reserve data released that afternoon were not interpreted by participants as showing an insurmountable reserve need. The misperception persisted into the following Monday morning, November 27. After discussion at an FOMC conference call on Monday morning, the Desk entered the market before its customary time and drained reserves even though a large deficiency was anticipated. The drain corrected the market's misimpression of the policy stance but left very large reserve needs, which were met with heavy borrowing that evening and with large RP operations over the next two days.

The miscommunication resulted from a confluence of factors. The FOMC's previous decision to reduce reserve pressures, made in early November, had come as a surprise to market participants, who had not been expecting such a move until later in the month or at the time of the Committee's December meeting. On November 22 there was some speculation that another step might be in the offing, but discussions between Desk personnel and market participants did not indicate a widespread expectation of an imminent easing, even though the durable goods report released that morning had been weaker than anticipated. Moreover, analysts generally viewed the reserve need as being smaller than suggested by the Desk's projections, so they did not anticipate that a System operation would be necessary. Finally, the newspaper article seemed to confirm the view, which had previously been just a suspicion, that an easing had occurred.

Forecasting reserves and operating factors

When the Desk formulates a strategy for meeting reserve needs, it takes account of potential revisions to the estimated demand for and supply of reserves. On the demand side, these revisions can take the form of changes in estimated required reserve levels or in the banking system's desired excess reserve balances. On the supply side, revisions to estimated operating factors, or sources and uses of nonborrowed reserves other than open market operations, can change the reserve outlook. In both cases, revisions late in the maintenance period are especially difficult to deal with since they may necessitate very large reserve operations.

The accuracy of required reserve forecasts was about unchanged in 1989 relative to the previous year. The mean absolute error in forecasting required reserves on the first day of the period was around $325 million in 1989, compared with about $300 million in 1988.[26] This steady forecasting performance came despite an increase of $125 million in the mean absolute period-to-period change in required reserves. Forecasts became more accurate as the maintenance period progressed; the mean absolute prediction error

[26] The Trading Desk uses forecasts of required reserves, excess reserves, and operating factors made by both the Federal Reserve Bank of New York and Board staffs. When a range of forecast errors is given in the following discussion, it reflects the two staffs' varying degrees of success in forecasting reserve measures.

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fell to roughly $200 million at midperiod and to about $70 million to $90 million on the final day. These errors are a bit larger than their 1988 counterparts. in addition, some sizable revisions took place after the maintenance period ended, especially late in the year.

Excess reserves were somewhat more predictable in 1989 than in 1988. The beginning-of-period mean absolute forecast errors were about $135 million to $150 million, compared with $160 million in 1988.[27] The mean absolute period-to-period change in excess reserves was about the same as in 1988. The largest forecast errors occurred in the April 19 maintenance period, when excess reserves averaged $223 million, the lowest level since contemporaneous reserve accounting was introduced in February 1984.

The average level of excess reserves held by the banking system shrank to $970 million in 1989 from just over $1 billion in 1988. Excess reserves had risen each year from 1979 through 1987, and then had stabilized in 1988. Provisions of the Monetary Control Act of 1980 that were phased in between 1980 and 1987 expanded the number of institutions subject to reserve requirements and resulted in increased excess reserve holdings. In addition, rising Fedwire activity increased the need for reserve balances at the Federal Reserve.[28] Since large banks tend to monitor their reserve balances closely to avoid holding non-interest-bearing excess reserves, their average holdings of excess reserves over a year are typically close to zero. These banks generally make use of the carryover privilege, under which banks can apply a portion of the excess reserves held in one period to their requirements in the following period. Carryovers tend to produce a sawtooth pattern of excess reserve holdings at large banks, and during 1989 this pattern at times showed through to aggregate excess reserve holdings. Smaller banks, however, generally lack the resources to monitor their reserve positions accurately, and they tend to hold positive levels of excess reserves.

Despite a marked jump in the variability of operating factors from period to period in 1989, the accuracy of operating factor forecasts was about the same as in 1988. The mean absolute error of first-day forecasts was about $900 million to $1.1 billion in 1989, compared with $900 million to $1 billion in the previous year. Although projections of reserves supplied by operating factors improved as the period progressed, the average absolute errors increased relative to their 1988 levels. The mean absolute forecast error around midperiod was about $450 million, and that for the final day of the period was roughly $70 million to $90 million. In 1988, these errors were $325 million to $470 million and about $50 million, respectively.

The 1989 forecasting performance looks better when compared with the mean absolute period-to-period change in operating factors. The mean absolute change surged to $3.4 billion per period, up sharply from $2.0 billion in the previous year. As a proportion of the average absolute change, mean absolute errors in forecasting operating factors on the first day of the period were only about half as much as their 1988 counterparts.

Much of the increase in the average period-to-period change of operating factors reflected the behavior of the Treasury's balance at the Federal Reserve. The Treasury tries to maintain a $5 billion balance in this account.[29] Additional funds are held in Treasury tax and loan (TT&L) accounts at participating depository institutions.[30] If the Treasury anticipates that its balance will fall below the $5 billion target level, it may "call" funds from its TT&L accounts to bring its balance up to the target level. Similarly, if the Treasury's balance at the Federal Reserve is expected to exceed $5 billion, the Treasury can directly place funds into these TT&L accounts. However, since depository institutions must fully collateralize and pay interest on TT&L funds, the institutions set limits on the total amount of funds they will accept based on their ability to make profitable use of these funds and on the availability of collateral. Treasury funds in excess of TT&L capacity must be held in the Treasury's Federal Reserve balance. Typically, around major tax dates, the Treasury's cash holdings substantially exceed the capacity of the TT&L accounts. In 1989, capacity limitations forced the Treasury's Fed balance to exceed its target level on about fifty-five business days, compared with about forty days in 1988.

The mean absolute period-to-period change in the Treasury's balance rose to $2.8 billion in 1989 from $1.5 billion in 1988. The increased variability of the balance stemmed in part from an increase in tax receipts in 1989 relative to 1988, while the aggregate capacity of TT&L accounts remained about unchanged. With

[27]These reported forecast errors overstate the degree of uncertainty about excess reserves. The Desk supplements beginning-of-period and midperiod forecasts with informal adjustments that are based on the observed pattern of estimated excess reserve holdings as each maintenance period unfolds.

[28]See discussion in 1988 report, p. 101. In 1989, the turnover rate of reserve accounts resumed its upward movement after having stalled in the previous year.

[29]In late 1988, the Treasury raised this target level to $5 billion from $3 billion in order to reduce the likelihood of an inadvertent overdraft.

[30]Individual nonwithheld taxes are paid directly into the Treasury's account at the Federal Reserve. Most other Treasury tax receipts are initially deposited into TT&L accounts.

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TT&L capacity at roughly $30 billion, the substantially higher volume of tax payments received by the Treasury in 1989, especially in April and June, caused its balance at the Federal Reserve to surge to levels significantly above those in 1988. For example, the Treasury's balance at the Fed averaged $15.1 billion and $19.7 billion in the May 3 and 17 maintenance periods, respectively, but averaged only $9.2 billion and $9.6 billion for the corresponding periods in 1988.[31] The buildup and reduction of the Treasury's balance produced large changes from one period to the next, resulting in the 1989 rise of the absolute period-to-period change in this balance.

The forecast errors for the Treasury balance were a bit larger than in 1988. The mean absolute errors of the first-day forecasts were about $725 million to $800 million in 1989, compared with $700 million to $750 million in 1988. These errors were elevated somewhat by large forecast errors in the October 4 period. During this period, RTC payments fell well short of expectations. On September 29, the Treasury's Fed balance exceeded expectations by about $6½ billion to $7½ billion and thus contributed to a large forecast miss for the period-average Treasury balance.

Initial forecasts of U.S. currency, the foreign RP pool, float, and foreign currency were subject to sizable revisions as the maintenance period progressed. U.S. currency was difficult to predict in 1989, in part because it grew considerably more slowly than expected during most of the year but then experienced a year-end rise that was somewhat larger than usual. The beginning-of-period mean absolute forecasting errors were about $350 million to $400 million, somewhat above their 1988 levels. Forecasting the foreign RP pool on a two-week average basis was also harder since the level of the pool was also somewhat more variable in 1989 than in 1988; the first-day average absolute forecast error was about $275 million. First-day forecasts of Federal Reserve float, including the so-called as-of adjustments that correct various reserve transfer errors, had mean absolute errors of about $200 million to $225 million. Forecasts of foreign currency had a beginning-of-period mean absolute error of about $200 million; however, this error overstates the uncertainty the Desk faced. The reserve effect of foreign currency intervention occurs two days after the transaction. The Desk was informed about the size of the intervention on the day before the transaction settled, so that it knew one day in advance what the reserve impact would be. Because the Desk was also informed about warehousing transactions before they occurred, the deterioration in forecast accuracy did not pose significant day-to-day difficulties in implementing policy.

[31] In 1989, the Treasury's Fed balance averaged $14.9 billion per day on those days when TT&L accounts were at capacity, compared with $10.7 billion in 1988.

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Treasury and Federal Reserve Foreign Exchange Operations

February-April 1990

The dollar gained support during the February-April reporting period as the prospects for U.S. growth came to be viewed as somewhat better and earlier expectations that monetary policy would ease were replaced by consideration of a possible tightening. At the same time, factors abroad strongly influenced individual exchange rates. Accordingly, the dollar moved up the most against the Japanese yen, which was affected by political uncertainties and weakness in Japan's stock market. The dollar also stopped its decline against the German mark amid concern about the potential inflationary implications for Germany of economic and monetary union between East and West.

During the three-month period, the dollar declined less than ½ percent against the mark and more against some other European currencies, ending the period about 18 percent below its mid-June 1989 highs against the mark. In contrast, the dollar rose 10 percent against the yen to trade nearly 5 percent above its mid-June 1989 levels. On a trade-weighted basis as measured by the staff of the Federal Reserve Board of Governors, the dollar rose more than 1 percent to end the period 12½ percent below its highs of mid-June 1989.

Intervention operations carried out by the U.S. monetary authorities during the period were aimed primarily at moderating the rise of the dollar against the yen. During the three-month period, the Desk sold a total of $1,780 million, of which $1,580 million was sold against yen and the remainder against marks. Of these totals, $375 million of the dollar sales against yen was financed by the Federal Reserve System. The remaining $1,205 million sold against yen, together with the entire $200 million sold against marks, was financed by the U.S. Treasury through the Exchange Stabilization Fund (ESF).

A report presented by Sam Y. Cross, Executive Vice President in charge of the Foreign Group at the Federal Reserve Bank of New York and Manager of Foreign Operations for the System Open Market Account. Christopher B. Steward was primarily responsible for preparation of the report.

February through the beginning of April

Reports indicating that U.S. economic growth was quickening helped improve sentiment toward the dollar as the period opened, tending to dispel the prevailing impression that U.S. monetary policy was likely to ease. In the first weeks of February, data were released showing strong increases in employment, a strengthening of retail sales, and a sharp rise in producer prices for January. About the same time, comments from some Federal Reserve officials suggested that the likelihood of a recession in the United States had diminished. Subsequent data and testimony by U.S. monetary officials reinforced the view that the balance of policy concerns had shifted from supporting growth to restraining inflation.

This shift in assessments of economic and policy conditions in the United States provided a foundation for a firmer tone to the dollar for much of the period under review. Within that framework, the extent to which the dollar advanced against another country's currency depended very much on developments in that country.

Thus, as the period began, the European currencies continued to gain support from the enthusiasm engendered late last year by reforms in Eastern Europe. With institutional investors, especially Japanese investors,

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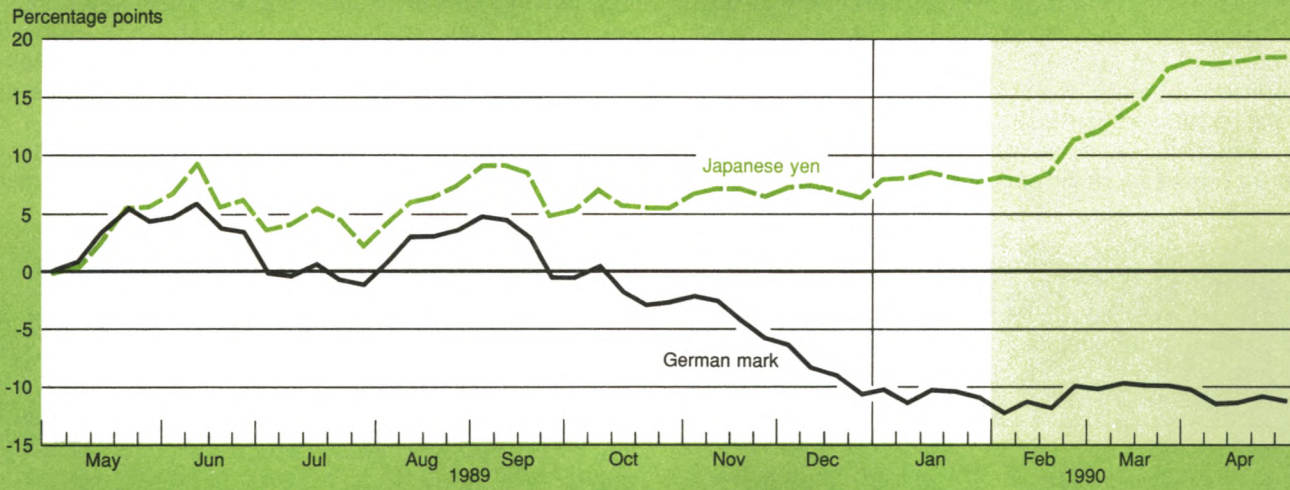
reportedly expanding their portfolio investments in European currencies, the dollar extended the decline against the mark that had begun when the Berlin Wall was opened in October. On February 7 the dollar reached DM 1.6490 — its lowest level against the mark in almost two years.

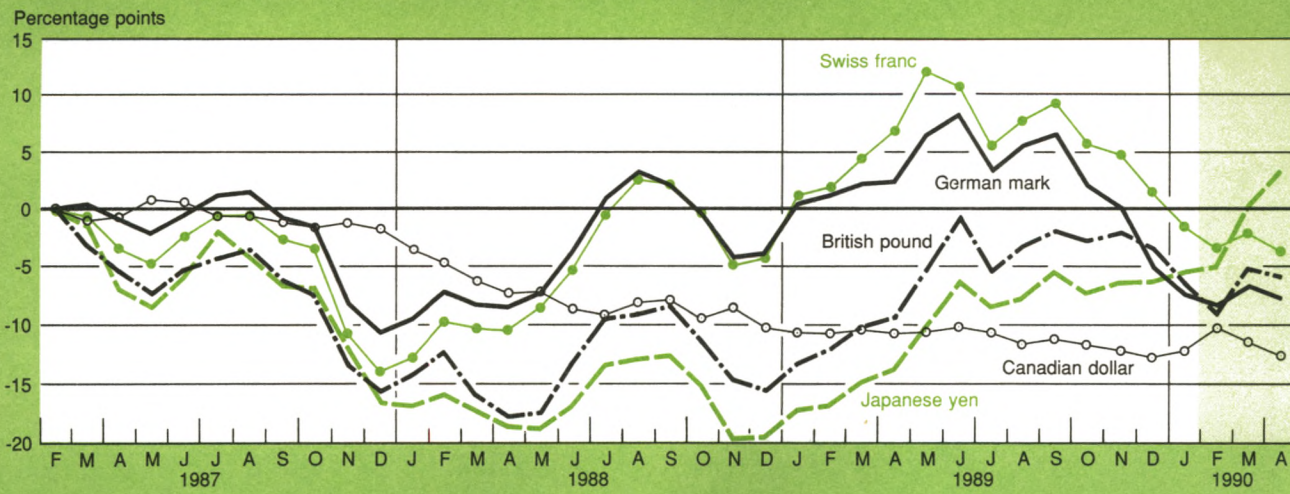
Then on February 7, the West German government announced plans for immediate talks on monetary union between East and West Germany, and the dollar began to firm against the mark as attention quickly focused on the possible inflationary consequences of such a move. Market participants feared that the conversion of East German marks into West German marks would result in a worrisome increase in German monetary aggregates or unleash pent-up demand for German products. They noted that the new source of demand would materialize at the same time that West German residents would be feeling the effects of a tax cut. A new round of wage negotiations by the country's largest trade union was an additional source of concern. As inflation anxieties mounted, German bond prices softened, and yields hit levels above comparable

Chart 1

The dollar again came under strong upward pressure against the Japanese yen during the period . . .



while remaining well below its year-earlier highs against most other currencies.



The top chart shows the percent change of weekly average rates for the dollar from May 1989. The bottom chart shows the percent change of weekly average rates for the dollar from February 23, 1987, the date of the Louvre Accord. All rates are calculated from New York *closing quotations.*

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U.S. bond yields for the first time in ten years.

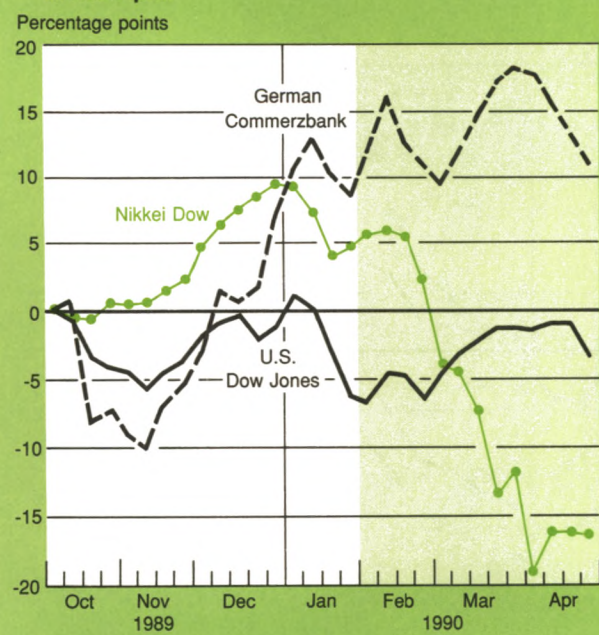
Against the yen, the dollar was trading in a fairly narrow range when the period opened, as market participants awaited the results of parliamentary elections in Japan on February 18 to see whether the ruling Liberal Democratic party (LDP) could maintain control in the lower house. On news that the LDP had won a larger than expected majority, the dollar declined to touch its period low against the yen of ¥143.60 on February 19. But soon thereafter, the dollar began to firm as market participants questioned whether the LDP's strong showing would be sufficient to ward off pressures from the opposition-dominated upper house and address in a meaningful way the challenging economic and trade issues confronting Japan. Before the elections, Japanese short- and long-term money market yields had been rising slowly in the expectation that an increase in the Bank of Japan's discount rate would be announced soon afterward. In the event, concerns over escalating interest rates abroad and accelerating monetary expansion at home combined to trigger a sharp drop in Japanese stock and bond prices in the weeks following the elections. The Nikkei Dow index of the Tokyo stock market fell 10 percent and Japanese government bond yields climbed well above 7 percent. Market participants came to believe that the Bank of Japan would be reluctant to tighten monetary policy in these circumstances, but they remained concerned whether adequate measures would be taken to break the rapidly deteriorating sentiment surrounding Japan's financial markets.

Against this background, upward pressure on the dollar against the yen intensified. On February 23, the U.S. monetary authorities, in keeping with Group of Seven (G-7) understandings on exchange rate cooperation, intervened to resist the dollar's rise against the Japanese currency. As upward pressure on the dollar against the yen continued, the U.S. authorities intervened in moderate amounts through March 2, selling a total of $650 million against yen. Financing of these operations was shared equally by the Federal Reserve and the U.S. Treasury.

At that time, the dollar also came under more intense upward pressure against the mark as fears of German

Chart 2

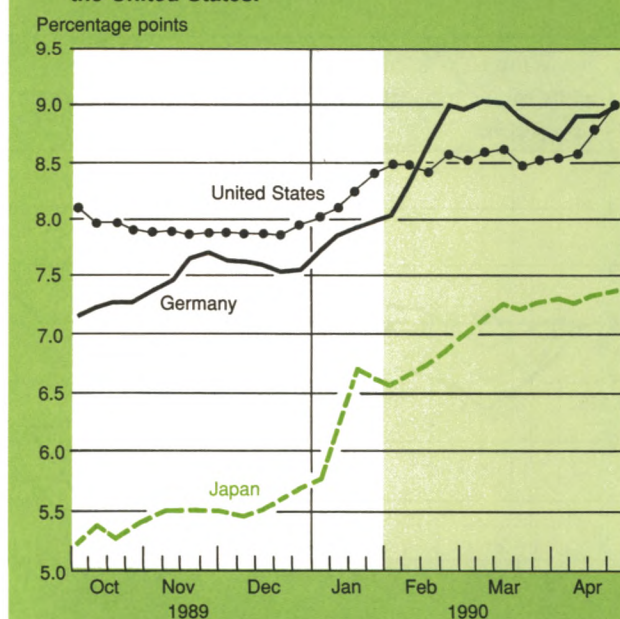
The Japanese stock market came under intense downward pressure during the period, stabilizing in mid-April.



The chart shows the percentage changes for the weekly average stock indexes from September 31, 1989. All figures are based on closing rates.

Chart 3

Long-term interest rates rose nearly 1 percentage point in Germany and Japan and about 1/2 of 1 percentage point in the United States.



The chart shows daily U.S., German, and Japanese government long-bond yields.

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inflation intensified. As the dollar advanced to DM 1.7237 on March 1, its highest level against that currency since January, widespread reports circulated through the markets that the Bundesbank and other European central banks were intervening in the foreign exchange markets to support the mark and resist the dollar's rise.

On March 5, with the dollar rising against both currencies, U.S. Treasury officials decided to reinforce their intervention in yen with sales of dollars against marks. Prior to those mark purchases, several officials within the Federal Reserve had expressed concern that the size of the intervention operations might contribute to uncertainty about the Federal Reserve's priority toward achieving price stability. Concerns were also voiced that expanding the operations to include other currencies might be seen as an attempt to promote a broad-based decline in dollar exchange rates. At the time, Federal Reserve holdings of foreign currencies, taking into account anticipated further interest earnings, were approaching the limit of $21 billion authorized by the Federal Open Market Committee (FOMC). Under these circumstances, the decision was made not to seek authorization from the FOMC for continued

Table 1

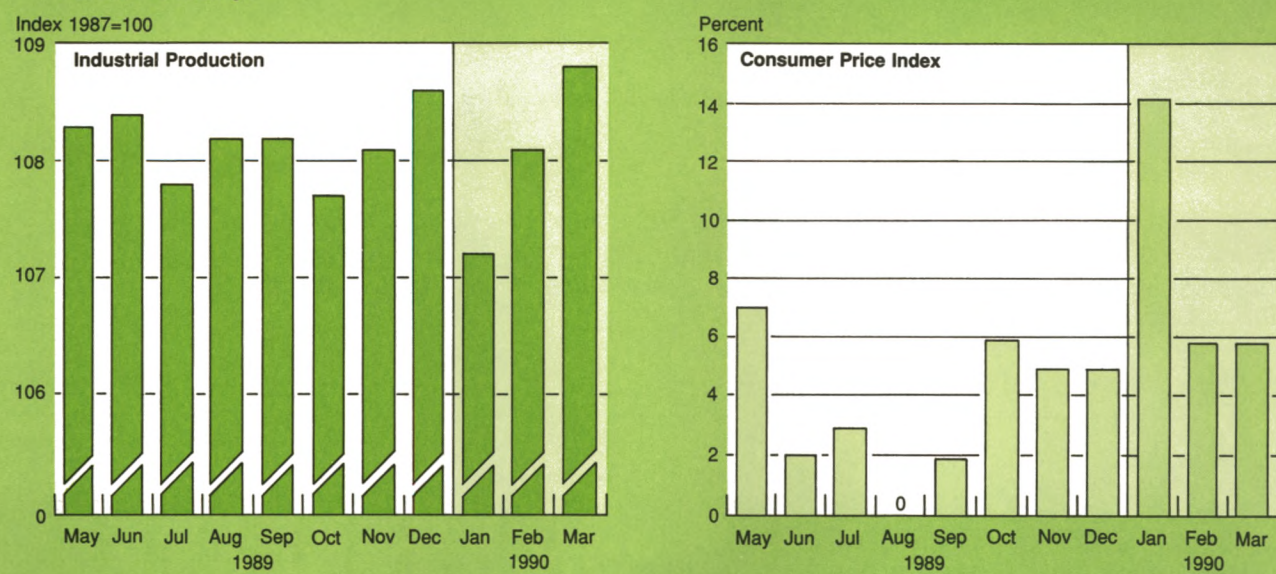
Federal Reserve Reciprocal Currency Arrangements

In Millions of Dollars

Institution	Amount of Facility April 30, 1990
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
Deutsche Bundesbank	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:	
Dollars against Swiss francs	600
Dollars against other authorized European currencies	1,250
Total	30,100

Chart 4

Data released during the period were seen as indications of stronger growth and price pressures in the U.S. economy.



The left chart shows monthly industrial production figures for January, February, and March, seasonally adjusted. The right chart shows the monthly rise in the seasonally adjusted U.S. consumer price index, annualized. Consumer price data for January, February, and March were released on February 21, March 20, and April 17, respectively. Industrial production figures for January, February, and March were released on February 16, March 16, and April 17, respectively.

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Federal Reserve operations pending a review of Federal Reserve foreign currency operations at the FOMC's March 27 meeting. Thus, from March 5 through March 27, all U.S. intervention operations, totaling $830 million against yen and $200 million against marks, were financed solely by the U.S. Treasury through the ESF.

At the March 27 meeting, the FOMC voted to approve an increase in the authorized limit on Federal Reserve holdings of foreign currencies from $21 billion to $25 billion. When the dollar again came under upward pressure against the yen on March 28, the

Table 2

Drawings and Repayments by Foreign Central Banks under Reciprocal Currency Arrangements with the Federal Reserve System

In Millions of Dollars; Drawings (+) or Repayments (−)

Central Bank Drawing on the Federal Reserve System	Amount of Facility	Outstanding as of January 31, 1990	February	March	April	Outstanding as of April 30, 1990
Bank of Mexico†	700.0	700.0	−700.0	—	—	0
Bank of Mexico‡	700.0	—	—	+700.0	−158.2	541.8

Data are on a value-date basis.
†Drawn as a part of the $2,000 million near-term credit facility established on September 14, 1989. Facility expired on February 15, 1990.
‡Represents the FOMC portion of a $1,300 million short-term credit facility established on March 23, 1990.

Table 3

Drawings and Repayments by Foreign Central Banks under Special Swap Arrangements with the Federal Reserve System

In Millions of Dollars; Drawings (+) or Repayments (−)

Central Bank Drawing on the Federal Reserve System	Amount of Facility	Outstanding as of January 31, 1990	February	March	April	Outstanding as of April 30, 1990
Bank of Mexico†	125.0	34.1	−34.1	—	—	—

Data are on a value-date basis.
†Drawn as a part of the $2,000 million near-term credit facility established on September 14, 1989. Facility expired on February 15, 1990.

Table 4

Drawings and Repayments by Foreign Central Banks under Special Swap Arrangements with the U.S. Treasury

In Millions of Dollars; Drawings (+) or Repayments (−)

Central Bank Drawing on the U.S. Treasury	Amount of Facility	Outstanding as of January 31, 1990	February	March	April	Outstanding as of April 30, 1990
Bank of Mexico†	425.0	334.1	−334.1	—	—	—
Bank of Mexico‡	600.0	—	—	+600.0	−135.6	464.4
Central Bank of Venezuela§	104.0	—	—	+25.0	−25.0	—
National Bank of Poland‖	200.0	86.0	−86.0	0.0	0.0	0.0

Data are on a value-date basis.
†Represents the ESF portion of a $2,000 million near-term credit facility that expired on February 15, 1990.
‡Represents the ESF portion of a $1,300 million short-term credit facility established on March 23, 1990.
§Represents the ESF portion of a $400 million near-term support facility that expired on April 30, 1990.
‖Represents the ESF portion of a $500 million short-term credit facility established on December 27, 1989. The ESF facility will expire on May 31, 1990.

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Desk intervened to sell $50 million against yen, financed once more by the Federal Reserve and the U.S. Treasury equally.

As April began, sentiment toward the yen was still negative and Japanese stock and bond prices remained under downward pressure amid market concerns about political leadership and economic policy in Japan. A March 20 increase of 1 percentage point in the Bank of Japan's discount rate had not immediately relieved the pressures against the yen. An important round of negotiations under the Structural Impediments Initiative was getting under way between the United States and Japan in an atmosphere of growing U.S. concern and considerable uncertainty in Japan over their possible outcome. On the first trading day of the new Japanese fiscal year, the Nikkei Dow index closed nearly 25 percent below — and yields on Japanese government bonds about 75 basis points above — levels prevailing at the beginning of the period. Against that background, the dollar reached ¥160.35 on April 2, the highest level for the dollar against that currency since December 1986.

Up to that point, most market participants had not expected the upcoming G-7 meeting to focus strongly on currency issues. But as developments in Japan unfolded, reports began to circulate that the G-7 might implement a massive yen support package. Market participants therefore adopted a more cautious attitude as the date of the April 7 meeting approached, and the dollar began to ease somewhat against the yen.

April developments following the Paris G-7 meeting

The statement released following the G-7 meeting on April 7 reported that the G-7 "Ministers and Governors discussed developments in global financial markets, especially the decline of the yen against other currencies, and its undesirable consequences for the global adjustment process and...reaffirmed their commitment to economic policy coordination, including cooperation in the exchange markets."

On the Monday following the G-7 meeting, the dollar moved erratically as market participants assessed the implications of the statement. In Far Eastern trading before the opening of the Tokyo market, the dollar rose sharply against the yen as market participants interpreted the statement as indicating a lack of G-7 commitment to aggressive intervention in support of the yen. In Tokyo, however, market reports predicting stepped-up concerted intervention by the G-7 countries brought the dollar under strong downward pressure, and the dollar moved down from ¥160 to ¥155.45 within a few hours. During the day, the dollar began to rise once again on reports of coordinated, but not large-scale, intervention. As the dollar continued to rise against the yen in New York, the U.S. monetary authorities, in their only intervention in the month of April, sold $50 million against yen, shared equally between the Federal Reserve and the U.S. Treasury.

In the weeks that followed, a number of developments combined to lessen negative sentiment towards the yen. First, market participants came to view the Bank of Japan's March discount rate increase as sufficient, at least for the time being, and expectations of a further rise in interest rates dissipated. Furthermore, in retrospect, market participants came to see the variety of international negotiations leading up to the Structural Impediments Initiative talks and the G-7 meeting as being rather successful and diminishing the strains within the Japanese leadership. Finally, Japanese stock and bond markets became more settled in early April, recouping some of the losses sustained earlier in the period.

In Europe, the focus of market attention during April remained on Germany and German monetary union. Market participants began to feel that the inflationary risks of monetary union had been exaggerated. As confidence grew that Bundesbank policy would be sufficiently restrictive to contain pressures that might emerge, sentiment toward the mark became more favorable.

Under these circumstances, the dollar stopped advancing against the mark and the yen during April. But at the same time that sentiment towards these other currencies was improving, the dollar continued to draw support from U.S. data releases suggesting strong economic activity and from the belief that U.S. monetary policy would remain directed at dealing with price pressures. The dollar therefore closed the period near its three-month high against the yen at ¥158.90

Table 5

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

In Millions of Dollars

February 1, 1990 to April 30, 1990	Federal Reserve	U.S. Treasury Exchange Stabilization Fund
Realized	0	+292.4
Valuation profits and losses on outstanding assets and liabilities as of April 30, 1990	+1,996.9	+881.8

Data are on a value-date basis.

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and around the midpoint of its three-month trading range against the mark at DM 1.6790.

For the period as a whole, the U.S. monetary authorities sold a total of $1,780 million — $1,580 million against Japanese yen and $200 million against German marks. The U.S. Treasury, through the ESF, sold $1,205 million against yen and $200 million against marks, while the Federal Reserve sold $375 million against yen. During March, the ESF "warehoused" $2,000 million equivalent of foreign currencies with the Federal Reserve, bringing the total of warehoused funds to $9,000 million equivalent. The warehousing transactions resulted in realized profits of $292.4 million for the ESF, reflecting the difference between the rate at which the warehoused funds had originally been acquired in the market and the rate at which they were exchanged with the Federal Reserve.

* * *

In other operations during the period, on February 9, 1990, Poland repaid in full its outstanding commitment to the ESF of $86.0 million. The commitment was from a drawing made at the end of 1989 under a $500 million short-term support package established with the ESF and the Bank for International Settlements (acting for certain participating member banks).

Also in February, Mexico repaid in full its outstanding commitments under the $2,000 million multilateral facility established on September 14, 1989. Mexico made partial repayments of $6.1 million each to the Federal Reserve and ESF on February 2. Final repayments of $728.0 million and $328.0 million were made to the Federal Reserve and ESF, respectively, on February 15.

On March 23, the Federal Reserve and Treasury agreed to establish a $1,300 million short-term credit facility with Mexico. The Federal Reserve's share of $700 million was provided under an existing reciprocal swap line, while the ESF's share of $600 million was provided under a special swap arrangement. On March 28, Mexico drew the entire amount of the facility. Subsequently, Mexico made partial repayments on two occasions in April, reducing its outstanding commitments to $541.8 million for the Federal Reserve and $464.4 million for the ESF by the end of the period.

On March 16, 1990, the U.S. Treasury and the Bank for International Settlements (acting for certain participating member banks) agreed to provide the Republic of Venezuela with short-term support of $400 million for economic adjustment efforts. The ESF's share in the facility was $104 million, of which $25.0 million was drawn on March 30. Venezuela repaid $15.3 million to the ESF on April 6 and the balance on April 30, thereby liquidating the facility.

As of the end of April, cumulative bookkeeping or valuation gains on outstanding foreign currency balances were $1,996.9 million for the Federal Reserve and $881.8 million for the ESF (the latter figure includes valuation gains on warehoused funds). These valuation gains represent the increase in 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 regularly invest their foreign currency balances in a variety of instruments that yield market-related rates of return and that have a high degree of quality and liquidity. A portion of the balances is invested in securities issued by foreign governments. As of the end of April, holdings of such securities by the Federal Reserve amounted to $6,631.3 million equivalent, and holdings by the Treasury amounted to the equivalent of $6,977.3 million valued at end-of-period exchange rates.

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U.S. MONETARY POLICY AND FINANCIAL MARKETS
Ann-Marie Meulendyke

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